Improving Communication in Acute Trauma

Christian Juhra, Frank Ückert, Thomas Weber, Sebastian Hentsch, Rene Hartensuer, Thomas Vordemvenne and Michael J. Raschke

Abstract

In 2008, approximately 4,500 people in Germany died in traffic accidents and around 71,000 people were badly injured. Altogether, yearly productivity loss caused by these injuries is estimated to be around 5 billion Euros. International and national studies revealed the trauma centre level of the primary hospital as the major predictor for trauma-related mortality. In 2006, the German Society for Trauma Surgery (DGU) called its members to form regionally based networks of hospitals engaged in trauma care. In April 2008, 45 hospitals in the north-west region of Germany, two hospitals from the Netherlands, and the local emergency services founded the "TraumaNetwork NorthWest (TNNW)." The major goals of these networks are: 1) To shorten the time between accident and admission to the appropriate hospital, 2) to create effective ways of communication, and 3) to implement common pre- and in-hospital standards for trauma care. In order to improve acute trauma care, we looked for new ways of communicating from hospital to hospital, as well as from emergency services to hospitals. Local emergency services will be able to locate the site of an accident on a digital map and find the next (in terms of transport time under emergency conditions) appropriate hospital with free capacity. The emergency physician at the accident site also has an overview of the nearest trauma centres on a hand-held device and can contact them if required. Hospitals can exchange diagnostic data (e.g., CT scans) securely via a fast Internet connection and view the scans either on their own radiology workstation or on an integrated web viewer. Since the necessary software is not commercially available, a team of computer and medical specialists was commissioned for developing the software for commercial use. After the software is in place, a pre- and post-analysis will be performed to study the consequences of the new communication on transport time and injury-related mortality within the region. The project is recognized as a pilot project by the DGU and – if successful – is meant to be adapted across Germany.

Introduction

In 2008, approximately 4,500 people in Germany died in traffic accidents and around 71,000 people were badly injured. Altogether, yearly productivity loss caused by injuries is estimated to be around 5 billion Euros. International and national studies revealed the level of the primary trauma care hospital as the major predictor for trauma-related mortality.

As soon as someone calls 112 (equivalent to 911 in the US), ambulances and/or air ambulances with trained emergency physicians will be sent to the accident. After initial treatment at the site of the accident, the patient should be transported to an appropriate hospital with the necessary capacities, which is chosen by the local dispatch centre. However, until recently, it was necessary to call each hospital individually in order to find a matching hospital with free capacities. In reported cases, up to three hours were spent solely to find a suitable hospital.

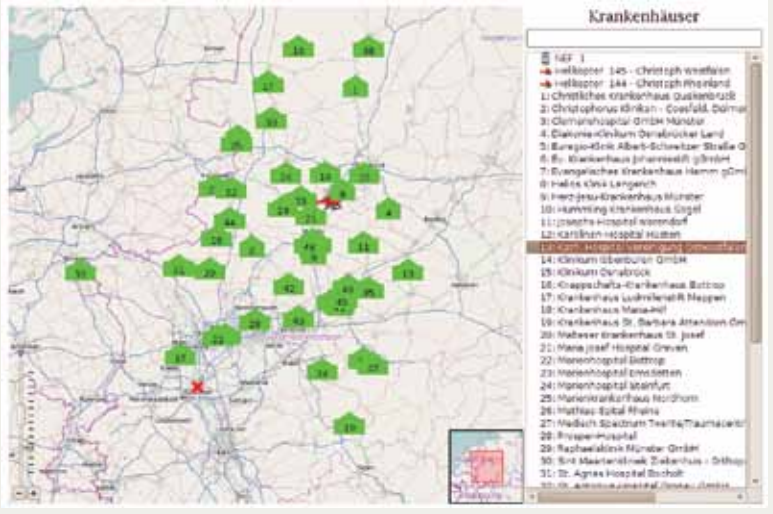
In 2006, the German Society for Trauma Surgery (DGU) called its members to form regionally based networks of hospitals engaged in trauma care (Schwerverletztenversorgung 2006). Depending on its capabilities, each hospital engaged in such a network will be certified as a trauma centre with one of the following levels of trauma care:

- **Level 1:** Capable of treating all kinds of trauma (including children) and capable of treating two or more trauma patients simultaneously.
- **Level 2:** Capable of treating most kinds of trauma (including head injuries).
- **Level 3:** Capable of providing basic life-saving surgery for trauma patients.

