Improving the spirit
– Increasing the chances of survival

Results of multiprofessional training of medical teams in Iraq and Norway

Torben Wisborg Hammerfest 2008

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The philosophers have only *interpreted* the world, in various ways. The point, however, is to *change* it.

Karl Marx. "Theses on Feuerbach" (1845), Thesis 11

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***At man, naar det i Sandhed skal lykkes En at føre et Menneske hen til et bestemt Sted, først og fremmest maa passe paa at finde ham der, hvor* han *er, og begynde der*.** Dette er Hemmeligheden i al Hjælpekunst. Enhver, der ikke kan det, han er selv i en Indbildning, naar han mener at kunne hjælpe en Anden. For i Sandhed at kunne hjælpe en Anden, maa jeg forstaae mere end han — men dog vel først og fremmest forstaae det, han forstaaer. Naar jeg ikke gjør det, saa hjælper min Mere-Forstaaen ham slet ikke. Vil jeg alligevel gjøre min Mere-Forstaaen gjældende, saa er det, fordi jeg er forfængelig eller stolt, saa jeg i Grunden istedetfor at gavne ham egentligen vil beundres af ham. Men al sand Hjælpen begynder med en Ydmygelse; Hjælperen maa først ydmyge sig under Den, han vil hjælpe, og herved forstaae, at det at hjælpe er ikke det at herske, men det at tjene, at det at hjælpe ikke er at være den Herskesygeste men den Taalmodigste, at det at hjælpe er Villighed til indtil videre at finde sig i at have Uret, og i ikke at forstaae hvad den Anden forstaaer.

Søren Kierkegaard. *Synspunktet for min Forfatter-Virksomhed (Samlede værker ved Peter P Rohde, 3. udgave, Bind 18, side 96-97)*

To be a teacher does not mean simply to affirm that such a thing is so, or to deliver a lecture, etc. No, to be a teacher in the right sense is to be a learner. Instruction begins when you, the teacher, learn from the learner, put yourself in his place so that you may understand what he understands and the way he understands it.

Danish philosopher Søren Kierkegaard. *The Point of View for My Work as an Author* (1848)

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Preface and acknowledgements

> **This thesis is dedicated to some of the real heroes of trauma care; the paramedics and first responders working in the mine fields, and the health personnel working in minor hospitals facing the infrequent victims of major trauma. They all continuously strive to improve, in the interest of their fellow villagers and citizens.**
>
> ***"Rêgey hezar mil bi hengawêk dest pêk dekat."*** **The distance of 1000 miles begins with one step.** Kurdish proverb.

This study stems from a genuine interest in trauma and trauma victims, and especially in what could be described as a just and fair access to modern trauma care for all. Based on a common sense for justice from childhood, I realized the cruel consequences of imperialism when working in a Palestinian refugee camp in the Lebanon immediately after the Israeli invasion of Beirut in 1982. Since then I understood that trauma doesn't hit by random, and that access to proper care is a political issue.

Having studied trauma and aspects of trauma care for many years two activities deserved a more thorough evaluation; the BEST (Better & Systematic Trauma Care) team training concept and the mine injury management program, really a trauma care system for the rural South. I hope that this thesis not only has taught me more on scientific thinking, but will help us understand how to bring trauma care to those standing in the back of the queue – in the wealthy European countries or in the low-income countries of the South.

Both programs are collective efforts, and the thesis reflects thoughts, discussions and work by many individuals. I hope that it will be viewed as a result of these concerted efforts, documenting that health workers do take responsibility for further development of their services, rather than just being "my thesis". I owe thanks to a number of people for support and cooperation. First of all friends and colleagues in the two programs; I met Guttorm Brattebø simultaneously with meeting my wife Ellen, and fortunately married the right one. Without Guttorm's incredible enthusiasm much of this would never have happened.

Many persons contributed to the papers in the thesis, and to the work at large. I thank all co-authors, and especially Dr Mudhafar Murad for continued cooperation and hospitality. I have learned more from you and your paramedics than I have taught in Kurdistan.

Thanks to Professor Torkjel Tveita, Department of Anaesthesiology, University Hospital of Northern Norway for being a very supportive and interested main supervisor for the work. Thanks to Professor Berit Støre Brinchmann, Unversity College of Bodø who was assisting supervisor for the qualitative studies and to PhD Hans Husum, Tromsoe Mine Victim Resource Center who was assisting supervisor until early 2006.

I also want to thank fellow researchers at home and at Hammerfest Hospital for discussions and help. Your impact was larger than you know, and I especially hope that this thesis again underlines the feasibility of producing serious research in Hammerfest and outside a university campus. My colleagues at the Department of

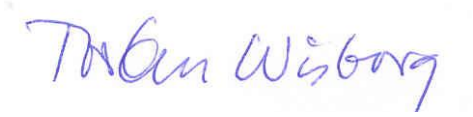
Anesthesiology and Intensive Care at Hammerfest Hospital have been extremely flexible, and they have their share of the success of these studies.

This thesis was financially supported by Medical Research in Finnmark and Northern Troms; Northern Norway Regional Health Authority and Finnmark Hospital Trust.

Although the studies have now been successfully concluded, the road to this has not been pure joy. Thanks to those who made things difficult, for stimulating me to rise to the challenge, adapt, and overcome.

During the ten years of training, I have spent in total one of the years away from home. I am sure that my children understand the obligation resting on those of us living at "first class" to share our knowledge and skills, and to contribute to a more just future for all, where we see our possibility. Still, I owe thanks for support and backup to Ellen, Esben, Anna, Emil and Sigurd, and to my parents and parents in law.

Hammerfest, 19 December 2007



Torben Wisborg

Conflict of interests

All research and activities in connection with the trauma training – be it in Norway or Iraq/Iran – has been funded by public sources. My salary was provided by either research grants from Medical Research in Finnmark and Northern Troms; Northern Norway Regional Health Authority and Finnmark Hospital Trust, or research was done during study leave from my position as consultant anesthesiologist at Hammerfest Hospital.

Project costs for the Iraqi program were funded by the Norwegian Foreign Department, and for the Norwegian trauma team training by the involved hospitals and some public grants to the BEST Foundation. I have no personal financial interests in neither the Tromsoe Mine Victim Resource Center where I served as board member until May 2006, or in the BEST Foundation in which I am still the Foundation manager, a position without any salary. Full financial reports of the BEST Foundation with audits are displayed at www.bestnet.no.

List of papers

The thesis is based on five papers, referred to in the text by their Roman numerals.

I. Torben Wisborg, Guttorm Brattebø, Johannes Brattebø, Åse Brinchmann-Hansen. Training Multiprofessional Trauma Teams in Norwegian Hospitals using Simple and Low Cost Local Simulations. Education for Health, 2006; 19: 85-95.

II. Torben Wisborg, Guttorm Brattebø, Åse Brinchmann-Hansen, Per Einar Uggen, Kari Schrøder Hansen. Effects of Nationwide Training of Multi-Professional Trauma Teams in Norwegian Hospitals. Journal of Trauma, in press.

III. Torben Wisborg, Mudhafar K Murad, Odd Edvardsen, Hans Husum. Prehospital trauma system in a low-income country: system maturation and adaptation during eight years. Journal of Trauma, in press.

IV. Torben Wisborg, Mudhafar K Murad, Odd Edvardsen, Berit Støre Brinchmann. Life or death. The social impact of paramedics and first responders in landmine-infested villages in northern Iraq. Rural and Remote Health 2008; 8: 816 (Online) available from http://www.rrh.org.au

V. Torben Wisborg, Guttorm Brattebø. Keeping the spirit high: Why trauma team training is (sometimes) implemented. Acta Anaesthesiologica Scandinavica 2008; 52: 437-41.

A number of other articles in which I have participated are part of the background to this work. They are cited ordinarily in the text and appear in the reference list.

Abbreviations and definitions

- as used in the thesis. Citations are given *in italics*.

Paramedic Care provider with or without previous medical training given a three years gradual training to care for victims of mine and penetrating injuries in northern Iraq. Initially most paramedics had no medical background, later most trainees were nurses or medical assistants.

First responder Villager trained to assist the paramedic and to work individually or with other first responders providing early medical help to victims in the mine fields or villages.

South The countries also designated low- and middle-income countries, the Third world, and developing countries. Characterized by a high trauma related mortality and a poor access to medical help and knowledge.

North The affluent western countries, with a relatively low trauma related mortality and a huge number of medical experts. Even here, the access to medical help and the distribution of trauma related mortality and morbidity is skewed with the most affluent citizens having best access.

VAS Visual Analogue Scale, a line anchored with verbal description of two extremes in which a respondent can indicate his assessment of e.g. pain, own knowledge or other immeasurable quantities by putting a tick mark on the line.

ISS Injury Severity Score. An internationally agreed system for characterization of the anatomical severity of an injury (as opposed to the physiological impact of an injury).

RTS Revised Trauma Score. The physiological parallel to the ISS, assessing the impact of injuries on a person's physiology based on respiratory rate, blood pressure and consciousness.

PSS Physiological Severity Score. A substitute measure of physiological impact on the victim of an injury as used in the mine injury management program. It consists of weighted values of respiratory rate, systolic blood pressure and an assessment of consciousness.

TRISS Trauma Score Injury Severity Score. A combination of the ISS and RTS to predict mortality based on both the anatomical and physiological injury also taking into account the age and mechanism of injury.

ROC Receiver Operating Characteristic curves. A curve which illustrates the possibility of a given test to predict a certain outcome.

IV intravenous, injection of medicine and fluid directly into the veins of a patient.

Norsk sammendrag

Avhandlingen er basert på min deltakelse i to programmer: *Trauma Care Foundations* mineskadeprogram i Kurdistan, Nord-Irak, og *Stiftelsen BEST: Bedre & systematisk traumebehandlings* treningsprogram for traumeteam på norske sykehus, begge i perioden 1996 til 2006-7. I begge programmene var formålet å gi helsepersonell praktisk og teoretisk opplæring for å forbedre behandlingen av pasienter med skader og akutt sykdom.

Formålet med avhandlingen var å:
1. Beskrive og evaluere effekten av traumeteamtrening i Norge, og oppsummere helsepersonellets erfaringer fra implementeringen.
2. Beskrive og evaluere hvordan det prehospitale traumesystem i Nord-Irak modnet og tilpasset seg, og betydningen av systemet for landsbyboerne i mineområdene.

Avhandlingen består av fem artikler. I den første beskrives treningsprogrammet for traumeteam som en løsning på teammedlemmenes opplevde mangel på teamferdigheter (kommunikasjon, ledelse og samarbeid). I den andre artikkelen evalueres effekten av treningen på opplevd behandlingskvalitet under resuscitering av multitraumatiserte, individuell viten og fortrolighet. Vi evaluerte også muligheten for å gjennomføre teamtrening. Det tredje studien er en oppfølging av mineskadebehandlere og førstehjelpere i Nord-Irak med vekt på hvordan det prehospitale system modnet og tilpasset seg endrede behov. Betydningen traumesystemet hadde for landsbyboerne i mineområdene ble undersøkt i artikkel fire. Den femte artikkelen undersøkte hva som avgjør om norsk helsepersonell lykkes med implementering av teamtrening på sine sykehus.

Vi fant at korte treningskurser er effektive hvis de er målrettet og planlegges nøye etter deltakernes behov. Vi fant også at kunnskapen fortsetter å gro i organisasjonene og kan videreføres, men dette avhenger av at det finnes entusiaster som driver implementeringen, og i hvilken grad de får støtte. I begge områder tok helsepersonellet selv ansvar for å tilpasse viten og kunnskaper til nye pasientgrupper. Behandlingskvaliteten ser ut til å holde seg når kunnskapene blir brukt på nye grupper. I Nord-Irak førte modningen av traumesystemet til at tidsintervallet fra skade til første medisinske hjelp ble redusert og at den fysiologiske effekten av behandlingen økte gjennom studieperioden. I områder med sjeldne, krevende traumepasienter ser det ut til å være nyttig å dele erfaringer mellom helsepersonell ved nettverksmøter eller månedlige møter. Vi fant at helsepersonell tar ansvar for å forbedre sine tjenester, og at de er i stand til å overføre sine er faringer til andre områder i pasientbehandling.

Studiene viser at helsepersonellet er ansvarlige, og bruker hva de opplever som nyttige læringsmetoder dersom de får en viss støtte. Denne typen helsepersonell har en sterk endrings- og utviklingskraft. De beskrevne treningsmetodene ser ut til å ha stort potensial for spredning til beslektede områder. Medisinsk opplæring i fattige land er en politisk handling. Opplæringen har ikke bare konsekvenser for de skadde, mineskadebehandlere, og førstehjelpere, men også for samfunnet, og betydningen rekker utover det medisinske. Også i Norge er beslutningen om hvor man som utdannet med spesialkompetanse skal bruke sin energi et politisk spørsmål. Personskade rammer ikke tilfeldig. Det bør treningen ikke heller.

Summary

This work is a synthesis of experiences gained during ten years of helping healthcare providers improve their service to victims of injury and acute disease. This work is based on my participation in two programs: The *Trauma Care Foundation's* Mine Injury Management Program in Kurdistan, northern Iraq, and the *BEST Foundation: Better & Systematic Trauma Care's* trauma team training program in Norwegian hospitals. My experience with both programs took place from 1996 to 2006-7.

The purpose of the thesis was to:
1. Describe and assess the effects of trauma team training in Norway, and summarize health personnel's experience from implementation, and
2. Describe and assess the adaptation and maturation of a pre-hospital trauma care system in northern Iraq, and determine the impact of this system on villagers in mine-affected areas.

I have summarized these experiences in order to enable health workers with a need for training and system improvement to draw upon our experiences.

The thesis consists of five papers. In the first paper, the team training method from Norway is described as a solution to the team members' perceived lack of team skills (communication, leadership, and cooperation). In the second paper, the effects of team training are described in terms of perceived quality of care during multi-trauma resuscitation and individual knowledge and confidence. The feasibility of team training was also assessed. The third study is a follow-up of a program that trained paramedics and first responders in Kurdistan in northern Iraq, with an evaluation of the adaptation and maturation of the trauma system. The fourth study examined the impact of the development of chains of paramedics and first responders on Kurdish villages. Finally, the fifth paper examined how Norwegian healthcare personnel manage to maintain team training in their institutions.

In these projects, we found that short-term educational activities are effective if they are targeted carefully, which indicates that they should be planned and adapted with cooperation between the local healthcare workers and the external teachers. We found that it is possible to transfer knowledge that continues to live and grow in some organizations, but that this is dependent on support to enthusiasts in the organizations in question. In both locations, the healthcare providers adapted their new knowledge and skills to different patient groups and different medical situations. Treatment quality seemed to remain at a high level. System maturation in northern Iraq resulted in a reduced time interval between injury and the first medical response, and improved physiological function after transportation. In areas where demanding medical challenges, such as severe trauma, occur infrequently, it seems useful to share experiences among health workers. In both settings, we found that health workers take responsibility for further development of their services, and that they are able and willing to apply their experience to other areas of patient care.

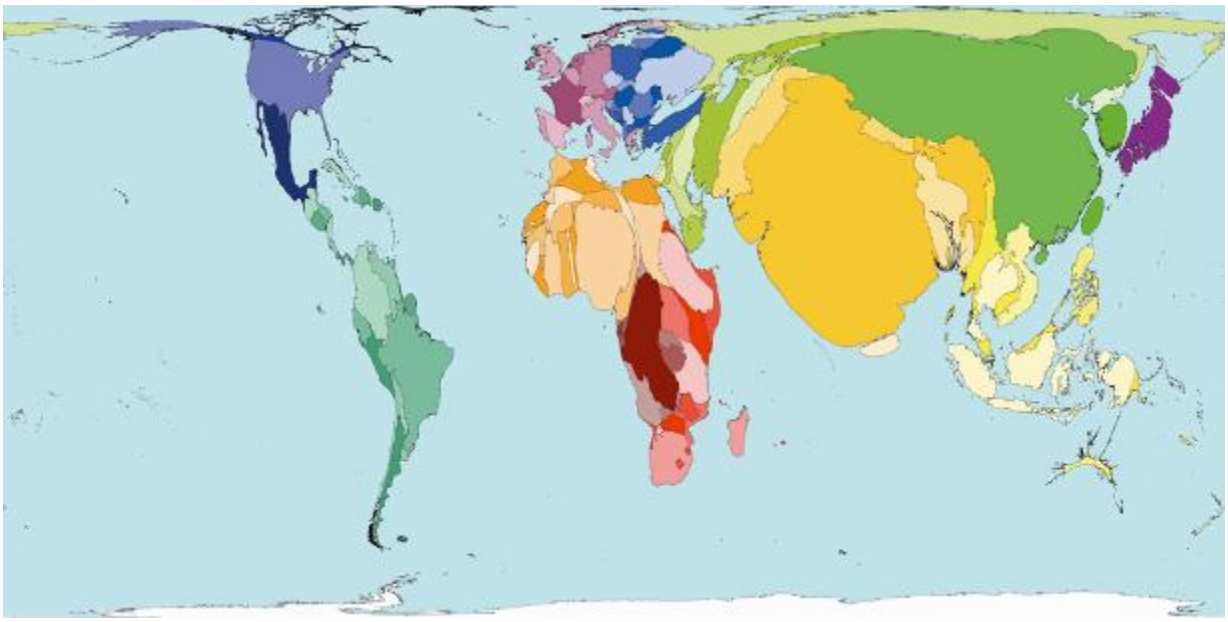
Healthcare providers will act responsibly and employ what they believe are useful training methods provided they receive some sort of support. Responsible health personnel can be a powerful force of change. The training methods described here have great potential for application in similar areas. Medical training in low-income countries is a political act that has implications for the trainees and the societies in which they live that reach beyond the medical arena. In Norway, the decision on where to devote ones energy is also a political matter. However, trauma does not occur indiscriminately, neither should trauma training.

