Analysis of cross-border trauma care cooperation

Displayed along the western border of Germany from Enschede (NL) to Sankt Vith (BE)

Bachelor Thesis
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List of acronyms and abbreviations

ABCDE Airway, Breathing, Circulation, Disability, Exposure
ALS Advanced Life Support
ATLS® Advanced Trauma Life Support
ÄLRD Ärztliche Leitung Rettungsdienst
BÄK Bundesärztekammer / German Medical Association
BE Belgium
BLS Basic Life Support
BTCCE Boundless Trauma Care Central Europe
DIVI Deutsche Interdisziplinäre Vereinigung für Intensiv- und Notfallmedizin / German Interdisciplinary Association for Intensive and Emergency Medicine
DGU® Deutsche Gesellschaft für Unfallchirurgie / German Society for Trauma Surgery
EMR Euregio Maas-Rhine
ANALYSIS OF CROSS-BORDER TRAUMA CARE COOPERATION

EMRIC  Euregio Maas-Rhine In Case of Crisis
EMS    Emergency Medical Service
ETC    European Trauma Course
EU     European Union
ESTES  European Society for Trauma and Emergency Surgery
GER    Germany
ISS    Injury Severity Score
ITLS   International Trauma Life Support
KTW    Krankentransportwagen
LPA    Landelijke Protocol Ambulancezorg
MMT    Mobile Medical Team
MRSA   Methicillin-resistant Staphylococcus aureus
MS     Member State
MUG    Mobile Urgency Group
NEF    Notarzteinsatzfahrzeug
NL     The Netherlands
NRW    North Rhine-Westphalia
PHTLS® Pre Hospital Trauma Life Support
PIT    Paramedic Intervention Team
RAV    Regionale Ambulancezorg Voorziening
RTW    Rettungswagen
SOP    Standard Operating Procedure
TRAS   Telemedical Rescue Assistance System
Abstract

**Background:** Injuries are the leading cause of death for young people. Therefore, good trauma care provision is important. Treating life-threatening injuries at the scene and a fast transport to the nearest trauma centre is associated with reduced mortality. Providing optimal trauma care across national borders is not always easy to achieve as countries have different standards and procedures. The Boundless Trauma Care Central Europe – Project has been initiated in order to facilitate cross-border care, standardise trauma algorithms and create a European trauma network in the future.

**Objective:** This paper is part of a continuous study and examines the pre-hospital trauma care cooperation along the central western border of Germany including experiences of emergency medical services (EMS) of the Netherlands, Germany and Belgium. It aims at analysing the current state of cross-border trauma care provision as well as involved laws and contractual agreements, determining obstacles and proposing solution approaches.

**Methods:** Different research methods have been used for analysis. Policy and stakeholder analysis as well as a non-systematic literature review have been used to describe current legislation concerning trauma care and differences in EMS and trauma systems. Additionally, twelve qualitative semi-structured interviews with stakeholders have been conducted. One EMS professional of each district in the research has been interviewed to determine in how far cross-border agreements are existent and implemented and how operations take place in reality.

**Results and conclusion:** Numbers of cross-border emergency operations differ significantly per region. On European level, legislation covering cross-border daily emergency care is missing. On national level, agreements between the Netherlands and Germany, as well as between Belgium and Germany do not exist. Nonetheless, on local level, some regions have made contractual agreements to provide cross-border emergency care. There are several obstacles for collaboration such as the lack of a solid legal basis, differences in EMS systems and trauma standards among the countries, communication issues and different hygiene standards. A legal basis has to be provided and differences in systems and care procedures must be mutually known and recognised in order to improve trauma care.
1. Introduction

Traumata with different causes and severity cause 5.8 million deaths per year worldwide (WHO, 2009a). Moreover, injury causes 16% of the global burden of disease (WHO, 2004). Trauma is defined as „an injury (as a wound) to living tissue caused by an extrinsic agent“ (DocCheck, 2014; Merriam-Webster, 2014), or the damaging event itself. Examples for these agents are accidents, violence, gunshots, falls, intoxication, corrosive injuries, burns and many others (DocCheck, 2014). A trauma can also be psychological; however, this will not be the focus of this paper. Although mortality caused by road injuries decreased by 50% since 1990, it is essential to proceed with further developments in trauma care (Institute for Health Metrics and Evaluation, 2013). More importantly, as for young people around the world (under the age of 45) road traffic accidents are still a leading cause of death (Oestern, Garg, & Kotwal, 2013).

Consequently, good trauma care provision should be of interest to health care providers and policy makers. It is proven that “the prognosis of severe trauma patients is determined by the ability of a healthcare system to provide high intensity therapeutic treatment on the field and to transport patients as quickly as possible to the structure best suited to their condition” (Tazarourte, et al., 2013, p. 477). Mortality can be reduced by treating life-threatening events in the pre-hospital phase (Gomes, et al., 2010) and by transporting the injured patient to the nearest trauma centre (Tazarourte, et al., 2013).

The provision of trauma care does not only concern ambulance services, as the trauma care chain has different layers (Jabakhanji & Meier, 2013). These layers are the dispatch centres, emergency services, professionals and hospitals as well as rehabilitation clinics; and lastly, legislators and insurers play important roles in healthcare and consequently in trauma care provision. The focus of this research, however, will mostly concern the first three layers, ranging from the first emergency call, answered by the dispatch centres and ambulances, to the handover in the emergency room. In order for the trauma care chain to run smoothly and most beneficially for the patient’s outcome all stakeholders and care providers have to work together in one coherent line, and should follow the same standards and algorithms. In border regions these pre-conditions are difficult to fulfil and problems arise when trauma care has to be provided. Problems exist such as different languages and communication problems between the layers themselves or with the patient as well as cultural issues. Moreover, financial insecurities, differences in education, responsibilities and competences of ambulance
personnel occur, and additionally, different algorithms and standards or technique problems (radio frequency) have to be considered (Jabakhanji & Meier, 2013).

All these problems should be tackled, therefore, in the Euregio Maas-Rhine (EMR) the project Euregio Maas-Rhine In Case of Crisis (EMRIC) has originated (EMRIC, 2014). Under EMRIC, a new project started, namely the Boundless Trauma Care Central Europe (BTCCE), which examines the trauma care provision in emergencies along the western border of Germany in cross-border operations with the Netherlands, Belgium, Luxembourg and France in order to improve it. Its main concern is to give patients “the best possible care required at every location within Europe without obstacles remaining that could impede this optimal trauma care” (EMRIC+, 2012).

In the scope of BTCCE, this research is a continuation of the already executed studies during the last years, including two bachelor theses on the same topic of cross-border trauma care cooperation along the western border of Germany from 2013. The focus of these studies has been on the hospital level of the trauma care chain. In line with this work, three researchers aim to examine the pre-hospital level in the cross-border setting along the western border of Germany. This paper is a part of this continuous study and focuses on the central part of the western border along Germany. This region includes Grafschaft Bentheim in Lower Saxony bordering the Netherlands, North Rhine-Westphalia (NRW) bordering the Netherlands, as well as the district Eifelkreis Bitburg-Prüm in the north of Rhineland-Palatinate bordering the German-Speaking Society of Belgium (see also figure 1). This paper analyses how German, Dutch and Belgian health care providers work in emergency and specifically in trauma care in the pre-hospital setting, whether cross-border collaborations exist and to which extent these have been implemented. It is explored how trauma care differs between the various regions and countries. Possible approaches for solving problems and best practices are suggested in order to create a common standard and foster collaboration, with the goal to improve trauma care and facilitate cross-border cooperation in the future. This research adds to the preceding studies a detailed analysis of the pre-hospital part of the trauma care chain, including opinions from emergency services providers, who have experienced cross-border trauma care operations on the scene. Overall, a deeper insight in the theme is given.
Various studies\textsuperscript{1} about emergency care and trauma care in the EMR already exist; these include analysis of legislation, agreements and difficulties resulting in several contractual arrangements between municipalities of the Netherlands, Germany and Belgium in this area. Therefore, analysis of the situation in the EMR will not be part of this research. Below, the above described research area is displayed.

\textit{Figure 1. Research area of this study}

\textsuperscript{1} i.a. Cross-border urgent medical assistance - Belgium - Germany - The Netherlands (Post & Stal, 2001); Building the Tower of Babel: Cross-border Urgent Medical Assistance in Belgium, Germany and the Netherlands (Post, 2004); Grenzüberschreitende Hilfeleistung in der Euregio Maas-Rhein (Ramakers et al., 2007)
2. Background

This section gives further background information around trauma care and the BTCCE project.

2.1. Traumata

As a consequence of the variety of causes and injuries, traumata can occur anytime and affect anyone to a more or less severe extent, which makes the treatment of trauma patients especially problematic. Traumata cannot be foreseen, as they occur suddenly (Deutsche Gesellschaft für Unfallchirurgie, 2011); there is no progression of a disease, which can be followed or where treatment and interventions can be prepared in due time. A patient, who is severely injured and needs further medical treatment right away after being initially stabilised by paramedics on the scene, needs to be transported to the next suitable hospital immediately. Being severely injured is commonly defined as being ranked on the Injury Severity Score (ISS) at sixteen points or higher (Schweigkofler & Hoffmann, 2013). Patients with multiple injuries get classified as ‘polytrauma’, when one of the injuries or the combination of several injuries is life-threatening (Maghsudi & Nerlich, 1998).