Forty-five hospitals in the north-west region of Germany, and two hospitals from the Netherlands, ranging from a 1,500 bed university hospital to small community hospitals, and the local emergency services, including approximately 30 different dispatch centres, founded the "TraumaNetwork NorthWest (TNNW)" in April 2008 (Figure 1). The TNNW serves around 5 million people in Germany and has to cope with an average of three life-threatening injuries per day.

The major goal of the TNNW is to ensure a short time between the accident and definitive surgical care. To reach this goal, fast and safe ways of communication between the partners in trauma care – emergency rescue services, emergency physicians and the involved hospitals – must be found.

Figure 1. Map of TraumaNetwork NorthWest with affiliated hospitals



Methods

Minimize Pre-Hospital Time

Most delays in pre-hospital trauma care are caused by searching for an appropriate hospital that is capable of treating the patient at the necessary time. The dispatch agent is responsible for choosing the right hospital. However, he or she only has information about the hospitals within his/her district. Therefore, sometimes several phone calls have to be made before the right hospital can be selected.

In order to accelerate the process of choosing the right hospital, each dispatch centre needs to have information about all trauma hospitals within the network. They need to know the capacities, the trauma-care levels, the departments and diagnostic capabilities (e.g., is the CT scan available right away?), and telephone hotlines.

Thus, we set up an Internet-based service, which can be accessed by each member of the TNNW at any time. Each hospital provides its data, as well as the current capability of treating trauma patients.

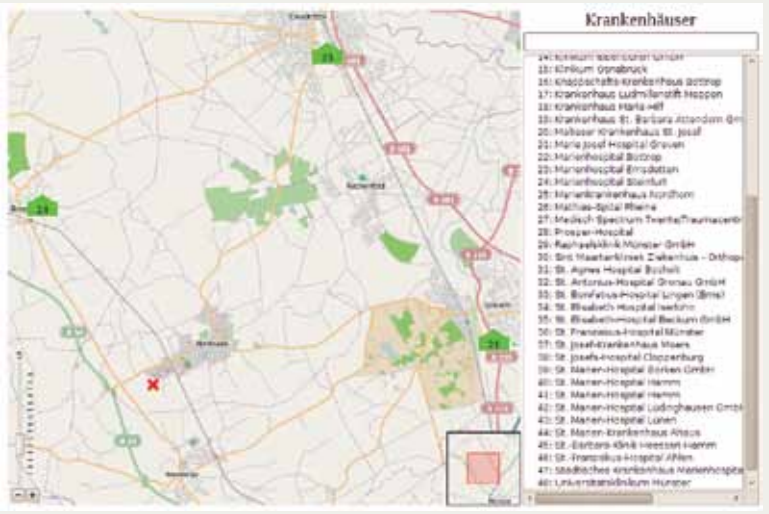
Local emergency services will then be able to locate the site of an accident on an electronic map and find the next (in terms of transport time under emergency conditions) appropriate, available hospital (Figure 2).

Provide Information at the Site of the Accident

In order to optimize this process even more, information about the nearest hospitals and their capacities must be available to the local emergency physicians at the site of the accident. However, this requires the localization of the accident site, either with a special GPS-equipped device or by locating a cell phone.

For this reason, we are currently developing a hand-held device, which displays the nearest hospitals, their distances to the accident site and the availability of a helicopter. After touching an icon representing the selected hospital, the choice is passed on to the dispatch agent, who will

Figure 2. Available hospitals



approve or select a different hospital. The chosen hospital is then contacted and the call is automatically forwarded to the hand-held device of the emergency physician (Figure 3).

