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Communication in Trauma Teams

Occurrence of CRM markers in patient simulator training

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ABSTRACT

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Abstract:

Trauma is a leading cause of death. There is a great need for training of human factors such as communication and teamwork in trauma teams. The use of simulation in medical education is increasing, and together with learning strategies based on experiential learning theory, it can be a powerful tool in team training. The aviation-based concept of crew resource management, CRM, in which framework communication is a key component, can be applied also in the health care domain.

The aim of the study was to investigate if change of communication is observable in trauma teams in CRM training and further to see if results are relevant for course development and patient safety improvement.

The setting is a simulation centre at a university hospital in Sweden. Three trauma teams were filmed during training and incidence and variation of chosen communication markers studied.

Results suggest that communication changes within teams and that different change is observable in different teams.

In an experiential learning perspective this indicates that the trauma team training in question should be developed further. In a patient safety perspective results indicate, together with other studies, that the hospital should integrate simulation training in a comprehensive patient safety programme.

Key words: Crew resource management, trauma team, communication, simulation, team training, medical education, experiential learning

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Preface

I want to thank the director Christer Carlsson and my friends and co-workers at Centre for Medical Simulation, Malmö University Hospital, for valuable input and cheerful support. I am grateful to my employer for the opportunity to carry out this thesis task and the master programme of which it is a part. It has been my ambition to produce “something useful” in return.

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Lastly, a thank you to my friend Mats Svensson at LUCSUS and everyone else who has helped me with advice, comments and provided mood-raising support.

1. Introduction

1.1 Welcome to the real world

> "I have been involved in quite a few trauma calls, but I have no ATLS training and prior to this day no in-house training of the procedures[1]."

This is a young, junior doctor in the absolute beginning of her medical career[2], quoted, as she was about to attend trauma team training for the first time, at the Centre for Medical Simulation, Malmö University Hospital. Fortunately, this surgeon-to-be was trained in this course in the very beginning of her residency. This is reality - as surprising it may seem to anyone outside the medical community - in the hospital subject to this study and most likely in most other Swedish hospitals. Many people take it for granted that hospital staff involved in acute situations and critical care train and practise, just as is done in aviation. But the truth is that many doctors and nurses in the Swedish health care system have never experienced multiprofessional team training and training of complicated medical procedures together, because there is no culture of training non technical, cognitive skills. This is however not unique for Sweden.

Secondly, it is a reality that injuries from trauma are the leading cause of death for people under forty years of age in the world. Optimal trauma care presupposes fast management and trauma patient outcomes are improved by quick recognition of injuries (Cole & Crichton 2006, Wisborg & Brattebo 2006a).

Reality is thirdly that a great number of near misses, incidents and adverse events[3] are reported every year from health care, all over the world. An often cited American report from the Institute of Medicine[4] 1999 states that medical errors in medicine cause the death of 44000-98 000 people annually in the US alone (Kohn et al 1999). In Sweden, there have been no extensive studies made on the incidence and panorama of adverse events. It is likely though that Swedish conditions are rather similar to those in countries like Denmark, United Kingdom and the United States where studies have been made (Socialstyrelsen 2006). Figures differ slightly, but the Swedish Board of Health and Welfare mentions numbers of between 5 and 10 % of all cases of care result in an unwanted event that leads to risk or harm to the

[1] Trauma call and ATLS® are explained in section 2.2, 2.3

[2] Vik ul (vikarierande underläkare), for the Swedish readers who are familiar with terminology of positions in the medical employment hierarchy.

[3] Adverse event is defined as "an injury caused by medical management rather than by the underlying disease or condition of the patient" (Kohn et al 1999, p. 29)

[4] Institute of Medicine (IOM) of the National Academies is a nonprofit organization specifically created for science-based advice on matters of biomedical science, medicine, and health in the United States.

patient. What is known is that appr. 1000 adverse events are reported each year according to Lex Maria[5].

1.2 Preventing mistakes

Just reporting adverse events and mistakes does not lead patient safety work forward. Investigating and getting to the bottom of each incident is crucial in order to prevent future recurrence of mistakes. One term for this is root cause analysis. There are no statistics from Sweden on the proportion of adverse events caused by lack of communication or leadership, bad decision-making or poor teamwork. Again we have to look abroad. The Joint Commission, the largest health care accrediting body in the United States, collects data of sentinel (adverse) events in American health care. According to statistics of root cause analyses, communication was the root cause to 65 % of all reported sentinel events in 2006 and leadership in almost 50 % of the cases (Joint Commission 2006). Seen over a ten-year period, communication is reported to be the leading root cause, 65 % (Ibid).

So why do mistakes happen? Are the individual health care workers not qualified or experienced enough? Are not safety programmes implemented in medicine and health care that prevent mistakes from happening? All these questions, frequently asked by patients and relatives are justified. But as in other high risk, high reliability organizations with high safety demands, the answer is that mistakes and errors **do** happen as soon as people are involved. Many factors contribute, a complex environment with a high degree of dependence on advanced technical medical devices, constant reorganizations, systems and organizational failures, individual fatigue, production stress, absent minds and loss of situation awareness etc. It is often a combination of little things, small errors that one by one are not enough to cause trouble, when the holes so to speak “line up”, that make accidents happen.

The official opinion of the Swedish Board of Health and Welfare is that there is great potential in development of preventive patient safety work in Swedish health care. (Socialstyrelsen 2007). Efforts can be made in different ways and on multiple arenas – education, in-service training, development of safe routines, change of attitudes etc.

The above mentioned Institute of Medicine-report, To Err is Human, has become the major reference work in this area. Since 70 % of all errors are thought to be preventable, much can be done to improve patient safety in all areas. One of the measures that are advocated in order to improve safety is simulation training (Kohn et al 1999).

[5] Lex Maria is the everyday term (from the national regulations concerning professionals in health care) that obliges all caretakers to report serious incidents to the Swedish Board of Health and Welfare (Socialstyrelsen).

2. Theoretical background – essential concepts

2.1 Patient simulation

"See one, do one, teach one" is a slightly casual, but frequently used characteristic of medical education and training. Clinical skills, mainly procedural and technical, have traditionally been taught from master to apprentice, from experienced physicians to more junior novices. Medical education is now in a period of great change - a period that will probably in a few years time be considered as a paradigm shift - implementing the use of various simulators, part task trainers, computerbased training programmes, computerized models etc into curricula on all levels. The reasons for this are demands due to the rapid changes in health care; increasing use of more and more advanced technology, structural changes leading to less patient time for doctors, attitudinal changes from more demanding patient groups and last but not least, a development of computer technology that actually makes it possible to resemble and replicate parts of, or the whole human body.

Although it has not been possible to verify, it seems that Sweden is much behind the United States and United Kingdom in the development of this area. To date, there are only two full-scale simulation centres in Sweden with a comprehensive approach[6], whilst centres in the US and UK together count in thousands.

Society for Simulation in Healthcare, SSH, defines simulation in the following way:

> "Simulation is a technique – not a technology – to replace or amplify real patient experiences with guided experiences, artificially contrived, that evokes or replicates substantial aspects of the real world in a fully interactive manner." (SSH, 2007)

Training in a full-scale simulation environment, using high-fidelity model driven mannequins, i.e. patient simulators, has many advantages. Individuals and teams can learn basic procedures as well as train complex courses of events. Practise of rare, but dangerous complications can be arranged. The milieu offers training possibilities for different professional categories (nurses, doctors, medical technicians etc). Research within many fields can be conducted. Scenarios can be standardized and repeated, without risks to living patients - patient safety is so to speak 100 %.

The rapid implementation of simulation-based programmes in health care education calls for a focus on how to use this new pedagogical tool most effectively. Three components are needed in this multiplication to reach the desired product, effective simulation-based health education, i.e. training resources, trained educators and curricular institutionalisation (Issenberg 2006). Sufficient resources means having adequate simulators, space, equipment, staff, associated curricula, assessment tools etc. Educators need to be trained in how to use simulators as an educational tool. Lastly, institutions implementing simulation-based training must "fully embrace its goal of improving patient care and patient safety" through systematically reducing the number of medical errors and committing to improving different competencies such as acute care and surgical skills, as well as non technical skills, i.e. crew resource management, teamwork and communication (Ibid).

[6] Additional, but still very few, hospitals have access to patient simulators

2.2 Trauma care and trauma training

> Trauma can be defined as "a body wound or shock produced by sudden physical injury, as from violence or accident."[7]

As stated in the introduction, trauma leads to death to more young people than any illness. 10-15 % of the trauma patients die due to mistakes, delays and mismanagement during the initial care, once the patient is admitted to the hospital, in the emergency room phase. The outcome, whether or not the trauma leads to death for the patient, can be improved if the patient is efficiently cared for by trained teams (Cole & Crichton 2006, Wisborg & Brattebo 2006a).

Standardized guidelines can help the care-taking team to apply their medical knowledge and optimise care. Advanced Trauma Life Support® is a framework with guidelines, published by the American College of Surgeons, for the management and care-taking of injured patients during the first hour. It is intended to aid and enhance the effective assessment and management of patients with multiple traumas. According to the ATLS® concept the management follows a specific order of examinations and measures that have to be taken. They are symbolized with the letters A (airway), B (breathing), C (circulation), D (disability) and E (environment or exposure). The idea is that you should secure vital functions (free airway and breathing) before you continue with the next step. Examinations later on in the management chain, such as logroll to check the back for injuries, have to wait (ATLS 1993).

The procedures of ATLS® are developed as help to the physician and his/her role in the trauma care, and ATLS® courses are designed for physicians only. For trauma nurses, there is an equivalent training programme, Trauma nursing core course, TNCC (ENA, 2007). Both ATLS® and TNCC thus deal with training of individual skills. There is a general need for increased training of teams in order to better prepare individuals and trauma teams involved in initial trauma care. This is concluded in two Nordic studies (Wisborg et al 2005; Wisborg et al 2006a).

To my knowledge, Center for Advanced Medical Simulation, Karolinska University Hospital in Huddinge, was the first hospital to implement CRM principles in trauma team training in Sweden. At the time of the above mentioned survey (Wisborg et al 2005) there was no movement for synchronizing this initial team training to the level of regular CRM training in Sweden and that is still the case, although Malmö University Hospital has implemented team training according to CRM since 2005.

2.3 Trauma care at Malmö University Hospital

Malmö University Hospital (UMAS) is the first choice hospital for appr. 360-400 000 inhabitants in and around the city of Malmö in southern Sweden. The hospital's emergency department takes care of around 60 000 patients each year. Appr. 450 trauma calls are called annually. However, there are no reliable statistics on this (Ribbe et al 2007).

A trauma code is called when an expected patient has severe injuries, for example from a traffic accident > 70 km/h, a fall from more than 4 meters, a penetrating injury to the

[7] www.dictionary.com, Trauma, retrieved 070528

face/neck or thorax. The specific trauma code criteria for UMAS can be found in Swedish in appendix 4.

According to a recent peer review executed by the Regional Medical Advisory group for Trauma[8], trauma care at UMAS suffers from lack of structure. There is no comprehensive organization. The coordination between different involved departments is insufficient. All surgeons are required to attend an ATLS® course, but the actual number of how many who has completed a course is not known to the management of the Department of Surgery (Ibid). The report also points out that the trauma team training organized by Centre for Medical Simulation (see section 3.1) constitutes a great possibility, that it is carried out according to the ATLS® principles and that it can improve by ensuring that all employees in the trauma teams attend the course (Ibid).

UMAS is not large enough to have designated trauma teams on call 24 hours a day, seven days a week. When a trauma call starts, an ad hoc team consisting on the people on call is paged through the ordinary paging system. At a given time, the team then thus consists of the physicians and nurses on call. According to the hospital's Guidelines for Trauma Room Work (UMAS 2007) the team has the following composition:

- Surgeon 1 is the surgeon on call in the emergency department (ER) at the time of a trauma call. Surgeon 1 is by definition the medically responsible physician in the trauma room. It is often a registrar/resident, but can in rare cases be a doctor who is not yet licensed[9].
- Surgeon 2 is the surgical consultant/attending surgeon on call in the hospital, not necessarily present in the emergency department at all times. He or she can be occupied in the operating room (OR) with acute surgery or doing rounds etc.
- The anaesthesiologist can be a junior or senior registrar/resident anaesthesiologist. He or she is mainly in charge of checking and maintaining airway and breathing, A and B in the ATLS® procedure.
- The nurse anaesthetist, a CRNA registered nurse with a specialist degree in anaesthesia.
- Orthopaedic surgeon, a resident or sometimes a specialist
- Two ER-nurses:

  Nurse 1, a registered nurse, among whose tasks it is to give drugs, set IV-lines on the patient etc

  Nurse 2, a registered nurse responsible for documentation, drawing up drugs etc in the trauma room
- ER nurse assistant, the person who cuts the patients clothes, takes blood pressure, places catheters, and assists physicians and the team with various tasks.