Introduction

“Good trauma care doesn’t happen by accident (1)”

Every day, 16,000 men, women, and children are killed by injuries, and thousands more are permanently injured worldwide. It is estimated that for every death there are dozens of hospital admissions, hundreds of emergency department visits, and thousands of doctors’ appointments, in the countries where such facilities exists. Injuries are responsible for six of the 15 leading causes of death in 15 to 44 year-olds worldwide (2). Globally, 69 % of the trauma related deaths in 2002 were caused by unintentional injury, while 31% were caused by intentional injury (3). Without new or improved interventions, road traffic injuries will be the third leading cause of death worldwide by the year 2020 (4).

This burden of injury is not uniquely a Western phenomenon. Almost 90% of deaths due to injuries occur in low- and middle-income countries (5). Injuries from road traffic accidents, interpersonal violence, and war are among the leading causes of death in low- and middle-income countries (2). The distribution of resources is skewed in these countries, with most physicians and medical facilities located in major cities (6). The rate of prehospital death is highest in the countries with least resources (Figure 1) (7).



1. Where is the problem? Territories are sized in proportion to the absolute number of people who died from injuries in 2002. (3)

Interestingly, there are also differences in Norway, with remote areas being relatively harder hit from violent death than more urban areas (8). In Norway, injuries are the leading causes of death before the age of 35 (9). Deaths due to unintentional violence outnumber the few intentional deaths in Norway. In Europe, Norway is at the high end of statistics concerning mortality and morbidity due to injury (10). Despite large differences between rich Western countries and the countries of the South (see explanation in the Abbreviations section), the poor and less educated are universally most affected and the least served by trained medical personnel.

Traditionally, injuries have been viewed as “accidents” or random occurrences, and therefore are more or less unavoidable. This is one reason for the lack of research regarding this major cause of deaths, especially when compared to cardiovascular diseases and cancer.

A public health approach to the trauma epidemic would be to describe the problem by magnitude and characteristics. One would then assess the factors that increase the risk of injury and death in order to determine which factors could be modified. The third step would be to evaluate the possibility to intervene against these factors in small scale pilot studies, and the fourth step would be to implement the most promising interventions (2).

One rather mechanistic description of possible approaches to reduce injury on the personal level is Haddon's matrix (Figure 2) (11). This system describes the interaction between a noxious substance or energy and the victim in three time phases: pre-, per-, and post-exposure, and the causal and contributing factors at the level of human, vehicle, physical environment, and social and cultural environment.

Haddon's Matrix Explained

Phase/Factor	Host (Human)	Agent (Vehicle)	Physical Environment	Social/Cultural Environment
Pre-Event The build-up of uncontrolled energy is released.	**Will an event (crash) with the potential to cause injury occur?** Interventions in the pre-event phase are designed to reduce the number of events with the potential to cause injury.			
Per-Event Energy is transferred.	**Will an injury occur?** Interventions in the event phase do not stop the event, but reduce the number of injuries that occur as a result.			
Post-Event Factors about the state of the person, agent, or environment affect what the energy does.	**What will the outcome of the injury be (e.g. how severe will it be)?** Interventions in the post-event phase do not stop the event or the injury from occurring, but reduce the severity of injury and optimize the outcome for the injured party. Generally, interventions that affect the post-event phase would need to be accomplished prior to an injury event occurring.			

Example of a Crash Involving Older Driver

Phase/ Factor	Host (Human)	Agent (Vehicle)	Physical Environment	Social/Cultural Environment
Pre-Event	**Examples of modifiable factors:**			
	Vision impairment	Adjustable pedals that are easier to push; tire pressure	Night, rain	Society does not support driving evaluations.
Per-Event	**Examples of modifiable factors:**			
	Seatbelt use Distance from airbag	Lack of airbag	No guard rail separating traffic	Seatbelt law; acceptability of wearing seatbelts
Post-Event	**Examples of modifiable factors:**			
	Physical condition of individual	Integrity of fuel system	Response of 911 and EMS	EMS trained in the special needs of injured older adults

2. Haddon's matrix explained by an example. (12)

As healthcare providers, we are involved mainly at the post-event level. A number of interventions have been implemented at this level in Western countries. The majority have been in specialized health care, although emergency dispatch systems, ambulances, and advanced pre-hospital care have been improved as well.

Mistakes happens during health care delivery, especially during fast-paced and high-pressure situations like trauma care; and, a number of trauma-related deaths are preventable (13). Several studies have shown that the establishment of regional trauma systems has reduced trauma-related mortality (14-24). Many countries have aimed for regionalization when feasible from a geographic, political, and logistic point of view. So far, this has not been considered an option in Norway due to the long distances between communities and the harsh climate. Moreover, with a limited population, developing and maintaining trauma care skills can be challenging. The subtitle of this section – Good trauma care doesn't happen by accident - suggest the dilemma:

> *Apart from war zones and those civilian environments that resemble war zones, significant trauma is a relatively infrequent event. Unless the delivery of care is concentrated on relatively few hospitals, most trauma care providers see far too little trauma to learn and maintain their skills in an opportunistic way (1).*

Contrarily, in low- and middle-income countries, trauma is an epidemic out of control, and is increasing. Most injury-related deaths occur in these countries, and are related to traffic injuries as well as to war and war-related injuries. In this thesis, landmine injury was the starting point to trauma care in the South. Landmines are indiscriminate weapons that have been employed in many countries around the world (25-27). It is estimated that 110 million live mines are distributed throughout at least 70 different countries (28). These mines kill and maim, especially in poor and rural populations, and the death rate in the prehospital phase following injury is estimated to be 30-40% (29, 30). Despite the ban on production, stockpiling, and use of mines since 1999, existing mines will remain active for many years to come, and the weapons industry is developing new weapons to replace them. For example, the United Nations estimates that Israel deployed *hundreds of thousands* of cluster bomblets during the invasion of the Lebanon in the summer of 2006 (31). The need for health personnel and first responders to handle these injuries is obvious, especially in the South. Most victims of land mine injury are peasants, nomads, and children living in villages, the rural poor. Villagers collecting firewood and food, herding cattle, or tilling their fields are particularly at risk. Similarly, when refugees and displaced persons return home they are at increased risk because they are now less familiar with their home environment. Those at highest risk for the indirect health consequences of landmines (that is, waterborne diseases, malnutrition, childhood infections, etc.) are again mostly the disadvantaged poor, especially children.

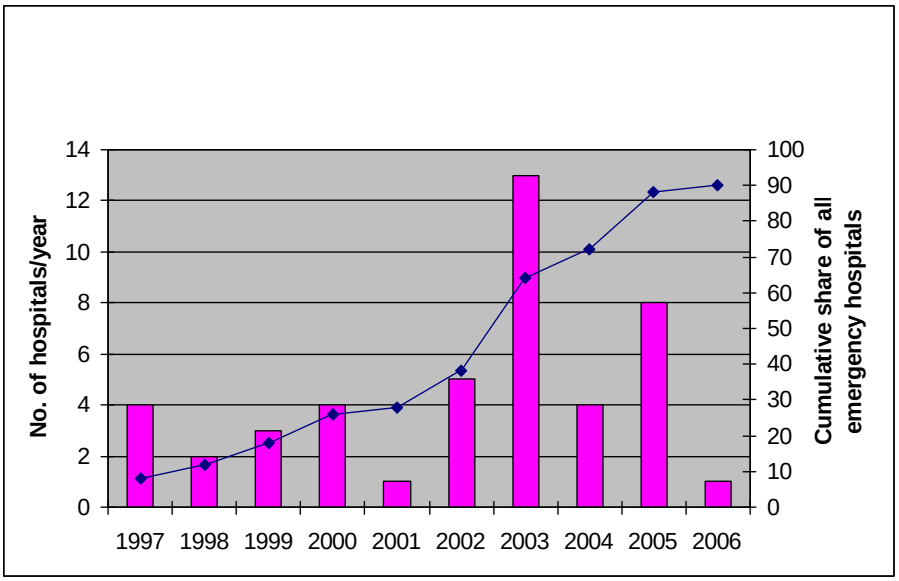
One might assume that training methods aimed at trauma teams in Western hospitals and those aimed at lay first responders in the South would be incompatible. However, their similarities are numerous and it is possible to draw upon experience gained in one setting and adapt to another – and vice versa. These two different settings form the background to this thesis.

Historical background for the studies

Trauma team training in Norway

In 1996, the trauma room in Hammerfest Hospital, a small community hospital in Northern Norway, was reorganized. The trauma organization was also restructured at this time and we needed to implement training procedures. The training concept was developed in cooperation with colleagues from another community hospital and a tertiary university hospital from other parts of Norway, and a medical educationalist from the Norwegian Medical Association. The course needed to be arranged locally, so that training could be repeated without bringing in external instructors. The first training was arranged in Hammerfest in April 1997, followed shortly thereafter in Voss, Odda, and Stord, three community hospitals in western Norway. Training was also arranged at the University Hospital of Bergen, the third partner in addition to Hammerfest and Voss.

This training method spread gradually by word-of-mouth to the majority of Norway's trauma hospitals (Figure 3). Enthusiasts at each hospital arranged the training locally; the instructors were anesthesiologists, surgeons, an intensive care nurse, a nurse anesthetist and a medical educationalist. The instructors were from different level hospitals. As the need for a coordinating organization appeared, we established a public foundation, the BEST Foundation: Better & Systematic Trauma Care (Appendix 1). Despite the institutionalization, BEST has remained a grass-roots organization with only one part-time coordinator employed.



3. Development of trauma team training in Norwegian hospitals. Bars represent the number of hospitals trained per year and the line represents the cumulative share of all emergency hospitals trained.

Paramedic and first responder training in northern Iraq

Norwegian health personnel have a long tradition of solidarity work in the South, especially with the Palestinians (32, 33). Hans Husum spent several years in Afghanistan during the Soviet occupation (34). This experience and his commitment to serving the oppressed resulted in requests for training lay-persons to treat victims of mine injuries left by the popular resistance coalition in Burma. Later, Hans Husum and Mads Gilbert used this experience to establish the Village University in Cambodia, as described in Husum's thesis (35), and the Trauma Care Foundation (Appendix 3). The teaching concept was to share advanced medical knowledge and procedures with practically experienced, but not necessarily scholarly educated, first responders in the villages with highest incidence of mine-related injuries. This experience was used when adapting the Village University training concept to Kurdistan.

The Kurds are an ethnic group who consider themselves indigenous to the region often referred to as Kurdistan, an area that includes adjacent parts of Iran, Iraq, Syria, and Turkey. With an estimated population of about 35 million people, the Kurds make up the largest ethnic group in the world without a nation-state of their own. Throughout the twentieth century, Turkey, Iran, Iraq, and Syria have suppressed many Kurdish uprisings (36). In preparation for the Iran-Iraq war (1980-1988), and during the simultaneous "Anfal" genocide campaign in 1988 (36), the Iraqi army forced all inhabitants of the Kurdish villages in northern Iraq to move to "collective towns", concentration camp-like villages. After the "uprising" against Saddam Hussein's regimen in 1991 at the end of the first Gulf war, poverty, origin and roots forced the collective town inhabitants to return to their homes, unaware of the locations of live landmines within their villages. In order to survive, impoverished villagers would collect firewood, herd livestock, and sell unexploded ordnances. In the villages that we trained, most families had experienced either death or disability due to landmine injuries.

4. Kurdish village in northern Iraq.

In 1995, a Scandinavian project employee and village elders carefully selected candidates for paramedic training. An emphasis was placed on selecting committed persons with practical experience in handling landmine injuries. The training was done as intensive courses of three weeks and arranged in different villages. After a three-weeks training period in spring 1996, the paramedics treated patients in their village for the next 11 months, under supervision of a local physician. Each paramedic received a backpack stocked with the necessary equipment, according to their skills and certifications. The local physician replaced needed supplies and equipment when the paramedic reported the patient using a specially developed form, the injury chart (Appendix 1).

After approximately one year of practice, the paramedics were given a new three-week training course during the spring of 1997. This course was developed based on the victims treated during the previous period, adding new skills and knowledge as necessary. After the second period of practice, a third training course was conducted during the fall of 1998. This course was delayed because some of the teachers experienced difficulties crossing the border into northern Iraq. After this third course, the paramedics were finally certified in a joint ceremony that included the local health authorities and the teachers. From the first training course on, the paramedics were encouraged to train fellow villagers as first responders and were encouraged to establish local chains of communication to the paramedics in case of landmine or other injuries.

After the first group of paramedics was certified, the local physician, Dr. Mudhafar K. Murad, established a local project organization, the Trauma Care Foundation Iraq. Dr. Murad and some of the most experienced paramedics from the first training group continued to train new paramedics in the areas most affected by mines. By 2005, 88 paramedics had been trained.

During the training, Hans Husum, Mads Gilbert, and I developed a textbook for self-study and further local training (37). This book has been translated into Kurdish, Khmer, Arabic, Burmese, Farsi, Portuguese, Vietnamese, and Spanish.

Trauma does not hit indiscriminately

This thesis is a collection of scientific studies, the theme of which reflects the personal and political beliefs of the author.

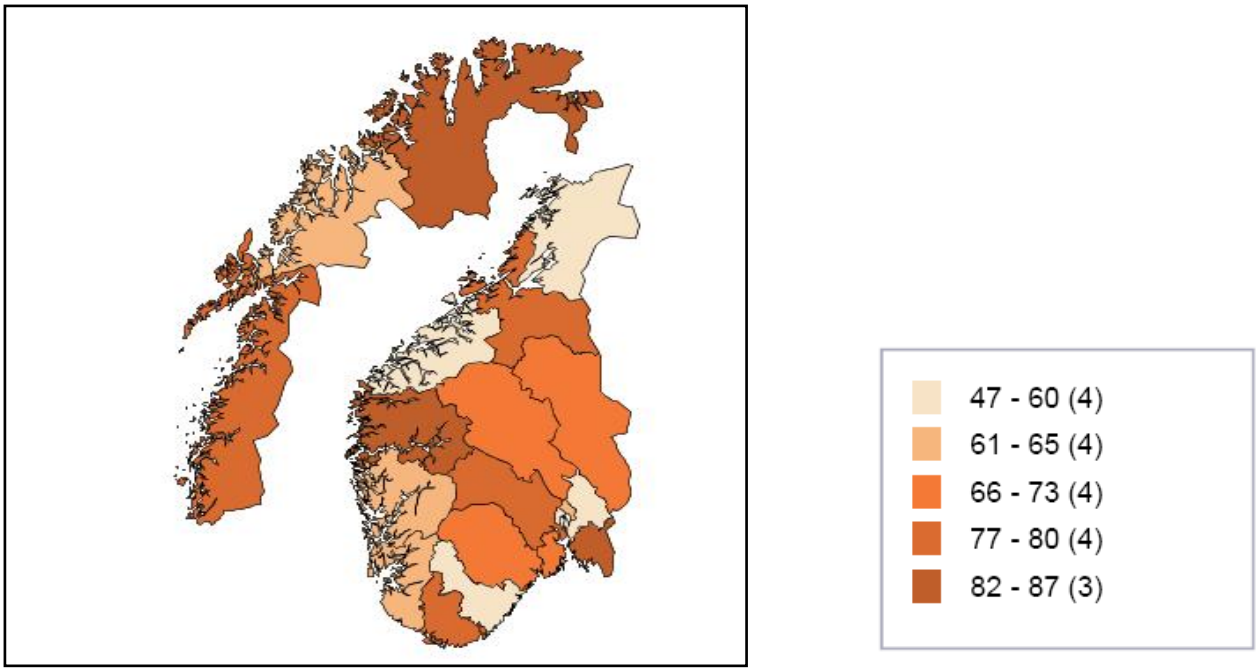
The risk of injury, intentional or unintentional, is not equal for all persons. The life expectancy of people who live in northern Iraq is shorter that of people who live in Norway. Currently, life in Iraq is more dangerous than ever, about 100 killings occur daily (August 2007) (38). A villager in northern Iraq explains it like this:

> *The war stopped, but killing and maiming continues constantly. If an animal detonates a mine in the mountains, the people of the village will immediately try to reach the place, in case it should be their children. Thus, we are living in an unstable situation* (Paper IV).