In the EU-27, injuries led to more than 230 000 deaths each year, “every two minutes one EU-citizen dies of an injury” (European Association for Injury Prevention and Safety Promotion, 2013, p. 6), almost 40 million people have to be treated in hospitals every year. However, fatal injury rates differ considerably throughout the European Union (EU) (see Figure 2). This displays the necessity to assess and evaluate emergency and trauma care in the different European countries to be able to exchange best practices and standardise treatment procedures.
2.2. Trauma standards

Since the 1970s, the term ‘golden hour’ (Wyen, et al., 2013) has been used to emphasise the importance of less treatment time on-scene and a rapid transport to the next specialised hospitals. However, there is still a widespread discussion around the world about the association between on-scene times and the medical outcome of the patient (McCoy et al., 2013; Newgard et al., 2010). Despite this discussion, emergency services’ primary concern is how to get “the right ambulance to the right patient at the right time” (Marsden, 1995, p. 177) and further, how to treat the patient most sufficiently and transport him as soon as possible to the most adequate hospital.

With the introduction of ‘Pre Hospital Trauma Life Support’ (PHTLS®) and ‘Advanced Trauma Life Support’ (ATLS®), programmes have been established in European countries to standardise trauma care and facilitate a rapid transport after initial stabilisation (Wyen, et al., 2013). ATLS®² has been developed as a strategy for handling trauma patients once they are hospitalised, starting with the care in the emergency room. PHTLS® builds up

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Fig. 2. Fatal injuries in EU countries (European Association for Injury Prevention and Safety Promotion, 2013)
on ATLS®, but is a modified version particularly designed for the pre-hospital setting (PHTLS®, 2014). In Europe, also other trauma standards have been implemented such as ‘International Trauma Life Support’ (ITLS), ‘European Trauma Course’ (ETC) or ‘TraumaManagement’. ETC has been developed by the ‘European Resuscitation Council’ in collaboration with other European organisations (European Trauma Course, 2014). TraumaManagement is adapted to the German emergency physician system into account (TraumaManagement, 2009).

Gomes et al. (2010) emphasise the fact, that the ABCD(E) methodology (which is a part of most current trauma standards and based on ATLS® and PHTLS®) is important in trauma care as treatment procedure. ABCDE stands for Airway, Breathing, Circulation, Disability and Exposure. The emergency professionals start with assessing and treating life-threatening airway problems, secondly breathing difficulties, thirdly any issues with circulation, bleedings and bone fractures, fourthly the neurological status assessment follows and lastly, undressing and further examining of the patient (Gomes et al., 2010). Paramedics have to decide if a patient is in a critical, life-threatening condition and needs to be transported right away or if it is more beneficial to give initial treatment at the scene. This decision is commonly referred to as the question between ‘scoop and run or stay and play’(Smith & Conn, 2009). Despite the positive view on PHTLS®, it is often criticised as not being applicable for all European countries, as it has been developed for the American paramedic-system (Wrobel & Lenz, 2012).

Although, common approaches and similar standards such as the above mentioned exist and are implemented in different European countries, emergency services still vary in their methods and the development process of pre-hospital trauma management has been different per country (Lockey, 2001).

2.3. Regionalisation and trauma systems

In Europe cooperation has commenced in many medical fields. However, trauma care is provided on a daily basis, often despite legal uncertainties. Nonetheless, there are already existing trauma networks in cross-border regions. In Germany, the German Society for Trauma Surgery (DGU®) established a system of trauma networks (Deutsche Gesellschaft für Unfallchirurgie, 2014a).
One trauma network consists of several hospitals, ideally several hospitals of each category: supraregional, regional and local trauma centres (Deutsche Gesellschaft für Unfallchirurgie, 2014c). Local trauma centres are mostly local hospitals with only limited resources, while regional trauma centres have more resources and specialities. A supraregional trauma centre can provide any needed care 24 hours a day, 7 days a week and are called maximum care hospitals. Depending on the case and on the facilities available in a given area, a patient can be transported to a local or regional trauma centre for initial stabilisation. When needed, the patient gets transferred to a maximum care hospital afterwards (Deutsche Gesellschaft für Unfallchirurgie, 2014c).

Figure 3 shows and explains which trauma networks and centres already are established along the central western border of Germany. It is displayed that two hospitals of the Netherlands, the Akademisch Ziekenhuis Maastricht and the Medisch Spectrum Twente in
Enschede joined the German TraumaNetzwerk and are certified trauma centres, which operate on a supraregional level.

2.4. **European Directive**

The movement of citizens in Europe has increased substantially during the last decades. People travel across borders for several purposes such as vacation, shopping or work, more and more also to seek healthcare services (Andritsos & Tang, 2013). The last point of seeking healthcare services in a foreign country has been facilitated by the European ‘Directive on the Application of Patients’ Rights in Cross-Border Health Care’, which has entered into force in 2011 and should have been implemented in every European country by October 2013. The Directive tries to “clarify patients’ rights with regard to accessing cross-border healthcare provision, guarantee the safety, quality and efficiency of care that they will receive in another EU Member State, promote cooperation between Member State on healthcare matters” (EUR-Lex, 2014). The directive regulates that patients are allowed to receive healthcare in a foreign state and get reimbursed up to the level the costs would be refunded in their own country; however, prior authorisation by the insurance company can be necessary in some cases. This directive has been a breakthrough for cross-border healthcare in Europe, but it is directed towards general healthcare. Trauma care or daily emergency care are not targeted by the directive.

2.5. **Euregios**

On local European level, ‘Euregios’ have been established in many different border regions; ‘Euregio’ stands for ‘European Region’, however, Euregios are commonly referred to as ‘Euroregion’ (Brand, Hollederer, Wolf, & Brand, 2008). Euregios, i.e. authorities, cooperate on many different fields such as public safety, tourism, environment and health issues. A common definition is missing due to significant differences in how far the Euregios are developed and organised (Brand et al., 2008). However, “cross-border cooperation is intended to help reduce the disadvantages of the border regions, promote their integrated development and improve the living conditions of the population in these areas” (Brand et al., 2008, p. 246), as these areas are often “economically weak” (Brand et al., 2008, p. 245). The research area of this study includes parts of different Euregios along the western border of Germany; firstly, the ‘EUREGIO’ around Regio Twente, Regio Noord- en Oost Gelderland (on Dutch
side) and Kreis Borken, Kreis Steinfurt and Grafschaft Bentheim (on German side); secondly, the Euregio ‘Rhone-Waal’ around the Regio Gelderland Midden, Regio Gelderland Zuid and Regio Limburg Noord (on Dutch side) and Kreis Kleve (on German side); thirdly, the Euregio Rhine-Maas-North around Regio Limburg Noord (on Dutch side) and Kreis Kleve, Kreis Viersen (on German side). Lastly, the northern part of the EuRegion SaarLorLuxRhein (German Speaking Society in Belgium, Saarland, Luxembourg, Lorraine in France, and Rhineland-Palatinate) is also included in this research (see figure 1) (euregio, 2014).

2.6. Current state of BTCCE

The analysis of cross-border trauma care cooperation along the western border of Germany started within BTCCE on the hospital level. Primarily, traumatologists have been interviewed and regulations concerning trauma care and hospital cooperation have been reviewed. The studies show, that cross-border trauma care cooperation does function very well in air rescue in contrast to the cooperation in daily care on the ground, which is not that far developed and regulated. Regional collaborations exist in different areas; however, the extent of the cooperation often depends on the people involved and is inhibited by a lack of a legal basis. Moreover, there are agreements between hospitals of neighbouring countries. Several problems and obstacles for the cooperation have been identified including insurance issues, communication problems between the dispatch centres and hospitals, different care procedures and cultural differences (Jabakhanji & Meier, 2013).

A letter of intent was signed by already involved partners agreeing on several points of action to improve trauma (Emric+, 2012). Nonetheless, new contacts have to be made in order to include at least one stakeholder or actor from each layer of the trauma chain in each district in the BTCCE project.

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3 These partners are the following professionals: Drs. Bertelink (Enschede, NL), Dr. Bodson (Liège, BE), Prof. Brink (Maastricht, NL), Prof. Edwards (Nijmegen, NL), Prof. Gerich (Luxembourg, LU), Dr. Henke (Oldenburg, DE), Prof. Pape (Aachen, DE), Dr. Pohlemann (Homburg, DE), Dr. Raschke (Münster, DE) and Dr. Wendt (Groningen, NE) (Jabakhanji & Meier, 2013).
3. Goals and research questions

This section describes the goals, which aim be achieved by the project in general and by this study. The goals lead to the research questions, which are stated afterwards.

3.1. Goals of the study

The goal of the project is to find a common approach within trauma care provision, to determine opportunities and barriers and propose possible solutions. A plan for each layer in the trauma chain shall be developed in the BTCCE project including a detailed description about how cross-border cooperation can be designed in the future and how treatment algorithms and quality can be standardised. The ultimate goal is to produce a script, which policy makers can use for guidelines on how trauma care should take place in Europe. Further, an European trauma network shall be established. Consequently, the produced script has to be informative for policy makers as well as practical for workers.