[8] Södra regionvårdsnämndens regionala medicinska råd för traumafrågor

[9] "Vik ul" is the Swedish term

2.4 Culture in trauma teams

The working culture of a specific trauma team is influenced by many factors, leadership being pivotal, but also by role competence, communication and patient status. This strongly suggests that human factors should be included in trauma team training "if a team is to capitalize on the important contribution of all team members including nurses" (Cole&Crichton 2006). The findings of this ethnographic study in the UK also suggest that support systems for role development for junior team leaders should be formalized.

Individual team leaders can have an impact and are ultimately responsible for team performance. For example, a team leader who initially establishes individuals´ names and states preferred modes of working could enhance the teamwork. The team leader needs to look upon his/her role as an information receiver and –sharer. Being team leader also means being responsible for the team. By giving guidance and support to individuals, besides coordinating the teamwork, and motivating with positive feedback, work smoothens up. It seems that team leaders using such means deliberately involve people from start and use humour to enhance teamwork. So besides clinical and communication skills, people-management skills are also a virtue for good team leaders.

Communication was considered fundamental to team performance in this study (Ibid). Stressful situations can lead to top-down, autocratic communication and individuals were seen to loose confidence. It has also been shown that patient status has great impact on how team members communicate, namely, the more critical the situation the noisier and less coherent the language. There was also evidence of mishearing and the need to repeat questions and/or answers.

CRM strategies, such as call-backs (closing the loop) were found to improve communication. Examples of that are confirming drug doses and checking priority order in multi-task situations. This key component was mainly observed between doctors and nurses, but also between other team members. The authors send a strong message to all health care bodies in their conclusion:

> "Crew Resource Management training should be offered to all members of the trauma team to help with leadership development, communication and collaboration. Whole team training promoting respectful interprofessional relationships will help to maximize the contributions of all members of the team, especially that of nurses and junior medical staff." (Ibid)

2.5 Crew Resource Management, CRM

The concept of Crew (or originally Cockpit) Resource Management training emanates from a workshop arranged by NASA, the American National Aeronautics and Space Administration (Helmreich 1999).

> "The research presented at this meeting identified the human error aspects of the majority of air crashes as failures of interpersonal communications, decision-making, and leadership. At this meeting, the label Cockpit Resource Management (CRM) was applied to the process of training crews to reduce "pilot error" by making better use of the human resources on the flight deck. Many of the air carriers represented at this meeting left it committed to developing new training programs to enhance the interpersonal aspects of flight operations. Since that time CRM training programs have proliferated in the United States and around the world." (Ibid)

CRM is an instructional strategy, containing generic principles, that train crews/teams to effectively use all of their available resources, i.e. people, equipment and information. It is many times, although not always, associated with teamwork during crises or situations of stress. The focus is on improving crew coordination and performance. CRM comprises "a wide range of knowledge, skills and attitudes including communication, situational awareness, problem solving, decision making, and teamwork; together with all the attendant sub-disciplines which each of these areas entails" (CAP 737 2006).

Murray and Foster (2001) have condensed CRM into the following major elements:

- Establishing leadership and support of the leader
- Recognizing specific functions of a leader
- The importance of communication
- The need for continuous reassessment
- The use of all available resources
- Avoidance of fixation of ideas and goals, and
- Consideration of personality traits for optimal group performance

Support of the leader is often referred to as "followership". A good follower assumes responsibility, gives feed back of relevant data, provides support, both cognitive and practical and owns delegated problems.

As stated above, communication is a key feature (Gaba et al 1994, CAP 737 2006). Depending on domain, different aspects of communication are emphasized. According to one of the more comprehensive medical textbooks that apply CRM in medical care, Crisis Resource Management in Anesthesiology (Gaba et al 1994), the important highlights in good communication are:

- Addressing your statements or messages to a specific person, in order to avoid pronouncing them into thin air,
- Closing the communication loop, which means providing and also asking for confirmation of critical information
- Foster an atmosphere of open information exchange among all personnel, which means that you should listen to everyone "regardless of job description or status"
- Continuous re-evaluation, meaning updating the situation assessment, which demands that information is collected, summarized and shared.

Information sharing per se is pointed out as another key factor for good teamwork. OR teams learned a new technique quicker if the climate was open and encouraged free exchange of information (Blum et al 2005). The study on culture, see above, points at information sharing as one of the major determinants of team performance (Cole & Crichton 2006). In one study, performed in a simulation setting, Blum et al planted clinical information - probes - with some team members in order to study information sharing. The authors concluded that there was a low level shown of sharing received information. This study also supported other studies that have shown that team members more easily share common, unnecessary information rather than unique information (Blum et al 2005).

The Canadian rhetorician Lorelei Lingard has investigated communication failures in the operating room, OR, from a rhetorical viewpoint (Lingard et al 2004). The study was performed in a clinical setting, that is the real OR, not in a simulated environment. The rhetorical framework is useful for analysis of communication in complex contexts. Studies made from this perspective will not only take into consideration **what** is said (content), but also **who** listens (audience), the **purpose** of the activity and the circumstances, the **occasion**. The ethnographic study in question describes the characteristics of communication failures, admittedly in the OR, but to my judgement the components of work in the OR are similar enough to the emergency room to make the comparison interesting.

Occasion failures were defined as "problems in situation or context of the communication event",

Content failure was defined as insuffiency or inaccuracy apparent in the information being transferred,

Audience failure was defined as gaps in the composition of the group engaged in the communication, and lastly,

Purpose failures were defined as communication events in which purpose is unclear or inappropriate.

Out of 421 communication activities 121 were noted as failures and categorized according to the above classifications. More than a third of all noted failures resulted in obvious effects on system processes, such as patient inconvenience, inefficiency, delay and team tension and thus represented a threat to among other things, patient safety. The failures occurred in appr. 30 % of information exchanges that are relevant to the ongoing procedure. Although the failures are simple ("communication is too late to be effective, content is not consistently complete and accurate, key individuals are excluded and issues are left unresolved until the point of urgency"), the nature of the failures poses a potential risk factor (Ibid). Therefore, it is not far-fetched to draw parallel between these failures and aviation checklists, and to "underscore the suitability" of intervention to improve communication in the OR (Ibid).

However, strong professional identities, and a traditionally very hierarchical culture in medicine pose problems to anyone planning to intervene to enhance communication. Lingard et al warns about these difficulties, but conclude:

> "However, notwithstanding the complexity of interprofessional communication, our descriptive classification of communication failures suggests critical aspects of team discourse that could be targeted for training activities to improve the communicative competence of the team". (Ibid)

A next step for work in this domain is to understand the connection between team communication, system processes and health outcomes. Lingard et al finally link to a study of behaviour and surgical results. Behavioural markers of surgical excellence, including communication style, were developed and could explain performance differences and clinical outcomes between surgeons in a paediatric surgical setting (Carthey et al 2003).

There are examples of elaborated assessment instruments for behavioural skills, of which the ANTS system, Anaesthetists´ Non-Technical Skills, is one. It is well known in the simulation community and it is validated measurement tool for measuring skills as task management, teamworking, situation awareness and decision making for anaesthesiologists (Fletcher et al, 2003).

2.6 CRM, does it work?

Nobody would dream of buying a ticket and travel with a commercial airline that does not have simulation training and training of CRM for their crews included in its safety and quality programmes. Still, the impacts of safety and saving lives from CRM training has yet to be proven, even in the domain from which the concept originates. The ultimate questions in health care - does it get safer, do fewer patients die – are relevant, but difficult to answer. Even fewer studies exist in this domain than in other high risk, high tech activities in society.

In a recently published study an American team of psychologists reviewed 28 published accounts of CRM training. Results showed that “the impact of training on learning and behavioural changes suggest mixed results across and within domains” (Salas et al 2006). And just as was shown in a previous study that the authors refer to, it is not possible in this study either to ascertain if CRM training has had an impact on organizational bottom line, safety.

The study in question uses a framework for evaluating training (Kirkpatrick 1976), in which learning is divided into a four level typology; effect on trainees reactions and feelings, learning and change of trainees attitudes towards CRM, behavioural change and the highest level being impact of training on the organizational level. The authors point out that it is difficult to judge why some CRM training programmes were successful or not. This is due to the lack of information about what specific CRM skills that were taught.

Eleven of the studies are from medicine. Not one had examined the impact of CRM training on the organization. The results vary. There is no unambiguous support for effectiveness of training. Some studies show that although training is perceived very positively, transfer to the clinical setting is not evident. Despite this, CRM training is needed and should be developed more in medicine, and there are chances of making it a success, if the medical community ensures careful design, implementation and management of CRM training activities, and learn the lessons from the aviation and military domains.

Further, this study does not mince words: “What is perplexing is that despite what is known about the science of training, organizations seem to ignore the available relevant literature that could guide and manage their CRM training efforts” (Ibid, p 408). Three main factors explain this insufficient use of existing knowledge; lack of standardization of CRM training, the problem of measuring and assessing performance, and thirdly the myths that surround this training concept.

Standardization is about what to train and how to train it. In the domains where governmental organizations have influence over the training, as in aviation, admittedly CRM development resources are provided, they are however limited to recommendations. Furthermore, the different names that are used for CRM training activities, partly depending on domain, suggest disagreement about definition. There is not either a standard set of what competencies that should be trained within the concept of CRM.

The problem of performance assessment must be addressed and the methods improved. “The tools being used now provide static information but are limited at allowing proper diagnosis of the required dynamic teamwork competencies” (Ibid, p. 409)

One myth in the CRM training community is that realism and high fidelity are crucial. This however is in reality limited to high psychological fidelity. Another is that subject experts, for example medically trained trainers when training CRM in the medical setting, should design

and drive training. Instead, a partnership composed of learning experts, who drive the design and subject experts, who contribute with domain specific and task related elements, is needed.

Instead of trying to provide decision-making levels in respective organizations with cost-benefit analysed proof of the value of CRM training, “this community” needs to emphasize and coordinate its efforts. A “mandate, access to data and resources to determine the efficacy of CRM training” is needed (Ibid p. 409). Salas calls for a directive from different bodies that are involved in CRM to ensure multiple-level, standardized evaluation of CRM training activities.

Despite that the evidence is “imperfect”, the conclusion of this study is that the community should have confidence in the “impressive” evidence that does exist.

Positive attitude towards CRM is the first step to translating aviation safety techniques successfully to the culture of medicine (Grogan et al 2004). This study shows strong support for CRM training from trainees, namely, training improved attitudes towards team building, communication, team decision making and also a generated a belief that CRM training will reduce errors and improve patient safety.

But in order to be effective it is not enough if CRM training is given only in single doses. Continuous booster doses are crucial:

> “CRM behaviours must become integral to team identities, organizational work cultures and clinical processes, as has become the norm in the airline industry. Hospital organization culture must change so that, as in an aircraft cockpit, CRM techniques become the ´way we do business here´.” (Ibid)

2.7 Experiential learning theory

Experiential learning theory (ELT) lies almost as an imperative and a fundamental framework for full-scale simulation activities all over the world. ELT is comprehensively investigated and described by David Kolb (1984).

> “It is the process of learning from experience that shapes and actualises developmental potentialities. This learning is a social process; and thus, the course of individual development is shaped by the cultural system of social knowledge.” (Ibid, p. 133)

ELT is a tool with which you can understand, manage and develop the way teams learn (Kayes et al 2005). If a team intentionally focuses on learning, it can increase the effectiveness and enhance development of team skills. Learning from experience can counteract different negative factors that are associated with teamwork, such as groupthink, overdependence of a dominant leader and a tendency to make riskier decisions than individuals alone. The key components in the experiential approach to team learning are conversation space, role leadership and team development, according to Kayes et al, and they have their roots in group dynamics research from the 1940´s.

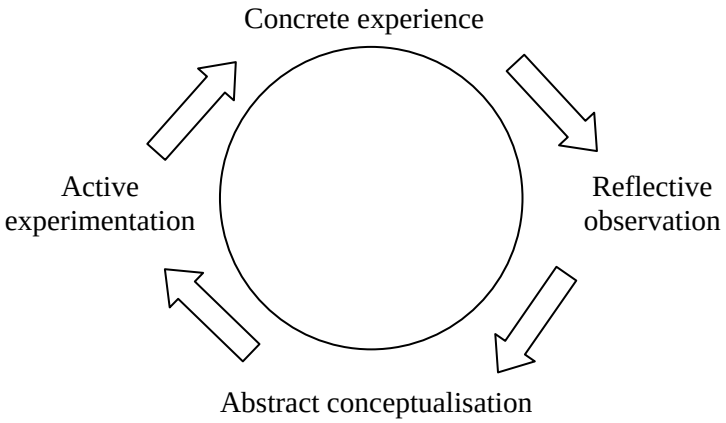
> “To learn from experience teams must create a conversational space where members can reflect on and talk about their experience together.” (Ibid, p. 332).