In Sweden, a number of studies have investigated the risk of traffic accidents, and found that the risk depends on social group, education, and area of living, among other factors (39, 40). A short citation illustrates this:

> *In conclusion, the excess risk of young drivers from lower socioeconomic groups is consistent over crash severity, but is more pronounced as severity increases and for certain crash circumstances* (39).

Finnmark, where I am living and working, is the largest, most sparsely inhabited and most distant county in Norway. It has a high rate of death after injury, as illustrated in Figure 5: 82-87 violent deaths per 100,000 inhabitants in 2004 (41). However, if one calculates only the reported daily war-related killings in Iraq, omitting all unknown deaths and all mine- and traffic-related injuries, the war related death rate for Iraq exceeds presently 135 per 100,000 inhabitants as per October 2007.



5. Mortality in Norway due to violent causes per 100,000 inhabitants for year 2004 (9).

Given the dissimilarities of Norway and northern Iraq, we wondered whether it would it be possible to improve the chances for survival by training the health personnel in these different areas using similar methods? Moreover, would such training enable the healthcare providers themselves to take responsibility for the health care they provided to their area? Does training in northern Iraq have similarities to training in Norway in a way that one training method can learn from each other, and vice versa? These were some of the questions I wanted to explore.

Aims

The aims of this thesis are to:

1. Describe and assess the effects of trauma team training in Norway, and summarize health personnel's experience from implementation.
2. Describe and assess adaptation and maturation of a prehospital trauma care system in northern Iraq, and the impact of this system on villagers in landmine-affected areas.

I intend to summarize the experiences in a fashion that would be useful for others who need training, especially with a team focus, and where training has to be done locally.

Methodological considerations

The methods used for assessing outcome are thoroughly described in each study. This chapter details and discusses some critical aspects.

When assessing long-term effects of training, one would expect that several confounding factors could interfere with the results. In quantitative research, investigators attempt to keep all factors constant while altering only the variable in question. Except for some types of laboratory experiments, this is impossible. Therefore we had to investigate and describe the effects with methods respecting the simultaneous development in the societies we were working in. Some of the research questions were most appropriately assessed using qualitative methods. Each of the two areas of training had its own characteristics and peculiarities, and all trainers were different (except for the author). Although a synthesis of the experiences is presented later in this summary, initially the studies are separated according to geographic area and the methods applied.

Papers I and II

The team training studies (Papers I and II) assess the effects of a one-day training course in Norwegian hospitals. The ultimate goal of this training was to improve survival and reduce morbidity for trauma patients treated by course participants during their ordinary, daily work, or by their colleagues, provided that the training had a general effect at the hospital. Because we trained personnel selected by the particular hospitals and, generally, only two teams from each hospital were trained, the chance that the particular constellation of a training team of 8 to 12 participants would meet again during an actual trauma case was small. This caused us to wonder how we would assess the effect of team training on mortality? Less than 2,600 inhabitants die from injuries annually in Norway, 870 of whom are elderly over the age of 74 who die from accidents, mainly falls (42). These victims are treated at 50 different hospitals. The physiological states of the patients at admission and their specific injuries vary, likewise do the patients' chances of survival given the same treatment. In addition, there are no central and few local trauma registries. Therefore, it was not possible to detect a statistically significant reduction in mortality or morbidity due to this intervention. In addition, the training was performed over the course of eight years (for the results reported in Paper II), and provider skill, available technology, and injury distribution evolved over time. Therefore, we had to develop alternative outcome measures.

When considering educational research, impact assessment has often followed a classification scheme originally suggested by Kirkpatrick in 1967 (43) and modified by Barr (44). Based on this scheme, one would assess the learner's reaction to the intervention, determine whether learning had taken place as defined by a change in knowledge or skills, observe for behavioral change after the learning, and finally, as the highest stage, determine whether one observes organizational or practice change leading to the desired outcome for patients. It seems that most evaluations presently occur at the lowest level (44-46).

We decided to ask participants' to provide a self-evaluation of their outcome, and supplement it with before-and-after self-reported assessments of knowledge and confidence. Because this project had a supportive format, and was not intended to evaluate the hospitals, we did not do formal pre- and post-testing as has been done in several of the international life-support courses, such as the Advanced Trauma Life Support (ATLS) course (47). These tests are intended to test factual knowledge in a multiple-choice format. In addition, we asked about the respondents' perception of quality during the last real trauma resuscitation they had participated in at their hospital. This question was phrased (my translation from Norwegian to English, TW): *Considering last time you participated in resuscitation and stabilization of one or more multi-traumatized patients, to what extent do you consider that the treatment went effectively and*

planned? This question was answered using a 10-cm visual analogue scale (VAS) anchored with the words: *little degree* and *high degree*.

To assess evolution over time, we distributed a third questionnaire to the hospitals, six months after the course. This questionnaire contained questions similar to those contained in the previous questionnaires, but could not be related to the previous questionnaires on an individual basis. We asked the hospitals to have all trauma team members answer this third questionnaire, independent of whether the respondent had actually participated in the training course.

Therefore, the outcome measures for the team training were 1) changes in self-reported knowledge and confidence, and 2) assessments of the course's impact on the hospital performance, and 3) self-reported assessment of quality of care during the respondent's last personal trauma experience. In Paper I, we also asked the course participants to report the major reasons for problems during trauma resuscitation, phrased (my translation from Norwegian to English, TW): *If you remember any situation during the resuscitation and stabilization of one or more multi-traumatized patients in which problems arose, what was it that did not work properly?* The question had tick-boxes, and respondents could choose more than one: *Leadership, prioritizing, communication, documentation, and others – with the option to write in free text*. Notably, the alternative "lack of knowledge or skills" was not available; initially, it was simply forgotten. Afterwards, when we started analyzing the results, we did not want to confound results by changing alternatives. However, this alternative did not appear as an explanation in the free text field.

Visual analogue scales

The respondents assessed their own knowledge, confidence, and the quality of care, using VAS. To convert qualitative, personal perceptions of confidence and knowledge to statistically manageable measures was difficult. Several solutions have been proposed, each with its own benefits and disadvantages. Although VAS offers the respondent the freedom to choose what he/she considers to be the most appropriate response to a question, studies have shown advantages of the Likert scale, a usually five-point ordinal scale first described in 1932, or other more categorized scales (48, 49).

The use of parametric statistics to compare VAS and Likert scale results has been a matter of debate; however, most of this debate began after we started our recordings (50, 51). Nevertheless, this manner of comparison appears to be an established practice in respected journals (52-55). In addition, there were enough observations in our study that even marginal differences could reach statistical significance, increasing the need for interpretation of results and use of common sense (56).

Paper III

The follow-up study of the prehospital landmine victim management program from northern Iraq was aimed at assessing the systems' maturation and adaptation to a changing panorama of injuries. In addition to measuring the retention of paramedics and the changing distribution of diagnoses, we measured time intervals from injury to first treatment and to hospital admission. We assessed the physiological impact of the injuries before and after prehospital treatment, as well as the mortality. The two last indicators will be discussed in detail here.

There is a difference between anatomical injury and physiological impact of injury. For example, if a person accidentally amputates a finger with an axe, there is a defined anatomical injury. If bleeding is stopped immediately by manual compression, the physiology of the patient will not be affected (that is, no changes in blood pressure, respiratory rate, or mental status would be expected to occur). On the other hand, if the victim loses consciousness after the injury, bleeding can continue. If the victim bleeds two liters before bleeding is stopped the same

anatomical injury now results in a grossly distorted physiological status, and thus a quite different starting point for the medical treatment.

Anatomical injury scoring

Internationally, all somatic injuries are catalogued anatomically and assigned an Injury Severity Score (ISS). This tool was originally developed for the study of automobile accidents, but has gained widespread acceptance and has been modified to cover most injury types (57). The intention is to enable comparisons of injuries and treatment outcomes, and to allow grading of anatomical injury severity. For example, if a patient arrives in hospital with a systolic blood pressure of 70 mm Hg, the chances of survival are better if the injury was a finger amputation than a bullet injury of the liver and kidney. By definition, all injuries are assigned a value between 1 and 6, and the three most severe injuries in different organ systems constitute the basis for calculating the ISS. There are a number of unresolved problems with the use of this score. The ISS does not take into account the possibility of several severe injuries in one organ system, which has lead to the suggested alternative New ISS (NISS) (58, 59). However, the ISS remains the internationally accepted method for characterizing anatomical injury severity. In this paper, the ISS was determined by Dr. Mudhafar, the head of the organization in Sulemaniyah, northern Iraq. Initially, both Hans Husum and I spent time in Sulemaniyah with Dr. Mudhafar on different occasions to determine that we agreed on the classification of injuries. In cases of doubt, the lowest and most conservative grading was consistently chosen.

Physiological injury scoring

Physiological scoring has been performed using a number of different scales. The Trauma Score was introduced in 1981, and consists of systolic respiratory rate, respiratory effort, systolic blood pressure, capillary refill time, and Glasgow Coma Scale (60). Glasgow Coma Scale assesses consciousness based on verbal response, eye opening, and motor response (61). In 1989, the Trauma Score was modified and simplified. Measures that were difficult to define and assess in the prehospital setting were eliminated. The Revised Trauma Score (RTS) consists of systolic blood pressure, respiratory rate, and Glasgow Coma Scale (62). This is an internationally accepted prehospital and hospital assessment of the physiological impact of injury. Physiological and anatomical injury characterization has been combined in a mathematical predictor of survival, the Trauma and Injury Severity Score (TRISS) (63). This is based on emergency department RTS, discharge diagnoses, ISS, age, and mechanism of injury (blunt vs. penetrating), and calculates probability of survival based on data obtained from a large American database, the Major Trauma Outcome Study, which consisted of 81,000 patients collected before 1987 (64). In this calculation, the different components of the RTS are weighted based on regression analysis using the patient database. Each component of the RTS is assigned a coded value.

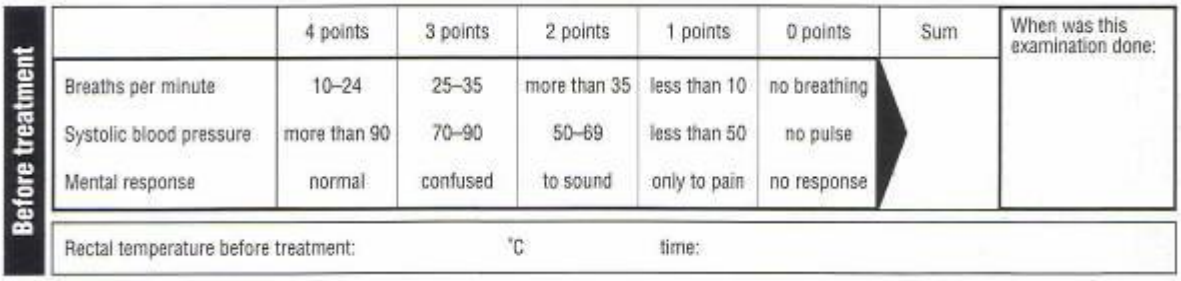
Revised Trauma Score Variables

Glasgow Coma Scale	Systolic Blood Pressure (mm Hg)	Respiratory Rate (min^{-1})	Coded value
13-15	>89	10-29	4
9-12	76-89	>29	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
3	0	0	0

The RTS is calculated as RTS = 0.9368 x (GCSc) + 0.7326 x (SBPc) + 0.2908 x (RRc), where GCS is the Glasgow Coma Scale score, SBP is the systolic blood pressure, and RR is the respiratory rate. The RTS thus assumes a value between 0 and 7.8408.

The Glasgow Coma Scale is difficult to remember and use in the prehospital setting. It has been argued that one could use the motor response alone as an indicator of consciousness (65). From the beginning of the mine injury management studies we decided to use a simplified five-

level scale for assessing consciousness. This Physiological Severity Score (PSS) used for data collection is presented in Figure 6 (see also Appendix 1, Injury Chart).



Before treatment	4 points	3 points	2 points	1 points	0 points	Sum	When was this examination done:
Breaths per minute	10–24	25–35	more than 35	less than 10	no breathing		
Systolic blood pressure	more than 90	70–90	50–69	less than 50	no pulse		
Mental response	normal	confused	to sound	only to pain	no response		
Rectal temperature before treatment:		°C		time:			

6. Physiological Severity Score (PSS), individual components.

There are differences between the RTS and the PSS, not only in the consciousness evaluation, where the PSS uses a simplified scale, but also in cut-off values in systolic blood pressure and respiratory rate. We realized this in 2005 and decided to continue using the PSS in order to avoid invalidating comparisons in the material from 1996 until now. It is noteworthy that as the systolic blood pressure and respiratory rate are weighted by factors less than 1.0, these differences have a relatively small impact. In a study of mine injuries from Cambodia and northern Iraq conducted from 1997-2001 (n = 737), we assessed respiratory rate as an indicator of risk of death and found that the value coded according to the PSS had a high accuracy in predicting death, which we interpreted as an indication of the test's robustness despite the differences in cut-off values as compared to the RTS (66).

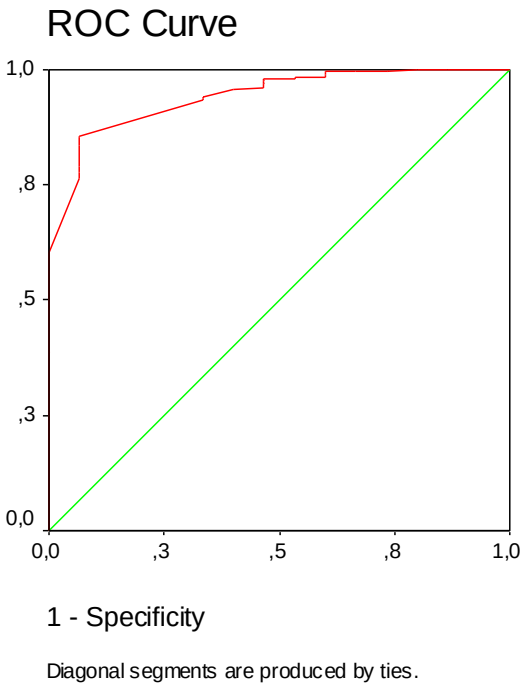
During the study period, victims of mine injuries and other penetrating injuries in the Sulemaniyah governorate were admitted to a surgical hospital for war injuries run by an Italian relief organization, the Emergency organization (67, 68). By agreement between Emergency and the local Kurdish medical authorities, all such patients were admitted to this hospital, while all other patients were admitted to the Kurdish hospitals, especially the Sulemaniyah Teaching Hospital connected with the medical school of the University of Sulemaniyah. The system for keeping medical records allowed a complete follow-up of patients admitted to the Emergency hospital, while it was impossible to follow up on victims admitted to other hospitals. Therefore, there is no ISS scoring and hospital physiological parameters data on victims admitted to other hospitals during the study period.

Our use of repeated physiological assessments as outcome measures makes it necessary to comment on the reliability of the measurements. We trained the paramedics on blood pressure measurement, counting of respiratory rate, and mental status assessment during the first training courses. Still, the crowded and dangerous scene surrounding a mine injury is not the place for prolonged assessments. Several studies have investigated the reliability of assessing physiological parameters such as blood pressure measurement, and have shown that these measures can be unreliable (69), especially in the ambulance setting (70) and for hypotensive patients (71). In addition, one could speculate that the paramedics had an interest in reporting improved physiology in order to prove the efficiency of their interventions (and the program itself). The design of our study, with assessments being done both at the primary encounter in field, immediately before hospital admission, and at by the hospital staff at hospital admission allowed us to compare these findings using the PSS scale, as was done in Paper III.

Physiological injury scoring and the risk of dying

If PSS is a useful indicator of injury severity, there should be a relationship between a low PSS and a high risk of death, and vice versa. This relationship was assessed using Receiver Operating Characteristic Curves (ROC; Figure 7). With this test, one plots the true positive (sensitivity) rate versus the true negative rate (1 – specificity) and receives a graphical estimate of the validity of the test as the area under the curve (AUC) (72, 73). If the coordinates of the curve are calculated, one can choose the most efficient cut-off value with respect to the disease or injury, and the consequences of the two alternatives in question. This will be in the upper left

corner of the graph, where the sensitivity is highest and the true negative rate is lowest. The diagonal line from the lower left corner to the upper right indicates the line of no benefit, that is, the test outcome if all coordinates were obtained by flipping a coin. Few authoritative references have stated the AUC that is sufficient to consider the test reasonably strong, and this will vary from situation to situation; but an area under the ROC curve of 0.8 is generally accepted to represent a reasonably powerful model. An area of 0.95 is considered to indicate a high level of accuracy (74, 75).