This research contributes to the above mentioned goals by analysing the trauma care chain along the middle part of the western German border. The goal of this study is therefore to examine the current state of trauma care provision in all cross-border regions and districts in the research area and to analyse agreements which have been made. This is not explained in detail for rehabilitation centres as this analysis would have exceeded the time period of this study. Moreover, details about the trauma care provision are analysed, problems elaborated as well as solution approaches described and further suggestions are made.
3.2. Research questions

Four main research questions have been developed to guide this research. These are the following:

- What is the current state of cross-border trauma care provision by emergency services along the central part of the western border of Germany?
  - What are existing problems in the pre-hospital management of trauma patients across these borders?
- Which contractual arrangements on cross-border emergency cooperation exist?
  - To what extent are they being used in practice?
- How can trauma care be improved in central Europe?
- What is the process of BTCCE and what are future plans?
4. Theoretical considerations

In 2009, the World Health Organisation published several guidelines for trauma quality improvement programmes (WHO, 2009b). It is stated, that in the process of quality improvement new strategies or corrective actions are only valuable when they are measurable.

![Figure 4. Closening the loop (WHO, 2009b)](image)

Figure 4 displays the ‘closening the loop’ circle, which is used to confirm and record the effect actions in trauma care may have (WHO, 2009b). The approach can be applied to this study as data-gathering and monitoring is conducted to identify cross-border trauma care issues. The findings and influencing factors are analysed and solution approaches are described later in this paper.

The chain of help in itself can be described within a different approach. The post-impact care strategy focuses on the occurrence of road injuries and associated problems and consequences (DaCoTa, 2012). The aim is to reduce the severity of outcomes and to improve trauma care systems. In order to provide more details about the trauma care chain, a new model has been created, modified after the Post-Impact Care strategy and a scheme of the ‘Traumakette’ (trauma care chain) (Wilhelm, 2011).
Figure 5. The trauma care chain

Figure 5 displays the newly created model, which is used to organise and analyse the research findings accumulated in this study. In this model the whole trauma care chain is included starting with the trauma incident, which causes a primary damage and leads to an emergency call. It is determined whether a patient in a cross-border setting can access the emergency medical system easily. Further, it is of interest how the dispatch centres cooperate and alert the appropriate and nearest ambulance. Differences in trauma care provision are evaluated and the patient handover to the emergency room department is analysed. In addition, legal issues are discussed. All factors except the trauma itself, which damage is out of the medical services’ control, influence the secondary damage to a patient. Therefore, improving the performance of each of the layers of the trauma chain as well as of collaboration and contact points between them is highly important to create a best practice approach in trauma care.
5. Methods

Different research methods have been used to conduct the research and answer the research questions according to the theoretical considerations of the trauma care chain. The research method consists of a policy analysis, a non-systematic literature review and qualitative interviews with different actors of the trauma care chain. Consequently, the research design is descriptive and evaluative when analysing policies and stakeholders and reviewing literature. Moreover, the research is also of exploratory nature, because qualitative interviews have been conducted and analysed with the purpose of exploring any difficulties in cross-border trauma care.

In particular, information about laws and regulations concerning the health systems and trauma care have been gathered for each of the districts along the border area in all countries, namely Germany, the Netherlands and Belgium. Additionally, laws about the provision of cross-border emergency and trauma care have been studied. For the purpose of analysing different standards, approaches and policies in the different countries, data about the education, responsibilities and structures of dispatch centres, emergency services and ambulance workers, hospitals and trauma centres and their staff have been collected.

5.1. Literature review and policy analysis

Data has been collected by reviewing laws, policies, regulations, governmental reports and articles concerning traumata, trauma care provision, the trauma care chain and its layers, regulations in place in the different districts, and cross-border collaborations. Journal articles are of particular importance as common source for information in the medical field (Davis, Bagley Thompson, & Panacek, 1995) because they are more up-to-date and published frequently. The databases Pubmed, BioMed Central and Science Direct have been used to search for scientific articles because these databases focus on medical issues. Moreover, Google and Google scholar have been used to find websites from medical associations and articles related to this research. The following search terms have been used ‘trauma’, ‘trauma care provision’, ‘trauma care chain’ / ‘Traumakette’, ‘cross-border care’, ‘trauma system’, ‘trauma standards’, ‘Euregio’, ‘emergency system’, ‘PHTLS’, ‘ATLS’, ‘European Trauma Course’, ‘Traumamanagement’, ‘DGU’ and combined with terms such as ‘cross-border agreements OR collaboration’ and ‘Germany, the Netherlands, Belgium’. Websites about
different districts and regional institutions have been investigated for relevant information about trauma care provision. As policy analysis has been included in this research, other websites of institutions such as the governments or the European Commission has been searched for details about existing laws, regulations and recommendations. While conducting the literature review and policy analysis unsolved problems and open issues as well as best practices already occurred and influenced the content of the interviews with stakeholders.

5.2. Qualitative interviews

Further data collection techniques have indeed been qualitative interviews with stakeholders and actors in the pre-hospital sector. These interviews were conducted in order to get a deeper insight and foster understanding (DiCicco-Bloom & Crabtree, 2006) about different standards and algorithms in trauma care and provide the research with necessary information on how operations take place on a daily basis, as the reality might be different from the description in scientific literature or contracts. Semi-structured interviews have been made, which are “generally organised around of predetermined open-ended questions, with other questions emerging from the dialogue between interviewer and interviewee/s” (DiCicco-Bloom & Crabtree, 2006). In this sense, the interviews have been semi-structured in order to serve as an open atmosphere and to provide the ability for a better interaction with the interviewed person.

The goal of this research method was to interview one stakeholder in each district of the research area; it had been difficult to determine selection criteria beforehand as the responsibilities for EMS in these districts differ between the countries. In Germany ‘Landkreise’ (administrative districts) and ‘Kreisfreie Städte’ (autonomous cities) are responsible for emergency care provision, while in the Netherlands, this is coordinated by ‘Regionale Ambulancezorg Voorziening’ (RAVen) and in Belgium this happens on federal level (M. Ramakers, personal communication, February 11, 2014). Moreover, the research has been dependent on the reaction of contacted persons, and their motivation and time to cooperate and be involved in the study. Consequently, different actors have been contacted and interviewed. In Germany, the (municipal) public order offices have been contacted (via letters and emails), because the interviews should also serve as a basis to encourage these districts to support the BTCCE-project in general. Sometimes the researcher has been referred to the medical manager of the district or another person with experience in cross-border care.
In the Netherlands, the Manager Ambulancezorg of the RAVen have been contacted via email and interviewed, together with their medical managers most frequently. In Belgium, as ambulance care lies in the responsibility of the federal state (Post & Stal, 2001), it was difficult to contact one person, who is responsible for the emergency service in the German Speaking Society, as the emergency service is provided by different organisations. This is why the head of the dispatch centre in Liège has been contacted via email and interviewed in order to get a good overview about the emergency system in Belgium in general and issues in the German Speaking Society as well. The table below states who has been interviewed and how the interview has been done.
Table 1

Overview interview partners

<table>
<thead>
<tr>
<th>Country</th>
<th>Region (Kreis/RAV)</th>
<th>Name</th>
<th>Position</th>
<th>Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>GER</td>
<td>Grafschaft Bentheim</td>
<td>Dr. Binsfeld</td>
<td>Ärztliche Leitung Rettungsdienst</td>
<td>Telephone</td>
</tr>
<tr>
<td>GER</td>
<td>Kreis Steinfurt</td>
<td>Dr. Fuchs</td>
<td>Ärztliche Leitung Rettungsdienst</td>
<td>Telephone</td>
</tr>
<tr>
<td>GER</td>
<td>Kreis Borken</td>
<td>Mr. Gördes</td>
<td>Abteilungsleiter Bevölkerungsschutz</td>
<td>Telephone</td>
</tr>
<tr>
<td>GER</td>
<td>Kreis Kleve</td>
<td>Mr. Welke</td>
<td>Abteilungsleiter Rettungsdienst, Leitstelle</td>
<td>Telephone</td>
</tr>
<tr>
<td>GER</td>
<td>Kreis Viersen</td>
<td>Mr. Placca</td>
<td>Lehrrettungsassistent Nettetal</td>
<td>Telephone</td>
</tr>
<tr>
<td>GER</td>
<td>Eifelkreis Bitburg-Prüm</td>
<td>Mr. Nußbaum</td>
<td>Lehrrettungsassistent Bitburg</td>
<td>Telephone</td>
</tr>
<tr>
<td>NL</td>
<td>RAV Twente</td>
<td>Mr. Legebeke</td>
<td>Beleidsmedewerker</td>
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<tr>
<td>NL</td>
<td>RAV Noord en Oost Gelderland</td>
<td>Mr. van Pijkeren</td>
<td>Manager ambulancezorg Witte Kruis</td>
<td>Telephone</td>
</tr>
<tr>
<td>NL</td>
<td>RAV Gelderland Midden</td>
<td>Mr. Goselink</td>
<td>Manager ambulancezorg Medisch manager</td>
<td>Telephone</td>
</tr>
<tr>
<td>NL</td>
<td>RAV Gelderland Zuid</td>
<td>Dr. van Grunsven</td>
<td>Medisch manager</td>
<td>Telephone</td>
</tr>
<tr>
<td>NL</td>
<td>RAV Limburg Noord</td>
<td>Mr. Lemmen</td>
<td>Manager ambulancezorg Medisch manager</td>
<td>Personal meeting</td>
</tr>
<tr>
<td>BE</td>
<td>Liège</td>
<td>Hr. Fanuel</td>
<td>Head of dispatch center</td>
<td>Personal interview</td>
</tr>
</tbody>
</table>

In total, twelve interviews have been conducted, one in each district of the research area. The majority of the interviews had to be conducted via telephone, one interview has been face-to-face. The interview with the RAV Limburg Noord was incorporated into a general meeting. The interviews have been recorded after asking permission of the interviewees. The interview questions and the transcribed interviews can be found in the appendices of this paper. Only passages concerning the interview questions have been transcribed as most of the conversations also included general or unrelated aspects.