I perceive this conversational space to be multidimensional. There must be time space, there must be room space and there must be space in terms of a trustworthy and confident climate. Using this conversational space - acknowledging each other with respect and an open mind to different point-of-views that will emerge - where they can investigate and integrate their

different experiences, the team transforms into a self-analytic group, and they can create a common shared image that enhances their learning. During this process, the team develops from “a group of individuals into an effective learning system” (Kayes et al 2005).

Team development follows the experiential learning cycle, developed by Kolb (1984). (In this context there is only room for a short summary of the different stages.) Kolb defines learning “as the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience” (Ibid, p 41).

Figure 1. The Experiential Learning Cycle, from Kolb (1984).



“Reflective observation” and “active experimentation” explains the different ways in which we transform experience. “Concrete experience” and “abstract conceptualisation” are the two related modes in which we grasp and understand what we are or have been doing. The learning process just does not go one turn around the circle, in the ideal experiential learning situation the team “touch all the bases – experiencing, reflecting, thinking and acting” repeatedly (Kayes et al 2005).

Psychological safety is also highlighted in the Kayes paper. High psychological safety is about creating a climate so that the team is able to and feels comfortable in bringing up potentially sensitive and difficult issues. The reported findings seem logical; a climate of high psychological safety enhances team learning. In order to create the positive climate it is vital that the norms concerning the conversational space support the experiential learning cycle so that all the different phases of the cycle are passed through.

There are several functional aspects of team learning. Purpose, membership, roles and role leadership, context, process and action are all functional factors that need to be taken into consideration. It is the mutual and shared sense of purpose that distinguishes a group from a team. It is easy to see that a clear mutual and shared goal can counterbalance the risk of individual team members letting their own drives steer their actions. The individual members all carry their different luggage to the learning event, eg. previous experience skills, styles, personalities, knowledge etc. Therefore, factors as team size, team diversity, cohesion, trust and inclusion influence the learning situation in different ways.

Kolb advocates that learners need abilities to be effective, abilities to experience in a concrete way, to observe in a reflective manner, to conceptualize in an abstract mode and finally the ability to actively experiment with the new knowledge.

> "That is, they must be able to involve themselves fully, openly and without bias in new experiences. They must be able to reflect on and observe their experiences from many perspectives. They must be able to create concepts that integrate their observations into logically sound theories, and they must be able to use these theories to make decisions and solve problems" (Kolb 1984, p 30).

The most effective team learning occurs when the team advances through the learning cycle several times during the "project". The strengths and weaknesses of each team are related to the stage in the learning loop that the team disregards. Also, facilitation by a trainer/instructor who can ensure that the team actually does pass all the stages is vital.

> "Although the learning cycle is somewhat intuitive, teams do not necessarily engage in the cycle. This is particularly important for those who are interested in simulations and experiential education" (Kayes et al, p. 349)

3. Trauma team training at Centre for Medical Simulation, Malmö

3.1 Centre for Medical Simulation

Centre for Medical Simulation (CMS) at Malmö University Hospital (UMAS) is an educational unit organized within the planning department, directly under the hospital management level. It started out as a section of the anaesthesia department, initiated and led by the then department head, but later transformed to a more overhead unit of the hospital. The trainees at the centre are nursing and medical students, interns/house officers, residents, specialty registrars and consultants/attending physicians. Students from the regional Swedish Rescue Services School[10] have also been offered training, as well as the regional prehospital care organisation (KAMBER).

The training rooms at the centre are realistic medical settings, equipped with supplies and devices normally found in the room that is the setting for every specific course, in this case a trauma room. Simulated, clinical scenarios and procedures are conducted using a computerized full-scale mannequin[11] and ordinary medical technical devices. The patient simulator is model-driven, i.e. it answers to different measures taken by the trainees. "The patient" speaks in real time, a feature enabled by the fact that the operator, who sits behind a one-way window and hence can see and hear everything, acts as the patient´s voice and answers according to questions that are asked, examinations that are performed etc. This role is crucial in the scenarios. The operator can enhance realism and in cases help move the scenario forward if needed.

[10] Räddningsverkets skola i Revinge

[11] A Human Patient Simulator®, from METI Inc, USA

Currently, instructor staff at CMS is one anaesthesiologist and four nurse anaesthetists. In addition to that, the director, also an anaesthesiologist, sometimes works as an instructor.

Practice and supportive feedback is provided to enhance teamwork skills and the overall vision for training activities is of course to reduce adverse events and medical errors in clinical reality. The simulated scenarios are recorded with small ceiling-mounted cameras, so that trainees can view their performance in structured group debriefings facilitated by CMS instructors directly after training. The films are used as a pedagogic tool. CMS staff present are always, at the minimum, an operator running the simulator, an instructor/debriefing leader and a facilitator helping out in the simulation room.

The centre emphasizes its "house rules", not yet formally documented, to every group of trainees:

- This is a place for learning and reflection, for professional development both as an individual and team member, rather than a place for evaluation and appraisal.
- Everyone is entitled to his or her own experience, without having it judged.
- What happens during training shall not be the subject of stories outside the centre

3.2 Need for trauma training

At the end of 2004 the former Simulation Centre (at that time a unit within the anaesthesia department) was approached by the then trauma responsible surgeon, who had identified a need for some sort of local training of junior surgeons who had not yet attended an ATLS® course. His initial idea was to train only surgeons and "maybe have anaesthesia present as some sort of actor". The team at the simulation centre had just then started to explore the concept of team training and CRM and immediately suggested that the course would be designed as a training act for the whole trauma team rather than individual training.

After a few rounds of discussion the heads of the four departments involved, i.e. anaesthesia, surgery, orthopaedic surgery and the emergency department, decided to let the simulation centre custom make a course for trauma staff at Malmö University Hospital. Nurses and physicians from these departments designed the course jointly.

The programme was implemented in September 2005. To date, 29 course days have been carried out and appr. 220 employees[12] involved in trauma work have attended the course.

3.3 Description of the course

Curriculum

There is no formal documentation of the design and implementation process of this course. This description relies on my memory and the fact that I was involved from the beginning.

[12] Due to difficulties in freeing staff from clinical work, some courses have run with only one surgeon present, as it sometimes is in the trauma room.

The purpose of the course, as it is presented to trainees, is to raise quality of teamwork in the trauma room and finally and hopefully quality of trauma patient care. Curriculum and scenarios are partly based on recorded actual mishaps and adverse events in the ER. At the time, there was no compiled report on causes for adverse events from the hospital's database for reported events. However, nurses from the ER knew about several reported events that concerned communication, attitudes, unclear roles and unclear responsibility.

Although procedures must follow ATLS®, focus is not on the medical do´s and dont´s but on teamwork and the basic principles of CRM - cooperation, communication and leadership. Clinical procedures and curriculum closely correspond to each other. The design process initiated a revision of the Guidelines for Trauma Room Work at UMAS.

The means are a didactic lecture about CRM and three scenario training sessions of about 15-20 minutes long followed by debriefing sessions of about an hour (the first debriefing being significantly shorter). In the scenarios the trainees practice the above guidelines by using ATLS® and the CRM principles. The trainees have been asked to prepare themselves by reading through the guidelines, as well as some basic information about the simulation centre. The course is a one-day course. All the scenarios are recorded and the films are used for debriefing.

The lecture is a 45-minute introduction to keywords of CRM of which very few have heard before; Role clarity, global assessment, communication, support and resources. The trainees are encouraged to find examples from their own clinical experiences. Differences between communication in aviation and health care are discussed. Under the headline communication the following "do:s" and "don´t:s" are emphasized:

- Respect the patient and your colleagues
- Be distinct – "someone" is not a name
- Communicate decisions, orders and measures out loud to team members
- Give feed-back to confirm information transfer
- Share your suspicions and findings
- Create a permissive climate –avoid groupthink

Scenarios

I am not going to not describe the scenarios in detail. The reason for this is that there is a pedagogical intention about not letting trainees know the scenarios in advance. However, in each scenario the team takes care of a severely injured trauma patient. The patients and their injuries are all very probable, in fact one or two are based on actual medical cases from the hospital's ER. The all have a written script with anamnesis, accident description etc. Each scenario has a predecided "stopping point". The patient is awake and speaks in the present with the team, i.e. it is not a pre-recorded or computer voice. As described previously, the operator can see everything that happens, where on the body the doctors press and feel, and can answer accordingly.

The patient in scenario 1 has not been taken to the hospital by ambulance, but has instead showed up in the reception and he is therefore not initially assessed as a trauma patient. He is put in an ordinary exam room and gets worse. The team then assembles one by one. Scenario 2 and 3 are "ordinary" trauma calls, that is there is a call and the team gathers before the

patient arrives in the trauma room. The patients are all severely injured due to accidents, conscious upon arrival and therefore able to speak with the team.

Participants - trainees

The target group is everyone in hospital staff involved in trauma calls. It is actual trauma teams that are trained, randomly put together for the course, just as they are randomly put together in the clinical setting, based on who is on call a specific day.

During the training the two surgeons usually switch roles during the day so that the surgeon acting as number 1 in the first scenario, assumes number 2:s role in the second and usually switches back to number 1 in the last scenario. Often the more senior surgeon assumes the number 2 role, since that is the way it is done in clinical reality.

Evaluation of the course

The course is evaluated by the trainees directly after the course day, in a short questionnaire. There is also a short pre-course questionnaire, where we ask the trainees are asked to agree on a VAS scale to certain statements about trauma room work.[13] Unfortunately, the question whether or not the trainees are familiar with the concept of CRM is not asked, however it has been put orally to many of the course teams. Only occasional participants seem to have heard of CRM, either from watching TV-programmes about air disasters or those few who have attended other courses at CMS.

After the course trainees are asked to answer two questions, by noting on a VAS-scale to what degree they agree with the statements: *I believe that I will change the way I work after this course*, and *I believe that the team will change the way it works after this course.* High median values have been shown, 9,0 and 9,3 respectively. In addition questions about the course itself – realism, what can be improved etc, are asked.

4. Aim of the study – research questions

During the now almost 30 performed trauma team courses at CMS, we as a course organizer, have concluded at the end of almost every course day that the team performed “better” during the last scenario than in the first - a sort of face validity. But is that true? Is there support in the recorded scenarios of that ”gut feeling” of ours, i.e. is it possible to verify change by analysing the films? Can the course organizer learn from reviewing recorded scenarios?

One of the hallmarks of CRM being communication, the bottom-line question sums up to: Does communication change within the team during a course day? If one breaks down the word communication, four key activities stand out: addressing of messages, giving feed back/closed loop communication, sharing findings and presenting summaries of present status out loud, and lastly, followership.

[13] Visual Analogue Scale, an ungraded scale on which the trainee in this case can mark how much he or she agrees with a statement. Evaluators then measure the marked value, usually between 1 and 10.

How do they manifest and change in a team of medical staff who, by anecdotal evidence, are not familiar with CRM?

- Do the team members **address** the receiver of a message or given order, by using their name or professional role, more often in the last scenarios?
- Do team members who have been given orders **close the loop** (closed loop communication), that is, clearly state that they have understood and/or executed the order, more often in the last scenarios?
- Do the team members **summarize** the situation, in order to facilitate further procedures, and **share** their findings out loud, more often in the last scenarios?
- Do team members who are followers help the leader by **suggesting actions, alternative diagnosis** etc, more often in the last scenarios?

How can the above manifestations be understood and applied

- in an experiential learning perspective,
- in the patient safety and clinical setting perspective,
- in the medical education perspective?

5. Method

5.1 Theory of group observations

> "Observation: an act or instance of viewing or noting a fact or occurrence for some scientific or other special purpose"[14]

There are many ways in which to conduct an observational study. For example, group observations ca be performed directly when the act (-ions) or instance actually takes place, or at a later time, with the help of some sort of audio or visual recording (video, DVD etc). The observations can be made in the open or hidden, and the observer can to different degrees be a part of the observed events, or strictly be a non-participative observer. Historically, group research as a psychological method has mainly been conducted on groups that have been put together for the purpose of the study. The teams that will be studied in this paper are authentic, in the meaning they "exist and act as a natural unit in an organization", as described by Einarsson&Chiriac (2002).

Depending on the questions you are seeking to answer you can use different models. One model that seems appropriate in this case uses two dimensions and distinguishes between hypothesis testing or theory generating studies and also the degree of structure in the observations.

[14] www.dictionary.reference.com/browse/observation , retrieved 070522

Table 1. Model of different group observation studies. (Einarson&Chiriac, 2002)

Hypothesis testing

High degree of structure	**A**	**B**	Low degree of structure
	C	**D**	

Theory generating

Whether a study is aiming at proofing already existing knowledge or at creating new insights, places it in the vertical dimension. The horizontal, structural dimension refers to how much the observer has predetermined the way in which the registrations of the observations are made. In a study to the left in this horizontal dimension the observer has decided relevant situations and categories and the observation diagram is very comprehensive. All chosen variables can be categorized according to the used diagram, and the observer can then very easily note the registrations directly in the diagram. Usually the design of the diagram is based on thorough preparation and pre-testing. According to Patel (ibid, page 19) the following conditions have to be met:

1. The categories have to be so well defined that the observer correctly can identify to which category a certain behaviour belongs
2. The categories have to be exclusive, a behaviour can only be placed in one category
3. The number of categories have to be relevant to the research question
4. The diagram has to be designed so that it is easy to use.