7. Example of ROC curve with PSS upon first contact with victim as test variable and death as the outcome. AUC = 0.942 (95% CI, 0.899-0.985). Penetrating injury, northern Iraq 1997-2004.

Patient diagnoses

Patient diagnoses were made by Dr. Mudhafar based on the injury charts. For the patients not admitted to the Emergency hospital or treated in local clinics, the diagnostic accuracy was based on the paramedics' reports. Some paramedics, mostly of the first group but a few from the later groups, did not have a formal medical background, putting the accuracy of the diagnoses in question. In Paper III, we distinguished between penetrating and blunt injury and other medical emergencies only. For analyses on that level, the possibility of inaccuracy in the diagnoses should not be significant.

Mortality as an outcome measure

Mortality after mine injuries has traditionally been reported as the total mortality, including victims fond dead in the minefields (29, 76). We followed this convention in our study in Iran (30). Using mortality as an outcome measure can be problematic. Because on-site mortality is high, 75% in one study (76) and one-third in another (29), observed reductions in total mortality can reflect either a reduced number of mine injuries in total, or a treatment effect. Therefore, it is also necessary to examine the mortality of patients after they have been found alive in order to assess any program effects on mortality. In the first study using combined material from northern Iraq and Cambodia, the total mortality was 158/1,061 or 14.9% (77). The on-site mortality was 123/158, while 14/158 died during transportation and 21/158 died after hospital admission. In total, 35 of the 1,061 victims (3.3%) died during or after transportation, but because the deceased victims were untreatable, the true proportion of victims dying during

treatment was 35/ (1,061-123) = 35/938, or 3.7%. Assuming that all fatalities that occurred after the victim was found alive were potentially preventable given sufficient prehospital treatment, the number of live victims required to detect a reduction in this "treatable" mortality by half with an alpha of 0.05 and a beta of 0.20, would be 630.

Papers IV and V

After working with so many committed health workers, both Kurdish and Norwegian, for many years, I wanted to learn more about how my fellow healthcare workers perceived their roles in their environment, be it hospital or village. I believed that learning about their experiences would provide educational and inspirational material that could improve training activities and benefit others in similar practice.

To a researcher with long lasting experience in quantitative research (33, 78-81), performing qualitative research is challenging. Instead of measuring, the aim is to describe the social meaning that people attach to the world around them (82-84) in a manner that is reliable and valid for other settings as well, if possible (85). In traditional medical research, these two approaches are considered almost contradictory. However, qualitative research is well developed in other academic branches, and reliable tools are available (82, 86-89).

Grounded theory

The qualitative approach is a systematic approach for collecting and analyzing informants' verbal descriptions of their opinion about certain parts of their life or work. The method for data collection was defined by the circumstances, and is discussed in detail below. We asked the informants to speak among themselves, with us (in Paper IV, with the Kurdish program manager and co-author), and in groups. The analysis was performed using data obtained from written transcripts and translations. Given these preconditions, we determined that grounded theory would be a useful and appropriate technique (90, 91). Grounded theory has been used in mine injury studies and in studies of refugees (92, 93). Previous studies in the mine injury management program (94, 95) employed phenomenological analysis as described by Giorgi and modified by Malterud (84, 96, 97). Both are aimed at a scientific analysis of information collected, as phrased by Giorgi, …*when properly modified the phenomenological method can serve as the basis for the human sciences, including nursing. The use of such a method can make the qualitative analysis of phenomena rigorous and scientific* (96).

Grounded theory has traditionally been applied in settings similar to ours, and seemed to be adjustable and flexible without violating the method. Grounded theory is focused on social processes, while phenomenology is more concerned about individuals. In addition, one of the authors of paper IV (my qualitative advisor) had extensive experience with this method (98-104).

Data analysis

Data analysis in grounded theory is carried out in several tempi. Initially, the conversations are transcribed verbatim and read from beginning to end. The researcher tries to get an overall impression of *what is going on?* Then, the material is coded, which is a sentence for sentence analysis of content in which the researcher records his interpretation of the content of the conversation. Initially the coding is open, that is, the researcher attaches his interpretation to each subject discussed. This usually results in hundreds of codes. For Paper IV, 91 codes were found after the initial open coding. The next stage is selective coding, where the researcher starts to see "a system" in the findings ("categories"), and determines which findings will be the focus for further data acquisition. At this stage, the researcher might have to disregard a number of interesting findings. There may be too many loose ends, and it is time to concentrate on what appear to be the main findings. The findings are categorized and continuously

compared with the material in what is called the constant comparative method (90). Notes ("memos") are written during the analysis and interviews. They consist of observations, information, and thoughts of the researcher. Memos are considered as data as well, and are included in the analysis.

The material is then re-analyzed repeatedly to reassess the content and confirm the findings in the categories. By careful and repeated analysis, alternating between codes, memos, and interpretation, the main findings emerge from data (91). One of the important differences between grounded theory and other qualitative methods is that data acquisition and analysis are performed simultaneously, and findings in the data direct further data collection. Data collection and analysis continues until new data reveal no further information, at this point the material is said to be "saturated".

Preconceptions

One of the much-debated issues in qualitative research, especially when debated by traditionally quantitative researchers, is the attitude toward preconception. In classical grounded theory, the researcher was advised to try to keep his mind open when entering the field (90). In line with this, literature search at a later stage was advocated by Glaser in his development of the grounded theory from 1978 (91). What has been perceived as a demand for no preconceptions has been debated passionately, internationally and in our research group. However, it is difficult to find firm statements against the use of common sense and previous experience and knowledge in grounded theory. Strauss and Corbin characterize qualitative researchers as follows: *They are unafraid to draw on their own experiences when analyzing materials because they realize that these become the foundations for making comparisons and discovering properties and dimensions* (89). Likewise, another textbook says: *There is a difference between an open mind and an empty head… The issue is not whether to use existing knowledge, but how* (105). To enter the field completely virgin with a tabula rasa has not been a tradition in previous Norwegian research employing grounded theory (106). In addition, several reasons made a virgin approach impossible.

Performing research in a foreign culture like the Kurdish requires that the villagers display acceptance and confidence toward the researcher. We gained acceptance in the Kurdish villages over the years that we arranged training there, and this acceptance was encouraged by the fact that we were part of the Trauma Care Foundation. Generally, Dr. Mudhafar was the person trusted by the villagers, and we were accepted based on our association with him. In addition, a guest has to know and respect basic social rules for politeness and hospitality. We gained this knowledge during the nine years leading up to the focus group interviews. Without our knowledge of living conditions in Kurdish villages and social norms it would have been impossible to gain access to the villages and to the information that was basis for Paper IV. Large parts of the information used in this paper were gathered from informal conversations during overnight village stays. The formal interviews were supplemented by numerous memos taken during trips to villages and from previous stays in northern Iraq.

The research process

In grounded theory, data acquisition and analysis are performed simultaneously. After the first interview, the researcher is supposed to analyze the interview and then select the next informant in order to clarify what appeared through the first analysis (theoretical sampling) (90). Ideally, data sampling ceases when analysis reveals no new information and the material becomes saturated (87). In both studies (Papers IV and V), we performed the focus group interviews one by one. However, the time schedule for the trip to northern Iraq for Paper IV was fixed. It proved to be difficult to have written transcripts of the interviews ready for analysis between village visits as planned, especially because Dr. Mudhafar had to proofread the translations (see below). Instead, we discussed the findings from each village stay thoroughly before the next visit, trying to determine the main findings and adjust the focus for the next visit

accordingly. In addition, we had planned to supplement the data material if necessary in a second trip. This was unnecessary. The material gathered initially was sufficient, and we found that the interviews revealed the same information consistently. In other words, saturation was reached with the available material. Therefore, the working rules of grounded theory were respected as far as was possible, with no serious violations.

Focus groups

We used focus groups for both studies (107, 108). Focus groups were originally developed for marketing purposes, and the intention was to have informants reflect their own points of view with others in a group, and thereby develop new ideas and views. Focus groups are effective, and are particularly appropriate when the interviewer has a series of open ended questions and wishes to encourage research participants to explore the issues important to them, in their own vocabulary, generating their own questions, and pursuing their own priorities (107). In addition, this approach was necessary due to cultural constraints imposed by the Kurdish customs. It would not be appropriate to expect one-to-one meetings because local hospitality dictates that elderly and trusted people in a village accompany guests, especially foreigners and the Kurdish physician, when they visit a family. In addition, we wished to have views from females as well as from men, and one-to-one meetings with females would have been difficult to arrange. The group setting in the Kurdish study was not as strict as the focus group setting in reference papers; some participants were coming and going, and interruptions occurred when somebody left or entered the room. Interviews were conducted in four villages, and a total of 402 minutes of taped interviews were translated and transcribed. A total of 74 informants participated in the taped focus groups, with some participants coming and going during the conversations. Of the informants 50 were male and 24 were female. In addition, a number of conversations occurred in smaller groups with simultaneous translation, and were directly written into memos during the trips. Large portions of the information were gathered during informal discussions in the evenings and at tea. We included village leaders, paramedics, first responders, and ordinary men and women in the focus groups.

In Norway, the focus group participants were selected by the local contact person at the hospital. Our aim was to meet healthcare personnel who had opinions about the implementation of trauma team training in that particular hospital. The focus groups consisted of three to twelve informants, and conversations lasted for one or two hours.

Language and translation

In Paper V, all focus group conversations were recorded and transcribed modified verbatim, mainly by the author. In addition, we made extensive notes during the hospital visits and the data analysis.

The focus groups in northern Iraq (Paper IV) were held in Kurdish. The Kurdish co-author, Dr. Mudhafar, modified the groups and the discussion. These conversations were recorded and later transcribed and translated into English by a Kurdish English-teacher, and proofread by Dr. Mudhafar. Informal conversations were translated simultaneously by Dr. Mudhafar. Extensive memos were written continuously during our stays in northern Iraq and during data analysis. We compared the new information from the village visits with experiences and notes from previous visits.

The fact that only one of us understood what the discussion was about presented a challenge. Dr. Mudhafar spent all of his time during our stays in northern Iraq with us, and we had long preparations before the village visits. After each focus group, we discussed the content and the findings, and adjusted the focus for the next group. The translation and transcription turned out to be more time consuming than expected, and some of the transcripts were not available until after our departure from northern Iraq. However, we already had a good understanding of the content from our discussions with Dr. Mudhafar.

Tools for data analysis

We used the QSR NVivo 2.0 (QSR International Pty, Ltd, Melbourne, Australia) for data analysis in Paper IV. The program assists in sorting of codes and can be used for memos as well. This program is not used for quantitative analysis of data, such as the number of appearances of codes, but is merely a tool for keeping track of codes and citations. The program has been used for grounded theory qualitative research by others in the field (109). Data analysis for Paper V was performed using pen and paper. Transcripts were printed on paper and marked with different colors during the selective coding after the initial open coding.

Ethics

The trauma team training in Norway (Papers I and II) was based on best available knowledge (the Advanced Trauma Life Support concept) (47). No experimental design was involved, and no patients were part of the training. The didactic teaching and training methods were partially developed over time, during the course of the study. What was available at the time we started the program was unequivocally positive toward team training and attempts to improve team function and leadership (110-114). All available research on trauma system improvement showed either reduced or unchanged mortality, a large majority of studies reported improved patient outcomes after various system adjustments (13, 14, 17, 23, 115, 116).We considered the training to respect the Helsinki Declaration in all aspects (117).

Paper III continued studies of ongoing training programs in northern Iraq. Basic ethical considerations were discussed thoroughly in the thesis of Husum, 2003 (35). The study was approved by the Regional Ethical Committee for Western Norway (05/9370-190.05) and the local Health Authorities in Sulemaniyah, in addition to the Norwegian Data Inspectorate (05/01721-2).

Paper IV involved visits to villages in the mine-infested areas in Kurdistan. These visits were necessary to learn more about the impact of the paramedics and first responders in the villages. The villagers viewed foreign experts and relief organizations in general with great skepticism. One villager said: *Many organizations have come to this village and interviewed people about the things that are necessary in life, but until now, they have done nothing for people. They just wrote information on sheets.* We emphasized to the informants that the visits during this study were not surveys for new training, or paramedic placement, nor did they include any compensation of any kind. These visits, and the data acquired, were of little direct benefit to the informants, but were very helpful to us. The interviews were performed with mutual respect that had developed after years of medical service by the program to the villages. At the end of the conversations, many informants brought up the question about the origin of the mines and the responsibility of the producers and countries donating or selling the devices. The villagers were well aware of the history of the mines, and they underlined the impact of mines on the entire society. *Those countries that made these bad things are trading without thinking about the life of people. They made this for trading purposes. Like the Valmarra mine made by the Italians.* The villagers saw us as representatives of the suppressors and a means for voicing their anger and demand for compensation. The conditions of the study restricted the spread of personally identifiable information, but also represented a moral and ethical imperative to disseminate knowledge about the living conditions, including the effects of these weapons, in the minefields. The study was approved by the Regional Ethical Committee for Western Norway (05/9372-191.05).

Paper V studied the implementation of team training in Norwegian hospitals using healthcare personnel interviews. This study was approved by the Norwegian Social Science Data Services (26.06.2006, 14868/SS). We emphasized to the interviewees that the visits did not include any economic or other compensation. The study did not attempt a formal evaluation of the hospitals'

trauma system or training program. Respondents gave written consent, and we treated all material anonymously.

Results

The challenges

The training in Norway was initiated in order to address specific problems in the authors' own hospitals: training trauma teams to care for severely injured victims who appear relatively seldom, emphasizing a newly implemented team composition, team member roles, trauma protocols, team activation criteria, and trauma room physical design. Based on the authors' experience, the *a priori* matters most in need of training were communication, leadership, and cooperation, while technical skills, treatment priorities, and algorithms seemed less important at the time of course development. Over time, as more and more hospitals wanted to share our experience, we wanted to develop our experience into a training method that health professionals could use to cultivate and maintain team skills, and that they could apply to other areas outside trauma.

In northern Iraq, the training was aimed at reducing the high mortality associated with landmine injury, and at providing medical resources to areas where these were more or less completely lacking. Again, during the development of the program, it became an objective to describe the way that the Kurdish physician, the foreign teachers together with the paramedics, and the local healthcare authorities adapted the system to changing injury patterns, and increased the efficiency of the program by strategically placing and training paramedics.

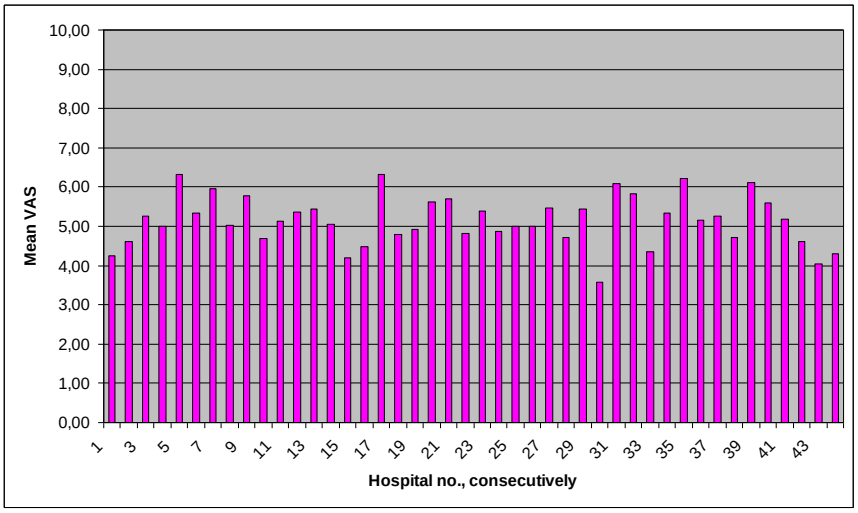
Because the intention of this thesis is to extract those experiences that could be useful for others and applicable to other settings, the results of the studies will first be considered individually. Then, the results will be summarized from a broader perspective before they are commented on in the Discussion section.

Norway

In Paper I, we studied the first 28 hospitals that took part in the training. In the pre-course questionnaire, the participants were asked to describe the major difficulties during their most recent trauma treatment experience, as well as what they perceived as the most needed improvements at their institution. From our own experience, we expected that the team function skills – communication, leadership, and prioritizing - would be the major problems experienced by the trauma team members. This turned out to be correct. It was obvious that the one-day course was perceived as useful by the participants; the course received high post-course evaluations in several dimensions. Nurses evaluated their outcomes somewhat higher as compared to physicians and others.