4 Names of the different positions are mostly given in the original language to prevent misunderstandings in translation
The interview questions have been based on already existing questions from the previous interviews within the BTCCE project with hospital professionals about the same topic of trauma care. Questions from a report about cross-border rescue have been used for this study (Pohl-Meuthen & Schäfer, 2006). Further, questions have been adjusted to the pre-hospital setting to fit into this research and others were added to get a more comprehensive picture of the different trauma care situations in the regions. Moreover, the core principles of BTCCE have been added in the beginning to emphasise the importance of the topic. The eighteen main interview questions (with various sub questions) cover different subject matters, beginning with trauma care provision in general, education of paramedics, emergency call and operation disposal, refunding of costs, cross-border operations and agreements, personal experiences, patient handovers, referral to rehabilitation centres and above all, positive and negative aspects. The interview questions were sent via email one week before the actual interview date with the intention to give the interviewee the possibility to prepare figures and numbers. The interviews on the German side were held in German, in Belgium in English, whereas during the interviews with the Dutch stakeholders, the language switched from German to English and sometimes to Dutch. However, as the Dutch project manager of BTCCE, Mrs. Ramakers, has been present for all Dutch interviews, this was an opportunity to tell details in the mother tongue of the interviewee.
6. Results

The following section firstly displays current legislation concerning emergency and trauma care in the three countries of this research. Secondly, the differences in organisation and standards of the various regions are explained in order to grasp a comprehensive picture of trauma care along the border of different countries. Findings, which emerged from the interviews, are discussed during the whole section, if applicable. Lastly, additional concerns covered by the interviews with stakeholders are analysed.

6.1. Legislation

6.1.1. European level

As indicated earlier, legislation on the European level covering emergency or trauma care issues is missing. In the EU, the Member States (MS) are responsible for health care provision (van der Molen & Commers, 2013). Although the European Directive on patients’ rights aims at facilitating the cooperation of MS in healthcare matters as well as the reimbursement after receiving healthcare in another MS (EUR-Lex, 2014), there are still problems and barriers in reimbursing emergency operations of foreign rescue services. These are elaborated in section 6.3.4. of this paper.

6.1.2. National level

On the basis of the Mainzer agreement between Belgium and Germany and the Anholter agreement between the Netherlands and Germany, public sector entities and public bodies are allowed to conclude public law agreements (Ramakers, Bindels, & Wellding, 2007). Furthermore, there are agreements between national states to assist each other in mass casualty events. For daily cross-border emergency operations, agreements between the Netherlands and Germany and further between Belgium and Germany on national level are missing. Belgium tried to foster an agreement with the ministry of health of North Rhine-Westphalia in Düsseldorf and an agreement is still in the production (M. Ramakers, personal communication, February 13, 2014). Between Rhineland-Palatinate and Belgium, an agreement about urgent medical help in rescue services has been made in 2009. In an

5 Deutsch-belgisches Abkommen über die die dringende medizinische Hilfe / Rettungsdienst, 2009
emergency, operation teams of both countries are only allowed to carry out activities, which
they are allowed to do in their own country. In a case of liability, the law of the country,
where the operation takes place, pertains (Emricplus, 2014).

Nonetheless, additions in existing legislation have been introduced, which regulate
that ambulances are allowed to use blue lights and sirens in the three countries and how they
have to act abroad during an emergency drive\(^6\). The federal state NRW includes foreign
emergency vehicles, whereas similar mentioning in laws of Lower Saxony and Rhineland-
Palatinate could not be found.

It has to be mentioned that despite the inability to sign an agreement on daily
emergency care between the Netherlands and Germany as well as between Belgium and
Germany on national level, framework agreements between Poland
(Bundesgesundheitsministerium, 2011) and Germany\(^7\) and also between the Czech Republic
(Bundesgesundheitsministerium, 2013) and Germany\(^8\) have been concluded. The agreements
cover topics such as operation standards, quality and safety criteria and liability issues.

### 6.2. Differences in emergency rescue service systems

The EMS systems of the Netherlands, Belgium and Germany differentiate considerably. It is
important to display these differences in order to understand why this influences cross-border
collaboration. Terminology concerning different types of ambulances or education is
described in the original language to prevent mistakes and confusion when translating them.

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\(^6\) Ausrüstung und Verwendung von Kennleuchten für blaues Blinklicht (Rundumlicht) und von
Warnvorrichtungen mit einer Folge von Klängen verschiedener Grundfrequenz (Einsatzhorn) an
Einsatzkraftfahrzeugen der Feuerwehren, der Einheiten und Einrichtungen der Gefahrenabwehr und des
Rettungsdienstes (2010); Brancherichtlijn Optische en Geluidssignalen Spoedeisende medische hulpverlening
(5.8.) (Ambulancezorg Nederland, V&VN Ambulancezorg, 2009); Arrêté royal du 1er décembre 1975 portant
règlement général sur la police de la circulation routière et de l'usage de la voie publique (article 37) (Institut
Belge pour la Sécurité Routière, 2014)

\(^7\) Rahmenabkommen zwischen der Bundesrepublik Deutschland und der Republik Polen über die
grenzüberschreitende Zusammenarbeit im Rettungsdienst, 2011

\(^8\) Rahmenabkommen zwischen der Bundesrepublik Deutschland und der Tschechischen Republik über die
grenzüberschreitende Zusammenarbeit im Rettungsdienst, 2013
6.2.1. Comparison of the emergency systems

This section describes the differences of EMS system and education of ambulance personnel in the research area.

Table 2

*Differences in emergency care units (Post, 2004)*

<table>
<thead>
<tr>
<th></th>
<th>Belgium</th>
<th>Germany</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Life Support</strong></td>
<td><strong>Ambulance</strong></td>
<td><strong>Krankentransport-wagen</strong></td>
<td><strong>Ambulance</strong></td>
</tr>
<tr>
<td></td>
<td>Ambulancier or nurse</td>
<td>Rettungshelfer</td>
<td>Ambulance nurse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rettungssanitäter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Rettungswagen</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rettungssanitäter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rettungssanistente</td>
<td></td>
</tr>
<tr>
<td><strong>Advanced Life Support and Prehospital Trauma Life Support</strong></td>
<td><strong>Mobile Urgency Group</strong></td>
<td><strong>Notarztwagen</strong></td>
<td><strong>Mobile Medical Team</strong></td>
</tr>
<tr>
<td></td>
<td>Doctor Nurse</td>
<td>Rettungswagen with Notarzt and supplementary equipment</td>
<td>Doctor Nurse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car with Notarzt and supplementary medical equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Notarzteinsatzfahrzeug</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Car with Notarzt and supplementary medical equipment</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 displays a schematic illustration of the emergency care units in Belgium, Germany and the Netherlands showing the different levels of care in the three countries.

**The Netherlands**

Since 2010, the Netherlands are divided into 25 security regions (‘veiligheidsregios’) to facilitate national cooperation in case of catastrophes between police, ambulance services and fire departments (Limburg-Veilig.nl, 2014). The ‘Tijdelijke wet ambulancezorg’ regulates emergency rescue service. Per security region a RAV is in charge to provide emergency care including running a dispatch centre (Wetgeving, 2012). The organisation Ambulancezorg Nederland releases the nationwide protocols for ambulance personnel (‘Landelijk Protocol Ambulancezorg’, short LPA). These standard operating procedures (SOPs) apply for all rescue operations in the Netherlands and are based on PHTLS® (Ambulancezorg Nederland, 2014). Below you can find an example of such an SOP of the LPA 7.2.
The ambulanceverpleegkundige is the professional responsible for the medical care on an ambulance. He is trained as a nurse and is legally entitled to diagnose and give medication as long as this is in line with the LPA (Academie voor Ambulancezorg, 2014).

The Netherlands also has introduced a nation-wide trauma network approach. Eleven hospitals have been designated as trauma centres in ten cities (see figure 7). Hospitals are divided into three categories, similar to trauma centres in Germany, ranging from highest level trauma centres (level 1) to regional hospitals with limited resources and capacities (level 3) (Jan ten Duis & van der Werken, 2003).
The Dutch EMS system works mostly without emergency physicians, which are nonetheless on-call in mobile medical teams (MMTs) positioned at eight trauma centres. Of these eight MMTs, four are helicopters located at hospitals in Groningen, Amsterdam, Rotterdam and Nijmegen (Jan ten Duis & van der Werken, 2003). The physicians can come to the scene with a vehicle on the ground or with a helicopter (Post, 2004). MMTs are called for when a narcosis induction is needed, in severe trauma cases or catastrophes. Additionally, in 2013, new dispatch criteria for the alerting of MMTs have been introduced (Landelijk netwerk acute zorg & Ambulancezorg Nederland, 2013). Further, a trauma register has been initiated (Wendt, 2008).