In a study with a low degree of structure, to the right in the horizontal dimension, the researcher, simply put, tries to gather as much uncategorized information as possible that might help answering the question(s).

Ethnographic, or field research, makes a clear distinction of the different social roles that the observer can assume in the field observations. Hammersley & Atkinson (1995) separates them into four (p. 104): the complete participant, the participant as observer, the observer as participant and finally the complete observer.

> "The complete observer has no contact at all with those he or she is observing".

The ethnographic approach presupposes that research should start without a hypothesis (Einarson&Chiriac 2002). The observer usually assumes a more or less participative role besides the observing. To complement the observations the ethnographer collects artefacts and documents and conducts formal as well as informal interviews (Ibid).

Other methods of collecting data when studying groups are group interviews, group diaries, self report forms and inquiries. None of these are suitable for the purpose of this study.

To my knowledge there is no specific theory on how to observe medical teams in simulated situations. Different assessment tools, of which the previously mentioned ANTS measuring assessment tool is well known, have however been developed.

So, how should this study be categorized? An ethnographic case study? Indisputably, observations of group behaviour are the main instrument. I am going to study what is obvious. It is also data driven, meaning that it is the data that I can see that drives my analysis and the concluding discussion. There will be no generalizations made, so the word descriptive must also be included.

One could of course claim that this in some way is a hypothesis testing study, the hypothesis being: Trauma team communication changes after a course like the one in this study. One can maybe claim that it might lead to theory generating studies, should I or anyone else choose to follow up on the conclusions.

Regarding the structural degree of the registrations I would argue that this is a semi-structured study. I *have* decided what categories of communication I am going to registrate (verbal, with predetermined specific messages). The diagram *is* easy to use. However the categories are not completely exclusive. A verbal message can be coded both as marker for addressing and for closed loop communication, for example.

To conclude, this study would best fit in the bottom left corner of square B, close to the intersection of the dimensions (see table 1). But it borders to the D square, the ethnographical approach. According to this the researcher can assume different roles, and it is evident here that I belong in the category of complete observers, since I perform the observations long after the scenarios have taken place.

5.2 Reliability and research quality

Einarsson&Chiriac state that one way of assuring or enhancing reliability in studies with a low grade of structure is to continuously note your way of action, as well as methodological and analytical questions (p. 140).

An account for one's pre-understanding of the subject is essential in quality discussions, as pointed out in different works on qualitative method (Einarsson &Chiriac 2002; Larsson, 1994). In order to ensure this quality criteria, one can present previous and ongoing research, one can present the theory against which analysis will be made and/or one can present one's own personal preunderstanding, i.e. relevant background and interests (Ibid, p. 164f). The latter follows.

My preunderstanding

Up until 2002 I knew little about medical education in general and the use of full-scale simulators in particular. I was at that time offered a position at the department of anaesthesiology at Malmö University Hospital, which included the task of assisting in setting up a full-scale simulation centre. I have since then been deeply involved in building this Centre for Medical Simulation (CMS) from the very start of its activities. I have many years experience as a professional communicator with different organizations within the Swedish health care system before joining the anaesthesia department at UMAS. I have a bachelor's degree in environmental health with a complement in media and communication sciences. I

have no formal medical education or training, however my professional background, working closely with physicians and nurses, has - at least due to my own judgment - educated me beyond the layperson level.

My three roles

My duties as coordinator at CMS include administrative as well as pedagogically directed tasks. I have been involved in developing most of the courses and the trauma team-training course was implemented partly on my initiative. I have an active part in the CRM lecture in the course. I have been listening to, although not led, many of the debriefing sessions following the training scenarios. I have talked to many trainees during and after the courses. It is therefore fair to say that I have a strong personal engagement and an own interest in this course in particular. I am at the same time so to speak the course developer, the teacher and the researcher. Apart from making me very familiar with this subject it constitutes a possible bias risk. But pre-understanding or preconception can also be used in a positive sense, as pointed out by Einarsson &Chiriac (2002). The observer can focus on the study instead of investing a lot of energy in understanding the context. However, one must remember this:

> "The important thing is that the researcher problematizes and relates to his or her pre-understanding, both during the study and in the presented text." (p. 40)

5.3 Research design

Limitations

I am not going to not answer the question *why* communication changes. I will not generalize and say that because communication changes within the three studied teams it will change accordingly in other teams, since we know from the ELT that many factors influence team learning. So explanations and generalizations do not belong here. That is just not possible for obvious reasons. It might just as well be the debriefing element as it is the scenario training. I do not intend to go into the question of transfer of learning from simulation environment to clinical practice, a totally separate issue that demands a totally different study design. So, it is solely a descriptive study.

Selection of films

I randomly picked three course dates/teams out of the first ten performed courses during fall and winter 2005-2006 and then the first, scenario 1, and last, scenario 3, of each course. The intention was first to examine five teams, but I was advised against that and settled for three. Scenario 1 and 3 are the same for all the teams.

Research ethics

The Swedish Research Council for Social Sciences (Humanistisk-Samhällsvetenskapliga forskningsrådet) has issued guidelines for video based research (HSFR 1996). Video should only be used when it is necessary to simultaneously do an audio- and visual registration of data. According to the guidelines, subjects of video-based research have the right to be

informed, to consent to participation and to remain anonymous. Further, the collected data must only be used for research.

It goes without saying that studies like the one here presented cannot be performed without recordings of the scenarios. One could maybe argue that data collection be limited to observing the scenarios as they occur. However this proposes wide difficulties, since it is practically impossible to register complex dialogue and several persons´ gestures as it happens. So, in reality, the study demands some kind of recording.

The requirements for information, consent and confidentiality are in principle not complicated to fulfil, and neither was the case here. The main ethical question that had to be dealt with in order to perform this study, was the fact that the films from the different scenarios were recorded with the explicit purpose to serve as a pedagogical tool during the courses. At the start of each course the trainees are always informed that the scenarios will be recorded, used during debriefings and then saved, as potential data sources for research. They are also told that **if** films in the future are to be used for research, every trainee will be contacted and asked to give their consent. Therefore, this thesis task had to start with an email to all trainees participating in the selected courses, asking for permission to use the films from their respective course (email, appendix 1).

The trainees were asked to reply with an OK or a refusal; if the did not answer within a three-week time limit that would be considered as an OK. One trainee refused participation. Due to that a new course date had to be randomly selected for observation and additional trainees asked for permission. None of them refused to participate.

The trainees are not in any way identifiable in my observation notes, and as I have stated in my information letter, it is not of any interest to me to study individuals, only the professional roles, i.e. the surgeon, the nurse anaesthetist etc, as a team member. There is no information about the participating individuals on the films. Unless you know these people by name, you will not know who they are.

The “requirement of usage” is hardly applicable, since the original purpose of filming is another than research. However, should this study or parts of it be presented in some context, these guidelines prevent the use of films as illustrative examples. Such use would most probably demand new consents from the trainees. This is also the reason why there are no pictures in this paper, something that might have facilitated understanding of what full-scale simulation is all about.

Review of films

I reviewed the DVD films using a laptop PC and headphones. I watched the first and last scenario of each team, before starting with the next team. I watched each recorded scenario twice, sometimes rewinding as not to miss anything, and I had to pause regularly in order to keep up concentration, since many lines were quite difficult to hear. For example, during some scenarios there were frequent moments when everyone was speaking at the same time.

On a large observation sheet, following a time line, I noted all statements that contained one of my chosen markers; addressing of messages, closed loops, summaries and examples of followership. I also noted who pronounced it. During the second review I noted, with another pen colour, statements or information that I had missed the first time, and also clarifications that can help the analysis.

The first review took approximately 1,5 hours, depending mostly on the voice levels in the team, but also on the actions. The scenarios where the work was not so structured took longer. The second review took less time to do, appr. 60 minutes.

I did not limit the noted observations to verbal activities. I also noted when there was evident eye contact or other body language signs, as a pointed hand.

Coding

After watching the scenario the first time, and writing down all audible lines containing markers, together with comments where appropriate, I coded each line that exemplified addressing, closed-loops, summarizing and followership according to table 2, see below.

The letter **a** (lower case) stands for unaddressed statements or orders. The capital **A** stands for an addressed statement or order. The **S** is for summary, marking all activities that are either a summary of present status, "where are we now", or a loud report to the rest of the team of vital patient data. The **C** is for closed loop communication, meaning a message that gives feedback about a given order etc. The **F** comes from the word followership. This letter marks verbal activities that help the leader or the team move forward in the process or reminds of things forgotten or missed.

After watching the scenario the second time, I did the same thing again, to minimize the risk of missing something, or to - in some cases reconsider my codings. After a discussion with Dr Lars Björk, senior consultant anaesthesiologist at CMS, and experienced trauma anaesthesiologist, all non addressed messages, i.e. small a:s (see table 2), that were complemented by evident eye contact or a pointed hand were transformed into an A-, symbolizing non verbal but still straight addressing[15]. The reason for this is that this kind of addressing is considered as clear as using a name or professional role in the actual trauma room. In addition, in the CRM lecture before the scenario training, eye contact is also used as an example of clear communication.

All the codes, the a:s, A-:s, S:s, C:s and F:s, were then transferred into a graphical table (appendix 2). They were placed in the "minute box" where they were pronounced. The markers were then summarized at the bottom. In this overview of marker incidence I have not presented the sender and receiver of each message.

After this summary, I very thoroughly read through my notes from the film reviews, noted interesting passages or quotes. Examples of these together with some general comments about the scenario are presented under Results. In a few situations I went back to the film and checked a specific moment or passage a third time.

[15] Example: Surgeon 1 to nurse 2, with evident eye contact: *Then we'll call trauma-CT.* Nurse 2 nods evidently, to confirm.

Table 2. Legend of codings

A message out into thin air: *"Can someone call X-ray and warn them that we are coming?"* or *"We need some more Ringer[16]!"*	a
"Please, put in two more green IV-lines…" together with a pointed hand or evident eye contact with the receiver.	A-
A message or request with a named (or functional) receiver: *"Anna, please call the OR and ask if they are ready for us!"* or *"Anaestehia, please check the breath sounds again."*	A
Loud summaries of present patient status or findings up to this point, or loud reports of new clinical findings: *A and B are OK, we suspect a major internal bleeding due to the patient´s abdominal pains and there is a fractured femur.*	S
"5 mg of morphine is in." Closing the loop, announcing that an order has been executed	C
Shouldn't we first do the logroll[17]? Examples of good followership, that is statements that help or remind the team leader, for example of measures that haven't been taken, or that moves the examination and procedures forward.	F

Methodological questions

The quality of each quotation and its respective coding is not taken into account. Either the quotation is an "S" or it is not. Furthermore, if a quotation is actually coded at all or not, is in this case subjective, since no systematic validation has been done. I have relied on my pre-understanding of CRM and of what I have learned from being involved in 25+ courses. A "C" can well be a "C" but if it is not clearly addressed, coded also as an A, meaning that the loop is closed, the value can be reduced. It wasn't until the reviewing part of the study was over that I realized I could have made such "cross-codings", but I did not.

Sometimes one activity (i.e giving feedback of an executed order for example) can result in two or even more noted activities. This example is from team 3, scenario 3:

7.30, nurse 1 reports: *5 mg:s of morphine given.* This is coded as a C and a small a. The nurse is attentive and notices that nurse 2 who was the target for the message did not catch it. So 15 seconds later he goes round the patient gurney to the other nurse and repeats while he has eye contact: *5 mg:s of morphine given.* This statement is coded as another C and an A-, since they had eye contact. Due to place of microphones in the simulation room, and the fact that the trainees move around it was sometimes difficult to hear conversation. This is more often the case for nurses and surgeon 2. I tried to rewind the film and listen until I captured the phrase, if that was not possible it just had to be omitted.

Using physical movements as complements to verbal markers leaves room for difficulties with establishing boundaries. One can therefore discuss reliability of the marker A-. As an observer, how can I be sure that what I see as a confirming nod of the head or seemingly eye

[16] Ringer´s Lactate Solution

[17] Logroll is the term for when you roll the patient over to the side, 90 degrees, to examine the back etc.

contact between two team members is in fact communication between just those individuals? I have chosen to include them in my results but not put too much focus on them.

The chosen scenarios are recorded in two different simulation rooms. This is due to the fact that the centre moved in January 2006. But since the room is arranged in the same way, and the team composition is the same, this should not influence the outcome of my analysis.

As described earlier, the two surgeons often switch roles from one scenario to another during the course. This could maybe have proposed a problem in this study, but thankfully in all the chosen films, the surgeon assuming the role of number 1 in scenario 1 is also surgeon 1 in the last scenario.

The operator's role is shared between two of the CMS staff. Their "style" as patient voice is not the same, probably due to different personalities. This could also have proposed a problem, but thankfully in this case as well, coincidence helped and the operator was the same throughout all six studied scenarios.