In Paper II, we assessed the impact of the one-day course on trauma team performance using a surrogate effect measure. We asked course participants about the perceived quality of care during their last trauma resuscitation. This question was asked to all trauma team members before the start of the training course and again six months after the last training course. We could then assess progress over time in the 13 hospitals that had participated in more than one training course and had replied to the questionnaire distributed six months after the last course. The perceived quality of care increased significantly between the assessments made at the beginning of the first training course, at the beginning of the last training course, and six months after the last training course. We then grouped the informants according to whether they participated in the training course, to assess whether participation in the training course itself influenced the evaluation in the questionnaire that was distributed six months after the last training course. We found that evaluation of the last trauma resuscitation the respondent had participated in was similar in both groups, but that knowledge of the correct order of procedures and confidence in the respondents own role during resuscitation was higher in the group that took part in training.

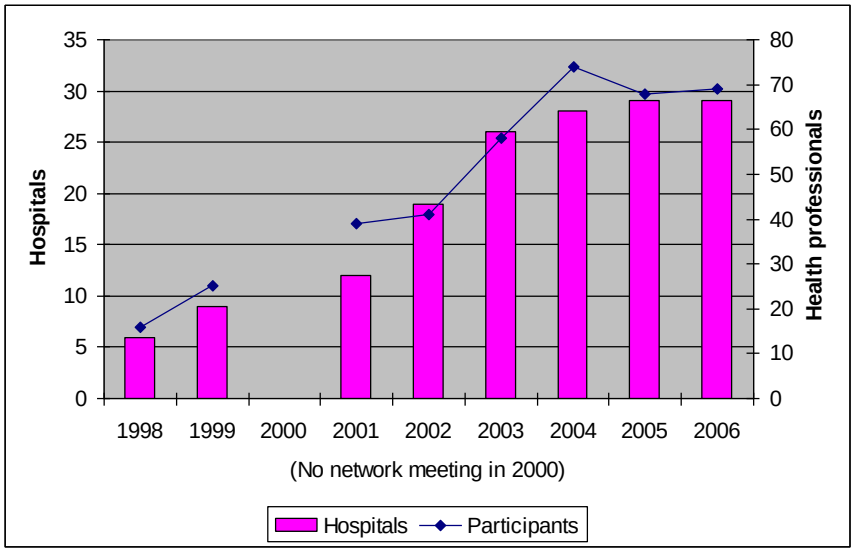
We expected that trauma care would evolve over the eight-year study period, independent of the training courses. In order to assess this, we compared the participants' evaluation of quality of care during their last trauma resuscitation before the first training course in each of the 44 hospitals consecutively enrolled in the program (Figure 8). We found no linear trend using a one-way ANOVA test for linear trends ($p = 0.364$), suggesting that changes in trauma care over the eight-year study period had not influenced the participants evaluation of quality of care delivered in their last trauma resuscitation.



8. Evaluation of the last trauma resuscitation the respondent participated in prior to the first training course at each of the 44 consecutively enrolled hospitals. Values are expressed as the mean score on a 10-cm visual analogue scale (VAS).

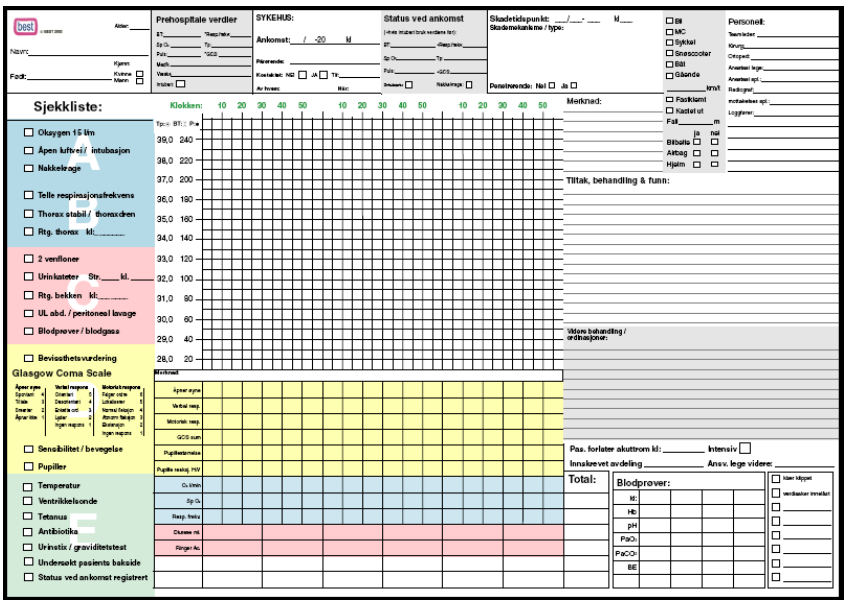
Other experiences and results from the Norwegian project

It became clear that the interested health personnel at each hospital would have a difficult time continuing the local training without assistance. From the inception of the program, we realized that these enthusiasts needed a supportive forum for regular exchange of experiences and procedures, and to help avoid duplicating work in other hospitals. In order to address these needs, we established an annual meeting to serve as a forum for personal and professional exchange regarding trauma team training. These meetings were also aimed at sharing actual case reports. All hospitals were asked to select one instructive case for presentation at the annual network meeting. The attendance at these meetings increased over time (Figure 9).



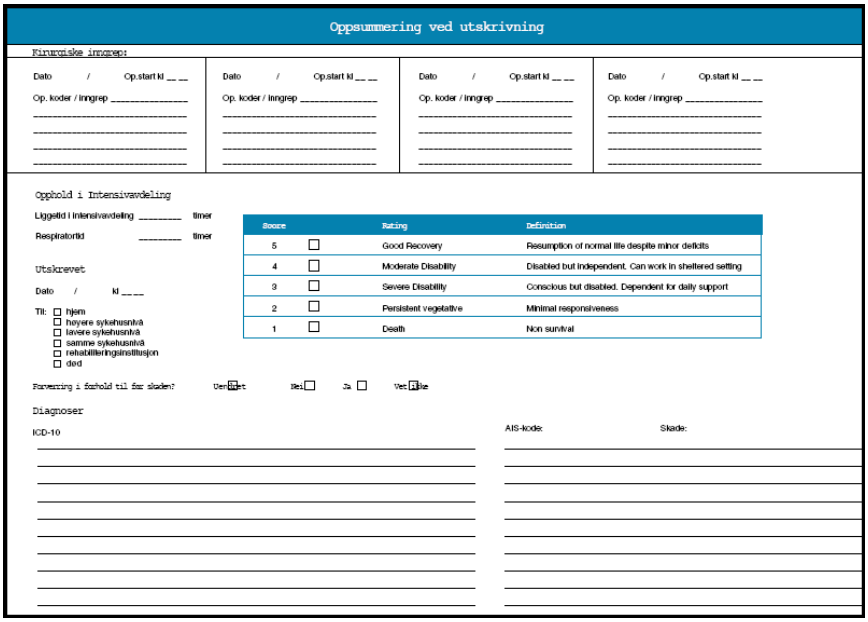
9. Participating hospitals and healthcare workers in annual network meetings by year.

Among the outcomes of the network meetings were a number of spin-off activities, which will be shortly described as they are part of the outcome of the training activities. Hospitals used different systems for keeping a manual record of treatment during the first hours after admission. After a network meeting discussion in 2001 and a subsequent e-mail consensus, an observation form was developed and offered to interested hospitals for production costs (Figures 10 & 11).



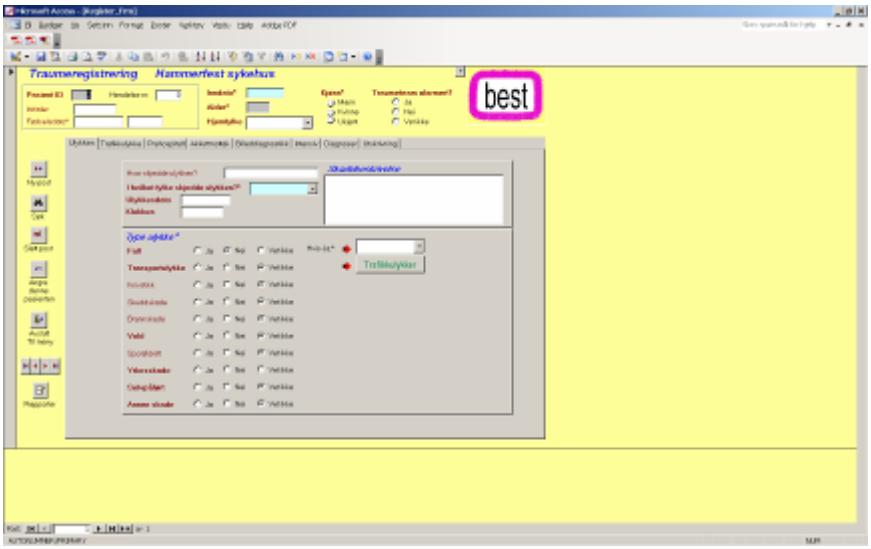
10. BEST observation form, second version, after revision in network meeting in 2004. Front page.

The observation form is now used in 40 hospitals, including the Norwegian Army, and 35,000 copies have been printed so far. In addition, we realized that none of the participating hospitals did a systematic registration of trauma patients in a fashion that enabled comparisons between hospitals and with international databases (64). To enable such a registration, the back page of the observation form had fields for collecting data necessary for the TRISS-calculations (63).



11. BEST observation form, second revision. Back page.

In addition, a database was developed in 2002 that has been gradually revised based on user feedback. It has been distributed at no cost to interested hospitals. Currently, approximately 10 to 15 hospitals use this database (Figure 12).



12. Screen dump of opening page in BEST trauma registry for individual hospitals.

Checklists are rarely used in hospitals. One of our studies indicated that the use of checklists would improve patient safety and reduce the risk of omissions and failures during the emergency room phase (118). Therefore, the network developed a checklist, 5,500 copies of which have been distributed to all involved hospitals (Figure 13).

13. Checklist for trauma team members developed by the network of hospitals involved in trauma team training.

After training had been implemented at several hospitals, we realized that surgeons in minor hospitals were reluctant to perform damage control surgery because the concept was not well known and few surgeons had practical experience. Damage control surgery is a strategy for the staged management of severe trauma using a modified operative sequence with limited surgery followed by physiological stabilization and planned re-operation for definitive repair (119, 120). In stead of arranging a course for surgeons, we decided to employ the team model again and organized a training course for surgical teams that focused on the decision-making process that follows when a patient is about to derange physiologically, in addition to surgical skills training (Figure 14). So far, 22 courses have been conducted for 70 teams from 30 different hospitals. The results are promising, and again support the value and effectiveness of team training (121).

14. Surgical and anesthesia team training damage control surgery in a pig. Dr. Karim Brohi from the Royal London Hospital and www.trauma.org teaching.

The experiences with trauma team training in Norway and the experiences from northern Iraq were used when the training concept was adapted to training prehospital trauma teams in the municipalities in northern Norway. This began in 2001, but gained momentum in 2004 (122). A group of primary care practitioners, ambulance personnel, and a primary healthcare nurse arranged training in most of the municipalities in Finnmark, northern Norway during 2004-2006. They are now in the process of rolling the program out all over northern Norway (Figure 15). The training methods have been used to train pediatric in-hospital emergency teams since 2005, a program that is also growing and spreading to other hospitals. In addition, one hospital has used the training method for medical and neurological emergencies, training teams who care for stroke patients to apply the methods similarly to trauma teams. These activities share some common characteristics: They were all started by healthcare professionals seeking to meet their own clinical needs; the methodology and course information is freely distributed upon request; and the organizing professionals are clinicians whose primary responsibility is clinical practice.

15. Prehospital multiprofessional team training in a remote municipality in northern Norway.

Over the years, certain principles have remained constant: The educational material is left with the hospital after training for future training; the training is arranged locally, for complete teams according to the hospitals' routines, in their real trauma rooms instead of simulator labs; we use simple resuscitation mannequins found at the hospital in training; and, the training is done in a peer-to-peer fashion by instructors from different hospital levels (community vs. University), with the aim of enabling the hospital to take responsibility for further local training. The vision of the BEST foundation reflects these principles (see Appendix 2).

In Paper V, we tried to learn from the hospitals about implementing team training as an activity to maintain preparedness for rare yet challenging events. From previous studies (118, 123, 124) we knew that not all hospitals actually continue training, even though they intended to do so at the inauguration course. This issue became a topic of interest at the yearly network meeting, because many enthusiasts were personally disappointed when they experienced obstacles at their hospitals. The results are presented in Paper V, and it seems that a number of recurring factors determined success or failure. Fortunately, these factors are not beyond the control of the individuals or the institution; in fact, they can be easily managed when the commitment is made to do so.

Northern Iraq

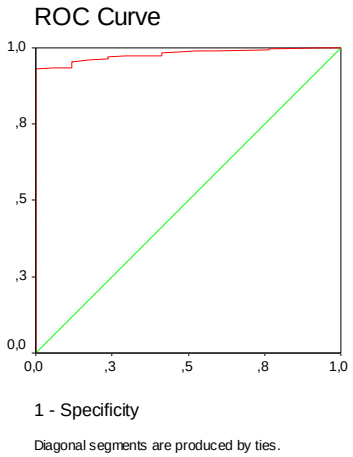
The studies in northern Iraq were intended as follow-ups of previous studies (59, 66, 77, 125-127), with an emphasis on describing how this program was adapted to address the changing injury patterns. We also wanted to study system maturation manifested by more precise localization of paramedics and first responders and improved outcomes.

In Paper III, we used retention of paramedics, distribution of patient diagnoses, delays of treatment and transportation, change in physiological indicators during the prehospital phase, and mortality as outcome measures. The complete results are presented in the paper, but some findings will be detailed here.

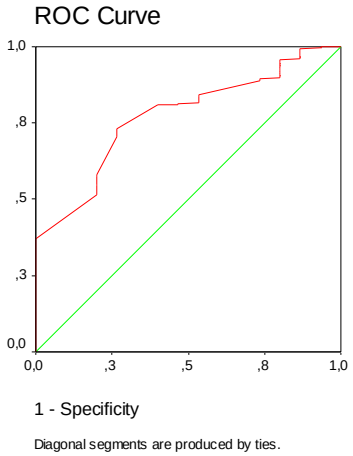
Mine injury-related mortality was discussed in the Methods section. In Paper III, we were able to report 30-day mortality for victims of mines and penetrating injuries only, due to the referral system for patients in northern Iraq. There were 919 victims of mines and penetrating injury. The on-site mortality was 139; 10 victims died during treatment by the paramedics and 14 victims died after hospital admission. Because the 139 victims were untreatable when found, the true mortality of potentially treatable victims was 24/ (919-139) = 3.1 %. This is 0.6 % less than the combined mortality from northern Iraq and Cambodia during the period from 1997 to August 2001 (77), but the difference is not significant (95 % CI of difference: –1.1 % to 2.4 %). In addition, some of the victims included in the combined mortality counts are included in Paper III. If victims injured before September 2001 are excluded from the material in Paper III, there are 431 victims of penetrating injuries. Of these, 52 died: 39 at the scene; eight during treatment; and five after hospital admission. Therefore, the true mortality is 13/(431-39) = 3.3 %. The difference between this mortality and the mortality in the study from 1997 to 2001 (77) is 0.4 %; the difference is not significant (95 % CI of difference: –1.7 % to 2.6 %).

Paramedic training included instruction on many advanced procedures, such as endotracheal intubation, cardiopulmonary resuscitation, jugular vein cannulation, venous cut-down, cricothyrotomy, fasciotomy, and chest tube insertion. Initially, we also intended to train for damage control laparotomy, but we found that most victims with torso injuries were either dead or only slightly inured, and that prehospital damage control laparotomy would be a medically unacceptable procedure to the health care system. When assessing the procedures that were actually performed, we found that the majority of victims were treated with simple procedures only. These results are presented in Paper III. In a separate study, we assessed the possibility of protection from hypothermia (126). In the present study, protection from hypothermia was applied for all victims, and was one of the backbones of the training.

We stratified patients into PSS groups in order to assess the effects of prehospital treatment. This way, we could determine whether the PSS could predict risk of death. If a low PSS were associated with a high risk of death, then an increase in PSS (treatment effect) would be considered valuable. In victims with a negligible risk of death (high initial PSS), an increase would have a small influence on risk of death. In addition, when the PSS is high initially, it is difficult to increase PSS. To determine the ability of the PSS to predict death we constructed ROCs. The ROC for a penetrating injury is shown in Figure 7. The ROC curves for blunt injury and for medical emergencies are shown in Figures 16 and 17, respectively. The area under the curve was 0.94 (95 % CI, 0.9–0.99) for penetrating injuries, 0.98 (95 % CI, 0.97–0.99) for blunt injuries, and 0.77 (95 % CI, 0.68–0.87) for the rest of the patients (for example, medical emergencies, burns, drowning, scorpion stings).