**Belgium**

In Belgium, ambulance care is regulated on national level. Ambulance personnel are most of the time composed of two ambulanciers, which are educated on basic life support (BLS) level (Post & Stal, 2001). However, Belgium slowly follows the trend to replace one of them by a more qualified person, namely a nurse, which is then called Paramedic Intervention Team (PIT) (H. Fanuel, personal communication, Mai 13, 2014). In addition, emergency physicians are available in Mobile Urgency Groups (MUG) for ALS interventions (Post, 2004). EMS in Belgium do not follow a certain standard, but PHTLS® has been appearing since a few years (H. Fanuel, personal communication, Mai 13, 2014).

Belgian ambulances and hospitals have to be approved by the Federal Health Inspection (Post, 2004). Nijs and Broos stated in 2003, that in Belgium, the trauma system was not very far developed, was lacking intra-hospital coordination and cooperation and transferral of patients to specialised care units; further, a trauma registry has been missing (Nijs & Broos, 2003).
Fanuel (personal communication, Mai 13, 2014) states that this has not changed in the recent years. It is mandatory by law to bring a victim to the nearest authorised hospital.

**Germany**

In Germany, each federal state has its own emergency medical services law. These regulate amongst others the composition of staff in an ambulance, which can be divided into a lower equipped Krankentransportwagen (KTW) or a higher equipped Rettungswagen (RTW). Comparable to the MUG car in Belgium, an emergency physician in Germany reaches the scene in its own car, namely a Notarzteinsatzfahrzeug (NEF), the so called rendez-vous system. Although the emergency medical services laws of Lower Saxony, North Rhine-Westphalia and Rhineland Palatinate differ, in all three laws, a Rettungsassistent is the responsible person on the ambulance (RTW) (Nüßen, 2014). In comparison, the German Rettungsassistenten have a lower education than their Dutch colleagues, who are trained nurses, however, on basis of a recommendation of the German Medical Association (BÄK) Rettungsassistenten are allowed to provide some advanced life support (ALS) measures within the so-called ‘Notkompetenz’ when the situation is life-threatening for a patient and an emergency physician cannot be at the scene in sufficient time (Bundesärztekammer, 1992). Currently, the EMS system in Germany is being restructured including changes in the education of paramedics. A better educated Notfallsanitäter will be the responsible person on the ambulance in the future (Stumpf + Kossendey Verlag, 2014). Standards of care and the level of ALS interventions performed by German paramedics differ at the moment between each administrative district, as in each ‘Landkreis’ the medical manager of the region (Ärztliche Leitung Rettungsdienst, short ÄLRD) is responsible for the education of the ambulance personnel, which allows competences on various levels (M. Ramakers, personal communication, February 13, 2014). Consequently, concerning trauma care, some regions work after PHTLS® standards, others use the German Traumamanagement programme or create their own SOPs. Nonetheless, all traumapatients, who are treated within a traumanetwork (of the DGU®) are registered in a national database (Deutsche Gesellschaft für Unfallchirurgie, 2014d).
Help period

The help period, which is the timeframe beginning with the emergency call until an ambulance should be at the scene, differs in the three countries. This is partly due to inconsistent definitions of this timeframe, which can be separated into the time a dispatcher needs to alert the ambulance, the time the paramedics need to get into the ambulance and lastly, the driving time to the scene. In the Netherlands the time to provision of care has been legally determined at 15 minutes (Ambulancezorg Nederland, 2014) (Jan ten Duis & van der Werken, 2003). In Germany, the legal help periods differ between the federal states, but ranges between 8 and 15 minutes; 8 minutes in urban areas and 12 in rural areas in NRW, 15 minutes in Lower Saxony and Rhineland-Palatinate (Niedersächsisches Ministerium für Inneres und Sport, 2008). In Belgium no help period is defined. Especially in the German Speaking Society, there are regions, where an ambulancier starts from home when he is called to an emergency mission. This leads to help periods of 20 to 30 minutes. However, H. Fanuel states, that this situation is improving every year (personal communication, Mai 13, 2014).

6.3. Analysis of qualitative interviews

This section displays all remaining aspects which have been mentioned by the interviewees.

6.3.1. Current state of cross-border trauma care provision

‘Trauma patients shall get the best care, regardless of place and time. Additionally, the patients shall be transported to the best resourced hospital nearby, in which case borders should be irrelevant.’

These core principles have been stated in the beginning of the interviews, which all stakeholders agreed to by common consent. However, in the course of the interviews it has become clear that interviewees agree in theory, but the extent to which cross-border care is actually performed differs considerably between the regions.
Table 3

**Numbers of cross-border operations in the research area stated by the interviewees**

<table>
<thead>
<tr>
<th>Region</th>
<th>Help to GER (primary missions)</th>
<th>Emergency admissions to German hospitals</th>
<th>Help from GER (primary missions)</th>
<th>Region</th>
<th>Help to NL / BE (primary missions)</th>
<th>Emergency admissions to Dutch / Belgian hospitals</th>
<th>Help from NL / BE (primary missions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twente</td>
<td>3 / year</td>
<td>0</td>
<td>54 / year helicopter</td>
<td>Grafschaft Bentheim</td>
<td>1 / month</td>
<td>Regularly</td>
<td>0</td>
</tr>
<tr>
<td>Noord en Oost Gelderland</td>
<td>0</td>
<td>20 / year</td>
<td>sometimes</td>
<td>Kreis Steinfurt</td>
<td>3 / month helicopter</td>
<td>1-2 / week (ground-level)</td>
<td>0</td>
</tr>
<tr>
<td>Gelderland Midden</td>
<td>Rarely</td>
<td>Not stated</td>
<td>Rarely</td>
<td>Kreis Borken</td>
<td>10 -15 / year</td>
<td>25 / year</td>
<td>0</td>
</tr>
<tr>
<td>Gelderland Zuid</td>
<td>Rarely</td>
<td>0</td>
<td>0</td>
<td>Kreis Kleve</td>
<td>&lt;5 / month</td>
<td>5 / month</td>
<td>5 / month (helicopter)</td>
</tr>
<tr>
<td>Limburg Noord</td>
<td>Rarely</td>
<td>0</td>
<td>10 -20 / year</td>
<td>Kreis Viersen</td>
<td>Rarely</td>
<td>50 / year</td>
<td>Not stated</td>
</tr>
<tr>
<td>Belgium</td>
<td>15 / year</td>
<td>Sometimes</td>
<td>80 / year helicopter (outside research area)</td>
<td>Eifelkreis Bitburg-Prüm</td>
<td>1 / year</td>
<td>Rarely</td>
<td>Not stated</td>
</tr>
</tbody>
</table>

Table 3 shows the stakeholders’ estimated average number of cross-border operations. The stakeholders could not distinguish the exact number of traumata out of the total operations. In the research area, Dutch ambulances rarely have primary missions in Germany. However, there is one exception, namely the Lifeliner 3 helicopter from the Radboud hospital in Nijmegen, which flies five primary missions in the region of Kleve per month (F. Welke, personal communication, May 21, 2014). Similarly, Dutch ambulances seldom transport emergency patients from the Netherlands to German hospitals, only the region Noord en Oost Gelderland brings patients to Germany roughly 20 times a year (M. van Pijkeren, personal communication, May 27, 2014). In contrast, German ambulances and the helicopter in Rheine (Kreis Steinfurt) have several primary missions in the Netherlands. However, this occurs not more than five times per month and region. Additionally, German ambulances bring patients...
to Dutch hospitals on a regular basis, although this ranges from one to two times a week (Kreis Steinfurt) to 25 times a year (Kreis Borken). These hospitals are located in Enschede, Nijmegen and Venlo. All three hospitals are located close to the German border, whereas only regional trauma centres are found close to the border on the German side, with the exception of Meppen as a supraregional centre in the North (figure 4).

**Contractual arrangements**

In the four regions of Twente, Noord en Oost-Gelderland, Grafschaft Bentheim and Borken, on-going cooperation exists in the area of general risk prevention for many years, which focuses mainly on fire brigades and disaster management (E. Gördes, personal communication, March 20, 2014).

**Region Twente/Grafschaft Bentheim/Steinfurt**

Several regions have made different agreements for cross-border care. The Dutch region Twente has made an agreement with the district Grafschaft Bentheim and the municipality Nordhorn in Lower Saxony, which regulates that Dutch ambulance verpleegkundigen and German Rettungsassistenten both work according to their own standards in cross-border operations (J. Legebeke, personal communication, April 14, 2014). Moreover, in 1998 an agreement between the EUREGIO was made, which is currently being renewed (M. Binsfeld, personal communication, March 20, 2014). Both regions consider cross-border cooperation as being necessary and good, but not as necessary as in other regions. In case of large-scale emergencies, regions ask each other for help and support despite the non-existence of an official agreement.

Concerning air rescue, it has been agreed that the primary helicopter from Rheine (Christoph Europa 2) and the helicopter for intensive care (Christoph Westfalen) also cover the region of Twente (K. Fuchs, personal communication, March 25, 2014). In 2013, there have been approximately 54 rescue operations by the helicopters in Twente.
Region Noord en Oost Gelderland/Borken/Steinfurt

In the past, there had been an agreement on cross-border emergency cooperation between the district Borken and the region Noord en Oost Gelderland. However, in 2011, it was decided to put an end to this because of legal uncertainties concerning the competences of Rettungsassistenten. The number of primary missions from the Germans in the region Achterhoek has fallen from 100 per year down to almost zero (E. Gördes, personal communication, March 20, 2014).