When interpreting the increase/decrease of the marker incidence, one must remember that the scenario/medical case 1 and 3 are not the same, that the course of events differs, something that t might have influence on the incidence of different markers.

6. Results

The results will be presented in the following way. Each course team and its behaviour in scenario 1 and 3 are described separately. All the six scenarios are respectively first commented in general terms, how I perceived the work in general non-criteria terms. Then follows, for each scenario, examples of passages or quotes that exemplify the different markers; a, A-, A, S, C and F (with the abbreviations at the end of each passage). They only constitute a sample, since data (neither films nor observation sheets) can be included in this paper. (In appendix 3 is a copy of an observation sheet.) The chosen passages demonstrate in some way the significance of different markers, for example addressing and what might happen if messages are unaddressed, or how good followership can help the work forward etc. Last comes a table accounting for the total incidence of each marker in each scenario. A total overview of marker incidence, minute by minute, is found in appendix 2.

Since each team constitutes the unit of analysis, there is no open account of which individual that says what in the total overview, although information of this is noted in the original observation sheets. I will discuss each group and their respective change of communication separately.

In the quotes, the trainees' real first names are exchanged to fictitious ones in cases when the real name was used to address someone. I lastly want to remind the reader of the fact that in scenario 1 the team members do not assemble before the patient arrives, but drop in as they arrive to the ER (see section 3.3).

6.1 Team 1

Scenario 1, general comments

Time of scenario: 16 minutes. In this scenario the work seemed to proceed in a quiet and peaceful atmosphere. Surgeon 1 seemed very calm but gave her orders very quietly and seemingly indistinct. More than once, deliberation between surgeon 1 and surgeon 2 was mumbling, and very quiet, and the anaesthesiologist was not invited to share clinical findings and decision-making. Probably due to indistinct orders, the administration of pain relief to the patient was firstly misunderstood by the nurse and then also delayed. Patient contact was sometimes poor, the man had to ask several times for pain relief without response of any kind. Both surgeon 2 and the orthopaedic surgeon enter the trauma room without introducing their presence.

Scenario 1, quotes and passages

1) At the end of the scenario surgeon 1 and 2 are discussing to change the original decision to take the patient to trauma CT and X-ray. They are whispering and mumbling together with the anaesthesiologst. You can only here the word "OR" (operating room) at the end. Nobody announces the changed decision to the team. Nurse 2 (documenting nurse) then asks out loud: *So what is the decision?* Surgeon 2: *To the OR.* Nurse 2: *No X-ray?* Surgeon 2: *No X-ray!* Nurse 2: *OK, I'll call the OR then.* **(F)**

2) At 5.40 surgeon 1 orders pain relief to the patient without addressing the order: *We give 5 mg:s of Ketogan.* At 6.45 the patient asks: Can I please have something for the pain. Surgeon 2 whispers: *Hasn't he been given that?* Surgeon 1 then orders: *He can have 5 mg:s of Ketogan, all right.* Nurse 2 answers: *Oh, did you say Ketogan? I've drawn up morphine*. Surgeon 1 responds: *That is also OK.* At 7.50 nurse 2 checks again when she's about to do the injection: *It was 5 mg:s of morphine IV? Yes please!* says surgeon 1. The loop is closed at 8.00 when the nurse says: *There, he's got 5 of morphine.* **(a, C)**

3) At 11.30 the anaesthesiologist asks: *Do we have reason to suspect any major bleeding?* He is answered by surgeon 1 who just after that summarises findings that are potential bleeding sources. **(F)**

4) The orthopaedic surgeon gives orders for relevant X-ray examinations in the 12th minute but without addressing. Surgeon 2 reminds of a plain X-ray or not? At 12.30 nurse 2 closes the loop, reporting: *X-ray is ready for us in 10 minutes.* **(F, C)**

5) Surgeon 2 asks in the 11th minute for breathing information: *Does he have similar breath sounds on both sides?* The anaesthesiologist listens and encourages her to listen by herself a minute later: *Please listen yourself so that more of us have listened!* **(F)**

6) The orthopaedic surgeon quietly enters the room in the 3rd minute without in any way introducing his presence to the team members. Surgeon 2 does the same in the 4th minute. (**No coding)**

Scenario 3, general comments

Time of scenario: 16 minutes. Team 1 worked quietly and calmly in the last scenario, just as in the first. Sequences of mumbling, inaudible conversation between the two surgeons made the scenario a little difficult to follow. My impression after watching the second scenario was that the group worked in a way quite similar to the first time.

Scenario 3, quotes and passages

1) Surgeon 1 frequently uses the unaddressed expression "we" when giving orders for drugs or different measures. At 2.00 surgeon 1 says: *Can we have some big IV:s? Can we take out Ringer as well?* **(a)**

2) At 6.59 surgeon 1 asks for blood tests: *Blood tests, have we taken those? Blood group, and Hb?* Nurse 2 answers: *Yes, they have been taken.* This message was picked up although it was not addressed. **(a, C)**

3) In the 5th minute the anaesthesiologist points at nurse 1, or the nurse assistant (difficult to judge from the film), and asks: C*an you hang a Voluven?* Forty seconds later, nurse 2 closes the loop, however unaddressed, and says: *The Voluven is running!* Surgeon 2 twenty seconds later asks, out in the open: *Has he got the Voluven now?* The anaesthesiologist responds: *Yes!* **(A-, C)**

4) Also in this scenario there is confusion concerning drug administration due to unclear messaging. In the 4th minute surgeon 1 asks, unaddressed: *Can we pull up some morphine – 5 mg?* More than a minute later nurse 2 asks: *How much morphine did you say?* at the same time as she gives the injection. Surgeon 1 answers: *5 mg:s.* **(a)**

This order is not confirmed out loud. In the 7th minute the patient moans from pain and surgeon 1 asks, without addressing the message or confirming the previously given order, 6.22: *Some more morphine, can we pull up that - 5 mg:s?* A minute later nurse 1 closes the loop, 7.12*: 5 mg:s of morphine given.* **(a, C)**

Forty seconds later the patient explicitly asks for more pain relief. Surgeon 1 answers, 7.57: *We are giving you that now – is that what we are giving him now?* Nurse 1 is giving the patient an injection in the right hand needle. She answers: *No,* and something inaudible. After hearing this *"No"*, surgeon 1 does not reassure herself that the morphine was actually given, although it seems like she did not notice when nurse 1 closed the loop at 7.12.

5) In the 14th minute, after surgeon 1 and 2 have discussed and decided to take the patient to trauma CT, surgeon 1 asks the orthopaedic surgeon: *Is there something more than the trauma CT?* Orthopaedic surgeon: *Yes, a femur.* Nurse 2 (she is the one whose duty it is to actually call the X-ray department) asks: *A plain X-ray of the femur?* Surgeon 1 answers her: *Yes, a plain X-ray of femur.* Then surgeon 2 reminds them all that there were findings suggesting a broken arm, by asking*: What about the arm?* The orthopaedic surgeon then gives an order to include also X-ray of the right arm and shoulder. Nurse 2 concludes: *Is that all?* Orthopaedic surgeon closes the loop by saying: *Yes, that's all.* **(F:s)**

Now what happens here is first that surgeon 1 wants to make clear from the orthopaedic surgeon all the examinations that have to be ordered at the X-ray department, so she "helps", hence the F. Then, nurse 2 wants to make sure that it is actually a plain X-ray, which is a different examination than CT. She also helps, hence another F. Surgeon 2 continues

“helping”, reminding of the arm and nurse 2 by concluding that no more orders are to be given.

6) Moments later, nurse 1 notifies surgeon 1 that the Ringer IV is finished: *One Ringer is finished, should I hang another?* Eye contact is observable. Surgeon 1 answers by nodding and it is probable that nurse 1 understands the message. **(F)**

Counted markers team 1, scenario 1 and 3

For a total time structured overview please see appendix 2.

Table 3. Incidence of markers team 1

	a	A-	A	S	C	F
Scenario 1	**21**	6	1	7	8	**11**
Scenario 3	**14**	6	3	8	10	**18**

Summary team 1

Differences of incidence of markers are obvious for small a:s and F:s, that is unaddressed messages/orders and signs of followership. The former has decreased by a third and the latter has increased by more than half. One must bear in mind that no statistics have been made. The only conclusion one can draw is that there is a difference. For the other markers the change of incidence is just 1 or 2, and the observation is hence that the markers for summarizing/saying your findings out loud and for closing the loop, have not changed. The “A” incidence is low in both scenarios.

It is interesting to note that although some orders or questions are unaddressed, pronounced into “thin air”, they get through and are answered (example 2, sc 3).

It is sometimes unclear whether or not messages actually get through (example 3, sc 3). The question from surgeon 2 some time after a closed loop from the nurse suggests that.

In example 4, sc 3 one can ask whether or not it is totally clear to surgeon 1 how much morphine, 5 or 10 mg:s, the patient has been given? This whole episode can be used as an illustrative example of how easily incomplete information potentially can lead to mistakes.

6.2 Team 2

Scenario 1, general comments

Time of scenario: 18 minutes. The work in this scenario sometimes seemed very noisy. Although structured, all team members were from time to time speaking in each other’s mouths. The anaesthesiologist explicitly had to ask for silence once and even the patient complained about not being able to hear when he was questioned. The team members did not introduce themselves or their professional role when entering the room. This was particularly obvious when the orthopaedic surgeon and surgeon 2 came in.

Scenario 1, quotes and passages

1) At 7.49 surgeon 1 asks: *Have we taken a new blood pressure?* She gets no answer, and asks again at 8.08, this time looking at nurse 1: *We would very much like a new blood pressure!* **(a:s)**

2) The 7th minute is very noisy: Surgeon 1 is reporting to surgeon 2. The anaesthesiologist is questioning the patient. The nurse assistant is reading different vital signs from the monitor (blood pressure, saturation etc) and calling them out loud to the documenting nurse 2, across the room. The high noise level is an obvious disturbance. After some moments the anaesthesiologist needs to ask for silence: *Two seconds, can we have some silence, can you please take two deep breaths!* Everybody actually becomes silent. **(no coding)**

3) The anaesthesiologist several times demonstrates good followership. In the 12th minute: *"Lisa"*[18]*, shouldn't we summarize what we have so far?* She answers: *Yes, we have come to D, we are about to turn the patient over (logroll) and then we will re-evaluate.* In the 18th minute, after a noisy minute when everybody is talking over the patients head about what to do next, the anaesthesiologist concludes: *Do we agree that we have free airway, that the breathing is OK, that we have a suspected internal bleeding and that we are going up to the OR?* While saying this he looks at both the surgeons and they confirm by nodding and saying: Y*es!* **(F, S)**

4) Differences of how, or if at all, a new team member introduces his or her presence in the room can be noted. The orthopaedic surgeon does not introduce himself when entering quite early in the scenario. Neither does surgeon 2. The orthopaedic surgeon is quiet and seemingly not noticed until very late in the scenario. After surgeon 1 and 2 have discussed and summarized the findings, surgeon 2 says: *We can ask the orthopaedic surgeon to come.* He does not see him until someone points at the orthopaedic surgeon who is in fact, and has been for some time, standing just opposite, on the other side of the patient, and continues: *How is it with distal status of the right arm?* **(No coding)**

When the anaesthesia team enters the room however, they announce their presence out loud: *Here we are from anaesthesiology.* Their presence is obviously noted, because the surgeon quickly answers: *Good, we could use some more needles so that we can hang the IV:s.* The anaesthesiologist responds: *Can you please tell us what happened first?* **(F)**

Scenario 3, general comments

Time of scenario: 20 minutes. Although there are some episodes in this scenario when team members speak in each other's mouths, there seem to be more quiet moments in this scenario. It seems like different team members deliberately refrain from speaking in order to give "talking space" for examination and questioning of the patient. A few times someone is interrupted, even when giving drug orders, leaving the ordination unfinished.