16. Blunt injury ROC curve, with PSS on arrival to victim as test variable and death as outcome.



17. Medical emergency ROC curve, with PSS on arrival to victim as test variable and death as outcome.

One outcome measure was system maturation manifested by a more precise localization of paramedics and first responders according to need. Time intervals are one measure of this maturation, and are described in Paper III. Another measure is the geographical location of paramedics. The map in Figure 18 shows how the paramedics were selected from areas with the highest need at the time of training. Initially, inhabitants of the minefields closest to the Iran/Iraqi border received training in order determined by the frequency of mine injuries (training courses 1, 2, and 3), and later when traffic injuries increased, the major roads were the target area (training course 4). A more detailed map of northern Iraq can be found in Appendix 4.

18. Geographical distribution of paramedics in northern Iraq. Groups are numbered according to their training. Red = 1, Green = 2, Yellow = 3, Orange = 4. See also map of Iraq in Appendix 4.

Paper IV describes the impact of first responders and paramedics in the villages. The findings are presented in the paper. It might be difficult for Westerners to imagine the living conditions in Kurdish villages. I refer the reader to the introduction of this summary and the introductory part of Paper IV. The Kurdish people have been suppressed for many years (36, 128). The foundations for the findings discussed in Paper IV were the following:

- ***The Kurds had to return to their villages.*** No "free" farming land was available, and the families had their own historical farming land to which they were forced to return. Some may think that the Kurds voluntarily entered the minefields, disregarding the potential risk posed by mines; however, this viewpoint reflects naïveté and ignorance of the realities in the Kurdish society. Thus, the "mine awareness" campaigns run by various relief organizations must have appeared ignorant at best, but also as offensive by the villagers.
- ***There was no knowledge of the mines upon return to the villages.*** The villagers returned to previous zones of war, which had been fluctuating through their villages for eight years. Different armies had planted mines in unorganized fashions, and the positions of the mines had shifted due to erosion, snow, and rain. The death toll due to mine injuries was highest immediately after the villagers returned to their homes, when medical services were completely unavailable. Hence, following the implementation of our training courses, many of the villagers made comments like: *"If we had any person like her [the female paramedic], I think that many of those that died were living now".*
- ***The Kurds have historically been forced to adapt to various external conditions that influenced their lives,*** be it by war, different suppressors, internal fighting, a harsh climate with failing agriculture, the international embargo toward the Iraqi government, or other threats. Thus, the current trend of increased migration toward the cities represents a continuous struggle for a life for families, not a drift towards a life in luxury in the cities. Kurdish families constantly weigh their chances for survival, trying to determine which

location provides the best odds. Although the villagers feel that they belong in the villages, they feel forced to move in order to have access to medical services and education for their children. A citation from the interviews illustrates this: *"The first important things are if you have the health services and the schools. If you don't have these two, the people can't stay. Even with bad roads and no electricity they can struggle, but these two are most important".*

- ***The improved economical situation in the cities reduces the possibility to live in the villages.*** As salaries in the cities increase, the young and educated people from the villages find better opportunities for family survival in the city. This pulls schoolteachers and nurses away from the villages. Currently, the formation of governmental and private security forces, different branches of police etc., is forcing the young men to leave the villages. Living expenses increase, and families need more money to survive. Therefore, the possibility of survival in the villages decreases.
- ***Although some of the minefields have now been demarcated, villagers still need to enter them.*** Mine injuries do not happen due to ignorance. Not all fields are demarcated, mines move due to erosion, and animals need to be herded. At times, villagers even needed to collect unexploded ordnances to sell for survival.

19. Demarcated minefields in Kurdish villages. A hidden threat for many years to come.

Summary of results common to both projects

In these projects, we found that short-term educational activities are effective if they are targeted carefully. This indicates that short-term educational activities should be planned and adapted in cooperation with the local health workers and the external teachers. We found that it is possible to transfer knowledge that continues to live and grow in some organizations, but that this is dependent on the enthusiasts in each organization receiving continuing support. In areas with infrequent high-demand challenges, it is useful to share experiences between healthcare workers. In all settings, we found that healthcare workers take responsibility for further development of their skills and services, and that they are able and willing to apply their experience to other areas of patient care.

Discussion

The results of these studies show that it is possible to assist healthcare personnel to take responsibility for improving the services they provide to the population they serve. My experience suggests that there are a large number of healthcare providers with a genuine wish to improve the service provided to their population in Norway and in northern Iraq. By sharing experiences and methods for teaching and training, these healthcare providers can continue to target their activities to meet the needs of their patients on their own.

The experiences summarized in this thesis were gained in quite different settings: the highly developed healthcare system of Norway and the non-existent prehospital system in northern Iraq. The two programs have been running in parallel; however, they were unrelated except that I took part in both. Nonetheless, they do have similarities, especially in the approach to the people requesting education and training. Therefore, it is relevant and appropriate to discuss the findings together, as opposed to separating them based on geography.

Do these training activities save lives or reduce morbidity?

In Western academic medicine and in the teaching community, the evaluation of teaching activities has been done with emphasis on the attitudes and attitude changes of the trainees (43, 46, 129, 130). Generally, program evaluation has been based on a classification proposed by Kirkpatrick (43), largely due to a lack of harder outcome measures. However, there are studies documenting a reduced frequency of errors following multidisciplinary team training (131), and a number of studies have documented improved survival in trauma systems after different system improvements (17, 118).

Kirkpatrick's evaluation criteria for educational activities (43)

Step	*Designation*	*Description from Kirkpatrick's original paper*
Step 1	Reaction	How well did the conferees like the program?
Step 2	Learning	What principles, facts, and techniques were learned?
Step 3	Behavior	What changes in job behavior resulted from the program?
Step 4	Results	What were the tangible results of the program in terms of reduced costs, improved quality, improved quantity, etc.?

In northern Iraq, where the number of victims was high, it was possible to show a reduction in the physiological impact of the injury on the victim and improved outcomes over time as a sign of maturation. It is remarkable that victims with severely reduced physiological function or with severe anatomical injuries experience improved physiological function during treatment and transportation (Paper III, Table 2), despite long transportation times (average transportation time from injury to hospital was 4.9 hours, decreasing from 9.6 hours in 1997 to 2.8 hours in 2004 [Paper III, Results]). A similar finding was reported in a recent study from a similar program on the Iranian side of the Iran-Iraqi border, where treatment during transportation of a median duration of three hours resulted in improved physiological function (132).

A prerequisite for accepting that an increased PSS reflects real improvement is that the initial PSS (on the scene of injury) actually reflects the risk of an adverse outcome. We assessed the ability of the initial PSS to predict mortality using ROC curves. As shown in the Results section, PSS predicted mortality to a high degree, even for blunt injuries and medical emergencies (in a bulk group), which had an area under the curve of 0.77 (although the PSS was never constructed for medical cases).

It is possible that paramedics would be tempted to inflate the second PSS (at hospital admission), because they were aware that program results would be evaluated partly by the use of this variable. Therefore, we asked the admitting hospital to record the same information in a

separate hospital injury chart. As reported in Paper III, the two PSS scores were comparable and actually showed a favorable agreement.

In northern Iraq, we also noted a reduced mortality after mine injuries. As discussed in the Methods section, reporting of mine injury mortality traditionally includes victims who died on-site, in the minefield. The reduced mortality observed could be ascribed to a reduced number of mine injuries, because the number of mine victims that were found alive and subsequently died was too low to determine the impact of the training on the mortality of this subgroup. There are many confounding factors here. The time from injury to first medical response decreased steadily during the observation period. Therefore, the lack of reduced mortality for victims who were found alive could result from the fact that dying victims were found and treated by medical personnel during the later years of the study, whereas early in the study, these victims would have been found as corpses. Therefore, our ability to observe a possible lifesaving effect of early prehospital intervention would have been masked.

In Norway, we found a systemic effect of team training in hospitals that took part in several training courses when we considered team members' evaluation of trauma care quality, but detected no effects on individual needs for learning. When we consider the results in Norway using Kirkpatrick's four levels of evaluation, this outcome measure indicates effects on levels 1, 2, and 3; however, we cannot directly claim an impact on level 4 – results in term of lives saved. However, our literature review indicated that progress in a number of systemic factors resulted in improved outcomes in other settings, which we take as an indication that this could be true for Norway as well (118).

We used self-evaluation/assessments, as discussed in the Methods section under Paper I and II. This was a deliberate choice, because the purpose of the training was supportive rather than evaluative. In most of the hospitals, course participants were chosen the morning of the training, despite previous planning. This could reflect the economical strain that Norwegian hospitals are under –"production" comes first, training and learning comes second. A format with assessment based on pre-course self-studies is used in many of the life support courses, such as the Advanced Trauma Life Support (ATLS). Based on our experience, use of this format would have resulted in a number of participants taking part in the training without having the intended knowledge prior to the course. Instead, we decided to make our course independent of preparations by the participants. Testing for factual knowledge prior to the course might make some participants feel dumb or ignorant, which would be a poor starting point for training. However, pre- and post course testing for factual knowledge could be useful for documenting improvements after the course and possibly documenting that the training in Norway saved lives or reduced morbidity.

Are health personnel able to take responsibility for improving their own systems?

When the day is over in Norway, or when the foreign teachers have left Iraq, has the training left the health personnel with more than factual knowledge? Are these short-term training activities enough to support the health personnel in continuing activities and improve their service to the population they serve? These studies support the assumption that health workers do take responsibility for their own patients by further disseminating the knowledge they have gained and the adjustments they have made to their own systems.

In northern Iraq, we encouraged the paramedics to train fellow villagers as first responders. We did this because the great distances from hospitals and the long transport times made it necessary to do whatever possible to reduce the time to first medical intervention. In order to improve the chances of implementing first responder training, we provided a detailed program to follow. We even asked paramedics to practice their training on other villagers while they were still in the training course. When we returned after one year, the paramedics and Dr. Mudhafar informed us that they had changed our suggested training program soon after we left. A one-

day course, as we suggested, was not suitable to the Kurdish style. It was better to remain in the villages overnight because many of the fruitful discussions and opportunities for exchange of experiences came during tea drinking at night. In this manner, the paramedics have trained about 6,000 villagers as first responders, and Dr. Mudhafar reported that a number of village representatives had approached him requesting first responder training in their villages. Others have found that this kind of cascade training fails because it is impossible to guarantee the training quality throughout the chain (133). However, Dr. Mudhafar personally supervised the training or visited the village in question afterwards to evaluate the results and training outcome.

20. Kurdish villagers in northern Iraq training bleeding control.

One of the indicators of increased first responder activity is the reduced time interval from injury to first medical help (Paper III). In addition, information obtained during the interviews for Paper IV and by Henrik Hedelin for his study (94) confirms that the first responders are working in a team with the paramedic in most situations. I consider this a proof of adaptation and maturation of the program, and a sign that the paramedics and the local coordinator take personal responsibility for the maintenance and distribution of the program in their area.

Initially, the training and equipment in northern Iraq was focused on victims of mines and war-related injuries only. The paramedics were equipped with backpacks containing medical equipment, and this equipment was reserved for the designated victims only; we imposed this restriction. The paramedics were given certificates requiring them to use the equipment only for trauma victims. However, from the beginning, the paramedics had used the equipment to treat all kinds of patients. They began to function as general medical resources for their societies, and therefore could not restrict their treatment or knowledge to certain patient categories only.

A similar development occurred in Norway. Many hospitals arranged local training activities themselves, and we observed an increasing use of trauma team training as preparation to treat the rare but challenging patients in Norwegian hospitals (118, 121, 124). In addition, an increasing number of hospitals take part in the yearly network meetings for exchange of experience and procedures. The same development was seen in a number of structural indicators, such as the existence of trauma teams, trauma protocols, trauma team activation criteria, and other educational activities for individual skills in trauma team members (118). The

increasing use of the team training technology in parallel fields is also taken as an indication that health personnel take responsibility for improving care in their domains. On the other hand, team training with simulated patients is not a “quick fix”. Several of the enthusiasts we met in the Norwegian hospitals had tried to convince their colleagues of the need for further local training, but failed.

Can our experiences be transferred to others?

These studies show that health personnel take responsibility for the care of victims of trauma in their areas, and that it is possible to initiate activities and transfer experiences and/or knowledge during short-term training sessions, be it in Norway or in northern Iraq.

There are prerequisites for transfer of experience. Knowledge is not necessarily followed by behavior change, and several studies have investigated the discrepancies between what healthcare providers know and what they actually do (134-136). It seems that a number of factors are necessary for adapting new practices or implementing new knowledge. In Paper V, we found that Norwegian healthcare providers generally needed some kind of support from the administrative level, and interest and acknowledgement from their superiors. We also found that working in groups and targeting what were perceived as mutual problems improved the chance of success.

The fact that the Norwegian experience was readily adapted by outsiders to fit their training needs indicated that the experience was relevant for others; it was useful for pediatricians and primary healthcare practitioners, and is now being adapted for medical and neurological emergencies. The relevancy of experiences depends on whether they are valid and reliable predictors of outcome for other, similar settings.

Validity and reliability

Reliability is the degree to which one can trust measurements. Do repeated measurements give the same result? Validity is the ability of the results gained in one setting to predict outcome when performing the same measurements or experiments in other settings.
The two concepts are mainly applied in quantitative research. Many quantitative researchers try to discuss findings from qualitative studies in these terms. In qualitative research, the discussion is generally broader, asking, “Does this make sense?” Malterud described it like this:

> *“Internal validity asks whether the study investigates what it is meant to, whereas external validity asks in what contexts the findings can be applied. The nature and extent of the data will ascertain which conclusions can be drawn about what. The aim of research is to produce information that can be shared and applied beyond the study setting”* (84).

In grounded theory, validity and reliability are seldom used. Instead, one discusses whether the findings *Fits, Grabs and Works* (90, 91). To “fit” indicates that the categories found in the data analysis are actually based in the data and not on preconceptions, and that they can be verified by the researcher when going back to the data. To “work” is a description of how well the theory that is generated is able to contain the findings, to explain new findings, and to predict what is going to happen. “Grab” is a measure of whether the researcher is able to present his findings in a readable, understandable, and trustworthy fashion (137).

It could be argued that doing research on one’s own projects gives a bias that will influence the findings. The researcher might be inclined to see the positive outcomes and disregard the negative. This concern should be taken seriously, both in quantitative and qualitative research. The two qualitative studies in this thesis are probably the most “safe” in this regard. We were very concerned about the trustworthiness and deliberately studied that which we needed to know more about, as opposed to evaluating the projects. The Norwegian study (Paper V) did

not concern the impact of the program itself, but rather the obstacles and challenges experienced by the health personnel during their attempts to continue further training locally on their own. The Kurdish study (Paper IV), was an attempt to let the villagers' view of the paramedics and first responders be heard, and was not an evaluation. By including a village without a paramedic, we hoped to get a broader view than just what might have been enthusiastic villagers in villages with a paramedic. When considering trustworthiness, the conversations turned away from the paramedic and first responders per se, and turned toward living conditions in the villages in general. For the quantitative papers (Papers I, II, and III) we wanted to select outcome measures that were as robust as possible. The individual outcome measures are discussed in each paper.

Translation is like seeing the back of the carpet

It is a challenge to do research in an unfamiliar culture and setting. We were concerned whether we could get a true impression of the villagers' views because some of us lacked knowledge of Sorani, the local Kurdish dialect. We had to rely on translations in order to perform the qualitative study in northern Iraq, and agreed that Dr. Mudhafar should modify the focus group discussions without simultaneous translation, as described in Paper IV. We also feared that politeness and respect for the Kurdish doctor (and possibly towards ourselves as well) would reduce the willingness to speak up and give a true picture. However, during the planning Dr. Mudhafar said, "*When you collect people from the village you will get the real picture because not all of them got benefit from the program, and they will speak up. The Kurdish people will speak up."* Because we were unfamiliar with the research method, we thought that we should attempt to "follow the book" by arranging formal focus groups, meeting with representatives from each village. Dr. Mudhafar understood that this would give us only part of the picture; we obtained at least as much information during informal conversations at night. As Dr. Mudhafar said, "*In the formal interview, people will say what they think you want to hear; in the informal meeting, they will say what they really mean*". Still, translation implies loss of information, as stated in the Kurdish proverb in the heading of this section. We tried to achieve an "objective" translation by having a Kurdish teacher of English translate the recorded interviews during our stay in northern Iraq. Afterwards, we more fully realized the value of our plan to work through all the transcripts with Dr. Mudhafar to get an understanding and to correct mistakes made during the translation. Another quotation from Dr. Mudhafar explains this, "*You could do the translation word by word, but in the villages, you should behave like one of them to get them to say what they mean. What they have in the heart and what they have in the brain".*

21. Meeting with villagers in a Kurdish village.

The findings from northern Iraq are probably transferable to other settings to the extent that when training is targeted carefully, with respect for and in cooperation with the trainees, it has the potential to be long lasting. An Australian report summarizes:

"*Getting the right "who" trained in the right "what" is crucial, and good planning, based on good science, is essential. … More is required, including careful attention to matching health worker competencies with community health needs, planning training methods that are likely to be effective and sustainable, and planning to evaluate not just the training program itself but its outcomes in terms of the objectives of the health system. In addition, the resources, anxieties and environment of those who will take part should all be considered"* (133).