Create Effective Ways of Communication

In acute trauma care, two ways of communication are especially important: The communication between the emergency physician or dispatch agent and the admitting hospital staff, as well as – in the case of a transfer – the communication among the treating physicians at the different hospitals.

The emergency physician needs to talk to the trauma surgeon directly in order to inform him or her about the type and degree of injuries. The emergency physician cannot waste time by being placed on hold. Therefore, each hospital had to establish a hotline for trauma emergencies. If such a hotline is not already established, a sponsored cell phone is offered.

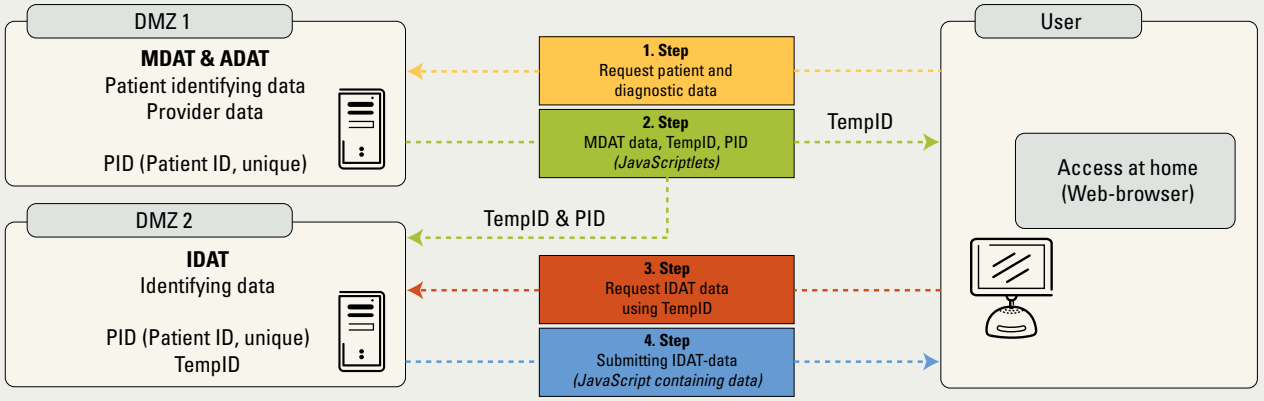
One of the most important aspects of a network of trauma hospitals is the exchange of X-rays and CT scans. Often the pattern of injury is more complex than initially expected and level 2 or 3 hospitals must seek the advice of a level 1 trauma centre. In an ideal world, the physicians of both hospitals would view the X-rays or CT scans at the same time and discuss the treatment options and follow-up treatment over long distance. The patient would be transferred to the level 1 trauma centre if necessary.

To facilitate the exchange of X-rays and CT scans, hospitals should be able to exchange diagnostic data (e.g., CT scans) securely via a fast Internet connection and view the scans either on their own radiology workstation or on an integrated viewer. Such a project can only be successful if no additional software or hardware would be needed (e.g., a web-based application (Jäckel 2008)) and if the tool is in accordance with federal security standards (Konferenz der Datenschutzbeauftragten des Bundes und der Länder) (Figure 4).

In 2002, video-conferencing tools were successfully used in southern Germany to exchange diagnostic data between 15 hospitals (Nerlich et al. 2000). In the US, a few closed telemedical networks with common T1 lines have been successfully implemented, such as the Southern Arizona Teletrauma Program (Lafiti et al. 2005). These networks profited from a relatively small number of hospitals and a shared T1 backbone. Unfortunately, the hospitals in the TNNW each had their