[18] The surgeon

Scenario 3, quotes and passages

1) Surgeon 2 foresees the need for a consult from another speciality and addresses nurse 2: *"Eva", please page the vascular surgeon!* The anaesthesiologist asks surgeon 1: *"Peter", do we want to keep his blood pressure low for now?* **(A)**

2) The orthopaedic surgeon is examining the patient in the 8th minute and tries to communicate: *He is quite swollen in his right leg, and....*but nobody hears him. Everybody is busy attending to his or her task for the moment. By saying the name of surgeon 1 his find might have been noticed. **(a)**

3) At 8.42 the anaesthesiologist asks: C, *can you please order some more O-negative blood?* At 10.00 he asks: *C, when this Voluven is finished, we will take a second one.* **(A)**

4) In the 10th minute the anaesthesiologist asks for pain relief to be drawn: *We can draw some morphine, we can draw ten...* and he is then interrupted by surgeon 1 on the word ten. His intention to ask for morphine is not completed. More than three minutes later, nurse 2 brings up the pain relief subject. The following exemplifies both followership, good addressing, but at first, lack of the same: *"Peter", should we give more pain relief – I have morphine here, 1 mg/ml? Yes, you can give five... (pause) millilitres.* The anaesthesiologist is concerned about not giving to much morphine and counters: *I would only take half of that, due to...* Surgeon 1 understands: *OK, we'll take it carefully, a little at a time.* It is then surgeon 2 who realizes that the changed dose might not have gotten through to nurse 2, and notifies her by saying: *"Anna", you heard two and a half?* "Anna" closes the loop some seconds later: *Two and a half of morphine given.* **(a, A:s, F:s, C)**

5) In the 9th minute the anaesthesiologist summarizes: *A and B are totally OK, should we fixate the pelvis with a belt*[19]*?* Surgeon 2: *We need to turn him over, and then we need to have the belt ready.* This starts a discussion of doing the logroll at this time or not. Someone gets the TPOD[20] and the logroll is performed in the following minute. **(S)**

6) Both the surgeons and the anaesthesioloist summarize patient status several times. At 5.00 surgeon 2 says, looking at nurse 2: *A and B are quite normal, C we are doing that right now.* 11.00: *A is good, B is good, C is stable but low, and we are attending to that now. D, we have no problems with that.* At 13.13 surgeon 1 makes a loud summary of all the injuries found. **(S)**

7) At the end of the scenario the patient's blood pressure falls, and the doctors start a re-evaluation of the decision to go to X-ray before taking the patient to the OR. It is the nurse anaesthetist who notices the team of this in the 18th minute: *His pressure is dropping now!* The re-evaluation starts, continues for a few minutes and then surgeon 2 concludes very clearly at 20.15: *OK, so we take the decision that he is going directly to the OR, not via X-ray.* **(S:s, F)**

Counted markers team 2, scenario 1 and 3

For a total time structured overview please see appendix 2.

[19] There is suspicion of a fracture to the pelvis

[20] An ingenious belt used to fixate the pelvis

Table 4. Incidence of markers team 2

	a	A-	**A**	**S**	C	F
Scenario 1	14	3	**12**	**10**	6	16
Scenario 3	16	4	**18**	**31**	5	18

Summary team 2

This team does not show very many closed loops, C:s, at all, neither in the first nor the third scenario. The A:s increase from 12 to 18, so do the S:s, from 10 to 31. There is practically no change of the number of small a:s, or F:s. The frequency of addressed messages, eg. use of first names coded as A, is high in scenario 3. There is thus observable change of the markers for clear addressing, A:s and loud summaries or information sharing, S:s.

The frequent examples of followership in both scenarios are more or less always followed up and seem to be seen as helpful. There are no verbal statements that indicate anyone being disturbed by the remarks or questions. Example 4 in sc 3 demonstrates both a safe culture where it is OK to have a different opinion and good followership.

This team shows frequent examples of addressing by name in both scenarios compared to team 1. Not addressing a receiver can in a noisy environment lead to a message being left unnoticed (scenario 1, ex 2 and scenario 3, ex 2). In scenario 3, ex 4 an unaddressed medication message is not completed, which seemingly delays pain relief to the patient.

6.3 Team 3

Scenario 1, general comments

Time of scenario: 14 minutes. The work seems to proceed rather rapidly, in a calm and quiet atmosphere. Surgeon 2 and orthopaedic surgeon enters at 2.35 without introducing themselves and are present in the room for more than five minutes without participating and without anyone taking notice of them. Once surgeon 2 has introduced herself, she supports the junior surgeon 1 by reminding of examinations and procedures that haven't been taken care of.

Scenario 1, quotes or passages

1) It takes more than four minutes from order to actual injection of morphine. The process starts with an unaddressed message. At 1.40 surgeon 1 says: *...and we'll give 5 mg of morphine IV.* At 2.16 nurse 2 gives a syringe to nurse 1: *Here's 5 of morphine.* Nurse 1 notes that there is not yet an IV line in the patient's hand, and puts the syringe back on the rack. The patient complains about the pain a few times and at 3.42 surgeon 1 asks nurse 1: *Did he get morphine?* He does not get an answer so at 4.00 he asks again, now addressing the question to nurse 1: *Did he get morphine, "Tomas"?* Nurse 1 answers: *Yes, it's on its way.* At 5.18 nurse 2 very quietly says to nurse 1: *I have the morphine here.* 5.23 the patient once again asks: *Have I been given some pain relief?* and surgeon 1 answers: *Yes you have!* Nurse 2 immediately counters with: *No, he hasn't!* whereupon surgeon 1 seemingly surprised says: *Oh he hasn't!* Nurse 1 just after that injects the morphine, but does not "close the loop", despite

the previous confusion and misunderstanding. Later on, at 11.4 surgeon 1 orders more morphine from nurse 1: *Can you give 5 more of morphine, "Tomas"?* There is no confirmation from nurse 1 that he hears the order, and he does not give feedback when the injection has been given. **(a, A)**

2) At 10.00 surgeon 2 asks surgeon 1 for a summary and his further plans. Surgeon 1 starts to systematically describe it in a low voice to her. At the same time the orthopaedic surgeon is examining the patient, and asking him in a loud voice to move his toes. This distracts the eyes of surgeon 2 from the face of surgeon 1 whom she is talking to, to the patient´s feet, and hence her attention. Surgeon 1:s summary disappears into thin air. At 10.22 surgeon 1 explicitly asks her: *So what do **you** think?* But he does not get an answer. Surgeon 2 instead starts to examine the patient´s abdomen for pain and injuries. At 11.12, after checking that blood pressure is low, she makes the decision without having finished listening to surgeon 1: *Let's do like this, we'll call the OR.* ***(No coding)***

3) As stated above, surgeon 2 several times reminds and thus helps surgeon 1 in the process. At 7.40 she asks him: *What about peripheral injuries? Is he fully examined?* Surgeon 1 responds that that is not the case. A minute later surgeon 2 reminds again: *Have we checked his back?* Surgeon 1 says: *No that's right, let's do that.* **(F)**

4) At 11.37 the anaesthesiologist asks the nurse assistant for help: *"Peter" can you please page my consultant and ask that he or she meets me in the OR, I'm going to need help with intubations because I'm not convinced that the neck is freed.* The nurse assistant asks something to be sure, and anaesthesiologist answers: *Ask him to come directly to room 8.* **(a, F)**

5) At 13.46, when the departure for the OR is approaching, the anaesthesiologist asks for help again: *"Peter" please call the OR and ask them to draw...*(says names of different drugs) *and to make sure that the difficult airway kit (svårintuberingsvagnen) is in room 8.* **(A)**

Scenario 3, general comments

Time of scenario: 17 minutes. The team works in a helpful and supporting manner. Loud reports of findings and summaries are frequent. All the team members contribute to the teamwork and help by suggesting the next step and by reminding of nearly forgotten matters.

Scenario 3, quotes or passages

1) At 4.45 nurse 2 ask surgeon 1: *"Sven", do we need O-negative blood here?* **(A, F)**

2) At 6.47 the nurse assistant sees ahead and asks: *Should I prepare the X-raydepartment that we (*might need*) trauma-CT?* Surgeon 1 answers: *Yes!* and half a minute later the nurse assistant loses the loop by saying: *I've called X-ray and they are prepared.* **(F, C)**

3) When it is time to do the logroll, surgeon 1 checks first with the anaesthesiologist at 7.18: *Is it OK to do the logroll now?* The anaesthesiologist responds: *Yes it is OK with me.* The team prepares for the logroll and the anaesthesiologist loud and clear announces: *Logroll, to the left, on three. One, two, three!* **(F)**

4) At 16.40 surgeon 2 asks the anaesthesiologist: *Should we intubate him here or in the OR?* The answer is: *No, we'll intubate upstairs.* **(F)**

5) There are frequent consultations between the physicians. 8.40 surgeon 1 makes a summary: *I think he has a pelvic fracture and a femur fracture* ...He then consults with the anaesthesiologist who says: *There could also be something in the abdomen. So what is the alternative? The angiolab?* Surgeon 1 decides to consult the senior surgical consultant, who is worried: *I am really worried about the low pressure. Shouldn't we push in some more fluids?* The anaesthesiologist answers: *We are already doing that.* Nurse 1 asks five seconds later: *Should I put excess pressure on this one*, looking at the anaesthesiologist who answers by nodding heavily. **(S, F:s)**

6) Nurse 2 makes sure that a new IV-line has been put in at 15.06 she tells the nurse anaesthetist, accompanied with eye contact: *You did see that I put in another needle?* **(F)**

7) At 17.50 the anaesthesiologist asks the nurse assistant: *C, can you please page urology and warn them that we might want help with a suprapubis catheter? Yes, I'll do that.* At 18.03 he closes to surgeon 1: *M, the urologist on call will come up.* **(C)**

8) At 11.50 surgeon 1 suggests to surgeon 2*: Should we call angio? Yes, I will see to that*, answers surgeon 2. Nurse assistant overhears and says: *I will do that.* Half a minute later he closes: *The angiolab is not occupied.***(F, C)**

Counted markers team 3, scenario 1 and 3

For a total time structured overview please see appendix 2.

Table 5. Incidence of markers team 3

	a	A-	A	S	C	F
Scenario 1	**12**	**15**	11	19	**17**	22
Scenario 3	**6**	**21**	12	20	**24**	21

Summary team 3

The number of a:s decreases and the number of C:s increase. One can also note, that the marker A- has increased, although as said before, I do not want to draw conclusions around the A-:s

The number of F:s is high in both scenarios. A few very clear examples of how to make an inventory of one's resources and ask for support are demonstrated by the anaesthesiologist. These are both key words in CRM (examples 4 and 5 in scenario 1).

In example 5 in scenario 3, the anaesthesiologist answers a question (coded as a F) by nodding excessively. I interpret this as his way of not wanting to disturb the surgeon 2 who is asking nurse 2 questions. This could, using other parameters than verbal statements probably be judged as good followership.

7. Analysis

One must bear in mind that this is **one** version of reality, and that it is small study with many limitations. As stated in the beginning of this chapter, the team is the unit of analysis. From this starting point we can look at the results as *intrateam change*, change within one team over time, from first to last scenario. Results also imply that *interteam comparisons*, i.e. to look at how communication differs between team 1, 2 and 3 in a specific scenario, are possible and interesting.

7.1 Intrateam change and inter-team comparisons

Intra-team change

The findings very clearly suggest that communication in the teams undergo change as a result of training. Crucial communication markers change to the better; a:s decreasing, A:s, C:s, S:s and F:s increasing to various degrees in the different teams.

Team 1

Results show that in team 1 change occurs with a:s (nonaddressed messages) and F:s (signs of followership). The decrease of a:s can be interpreted as a developed understanding of the relative uselessness of speaking without addressing.

At the end of scenario 3 there are a lot of F:s noted. This increase of F:s can be interpreted as a need for information due to the relative silence in the room and the fact that the two surgeons were mumbling to each other without sharing information. Maybe my initial feeling of the work being “calm and quiet” instead was perceived as information poor by the team and hence the need for questions and follow-ups? Statements that show good followership can be interpreted as an indication of both that the climate is of an allowing, permissive nature within the team, and that the teamwork progresses “better”.

Team 2

In team 2 change is obvious with A:s (addressing by name) and S:s (summarising). Increasing the number of addressed messages is interpreted as an experienced need for more accurate communication in the team. The increased use of summarising comments is interpreted as leadership and team insights of the help that loud summaries can offer to enhance the teamwork.

Team 3

In team 3 a:s (nonaddressed messages) decrease and C:s (closed loop communication) increase. As in team 1, a reduced number of a:s indicate that the team has developed their understanding of how important addressing is for targeting messages. Together with the team´s increased use of closed loops there is support for the assumption that this team has understood the value of clear communication and confirmation.

Inter-team comparisons

The findings also obviously suggest that the communication, and change of it, differs between the teams. It is difficult from the results to point out one team as having changed their communication more or better than another.

Team 1 shows many a:s compared to team 2 and 3 in the first scenario (but reduces them) and shows a greater increase of F:s than the two other teams.

Team 2 is the only team that shows a considerable increase of A:s from scenario 1 to 3. Team 2 also shows the largest number of S:s totally.

Team 3 shows many S:s and C:s already in the first scenario, compared to 1 and 2 and additionally increase the C:s.

So, how can the above manifestations of communication change be understood and applied in the perspectives of

1. experiential learning,
2. patient safety and quality of clinical work and,
3. medical education?

7.2 Experiential learning

Reflecting upon experience and thereby transforming the experiences into (new) knowledge, which is then experimented with, is the essence of experiential learning theory, ELT. Since change occurs in the teams and the teams develop in their work, it is likely that each team has passed through the experiential learning cycle and its different stages, however perhaps to various degrees. The teams have experienced a medical scenario, although simulated, that is, they have a common “concrete experience”. After that they enter the “conversational space” of the debriefing session, a space in both time and room. Here the next modes in ELT, “reflective observation” and “abstract conceptualization” take place. By watching themselves on the recorded scenario, discussing and reflecting over actions taken and not taken, they then conceptualize the need for change and improvement of the teamwork elements in question (addressing, closed loops etc). An opportunity of “active experimentation” is then offered to the team as they go into a new medical scenario in the simulation room. As described earlier, repetition of the learning cycle is important for team learning. The teams have here the possibility to repeat the circle three times during the course day. It is likely that this has contributed to the observed changed behaviour. The manifestation of learning could be tested if the same team trained together again, after some time (days or weeks).