Still, the district Borken has a functioning agreement with Ambulance Oost in Twente. Unlike the former case, here, Germans drive across the border with an ambulance and an emergency physician. Education, standards and equipment are acknowledged by both sides as being professionally qualified. It has been agreed that the Germans provide initial medical treatment until a Dutch ambulance arrives (which is alerted simultaneously), which then brings the patient to Dutch hospital. This happens 10 to 15 times a year (E. Gördes, personal communication, March 20, 2014). The helicopter Christoph Europa 2 also occasionally helps in Noord en Oost Gelderland, but no exact numbers were mentioned.

Region Gelderland Zuid/Kleve, Limburg Noord/Kleve, Viersen

There is no official agreement between Gelderland Zuid, Limburg Noord and Landkreis Kleve on cross-border cooperation on the ground-level, because of the missing legal framework, although there are ‘good-will’ arrangements. Ambulances from Kleve have primary missions in Millingen aan de Rijn (Gelderland Zuid) and Siebengewald (Limburg Noord). During the interview with the Landkreis Kleve, it became clear, that this region would not consider signing an official agreement unless all legal uncertainties are regulated. Nonetheless, the regions cooperate in the case of large-scale incidents and train for these once a year (F. Welke, personal communication, May 21, 2014).

The only official cooperation is in air rescue, which regulates that the helicopters from Nijmegen (Lifeliner 3) and Duisburg (Christoph 9) can be alerted for emergencies in the region of Kleve or around Venlo in Limburg Noord (F. Welke, personal communication, May 9).
Moreover, there are agreements for catastrophes including also the districts Viersen and Heinsberg. However, details could not be reported by the interviewees.

6.3.2. General view on cooperation

Almost all experiences from cross-border operations are positive. Usually, the climate between Dutch, Belgian and German dispatch centres, ambulances and hospital personnel is very friendly and professional (M. Binsfeld, personal communication, March 20, 2014). In particular, German stakeholders describe the cooperation as very good. This is particularly the case when German ambulances bring traumapatients to a Dutch trauma centre such as Enschede. The German interviewees speak in high terms of the professional and well-structured trauma teams in the emergency room as well as of the guidance German ambulances receive (K. Fuchs, personal communication, March 25, 2014; F. Welke, personal communication, May 21, 2014). Examples mentioned are the instruction by traffic controllers in the streets and in some cases ambulances are escorted from the border to the hospitals.

All interviewees have a positive view on cross-border cooperation, as it is an opportunity to exchange best practices, to learn from each other and patients can benefit solution. It has been emphasised, that the transport time to the next trauma centre is an important factor and should be minimised as far as possible.

6.3.3. Differences of air rescue and ground rescue operations

Air rescue seems to be more institutionalised than collaboration on the ground. M. van Pijkeren (personal communication, May 27, 2014) described the situation as follows, “with air rescue, it seems like there are almost no borders”. The most significant difference is that in air rescue, there is always an emergency physician. When a German Rettungswagen has a mission in the Netherlands without a NEF, hence without an emergency doctor, there is a difference in the level of competences (M. van Pijkeren, personal communication, May 27, 2014). If a Dutch ambulance were at the scene, the ambulance verpleegkundige could provide almost every medical care, which is needed, whereas the German Rettungsassistent is not entitled to do ALS measures. This difference can be made up when RTW and NEF are alerted
together into the Netherlands. However, this is not always the case, when there is a need for an ambulance. On the contrary, there are always specialised physicians at the scene if there is a helicopter (O. Thomas, personal communication, April 28, 2014).

6.3.4. Costs and reimbursement

The reimbursement mechanisms for cross-border operations differ throughout the regions of interest. The insurance companies play an important role in this. Overall, not all interviewees were able to answer questions about refunding of costs, as this is not their area of expertise or they do not get in touch with finances.

One common type of refunding costs for primary missions in the Netherlands is that the German ambulance service generates an invoice to the Dutch ambulance service, which then prepares a quittance for the Dutch insurance company (E. Gördes, personal communication, March 20, 2014). The insurance company pays all costs to the Dutch RAV, which has to forward the money to the German ambulance service (J. Legebeke, personal communication, April 4, 2014). In other regions, Dutch patients receive a bill and have to pay the German ambulance, but get the total amount reimbursed from their Dutch insurance (F. Welke, personal communication, May 21, 2014). In air rescue, when the helicopter from Rheine flies to the region of Twente, this operation is charged to the air rescue service of Groningen (J. Legebeke, personal communication, April 4, 2014). No information has been reported for the reimbursement of other helicopter services.

Difficulties in reimbursement do not only occur for primary missions in the bordering country, but also when ambulances transport a native patient from their own country to a hospital beyond the border. Further, secondary transports across the border after initial stabilisation or assessment of injuries have been difficult in the past as well. One patient had to wait for several hours until being referred from the Netherlands to Germany, because there was disagreement on which party would pay for the costs (O. Thomas, personal communication, April 28, 2014). However, when German ambulances transport patients to Dutch hospitals, it has been reported that German insurance companies will refund the care without problems. For this purpose the ‘European Health Insurance Card’ has been introduced, which is valid for emergency care provision (AOK, 2014). In contrast to this,
transports from German ambulances to or in Belgium are not entirely refunded. The European Health Insurance Card is also the basis for accounting there, but only the fee for emergency care provision is refunded. Every measure on top, such as the driven kilometres, has to be paid by the German ambulance service in Rhineland-Palatinate (T. Nußbaum, personal communication, April 7, 2014).

6.3.5. Problems and barriers in cross-border rescue operations

Several problems and barriers for cross-border operations in daily emergency care were mentioned by the interviewees.

Lack of legal basis

The interviewees rated the lack of a framework agreement between the three countries on national level as the major obstacle (K. Fuchs, personal communication, March 25, 2014). There is a need for regulation of topics such as liability claims (F. Welke, personal communication, May 21, 2014). Moreover, ambulanceverpleegkundigen have to be registered in the BIG-register in the Netherland in order to provide medical care (Jan ten Duis & van der Werken, 2003). In theory, all German professionals must be registered there as well. Furthermore, responsibilities and competences of the professionals differ and are not necessarily approved by the bordering country. Especially the Belgians leave their law unconsidered when they transport a patient to a hospital in Germany, as this is not allowed according to the Belgian law. Further, the dispatch centre in Liège introduced a policy, that if a German service can be at the scene at least eight minutes before a Belgian service, the Belgians may ask for help from Germany, although this is not legal (H. Fanuel, personal communication, May 13, 2014).

Communication (language)

Language is still a problem for cooperation. Nonetheless, English is seen as one possible alternative. In Belgium it is even more complicated, as French is one of three official languages spoken next to Dutch and German within the dispatch centre in Liège. It happens that a French speaking person in the border region to Germany calls 112 with a mobile phone, reaching a German dispatch centre. This has been problematic in the past, as the German
operators could not speak French. The same difficulty applies to the Belgian dispatch centre in Liège, when a German or German speaking person calls. Because of a lack of German speaking dispatchers, it is not always possible to answer an emergency call in German (H. Fanuel, personal communication, May 13, 2014).

Differences in emergency care and trauma standards

No German district in the research area arranges PHTLS® courses for its employees, although some follow the PHTLS® standards. One district uses International Trauma Life Support (ITLS). Traumamanagement is the standard in two districts, however, one is adjusted by the German Red Cross, resulting in slight differences between the two. Further, immobilisation plays an important role in PHTLS®, preferably an injured patient is immobilised by being strapped on a spineboard to prevent further injury to the spine. Dutch paramedics work predominantly with spineboards when immobilising a patient. Germans on the other hand use also vacuum mattresses. This can lead to difficulties in the emergency room, when a Dutch physician is not used to this kind of immobilisation procedure (O. Thomas, personal communication, April 28, 2014).

There are German districts, which only send an RTW together with a NEF to a scene in order to avoid legal uncertainties for the Rettungsassistenten in the cross-border setting (E. Gördes, personal communication, March 20, 2014). However, frequently emergency physicians are located further away from the border. Hence, if the Netherlands call for help, a German RTW could be at the scene quick, however, the physician would need more driving time and thus, leaving the Rettungsassistenten unassisted in a country, in which the citizens are used to comprehensive care by the ambulanceteam.

Unfortunately, quality suffers from the low number of operations a paramedic is part of every year. Therefore, ambulance teams try to work according to their own routine and materials to be secure in their actions.

Bordering several regions

Some German administrative districts simultaneously border several Dutch RAV regions and the other way around. Moreover, Belgium and the Netherlands are adjacent to different federal states in Germany. This leads to complicated preconditions for collaborations. The analysis shows that one district may have an agreement with one RAV, but not with the
following. To conduct official negotiations with several regions is very time-consuming and delicate (F. Welke, personal communication, May 21, 2014).

Documentation

In Germany, documentation during an emergency operation is done via so-called DIVI-protocols\textsuperscript{10}. In the Netherlands, documentation is done completely via laptops and sent to the hospital electronically. Documentation sheets can also be sent to German emergency rooms electronically. Documentation is difficult to maintain in case of cross-border emergency care and especially for rehabilitative care.

Operational readiness

When an ambulance has a mission in the neighbouring country, the ambulance leaves the own operational area undersupplied for a certain amount of time. On the one hand, several stakeholders rate this issue as very important and it must be taken into account (F. Welke, personal communication, May 21, 2014). On the other hand, the professionals also stated that longer transport routes should be accepted as long as it is beneficial for the patient.