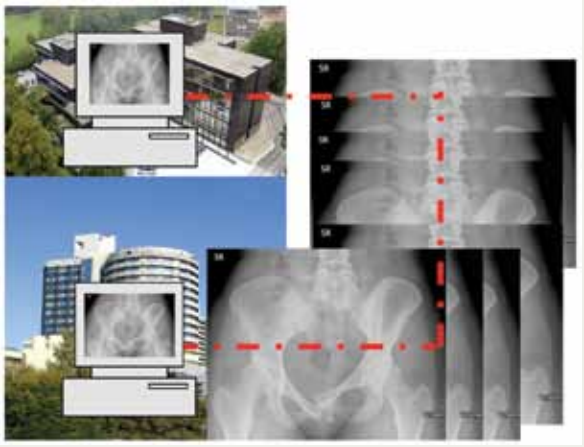
Figure 3. Hand-held device to locate the nearest hospitals (figure does not show the final product)

Figure 4. Security concept



own IT hardware and software. So we needed to develop new software that was independent of the existing IT-infrastructure (Figure 5). The result was a web application that can be accessed with any Internet browser. Each hospital can upload data (be it X-rays or CT scans in DICOM-standard or just usual JPG or PDF files) via this web application and send it to another hospital. There, the pictures can be viewed with the same tool that also provides the functionality of a DICOM-viewer.

Figure 5. Online exchange of X-rays



Implement Standards and Evaluation

It is absolutely essential to have common standards in a trauma network. Each patient has the right to the same quality of care independent of the hospital. However, standards have to be applied in different ways in different hospitals. While all hospitals have to agree on the contents of the standards, the implementation of those standards is a specific task for each individual hospital.

While some internationally accepted standards exist in trauma care (such as ATLS®), most standards still have to be developed. Existing standards of level 1 trauma centres are provided to all hospitals (such as the standard of cervical spine injury at the university hospital Münster). To develop additional standards, the members of the TNNW meet every two months at trauma conferences.

A continuous evaluation of the project is necessary to prove the success of the project and show the impacts on trauma care. Thus, the following data on the current situation were mnnbbb collected: the number of trauma patients treated each year in each hospital, the number of patients transferred to another hospital, the time needed for transportation to the hospital, and the number of times that other physicians were contacted to exchange X-rays or CT scans. As soon as the software is successfully implemented, another analysis will be performed to study the consequences of the new communication on transport time and injury-related mortality within the region.

Discussion

While Germany provides a very high standard in emergency medicine, the quality can still be increased, especially in time-critical emergencies such as multiple traumas. The time needed for transport to the right hospital, and being able to choose the admitting hospital quickly are critical survival factors.

Germany is a densely-populated country with a large number of hospitals. The next hospital is never far away, especially if the patient is transported by helicopter. However, less than 5% of the more than 2,000 hospitals in Germany are likely to qualify

as a level 1 trauma centre, and not all hospitals are engaged in trauma care at all. In the area of the TNNW, approximately 100 hospitals are present. Only half of those hospitals offer services for trauma care, and only four hospitals will likely qualify as level 1 trauma centres.

The purpose of IT is "to provide the right information to the right people at the right time for the right price" (Protti 2009). Our dispatch tool will provide the right information (the next available and appropriate hospital) to the right people (the dispatch agent or the emergency physician) at the right time (immediately), and even at the right place (the site of the accident).

In addition, hospitals can exchange data like X-rays or CT scans by using an Internet connection. The use of a taxi that carries the CT scans to another hospital will no longer be necessary. Again, we use IT to provide a faster and more secure way of exchanging information.

A potential problem remains the cost factor. In order for these tools to be successful, they need to be either free or available for a reasonable but low fee. While the development, implementation and testing of these tools are supported by grants, the continuous improvement and maintenance must be financed after the initial phase. Several models of reimbursement will need to be discussed. One reason for the slow start of teleradiology in Germany is the unsolved problem of reimbursement. As long as the reimbursement of a teleradiologic consultation is not solved, teleradiology will not be successful in Germany (Jäckel 2008).