Lessons learned

During these ten years, I had a number of experiences with my friends and colleagues during our work, discussions, travels, and teaching. Some of them are valuable and relevant in the setting of this summary.

In the South – the difference between solidarity and charity

The Kurds were encouraged to march towards Bagdad in February 1991 in the aftermath of the first Gulf War. They were lead to believe that the Iraqi army was diminished to a degree that they could overthrow Saddam Hussein, who had been brutally suppressing them for decades. This turned out to be a bad advice, and the Kurds were defeated and forced to flee into the mountains in the border areas between Iraq and Turkey (36, 128). This resulted in immense suffering on the part of the Kurds because it was winter and there was snow in the mountains.

International media attention informed the world about the situation, and the so-called “safe haven” was established by a coalition between United States, United Kingdom, and France. The Iraqi forces withdrew from the northernmost three provinces of Iraq, and a Kurdish government was established (36, 128).

At this time, international relief organizations started entering Iraqi Kurdistan. A massive influx of different organizations took place, some of which were said to be purely foreign military intelligence under the cover of charity. When we arrived in northern Iraq in 1996, the Sulemaniyah governorate was seemingly overwhelmed by relief organizations, who had established a sort of a parallel “government” with regular meetings where they shared responsibility but also decided who would start activities where. The country was flooded with signs saying which organization had provided what for this area, and many activities seemed to be aimed more at pleasing donors in the giving country and the organization headquarters than at providing lasting relief. Some of these activities were harmful to the receiving society. One example was the Emergency Surgical Center for War Victims (67, 68). This Italian organization, Emergency, sponsored by the European Union, erected a completely new hospital 300 meters from the Teaching Hospital of Sulemaniyah, the university hospital connected to the medical school of Sulemaniyah University. The hospital was staffed primarily by white foreigners in the medical positions, and was kept with almost military discipline. The hospital admitted only victims of mines and war injuries, and did not readmit patients after their initial discharge. Therefore, patients with surgical complications had to go to the teaching hospital. Gradually, the Emergency hospital employed the most successful of the Kurdish doctors, draining doctors from the teaching hospital. The impact of this hospital was a decreasing confidence in the teaching hospital by the population of Sulemaniyah. After some years, when mine injuries decreased and funding dried up in 2005, Emergency decided to move their activities, and some of the Kurdish staff followed them to their new programs. I asked Dr. Mudhafar what Emergency left for the Kurds in Sulemaniyah. He answered laconically, *“*the building*”*.

As Western medical experts, we have a moral obligation to share our knowledge with those in need. The manner in which we chose to do this is not irrelevant. An approach based on solidarity respects the recipients, considers their needs, and implies a genuine ability to listen to what they ask for. As explained by experienced Australian teachers:

> *“Training often fails for the simple fact that teaching does not equate with learning. There is a particular hazard that afflicts in-service training in resource-poor settings: when the “educated” trainer forgets that the rural health workers under his tutelage are adults, often with considerable skill and experience”* (133).

This knowledge is not new. See the Danish philosopher Søren Kierkegaards wise words at the inner cover. However, the knowledge is often forgotten.

Gender

The question of gender is addressed in the thesis, in part because it is required by the University, but also to show how our preconceptions failed.

In northern Iraq, the first group of paramedics consisted of males only. Based on advice from the elderly in the most mine-affected villages, the participants were selected by a representative for the Norwegian organization in close cooperation with the local authorities. When the Kurdish physician and organization took over program management, new trainees were selected among experienced male and females. The gender of the paramedic seems to be of no importance during an emergency. During the focus group interviews for Paper IV, the villagers commented:

> *“But, after she came here, she has been doing an excellent job, and we all we respect her work and we trust her. [We see] that she could save the life of many patients”.*

"In emergency cases it [the medic's gender] is not important. But there can be sometimes and in some cases if a male is a patient that the female can feel shyness and it will be better with medic of the same sex and not the opposite. But, in emergency cases it makes no difference".

22. Paramedic from second training course (with backpack), with first responders.

We expected that gender would be an issue in the Kurdish society, and that it would have been problematic for female paramedics to treat male patients, and vice versa. This assumption was incorrect.

In Norway, gender was not an issue. That is, we thought it was not. On the other hand, three of the founders of the training method are male physicians, and only one, the educationalist, is female. This could reflect the sex distribution among specialties (anesthesia and surgery/orthopedics), but it could also reflect who is capable of traveling, leaving children and family for training courses and congresses. In contrast, the coordinators of the BEST foundation have been female in excess of male, 3:1.

Both organizations, the Trauma Care Foundation behind the mine injury management program and the BEST Foundation, have a predominance of males in leadership positions, yet both organizations publish annual reports stating their commitment to equality between genders. In order to act responsible and trustworthy the question of equal gender representation needs to be raised in both of these organizations.

You can't push knowledge on people

The BEST foundation was able to reimburse the instructors for travel expenses and lost salary for a while, using funds from a grant from the governmental agency "VOX" – National Institute for Adult learning. We used this grant to provide training free of charge to interested hospitals, which provided an interesting experience. In the hospitals where trauma team members arranged a training course without having to arrange for reimbursement of costs, the interest and willingness to adapt their operating room programs to facilitate the training was far less than

that in the hospitals were funds had to be raised in order to have a training course. The amount of money paid for an ordinary training course was negligible compared to the work force resources the hospitals invested in our training courses, 40 to 80 personnel for one day. Still, this amount, which averaged approximately 3-4,000 US $ per course, caused department chairs to co-operate and find allowances in their budgets. This process seemed to be valuable per se, because it seemed to make the chairpersons eager to receive the highest possible return for their investment, and to open cooperation for a field of common interest.

Another interesting observation was that hospitals have never cancelled a single training course during the ten years we have been training. This indicates that the commitment mobilized by the enthusiasts affected their colleagues and superiors.

Simple things count – most

A lesson learned in northern Iraq was that advanced procedures were not necessary to achieve good results. Initially, we trained the paramedics in several advanced procedures, but they were seldom used. As we reported in Paper III, only 10 of 2,349 victims had endotracheal intubation performed, none of them had penetrating injury. Intravenous lines were placed in 2,045 victims, but the external jugular was used for only 24 victims, and venous cut-down was not used in any instance. This also indicates that the paramedics achieved great skill in intravenous access.

The findings in Norway were similar. The trauma team members in the Norwegian hospitals were generally very skilled and knowledgeable about trauma care. On the other hand, their team cooperation, communication, and leadership capabilities were deficient, as judged by themselves. It was remarkable to see the development in team skills from simulation one to simulation two. These team skills remained in the hospitals as organization, and even improved during the first six months after training. It is notable that these results were achieved without the use of advanced simulators. In fact, the trauma team training was purposely performed using only the equipment available at each hospital, to enable the hospital staff to continue training on their own.

Remain in clinical work

The trustworthiness of medical teachers depends on their medical experience and knowledge. Therefore, the BEST Foundation decided early that all teachers should have solid anchoring in their clinical practice, as should the educationalist. This had the purpose to improve credibility. It was also a necessity due to the economical situation of the foundation, which received reimbursement of costs only, from each participating hospital. All other activities, such as network meetings, lectures at conferences, and participation in similar activities, were funded by grants or by cost sharing between participants. The foundation received some prize money from national authorities and trauma organizations; however, the foundation avoided relationships with simulator producers and pharmaceutical industry personnel. The poor economy has posed a challenge for continuing training activities, but has also been an immense strength when considering credibility, as none of the involved could be suspected of participation due to personal benefits.

The activities of an organization shape its image. When running an organization in which the overall purpose appears beneficial, one might be willing to sacrifice some principles in order to remain in business. The Norwegian Peoples Aid was a helpful cooperating partner to the Trauma Care Foundation in the early days in Sulemaniyah. Norwegian Peoples Aid is internationally acknowledged as a capacity in mine clearance. When this organization came into economic hardship in 2000, they were approached by the Norwegian oil company Hydro, who had engaged in oil drilling in the border area between Iran and Iraq, on the Iranian side of the border. Norwegian Peoples Aid decided to do mine clearing on a commercial basis for Hydro in Iran. The clearing was strictly limited to the drilling fields. The nomad population in the area had exactly the same experience with mines as had their neighbours on the Iraqi side of the border,

loss of life and limb in all families. This clearing showed the local population that mine clearing is possible, but only to those who pay. As long as the nomad population does not own their oil-rich soil, they will have no mine clearing. Norwegian Peoples Aid made a profit of 30 million NOK, equivalent to 6 million US dollars in one year (138).

When activists start earning a living from what was originally a benevolent project, there is a risk that their decisions have a basis in more than the initial principles.

Possible drawbacks and dangers in the program

Several caveats should be mentioned about the training in northern Iraq. The emphasis on early access to medical care and the convincing initial results might encourage paramedics to try to reduce the access time to victims even further by entering minefields themselves. This is a moral dilemma as most of the paramedics and first responders will know the victims. In the contract between the local organization and each medic, the Trauma Care Foundation made clear restrictions that paramedics should not enter minefields. In addition, lectures were given by mine clearers on how to extricate victims from minefields without endangering the rescuer. I do not know to which extent the restrictions were observed, but during the training courses we interviewed each paramedic about his experience during the previous period. These interviews revealed a number of histories with quite innovative extrications, ranging from throwing ropes to jumping from rock to rock to the use of tractors. Being an outsider, we could not determine which moral imperatives would govern the paramedics.

In the Norwegian program, we recruited instructors from various types of hospitals so that participants could be trained by instructors from hospitals similar to their own. For example, we avoided having a team composed solely of university hospital instructors teach at a district hospital. We managed to maintain this practice throughout the training period. However, when considering the results, it was a failure on our part not to include more non-physicians as instructors. We have used nurse instructors in some courses, with great success. They have simultaneously worked as a coordinator for the organization; this nurse is the only employee in the BEST Foundation engaged with a part-time contract.

The program in Norway was originally intended as a self-help program, designed to solve training needs in our own hospitals. We trained our own teams, and thought that other hospitals could do the same, when they requested to have the training in their hospital. This was successful in many hospitals, but also failed in a number. Team training is not a “quick fix” to compensate for a low daily caseload. Team training with simulation is one approach to build and maintain competency in handling severely injured patients. To be efficient, it should be anchored in the organization in each hospital, and combined with other planned educational activities, such as damage control surgery training. These are all elements of the planned approach to total trauma patient care, which should reach beyond the individual hospital and include prehospital services and rehabilitation. This approach is under development in Norway (139).

Conclusions

The experiences gained through these studies document that low-cost, low-tech training is efficient in low-income countries as well as in Norway.

In northern Iraq, we found that a low-tech prehospital trauma care system that was originally designed to treat penetrating trauma could be adapted for changing injury patterns and gradually evolve from a trauma care resource into a more universal healthcare resource for the villages. In addition, the system matured over time because of careful selection of paramedics and training of the village first responders; thus, the time intervals to first medical contact were reduced, which decreased the physiological impact of injuries and illness. In addition, the local authorities gradually accepted the system.

In Norway, we have documented how multiprofessional teams in different hospitals take responsibility for the quality of their own trauma care. We have reported a national improvement in care that is superior to that of any other country we know. This is remarkable considering that no public or governmental campaigns to improve trauma care were made, as has been done for other quality improvement activities. This improvement has been achieved without industrial or pharmaceutical support, from professionals to professionals. The fact that this initiative began in two district hospitals and a university hospital, and spread to 49 (as of November 2007) of 50 acute care hospitals is also unique for this type of quality improvement activity.

Through well-planned and targeted short-term educational activities, it is possible to enable healthcare providers to improve their service to their patients. A prerequisite for this is that the trainees, trainers, and local anchoring persons work together to determine the course content.

Healthcare providers will act responsibly and employ what they see as useful training methods provided they are supported to some extent. In low-income countries, there will be a need for economical support until the authorities either see the benefit of, and need for, the spread of the knowledge, or are forced by a popular demand to implement the method. In high-income countries, the required support is administrative. Management must be willing to allocate some working hours to training. Responsible healthcare personnel are a powerful force of change. Their devotion should be appreciated. Large effects can be achieved with small input from the administrative side.

The training methods described here have great potential to be applied to similar areas. In Norway, we have already seen the methods describe here applied to pediatrics practice, primary healthcare practice, medical emergencies, and neurology practice. In the South, the experiences are being transferred from Iraq to Iran, as well as into Vietnam with Cambodian instructors.

Medical training in low-income countries is a political act, and has implications for trainees and their societies that reach beyond the medical content. To avoid creating damage this training should be targeted in close cooperation with the trainees and local coordinator. In Norway, the decision on where to devote ones energy is a political matter as well. Trauma does not hit indiscriminately, neither should trauma training.

Implications for further research

Improvements in trauma care should be implemented following a thorough analysis of the current state in the area or service concerned. This analysis will help to determine where the need for action is greatest.

These studies raise a number of questions:

- Is the possibility to improve physiological status after injury by applying the described simple measures restricted to a certain timeframe? To what extent can good prehospital care compensate for being a long distance from the nearest surgical care?
- In northern Iraq, we have shown that prehospital trauma care can be improved. It seems that the Kurdish authorities have come to realize the need for training in the emergency rooms of the hospitals and clinics. How should the knowledge about good trauma care be implemented in the hospital phase in northern Iraq? What are the obstacles and how to overcome them?
- The training of prehospital paramedics and first responders had an impact in Kurdish villages far beyond the medical content. Likewise, the social gatherings of mine injury survivors had a mobilizing effect, which could be a political power. These effects in society, and the political power of medical capabilities in neglected villages should be studied.
- Team training in Norway was efficient for trauma teams. The training method seems promising for pediatric practice as well as for prehospital care. It would be interesting to study which components of the training concept are relevant in other settings.
- We have advocated the use of very simple simulation to enable further local training. Parallel to this, an army of advanced simulators have been developed and have gained wide acceptance. We should study the benefits and disadvantages of our simple model compared to the advanced simulators, in terms of educational outcome and of technological dependency. In addition, the use of live actors versus mannequins should be evaluated.
- Debriefing after team training is the most challenging but probably the most important part of team training. When we distribute the knowledge of team training, we should study and refine the debriefing skills of the facilitators/instructors.
- Trauma affects the poorest and least educated hardest, regardless of geography. This has been overlooked in most European societies. Recognition of this fact has great implications for prevention and should be explored further.

Suggestions for healthcare personnel needing to improve their teams or knowledge – in North and South

Before establishing trauma training, or trauma team training, it is necessary to define the goals of the training. Are task skills the most prominent needs of the team? Are communication and cooperation the main problems? Leadership?

After an analysis of the desired outcome, one should define the present skills and knowledge of the trainees. At this time, it is possible to choose educational strategies.

Training by practice, that is simulation, is by far the most efficient way to learn practical skills. This training does not need to involve technologically advanced and expensive equipment; fellow students/colleagues are good models for many purposes. Invasive procedures can be trained using animals, provided this is ethically and religiously acceptable.

Measurements or assessment instruments should be defined when training scenarios are developed. Learning should be guided carefully, which demands cooperation between the medical and educational experts.

Students/trainees should be aware of the educational goal before entering into training. This requires a thorough briefing, including rules for simulation.

Prepare for feedback given in relation to training, with emphasis on the educational goals. This concerns the team as a whole, but often also individuals. Because simulation can be an emotionally powerful tool, a structured debriefing should be prepared. This includes a blowout phase to terminate simulation and re-enter reality, development of a shared understanding of what happened (shared mental model), and defining educational outcome and point of improvement before the next simulation. Our experience is that two repeated simulations with increasing complexity based on initial performance are appreciated by the trainees.

The training activities should be evaluated, not only on the day of training, but over time in order to assess the impact on the original goal, and to find other possible unforeseen effects.

Particularly helpful references for training in low-income countries include references (37, 133, 140), and for training team skills in high-income countries, see references(114, 141-147). See also the websites of the BEST Foundation and the Trauma Care Foundation (Appendices 2 and 3).