MRSA

Different standards in hygiene in general and in the combat against MRSA (Methicillin-resistant Staphylococcus aureus) in particular have been mentioned as a difficulty. In the Netherlands a strict policy leads to the isolation of all patients, who have been hospitalised outside the Netherlands in the past year (Jan ten Duis & van der Werken, 2003). This procedure may be difficult to explain to patients, who may still be responsive (K. Fuchs, personal communication, March 25, 2014). This strict procedure of isolating suspected MRSA cases can also lead to a refusal by the Dutch hospital towards a German patient.

Emergency calls and dispatching

Emergency calls done via mobile phones in a border region may not reach the appropriate dispatch centre, but instead the bordering country’s centre. Usually, the call is forwarded via telephone to the correct dispatch centre. Sometimes, a fax is sent additionally in order to prevent misunderstandings.

\textsuperscript{10}These protocols have been developed by the German Interdisciplinary Association for Intensive and Emergency Medicine. Different protocols exist and vary in size and scope (Deutsche Interdisziplinäre Vereinigung für Intensiv- und Notfallmedizin, 2014).
Although a few German dispatch centres have a Dutch C2000 device to transmit messages within the radio frequency into the Netherlands, the dispatch centres usually communicate via telephone (J. Legebeke, personal communication, April 4, 2014). In the past, the region of Gelderland Zuid tried to collaborate with the helicopter Christoph 9 from Duisburg, but the missing C2000 device put an end to this initiative (P. van Grunsven, personal communication, April 3, 2014). German RTWs and NEFs which operate in the Netherlands cannot communicate with the dispatch centre abroad and loose contact to their own centre when they are too far away. This is a massive problem as ambulances need to be able to communicate with the dispatch centre responsible for the area (O. Thomas, personal communication, April 28, 2014).

**Advance notification and handover procedures**

Advance notification to the foreign hospitals usually takes place through the own dispatch centre (J. Legebeke, personal communication, April 4, 2014), which calls the hospital and notifies it on the arrival of upcoming ambulances. In some regions, a doctor-to-doctor or also a paramedic-to-doctor conversation takes place to discuss the patient’s injuries more into detail (F. Welke, personal communication, May 21, 2014). Usually, an advance notification to the hospital and handovers in the emergency room between Dutch professionals follow a specific standard, called MIST-protocol. MIST stands for Mechanism of injury, Injuries found and suspected, Signs (vital parameters) including ABCD givens and Treatment given (Ambulancezorg Nederland, 2014). Contrary to this, there is no uniform standard for advance notification or handovers in Germany. Within the Belgian EMS system, usually no advance notification takes place from the ambulance or the dispatch centre to the hospital. Consequently, this leads to inconsistent procedures in cross-border care. The region Noord en Oost Gelderland agreed on a specific German standard for patient handovers in German hospitals through Dutch ambulances, however, details about this could not be provided (M. van Pijkeren, personal communication, May 27, 2014).

**Postoperative management and rehabilitation**

Dutch hospitals discharge their patients sooner than German hospitals, because their postoperative therapy system differs. At home, treatment is assured through support and care by mobile nursing services. This service does not exist in Germany to the same extent, which
is why German patients being discharged from the Netherlands are cared for insufficiently back in Germany (M. Binsfeld, personal communication, March 20, 2014).

Critical points

One interviewee warned not to see cross-border cooperation as a general solution. Each district should provide a sufficient basis for care on its own and seek help by their neighbours as a possibility additionally to regular care. It is questioned, whether compensating deficits in the own district by cross-border cooperation on a daily basis is a sustainable solution (M. Binsfeld, personal communication, March 20, 2014). Contrary to this, other stakeholders see cross-border cooperation as a good opportunity to utilise resources optimally (L. Placca, personal communication, May 15, 2014).

Several interviewees criticised the wide range of projects covering cross-border health care issues. The stakeholders are asked to participate in many different projects from various regions and institutions. Some projects try to answer questions and issues, which have been already answered and solved by other ventures leading to unnecessary duplicates with no added value (M. Binsfeld, personal communication, March 20, 2014; E. Gördes, personal communication, March 20, 2014).

6.4. Current problem-solving approaches

In order to improve cross-border emergency care, there are different problem-solving approaches which have been mentioned by the interviewees. In the EUREGIO, workshops for EMS employees and managers are offered (E. Gördes, personal communication, March 20, 2014). Moreover, the EUREGIO has developed the A-Z Euregio app which supports the ambulance personnel in cross-border operations. It offers general information on cross-border health care as well as detailed data on hospital locations and their speciality units, ambulance stations, procedures for catastrophes and a medical dictionary (AcuteZorg Euregio, 2014). In the Eifelkreis Bitburg-Prüm, employees from one alarm post, which is located close to the Belgian border, have been sent to language courses (T. Nußbaum, personal communication, April 4, 2014).
The dispatch centre of the region Twente intends to include the addresses of neighbouring cities and municipalities in their system in order to be able to locate emergency calls from bordering countries (J. Legebeke, personal communication, April 4, 2014). However, this has not been implemented until now. Other dispatch centres have the possibility to roughly determine the location of a caller within their system (F. Welke, personal communication, May 21, 2014). Technically, it is possible to determine the location of a mobile phone caller; however, this approach still suffers from inaccuracy and data protection issues. A caller would need to give informed consent, which is too time-consuming in an emergency. Moreover, it was unknown to the interviewees whether this is even possible across borders as different telephone companies would be involved (F. Welke, personal communication, May 21, 2014).

Euregio Maas-Rhine

As the EMR is very active in cross-border emergency care with around 400 cross-border missions each year, it is briefly described in order to mention its solution approaches. The basis for this collaboration is an agreement\(^\text{11}\) between three administrative districts in Germany (Stadt Aachen, Städteregion Aachen, Kreis Heinsberg) with the GGD Zuid Limburg. The renewed agreement from 2013 still has to be approved by the Regierungsbezirk of Cologne (M. Ramakers, personal communication, February 13, 2014). Nonetheless, the contracting parties mutually recognise the legal standards for ambulance personnel, vehicles and technical equipment. German and Dutch paramedics work according to their own standards. It has been agreed on a ‘rendezvous-system’ meaning that the foreign ambulance service offering assistance only provides immediate lifesaving action on the scene until the ambulance of the own country arrives. In order to improve cross-border relations, the EMRIC office has been put in place, financed by the seven public partners that are responsible for public safety, public health and disaster management. There is one steering committee and different focus and work groups, which hold meetings three or four times per year in order to discuss current issues in cooperation, or start new initiatives (Lenkungsgruppe "Euregio Maas-Rhein in Crisesmanagement" (EMRIC), 2012). A document\(^\text{12}\) has been developed describing the cross-border procedures in catastrophic situations (Eumed Euregio Maas-

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\(^{11}\) Öffentlich-rechtliche Vereinbarung über eine grenzüberschreitende Zusammenarbeit im öffentlichen Rettungsdienst / Publiekrechtelijke Overeenkomst Grensoverschrijdende Buren-Ambulancedhulpverlening, 2002 and 2013 (renewed version)

\(^{12}\) EUMED - Grenzüberschreitende medizinische Hilfe bei Großschadensereignissen in der Euregio Maas-Rhein, 2012
Rhein, 2012). Further, an euregional training day has been initiated (Ramakers, Jabakhanji, & Thönis, Projektbuch 2009/2013, 2013). In the EMR, the helicopter Christoph Europa 1 (Würselen, Germany) covers the Dutch region of Zuid-Limburg during the day. These operations are paid by the Dutch ministry of health. Further, there is an agreement with the Dutch health inspection about the registration of German paramedics and physicians in the BIG-register, which consequently does not apply to the German ambulance personnel in this region (M. Ramakers, personal communication, 2014).

A potential solution to diverging education and competences in Aachen (Germany) is a Telemedical Rescue Assistance System (TRAS), which has been introduced in the EMS system to support Rettungsassistenten at the scene. A specialised physician from a designated teleconsultation centre can assist the Rettungsassistent in the ambulance by interpreting the patients’ symptoms and giving orders such as giving certain medication (Schneiders et al., 2012, p.410). In the cross-border setting, this system could decrease the differences in education and competences of Dutch, Belgian and German paramedics.
7. Discussion

7.1. Theoretical considerations

When applying the theoretical background, namely the trauma care chain, to this research, it becomes explicit how important a solid legal basis for cross-border trauma care provision is. The impact of missing regulations influences the entire trauma care chain negatively. Still, the EMS system cannot prevent the primary damage a trauma incident brings upon the patient. Despite this, the secondary damage to a patient is influenced by various aspects of the trauma care chain. Emergency calls in the research area do not always reach the correct dispatch centre right away, as can be seen with the example of the mobile phone. Therefore, the access to the emergency medical system is prolonged as the call has to be forwarded to the correct dispatch centre, repeatedly transferring calls is possible. Moreover, language issues can complicate the communication between the caller and the dispatcher. Once, the emergency call has reached the responsible dispatch centre, the EMS is alerted without further delay. Alerting an ambulance of the foreign country is done through the foreign dispatch centre. However, this is not happening in all regions because of the legal uncertainties mentioned before. Consequently, the ambulance, which would be quickest at the scene, is currently not always alerted, leading to a prolonged period in which the patient is not receiving any medical attention. As a result, necessary immediate lifesaving actions might be postponed. If, however, a foreign ambulance and/or medical car are given the mission to go across the border, they are often dependent on the radio communication with their own dispatch centre in order to receive all important data about the patient and the location of the incident. Radio devices of the different countries are not always compatible and not all vehicles and helicopters or dispatch centres have the radio apparatuses of the neighbouring country.