The necessity of a psychologically safe climate in the learning situation is emphasized in 2.7. Since change has occurred in all three teams, it is likely that the climate in this specific training situation is perceived safe and confident enough for open reflection and discussion.

Learning in the group is influenced by the team’s collective needs and the individual team members´ previous experiences. Any given team is a combination of the members´ previous experiences, preconceptions, attitudes, professional roles and personality. The increase/decrease of a marker’s incidence can be interpreted as that team’s unanimous choice

of what to focus on after debriefing themselves. Whether or not the choice is unconscious or a conscious and pronounced consensus decision by the team during debriefing is difficult to say, since debriefing sessions in this course to date have not been recorded and evaluated.

7.3 Patient safety and quality of clinical work

Many good communication events are manifested, and show an increase, events that in a patient safety perspective are valuable for reaching a higher level of safe teamwork. They can be used as examples of how good communication can help reduce risks. First and foremost I think of events that indicate good followership. Events when team members share their findings out loud to the team, and summarise what they have found, also facilitate patient management and hopefully hence quality and safety.

On the other hand, many events demonstrate potential risk sources, not least the ones concerning drug administration. There are not so few examples in all recorded scenarios of potential misunderstanding or delay, which to my interpretation are mainly caused by lack of clear addressing. The number of unaddressed messages is reduced in two of the teams, and the number of addressed messages shows an increase in one team. This can indicate that something happens that is positive for patient safety.

The increase of closed loop communication in one team, and of signs of followership in another, is also positive for patient safety outcomes. Use of closed loops indicates a lessened risk of measures being forgotten or being left into thin air, as does good followership.

Communication with the patient is more of a quality than a safety issue. Although not the specific subject for this study, one can observe interesting events, and I allow myself to mention them. The way different team members address and speak to the patient can be perceived as patronizing. The different “patients” in the studied scenarios at times had to wait several minutes for pain relief. Not once was the patient given an explanation for the delay (that you do not want to reduce pain to much before you have fully examined the patient in order to discover injuries); the only answer to his pleas being phrases like: “*Soon”* or *“In a minute”*. Medically experienced can of course argue that team focus needs to be on quick management and that patient communication has a lower priority in the initial phase.

7.4 Medical education, the course and simulation

The fact that communication change occurs, implies that this trauma team-training course has had an effect. The group of trainees that assemble for a common learning experience constitute the learning team of the day. Within this sort of meta-function as “a learning team”, they are also to act as a medical team with the function to take care of a trauma patient. They have a metafunction, to form a learning team, and they have, within that, a pragmatic function, to care for the patient. In order to be a “good” learning team they have to accept their role as a trauma team in an artificial environment. Everyone so to speak has to agree to play the same game. The inter-team differences of change indicate that we, as a course organizer can do more to help them form “the learning team”. Just as we want them to form a high performing medical trauma team we should emphasize their role as a learning team, but also the individuals´ different and complimentary responsibilities.

One can also discuss whether or not the learners in the teams really have all the abilities that Kolb mean are necessary for a full experiential learning experience (see p. 12). One can for example question if the ability to reflect on one´s work and contributions in the trauma team is natural, or if it needs to be trained or at least addressed as an issue before the scenario training sessions take place.

Although my role as the observer is non participative, and hidden (i.e. the observations take place at a later time than the training), one can argue that the presence of the cameras in the simulation room might interfere with the work, just as it is not unlikely that the whole simulated situation interferes with the actions in the room. Do the trainees change/improve their behaviour because they feel more at home in the simulated environment, more comfortable doing this near-reality role-play at the end of the day, in the third scenario, than in the first one in the morning?

The analysis shows that communication has changed in the observed teams. But a vital element of the course in whole is not investigated, i.e. debriefing. Therefore it is impossible from this study to say anything about what causes the changes. To which extent it is the simulations, the CRM lecture, the debriefing, the trainees' previous experiences, or their attitudes to simulation and to team training, is yet to be explored.

8. Discussion

Team training

An alarming result of the study is the occurrence of communication elements that demonstrate potential risks. If potential harmful situations occur in simulated scenarios, one can only imagine the number of risk situations that occur in reality. Based on hearsay within the Swedish simulation community, it is a likely assumption to draw that a majority of employees in Swedish health care from different professions, i.e. nurses, physicians, technicians etc, have very little experience of team training together. This is remarkable, given the number of reported adverse events. Furthermore, it is also likely that many of them have had little or no team training during their undergraduate studies with their fellow students, let alone with students from contiguous health education programmes (for example, medical students with nursing students). One way of strengthening the effects of team training like the one described here might be to ensure in the future that health care professionals have encountered team training as an obvious element of their undergraduate training, as well as their following post-graduate specialist training. In a recently published report from the Swedish National Agency for Higher Education (Högskoleverket), emphasis is put on the advantages of learning centres with near-reality teaching forms, and the report expresses concern about the fact that the use of such learning centres for skills training is not more developed:

> "Such learning centres offer good possibilities for skills training but also to training of clinical assessments, communication, ethical considerations, integration of scientific knowledge and interprofessional cooperation." (HSV 2007, p.102).

Given the fact that change is observable suggests in the patient safety perspective that resources should be allocated for continuous team training of CRM or similar skills. The time when this and other hospitals try to prove organizational impact from CRM training of teams, and encounters difficulties in doing so, one should bear in mind that it is not necessarily

weaknesses in the method (CRM training) that is the cause. More likely, it will have to do with the amount of or rather lack of training opportunities and a too low degree of integration with other patient safety measures and programmes.

Malmö University Hospital lacks decisions on the management level of to which degree the resource of CMS can be fully used. The decision to continue this course lies with the department heads concerned; i.e. anaesthesia, emergency room, orthopaedics and surgery. There are of course economical aspects. Running advanced full-scale simulation centre is an expensive business. Apart from the course being costly to organise, every course day means production loss in some sense to involved departments sending trainees. Weighing costs and benefits, there is support for a call for a clear mandate from hospital management level for continuation of the course (see Salas 2006 and Issenberg 2006). The paper on culture in trauma teams also sends a strong recommendation to all health care bodies, that CRM training should be offered to all members of trauma teams (Cole&Crichton 2006).

On a national level one can also argue that training in simulated scenarios of team skills in critical situations become mandatory within specific medical specialities in order to achieve specialist degree, as is for example the case for anaesthesiologists in Denmark (Sundhedsstyrelsen 2004).

Team composition

In part 2.7 of this paper experiential learning theory is shortly accounted for. David Kolb developed these theories further into different learning styles; of which's´ significance there is differing opinions. According to those theories, in which the learning style categories "watchers" and "doers" are used[21], heterogeneous teams are reported to perform better. Assuming there is any relevance to these theories, perhaps the fact that the change differs between the groups can be explained by and have something to do with team composition. Interesting questions arise around how much a specific team member influences communication. Perhaps different team members influence which communication markers that are likely to change and/or to which degree. Perhaps they influence a specific team's learning and the actions they take in the scenarios following the didactic lecture on CRM? What would happen to communication in a given team, if one team member were exchanged? This may be related to which team member who has the most significant impact on the communication in the team. Is it the respective formal position that influences the most, or is it personal features? According to the basic ideas of CRM together with the prerequisite in ATLS® procedures (the surgeon being the leader), best case it should be the leader, who sets communication culture. In a given team it can probably well be someone else. One can imagine that a nurse or nurse assistant by being a good follower, giving information, looking ahead and volunteering to do things, can well contribute to good communication culture. If we go one step further, and presuppose the surgeon's leading role, does it matter to team performance and further, team learning, if the surgeon is a "doer" rather than a "watcher"? Are watchers more inclined to be good communicators than "doers"? What if we exchange a surgeon "doer" for a surgeon "watcher" in the scenarios - how much would that influence actions, and hence the following reflections in the debriefing session?

[21] These categories are a simplification of the original categories, see Kayes et al 2005.

A team with many “watchers” is probably more inclined to reflect over the work, than a group dominated by “doers”. I believe it would be interesting to further explore the relationship between team composition and simulation-based learning.

On the other hand the issue of heterogeneity must be discussed. What parameters constitute heterogeneity in this context? Should one limit them to communication styles or also include gender, professional role, ethnicity, years of professional experience etc?

Course development

As a course organiser we have missed the fact that we are in the midst of an experiential learning cycle but have failed to reflect over our own learning process, learning of how to give the best possible course.

As stated before there is for example little knowledge of the debriefing element of this course. One issue that needs to be considered in possible future development is whether or not there is actually enough “reflection space” for the individual before the team debriefing. At present, the team goes directly from simulation training to debriefing. The results can perhaps benefit from some moments of individual reflection. Another matter that is yet to be discussed is if the debriefing is too controlled by the facilitator. The differences in change between the teams suggest that debriefing elements influence results. Perhaps control of the debriefing should be handed over to the team itself?

We have also overlooked the fact that the teams in training have two roles, that of a learning team and that of a medical team. We have not at all emphasized or even explained these double roles to them, only quickly mentioned that they are at the simulation centre “to learn from each other, and to grow as professionals, not to be evaluated”[22]. This is also something that needs to taken into consideration.

Future research

Besides the chosen indicators of communication change, i.e. the markers, there are other observed behaviours, manifestations and expressions that have not been captured in the observation sheets or only briefly mentioned in this study and that constitute future potential and interesting research areas.

Non-oral communication is one. How can directed hands and eye-contact enforce given orders? One can observe that the predecided positions of the different professionals in the room, positions that are clearly laid down in the trauma work guidelines (UMAS 2007) at UMAS, are not taken. How do positions in the room influence communication?

Decision-making is another. More than once the two surgeons are heard whispering to each other, discussing the next step and seemingly in the process of decision-making, deliberately or not keeping others, such as the anaesthesiologist out. Does open decision-making influence the teamwork and working climate in a positive direction? Maybe it is of vital importance to the feeling of cohesion in the team.

How leadership is manifested is also an interesting issue with practical applications, since the study on culture in trauma teams (Cole&Crichton 2006) suggests that (the essence of) leadership is pivotal to teamwork.

[22] Quote from the course introduction presentation

The role of the simulation operator is intricate in this context. Can the operator/patient´s voice be used as an instrument to enforce learning? The operators at the centre have different communication styles. Would the same changes have been observed with another operator acting as patient? If further research is to be conducted, maybe it is vital that the operator is the same since he/she might actually influence the course of events.

Can simulation based training of teams contribute to improved work environment? Anecdotal evidence and rumours indicate that the implementation of this course has started some kind of process in the trauma room, towards a shift of culture and also of positive attitudes towards the course in question. This is supported by the findings of Grogan et al (2004). It has been told that there is a saying in the trauma room: *Are we going to do like we usually do it, or shall we do it "the Simon way"[23]?* Several nurses report that their feeling is that the work in the trauma room is calmer and quieter than earlier. If there is any relevance to this, it does however not necessarily mean that it is the training itself that has evoked a process of change. It can just as well be the fact that people are starting to talk about how they work in the trauma room or that they feel recognized and seen and hence get a more positive attitude to their work. One way of achieving new and more knowledge from this course, and similar courses that are on the planning stage at CMS, in order to improve them and facilitate impact on an organizational level, could be to interview trainees before new courses are implemented and some time after completed course. In order to understand obstacles for transfer of skills to clinical reality more knowledge about culture, hierarchies and attitudes would probably be very valuable.

Transfer of skills to clinical reality is not a subject for this study. However, one cannot help reflecting over the fact that the "learning teams" in these courses are randomly put together and it is mere chance that decides when or if they will work together in this specific composition again. How much does that matter to transfer of learnt skills to clinical environment? If there is any transfer, which remains to be established, it would probably benefit if the learning teams had an opportunity to implement their joint learning and reinforce it in clinical reality shortly after the course, in the very same team.

During the process of reviewing and analysing the films it is very evident that many parallel processes and dialogues go on at the same time and that it would be very interesting in a patient safety perspective to follow specific tasks from order to completion. This presented study can perhaps be used as an inspiration of ideas to explore further and as an incentive to integrate team training at CMS as an obvious prerequisite in the hospital's patient safety programme. One idea is to use communication analysis similar to this but more advanced, to explore potential risks to patient safety in different environments, eg. the operating room, the trauma room, the delivery room, or other applicable clinical settings. Another can be to demonstrate examples of good and not so good patient communication.