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In addition to the five papers forming the thesis, a number of articles in which I have participated are part of the background to this work. They are cited ordinarily in the text and appear in the reference list. For easier reference I have indicated my name with **bold types.**

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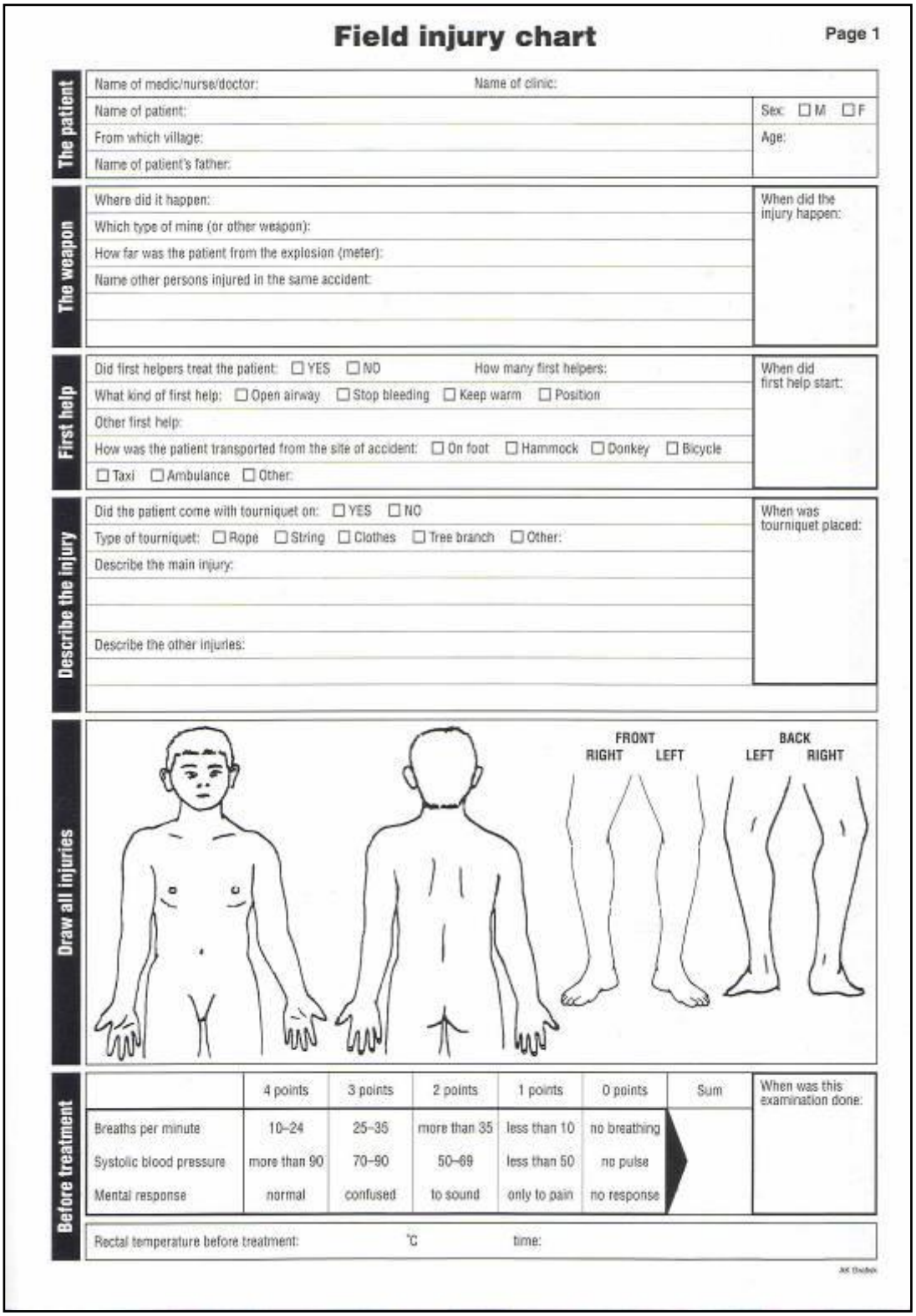
Appendices

Appendix 1

Injury chart facsimile



Field injury chart Page 1

The patient

Name of medic/nurse/doctor: Name of clinic:

Name of patient: Sex: ☐ M ☐ F

From which village: Age:

Name of patient's father:

The weapon

Where did it happen: When did the injury happen:

Which type of mine (or other weapon):

How far was the patient from the explosion (meter):

Name other persons injured in the same accident:

First help

Did first helpers treat the patient: ☐ YES ☐ NO How many first helpers: When did first help start:

What kind of first help: ☐ Open airway ☐ Stop bleeding ☐ Keep warm ☐ Position

Other first help:

How was the patient transported from the site of accident: ☐ On foot ☐ Hammock ☐ Donkey ☐ Bicycle ☐ Taxi ☐ Ambulance ☐ Other:

Describe the injury

Did the patient come with tourniquet on: ☐ YES ☐ NO When was tourniquet placed:

Type of tourniquet: ☐ Rope ☐ String ☐ Clothes ☐ Tree branch ☐ Other:

Describe the main injury:

Describe the other injuries:

Draw all injuries

FRONT RIGHT LEFT BACK LEFT RIGHT

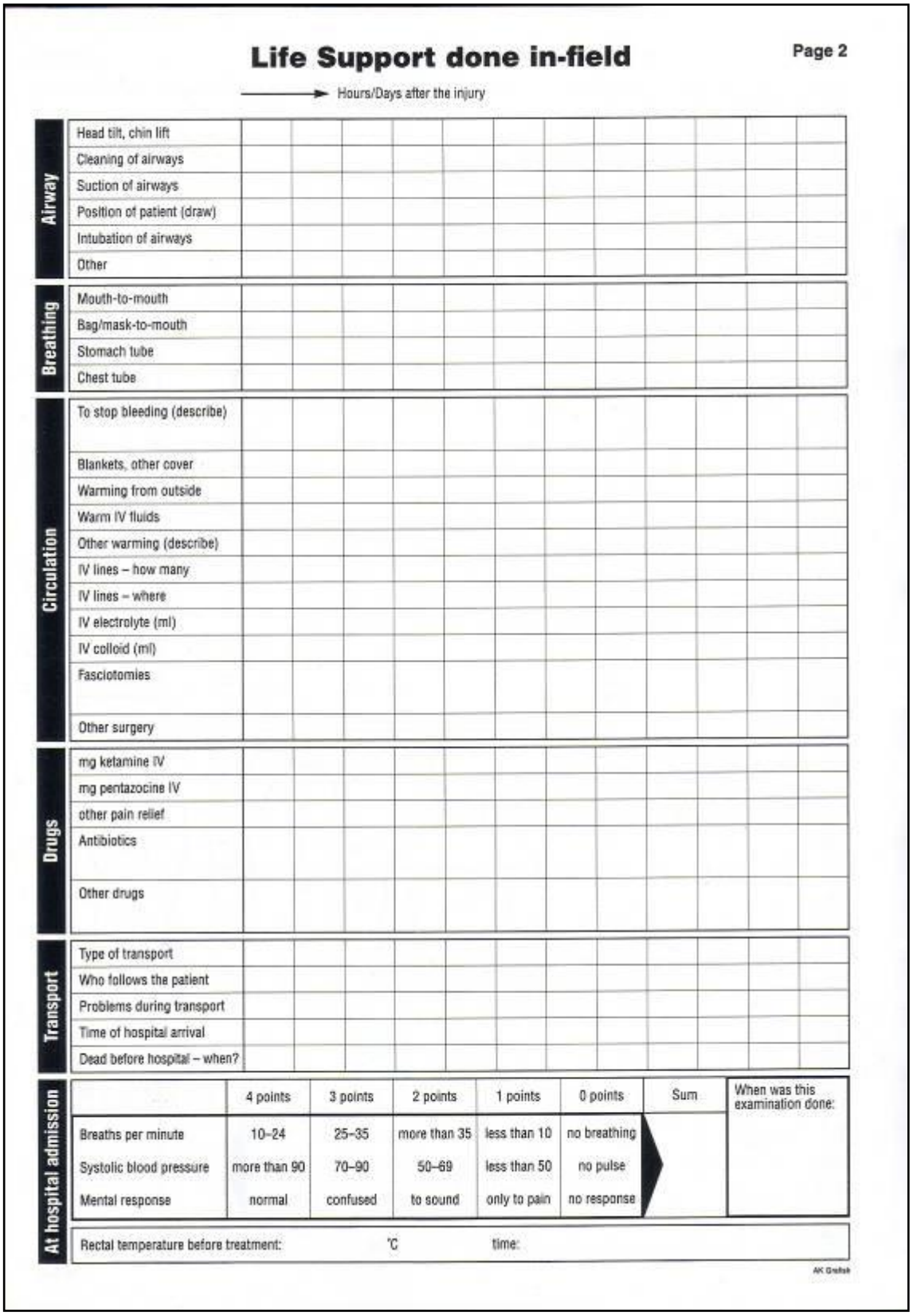
Before treatment

	4 points	3 points	2 points	1 points	0 points	Sum
Breaths per minute	10–24	25–35	more than 35	less than 10	no breathing	
Systolic blood pressure	more than 90	70–90	50–69	less than 50	no pulse	
Mental response	normal	confused	to sound	only to pain	no response	

When was this examination done:

Rectal temperature before treatment: °C time:

Injury chart facsimile



Life Support done in-field Page 2

→ Hours/Days after the injury

Airway
- Head tilt, chin lift
- Cleaning of airways
- Suction of airways
- Position of patient (draw)
- Intubation of airways
- Other

Breathing
- Mouth-to-mouth
- Bag/mask-to-mouth
- Stomach tube
- Chest tube

Circulation
- To stop bleeding (describe)
- Blankets, other cover
- Warming from outside
- Warm IV fluids
- Other warming (describe)
- IV lines – how many
- IV lines – where
- IV electrolyte (ml)
- IV colloid (ml)
- Fasciotomies
- Other surgery

Drugs
- mg ketamine IV
- mg pentazocine IV
- other pain relief
- Antibiotics
- Other drugs

Transport
- Type of transport
- Who follows the patient
- Problems during transport
- Time of hospital arrival
- Dead before hospital – when?

At hospital admission

	4 points	3 points	2 points	1 points	0 points	Sum	When was this examination done:
Breaths per minute	10–24	25–35	more than 35	less than 10	no breathing		
Systolic blood pressure	more than 90	70–90	50–69	less than 50	no pulse		
Mental response	normal	confused	to sound	only to pain	no response		

Rectal temperature before treatment: °C time:

AK Grafisk

Appendix 2

The vision of the BEST Foundation: Better & Systematic Trauma Care

BEST intends to enhance the professional care and ability to handle trauma victims at all care-giving levels. BEST do this by practicing teamwork, leadership and communication within a multidisciplinary trauma team.

We endeavour to keep our methods realistic, trustworthy and evidence based. These methods should be available to use immediately and should be applicable to other specialties.

BEST aim to be trustworthy and idealistic, and to operate without creating profit. BEST aspire to break frontiers through an open and innovative work, and thereby continuing to increase the quality of trauma care.

BEST is actively seeking to cooperate with other partners and initiatives. BEST strive to be recognised by encouraging openness and a desire to share our methods and results. We aim to distribute these widely to others interested.

See also **www.bestnet.no**

Appendix 3

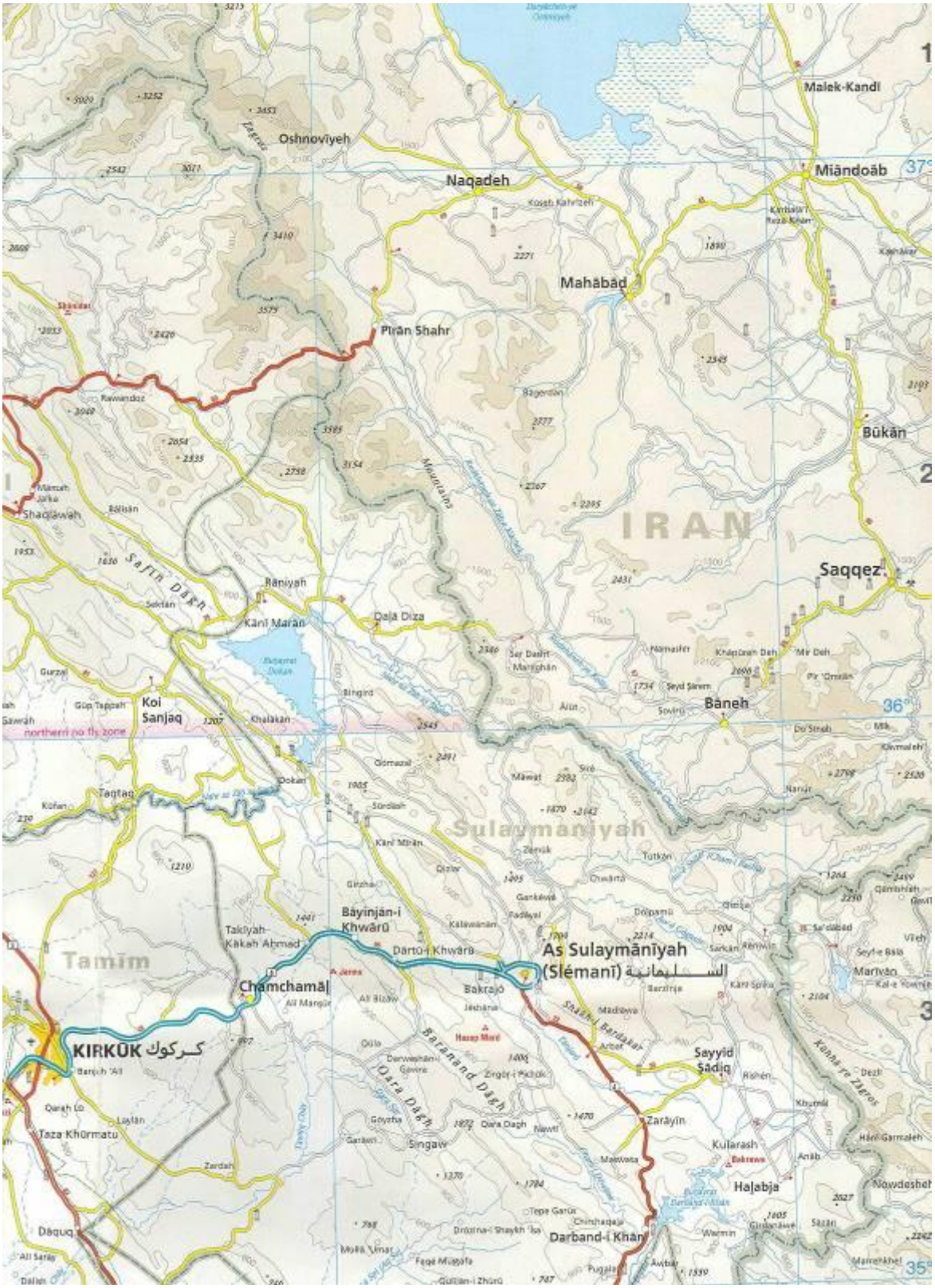
Tromsoe Mine Victim Resource Center (TMC)

- is a network of European trauma care doctors and health workers from the mine fields in South
- is an action research center working to find ways to save lives and limbs – not in mine victims only, but in all victims of war, disasters, every day accidents and emergencies
- is developing guidelines and teaching aids for low-tech, low-cost trauma care in the field and at district hospitals in South
- is not relying on Western expertise to solve health problems in South, but focuses on self reliance and empowerment in rural communities stalked by deadly epidemics of trauma and disease
- is a joint effort between the University Hospital Northern Norway, Trauma Care Foundation and WHO

See also www.traumacare.no

Appendix 4

Map of Kurdistan (Northern Iraqi part of Kurdistan)



Paper I

Torben Wisborg, Guttorm Brattebø, Johannes Brattebø, Åse Brinchmann-Hansen.

Training Multiprofessional Trauma Teams in Norwegian Hospitals using Simple and Low Cost Local Simulations.

Education for Health, 2006; 19: 85-95.

Paper II

Torben Wisborg, Guttorm Brattebø, Åse Brinchmann-Hansen, Per Einar Uggen, Kari Schrøder Hansen.

Effects of Nationwide Training of Multi-Professional Trauma Teams in Norwegian Hospitals.

Journal of Trauma, in press.

Paper III

Torben Wisborg, Mudhafar K Murad, Odd Edvardsen, Hans Husum.

Prehospital trauma system in a low-income country: system maturation and adaptation during eight years.

Journal of Trauma, in press.

Paper IV

Torben Wisborg, Mudhafar K Murad, Odd Edvardsen, Berit Støre Brinchmann.

Life or death. The social impact of paramedics and first responders in landmine-infested villages in northern Iraq.

Rural and Remote Health 2008; 8: 816. Available online from: http://www.rrh.org.au

Paper V

Torben Wisborg, Guttorm Brattebø.

Keeping the spirit high: Why trauma team training is (sometimes) implemented.

Acta Anaesthesiologica Scandinavica 2008; 52: 437-41.

The most faithful supporter beside the computer

**trauma does not occur indiscriminately,
neither should trauma training**

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