However, the most important aspect of all tools is the time gained in the early phase of trauma care. As the DGU has already shown, the patient profits from a treatment in a level 1 trauma centre (Schwerverletztenversorgung 2006). Unfortunately, not all patients can be treated in such a trauma centre. Some patients will first need to be transported to another hospital in order to become stabilized, before being transferred to a level 1 trauma centre. Some patients will only be slightly injured and do not need the highest level of trauma care. Yet all patients have the right to expect the same standards in all hospitals and can expect their physicians to ask for a second opinion if their trauma exceeds the physicians' levels of experience.

The formation of networks is an important step to improve trauma care. But it is only the first step. As in real human relationships, networks must develop over time. For a relationship to develop, effective communication is essential. Any human relationship will falter if there is no opportunity to exchange thoughts. The same is true for hospital networks, be it in trauma care or any other medical discipline. A trauma network provides only the framework; it still has to be filled with life. It must be the aim of each network to provide opportunities for communication on different levels: A personal communication during conferences, a distant person-to-person communication using trauma hotlines, or an indirect way of communication by exchanging X-rays and CT scans.

For successful communication, a common language must be used and rules followed. Rules in a trauma network are defined by standards, whose implementation can differ from one hospital to another, but have to be followed by all hospitals.

All of the mentioned tools are part of a pilot project in Germany designed to improve acute trauma care. However, these tools are neither limited to trauma care nor to Germany. While each medical discipline has its own priorities in emergency care, saving time in pre-hospital care is the most important common factor. If it is possible to find the next level 1 trauma centre it can also be possible to adapt this tool to other conditions (e.g., stroke emergencies), and find the next available stroke unit. If these tools are successful in acute trauma care, more than just trauma patients may benefit from this project in the future.

Conclusion

No software is currently available that fulfils all needs of acute trauma care. Thus new web-based software tools are currently developed in order to improve acute trauma care. These tools will first be tested in the city of Münster. After testing and further developing, the tools will be provided to all EMS and hospitals within the region of the TNNW. The process and the effects of the tools on trauma care will be evaluated. EH

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About the Authors

The authors form the "Telematics in Acute Medicine (TEAM)" group, headed by Dr. Juhra and Prof. Raschke. For more information on the project and the project group, please visit the website: www.team-tnnw.de

Dr. med. Christian Juhra, MBA, University Hospital Münster, Department of Trauma-, Hand- and Reconstructive Surgery, Waldeyerstr. 1, D-48149 Münster, Germany, www.traumacentrum.de, e-mail: juhra@ukmuenster.de

Prof. Dr. med. Frank Ückert, Director of Department of Internet Technology in Research and Education, Westfälische Wilhelms-Universität Münster, Department of Medical Informatics, Domagkstr. 11, D-48149 Münster, Germany, e-mail: sek@imfl.de

Dr. rer. nat., Dipl.-Ing. Thomas Weber, German Aerospace Center, Institute of Aerospace Medicine, Linder Höhe, D-51147 Cologne, Germany, e-mail: Thomas.weber@dlr.de

Dr. med. Sebastian Hentsch, Central Military Hospital, Department of Trauma-, Hand- and Reconstructive Surgery, Rübenacher Strasse 170, D-56072 Koblenz, Germany, e-mail: sebastianhentsch@bundeswehr.org

Dr. med. Rene Hartensuer, University Hospital Münster, Department of Trauma-, Hand- and Reconstructive Surgery, Waldeyerstr. 1, D-48149 Münster, Germany, www.traumacentrum.de, e-mail: rene.hartensuer@ukmuenster.de

Dr. med. Thomas Vordemvenne, University Hospital Münster, Department of Trauma-, Hand- and Reconstructive Surgery, Waldeyerstr. 1, D-48149 Münster, Germany, www.traumacentrum.de, e-mail: thomas.vordemvenne@ukmuenster.de

Univ.-Prof. Dr. med. Michael J. Raschke, Director of the Department of Trauma-, Hand- and Reconstructive Surgery, University Hospital Münster, Waldeyerstr. 1, D-48149 Münster, Germany, www.traumacentrum.de, e-mail: Michael.raschke@ukmuenster.de