This study does not explore how the different CRM communication key elements and performed communication activities are followed up in the debriefing sessions. It is feasible that a link exists between the way they are talked about and how much focus is put on each marker, and notable change of incidence of that marker. It would be interesting to connect studies of communication in scenarios with a study of the following debriefing sessions and investigate how each communication activity is discussed; who brings it up, in what way it is

[23] "Simon" being the widespread name of the patient simulator, and "at Simon´s" is since long synonymous to team training activities at UMAS.

brought up, how it is discussed, how it is followed up by the debriefer, etc. Different debriefers might focus on different markers, does that matter? Different debriefers have very different debriefing styles, does that matter?

The experiences from reviewing recorded scenarios must be utilized. Further research demands a development of the audiovisual recording equipment so that every individual active in the scenarios can be heard. The current positions of the cameras are not optimal. Some actions happen outside the picture. This study has indicated that body language might be of interest as a research parameter. Should this be the case, more carefully chosen camera positions, maybe even a 360-degree camera or additional cameras, will be needed.

9. Conclusions

The initial question, do the teams actually work better, is not possible to answer from this study. However, the change of marker incidence appears to support the proposition that teams in general work better at the end of the day.

Given the fact that change is observed, to the better, and that research suggests that CRM training be repeated and more comprehensively integrated in the standard procedures and culture of health care bodies, it would appear that there is a need for this course to be followed up, to be developed further and its status as a (local) patient safety tool reinforced.

Other measures can be taken in order to strengthen the effects of this course. A clear mandate from the hospital management is one. Further development of the course, including its eventual expansion is another. The third may be to apply existing knowledge about the influence of team composition on course outcome into course curriculum.

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Author's note: The English translations of the Swedish titles are my own, and I apologize to the authors for possible loss of nuances

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Appendices

1. Email consent letter

2a, b, c: Overviews of counted communication markers

3. Observation sheet

4. Trauma code criteria in the ER at Malmö University Hospital

Appendix 1 Email letter asking for consent from trainees

Hej du har ju deltagit i traumakursen Trauma på Akuten på Simulatorcentrum någon gång sedan vi startade hösten 2005.

Jag skriver till dig i din egenskap av kursdeltagare.

Jag, som ju är utvecklingsekreterare och koordinator på Simulatorcentrum, kommer att skriva en magisteruppsats i pedagogik under våren 2007 och jag vill studera filmer från några enstaka traumakurser. Din kursdag har valts ut slumpvis. Jag kommer att titta på filmerna och försöka identifiera bl a hur ledarskap och beslutsfattande tydliggörs i arbetet. Jag kommer inte att studera, analysera och redovisa någon enskild persons arbetsinsats och det är inte intressant vad "Lisa" eller "Kalle" gjorde utan det jag vill titta på är de olika yrkesrollernas (dvs kirurgens, narkossköterskans osv) agerande.

Jag skriver till dig för att berätta om detta och för att fråga om du har några invändningar. Jag är tacksam om du snarast svarar på detta mail med ett OK, eller, om du absolut inte vill att filmen från din kursdag används, med ett meddelande om detta. Har jag inget hört ifrån dig den 23 mars utgår jag från att det är OK.

Mina granskningar kommer förhoppningsvis att kunna användas dels för att förbättra kursen, dels för att få ny kunskap om teamarbete i akuta situationer.

Har du frågor så hör av dig! Vill du läsa min uppsats när den är klar så går det självklart också bra.

Med vänlig hälsning

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Appendix 2 a

Team 1

Marker	a	a	A-	A-	A	A	S	S	C	C	F	F
Minute number	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3
1												
2			*	*				*				
3	****	***						*	*			
4		**	*							*		*
5	*			*	*	*		**				*
6	***						*****	*		*		**
7	*****	**							**	*	*	***
8	*								*	*	*	**
9	*	**			*	*			*			
10						*						*
11		*	***					**		**	*	
12	*		*				**			*	**	
13	****								*		**	
14		*		*						*		*
15	*	*	*					*	*	*	***	***
16		**		***					*	*	*	****
17												
Sum	**21**	**14**	**6**	**6**	**1**	**3**	**7**	**8**	**8**	**10**	**11**	**18**

Appendix 2b

Team 2

Marker	a	a	A-	A-	A	A	S	S	C	C	F	F
Minute number	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3
1												
2												
3	*					*		*				
4	*	*			*		*	**	*			
5	*					*	*	*				
6	*	*				***	*	*****		*	*	*
7		*		**			*	*	*		**	
8	*	**			***			**			**	
9			*	*	*	**		**				***
10	*	*			*	*		*			*	*
11	*	*			*	*		*		*	**	
12					***	*	**	*	*		****	**
13	*	**		*		*		*	*	*		***
14	*	**			*	*	**	***		*		*
15	**	*	*				*	*	*		*	*
16	*	*	*		*			***	*		*	*
17	*					***		**				*
18	*					**	*	**			**	*
19						*						*
20		***						*		*		**
21								*				
Sum	**14**	**16**	**3**	**4**	**12**	**18**	**10**	**31**	**6**	**5**	**16**	**18**

s

Appendix 2c

Team 3

Marker	**a**	**a**	**A-**	**A-**	**A**	**A**	**S**	**S**	**C**	**C**	**F**	**F**
Minute number	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3	Sc 1	Sc 3
1												
2	*				*	*			*			
3	**		*	*			*	*	*	*		
4	*			*	*		*	**				*
5			*	*	**	**	***		*	*		***
6		*	**	***	*		****	*	**		***	**
7	***			*		**	***	****	**		***	*
8	*	*	*	****	**				**	****	*****	*
9	*						*	**			*****	**
10		**		*			*	*		***	*	****
11				**				**		***		
12	*	*	****		***		***	**	*	***	****	***
13	**		****	*			*	*	*****	*	*	
14		*	*	***	*	*	*	*	*	**		*
15			*	*		**		*	*	*		*
16				*						*		
17						***		*		**		*
18				*				*		*		*
19						*				*		
Sum	12	6	15	21	11	12	19	20	17	24	22	21

Appendix 3

Kursdatum 051214=3
Scenario III
Grupp nr: 1
Längd: 18'34

0

1 Ambulansrapport
Pat. klagar på smärtor
1.53 NL pres. sig för pat. ~~[illegible]~~ 1 v bröst kir, (samt som NL pågår utprat)
.58 Thomas ge 5 mg morfin (A)

2
.10 Fri luft = ABC (S) Luftvägen e fri NL
.40 5 mg morfin givet (C)(A) ssk, ögonk. med kir, som undrar
2.16 pat: gl ångest andas ~~[illegible]~~
2.22 Det e på gång omvårdnad kir,

3 ~~[illegible]~~ radialis pulsen ca 70 NL (S)
3.05 persontransport ~~[illegible]~~

3.35 e han kunde bra andning? kir, → NL (A)(F)
3.53 det e mycket, mager kir, (S)
4.20 Han ska kolla prover Thomas (A)(F)
.25 Beställ blod (A) Thomas
4.35 Mardin, ska vi ha hit O neg blod (A) ssk₂ → kir,
4.36 kir, ~~[illegible]~~ (F) Ska jag lägga engångs... först? ort → kir, (F) Javisst
4.50 sätter på TPod utan att ha talat om det för patienten
5.13 ssk, kan jag komma till o förbereda? Varsågod ... ort.
5.45 kir, : först några andning ... (A) hit NL (S)
.50 NL mer vätska kanske nu (F)(A) ögonk. m kir,
5.54 ort → kir, (ögonk.) Får jag titta på vänsterbenet (F)(A)
6.47 ssk, Ska jag förts upp på ... CT? (F)(A) Ögonk. m kir
6.00 Om vi e färdiga i rummet (A) NL
.16 5 mg morfin till (dvs 15 + Thomas) kir, (A)
.20 ortoped rapport högt (S)
.28 Thomas, du kan komma hit (A) ssk₂
6.87 Han e stabil (S) (ort) - primär distal status (S)
6.48 Annan - dynamo ... utomhus ort (S)
7.10 NL kan jag ... = förberedda ssk, (C)(A) ögonkont → kir,
7.06 vänsterbenet ssk, → sskr (A) o så kan jag ... av morfin
.30 5 mg morfin givet (C)(A) ssk,
7.18 kir, → NL : E det ok o ... kanna upp? (F)(A)
7.44 ssk, går från till ssk₂ 5 mg morfin givet (A)(C)
För min del går det bra (NL) (C)
8.04 ... + vi på 3, 1 2 3 ... (S)
8.20 ort → kir, kan du ... över spinal ... (??) (F)
.40 kir, : jag tror han har bäckenfraktur femurfraktur (S) konferera m. NL — kan ju vara mitt ... kir,
8.56 vad är allt? ... ? NL → kir, (F)
9.00 Buksonen ... vad säger buksonen här?
9.07 jag är orolig ... kir₂ Ska vi ...
9.13 vi håller på NL (C)
9.16 Ska det va övertryck? (F)(A) (ssk,)
9.20 Han ... blod ... kir₂
9.50 Ska vi ha kateter (buksonen) (A)(F) Nej ...
4! ssk₂ (C)(A) ... förmodligen ... (NL)
konferens kir, + kir₂ 9.30 Han har ... men ...
10 resonemang Frågan e om vi ... (S) ... kir, → kir₂ (S)
.36 kapillärtest ... (S)(A) ja (C) kir₂
10.38 Han ... kir₂
48 kir₂ : Han ... blodet? ... kir₂
11.03 ort + kir₂ konferens (F) sammanfattar (S)
11.20 ... blod ... vi se om vi ...
.26 kir₂ Sammanfattar → vidare plan (S) han stab. ... (C)
11.28 ... fristen? kir, (F) Hans inte stabil! (C) NL
11.36 Vi har ... blod (C) kir,
11.48 kir₂ Han ... 25 min ... (S)
11.55 Ska vi ... angiografen? (F) kir, (A) kir₂ Ja jag gör det kir₂ (C)
10.48 Vi har ... O neg ... (C) kir,
12 .50 kir₂ kan ni ... upp ... op o ... att ...
12.52 Ort : Jag gör det (C)
12.54 NL ... kir₂
13.00 ... (S)
13.10 Chans att få ... kir₂ (A)
13.11 Ska vi göra en bedömning av ... kir, → ort (A)(F)
13 .16 angiolab ledigt (ssk) (C)(A) ögonk.
.30 ssk, ... (S)
.58 kir₂ Han pulsen hållit sig? (A) ögonk. ... Ja den har hållit sig! (C) ... ssk
14 .23 Ville du ha ... (F) ssk, (A) ögonk. m. kir₂
14.28 Är det ... kir₂ → ...
.35 Christer, ... (A) (...)
.50 Marten, ... (A) kir₂
15 14.52 Ja, ... (S) ... NL
15.0 kir₂ Ska vi ... !
.06 ... ssk, (C) ssk (A)
... 15.09 ... kir,
16
.30 Christer ... (A)
16.33 ...
.40 Ska vi ... här? (F) ... (C) NL
.35 ... (A) ... (S)
17 .50 ... (A) ... (C)
NL sammanfattar : uppdatering (S)
17.05 ... (F)(A) kir, ... (C)
kir, ... 180
18 03 Martin, (A) ... (C)
... konferera. ... att vi ha behövt en ...
1836

19

Hon pratade jag gör till bakom o ... om ovan gets (... !)
Ibl. svårt att läsa ... av kir,

(S) sammanfattar högt

(F) ... fr. ... ...

... ... 2 gör

Man kan se ... bedömning ... Bra patientkom. Bra samarbete ... o ...

Dokumentnamn			
Bilaga 1 till Traumaomhändertagande, Traumalarmskriterier			
Utgåva	Giltigt fr.o.m.	Godkänd av	Sid. nr
1.1	20061127		1 (1)

Traumalarmskriterier

Traumalarm utlöses generellt om någon patient på olycksplatsen har ett identifierat eller misstänkt hot mot vitala funktioner (A B C D)

1. Högenergivåld
    a. Fall från hög höjd (>4 meter, 2 vån)
    b. Fotgängare/cyklist påkörd av motorfordon
    c. Kastad av/ur motorfordon
    d. Motorfordon som slagit runt
    e. Fastklämmning (losstagning>20 min)
    f. Bilolycka >70 km/tim, MC-olycka>35 km/tim

2. Påverkad patient
    a. Cyanos (SP O_2 <90%)
    b. Annan andningspåverkan (AndningsFrekvens <10 eller >25)
    c. Svårhävd blödning
    d. Cirkulatorisk chock (Btr <80)
    e. Medvetandesänkning (RLS 3-8)
    f. Trauma med större brännskada (> 18%)

3. Allvarlig skada
    a. Penetrerande skada på huvud-hals, bröst, buk och prox extr
    b. Allvarlig ansiktsskada
    c. Instabil thorax
    d. Inhalationsbrännskada
    e. Kraftigt trubbigt våld mot skalle, thorax eller buk
    f. Instabil bäcken- eller femurfraktur
    g. Multipla frakturer på långa rörben
    h. Amputationsskador
    i. Spinal skada med extremitetspares
    j. Skada med upphävd perifer cirkulation i någon extremitet