When an ambulance team is at the scene, the medical care given by non-physicians differs significantly between Germany, Belgium and the Netherlands. Nonetheless, all teams can provide lifesaving actions on BLS level until an emergency physician arrives. The pre-hospital trauma care is not uniform because of different standards and procedures. Moreover, trauma networks have developed in different ways. The German and Dutch trauma systems are comparable as they have designated trauma centres and other hospitals can provide initial stabilisation. Advanced notifications to the hospital do not always take place and are done inconsistently. Nonetheless, almost all dispatch centres inform the foreign hospital about
arriving patients, but only some EMS personnel calls the emergency room themselves to communicate detailed information about the patient. This influences the preparedness of the admitting hospital. The patient handover between paramedics or emergency physicians and the employees of the emergency department differs as well. Whereas the Dutch paramedics have a strict protocol they follow, German and Belgian EMS personnel do not have a common standard. Further, in the trauma care chain, a hospitalisation in a less resourced hospital can lead to a delay in adequate care, as some care is only available in maximum care hospitals. After a patient is discharged, after-care and rehabilitation are important aspects to consider. In the Netherlands, patients are discharged sooner as compared to Germany leading to an inadequate care provision for German patients after being discharged by a Dutch hospital. All in all, there are many improvement possibilities within the trauma care chain in a cross-border setting, which could have a positive influence on the secondary damage of a trauma victim.

**Contractual agreements**

Different agreements have been made in the various regions covering issues such as working according to own standards, acknowledging education and equipment. In other regions, no official agreement has been concluded due to the lack of a legal basis. However, good-will arrangements exist and cross-border operations do happen in some regions.

### 7.2. Difficulties in cooperation

H. Fanuel (personal communication, May 13, 2014) describes this situation as follows, “the problem is the reality against the law”. At the moment, much legal insecurity inhibits cooperation and unclear circumstances discomfort all involved professionals. National laws should be adjusted or regulations need to be added covering daily cross-border operations. As nobody has tried to claim for damages until now, no legal consequences have reached the ambulance personnel. Agreements between the Netherlands and Germany, as well as between Belgium and Germany are absolutely necessary to regulate EMS provision in the foreign countries. Agreements for assistance in case of catastrophes are in place. M. Ramakers (personal communication, May 27, 2014) argues that the framework agreements between Germany, Poland and the Czech Republic as well as a similar agreement between the
Benelux-countries could be applied to the Dutch-German and Belgium-German situation easily.

Further, Dutch, Belgian and German ambulance drivers are allowed to use blue light and sirens in the other countries. However, consistent regulations about the recognition of the different EMS systems, standards, procedures and competences of the personnel are lacking. Whereas the Dutch ambulanceverpleegkundige works according to the LPA standards, based on PHTLS®, German and Belgian care provision differs per region and team. With the introduction of the PIT in Belgium and the new education of the Notfallsanitäter in Germany, competences of ambulance personnel are changing and equalising more.

In air rescue, cooperation seems to work very well as no significant difficulties have been mentioned. This is most likely due to the presence of a doctor on board. Reimbursing costs between the Netherlands and Germany does function quite well. However, when the way of refunding costs must include the involvement of the emergency service provider of the nation, which has not been actively involved in the prior process, it is quite complicated. Contrary to this, German operations in Belgium are not refunded entirely.

The professionals have emphasised that the medical care in another country will most likely not be entirely different, but rather very similar. Nonetheless, concerns have been raised concerning the treatment of children, support for the family members or follow-up care (O. Thomas, personal communication, April 28, 2014).

Overall, German emergency services (both air rescue and on the ground level) have significantly more operations on Dutch ground than the other way around. The fact that Belgian law prohibits the admission of patients to foreign hospitals (except the university hospital in Maastricht (Ramakers et al., 2007)), leads to illegal transports across the border, when Belgian EMS personnel decide to bring a patient to a German hospital anyhow.

In 2011, a multiple collision on the motorway A31 next to Gronau in Germany happened involving 104 people. In the end, there were twenty-one slightly injured patients, fourteen seriously injured patients and three people died. Two out of these patients were Dutch citizens (Nord-West-Media TV, 2011). Although Enschede is only located fifteen kilometres away, no Dutch ambulances had been requested and only few were brought to a hospital in Enschede (E. Gördes, personal communication, March 20, 2014), despite the fact, that the Radboud hospital in Enschede was the closest supraregional traumacentre. This shows
that despite the near resources of the neighbour’s emergency services and a qualified trauma
centre, EMS systems still fail to alert the neighbours and ask for help. Chances to provide
important immediate emergency care are missed, which might have saved lives.

It can be stated that no agreements in the research area exist, which cover the issue of
liability in case of any damage claims by a patient. “Therefore, if and when a situation
involving liability should arise, international, European and national laws and regulations
would have to be applied in determining how and why a professional can be held liable and
which specific laws apply” (van der Molen & Commers, 2013, p. 989). There is no precedent
for such a case on European level. It seems, that policy makers benefit from the fact, that
there has never been a case like this and, that they are waiting until it becomes a problem to
actually deal with this issue. Consequently, current approaches in cross-border emergency
cooperation are to “tackle each legal challenge as it comes along” resulting in “mostly
temporary solutions” as well as in “legal uncertainty and risk” (van der Molen & Commers,
2013, p. 990). However, this is not desirable for today’s patient care in the European Union.

7.3. Future of BTCCE

“In border regions, a crucial factor in the development of health care projects is whether there
is sufficient will from local and regional actors for these initiatives to take place” (Legido-
Quigley, Glinos, Baeten, McKee, & Busse, 2012, p. 32). This statement can be supported by
the findings in this research. All interview partners have been asked if they were interested in
signing the letter of intent of the BTCCE project. The Dutch interviewees, as well as the
Belgian professional, agreed unanimously. In Germany, not all interviewees were willing to
support the project with their signature because some of the German interview partners do not
belong to the management level of the EMS provider and have to discuss such a contribution
with the head of their organisation. Further, it has been criticised that there have been too
many projects in the last years dealing with cross-border emergency care.

Within the BTCCE project, interviews with EMS providers along the entire western
border of Germany are conducted by three researchers. Therefore, stakeholders in all border
regions of the Netherlands, Germany, Belgium, Luxembourg and France are contacted. Two
of the researchers are paid by the Netwerk Acute Zorg Limburg. The project leader M.
Ramakers has established contacts to Denmark and Austria, which are also interested in
joining. Further, an article of the already executed studies about the hospital level is produced
and will be published in the near future (M. Ramakers, personal communication, July 10, 2014). Eventually, the results are intended to be presented to the ministries of internal affairs and health of all participating countries in order to issue a strong statement towards improvement of cross-border emergency care. During the international trauma congress in Frankfurt in May, the BTCCE project has been presented. Afterwards, the then President of the European Society for Trauma and Emergency Surgery (ESTES) Luke Leenen praised this initiative and assured further support of ESTES. A platform has been set up, involving two BTCCE partners, namely Prof. Brink and Dr. Pohlemann (H. Pape, personal communication, May 26, 2014). It remains to be seen in how far BTCCE and ESTES will cooperate. Nonetheless, any endorsement by the ESTES is highly positive for the BTCCE project. In addition, Ambulancezorg Nederland supports the BTCCE initiative.

7.4. Limitations of the study

Limitations of this research have occurred by several means. Up-to-date scientific literature could not be found concerning all research topics, for example about the Belgian relatively new PITs. Moreover, most of the interviews had to be conducted over the telephone. The researcher had never conducted interviews before; therefore, the first interviews were not as flexible as the following ones in terms of reacting on the interviewee’s answers and being flexible in questioning. Additionally, telephone interviews do not create a good atmosphere, as one cannot see each other. Conducting telephone interviews also brought technical difficulties, because the recording of the interviews were not always easy to transcribe afterwards. Therefore, parts of the interview with the region Gelderland Midden are missing, as they were not understandable in the record tape. Due to time constraints, no clarification of the statements has happened.

Another limitation was the language. Interviews with the German stakeholders were conducted without any difficulties as the researcher is a German mother tongue. The Belgian professional spoke understandable English. However, the Dutch stakeholders’ knowledge of German and English was not always so extensive, leading to shorter discussions about the topic compared with the German and Belgian professionals. Precise numbers of cross-border operations or admissions to hospitals could not be provided by the stakeholders, consequently

13 15th European Congress of Trauma and Emergency Surgery and the 2nd World Trauma Congress
real numbers might differ. Moreover, it has been difficult to exclude the EMR from this research as the bordering regions included information about the situation in this area in their answers and solution approaches can be found in its collaboration. Lastly, 12,500 words are not adequate for describing the cooperation in the research area precise enough and including the analysis of twelve stakeholder interviews.
8. Conclusions and recommendations

Cross-border trauma care cooperation differs significantly along the central part of the western German border. The lack of a legal basis on national level inhibits collaboration. Some regions made own agreements on cross-border emergency care and others provide care across borders without any written regulations to avoid being a target. This situation has to be changed in order to provide best trauma care in Europe as well as to improve cross-border emergency care in general. The possibility to transport patients to close hospitals with certain specialities is also needed for other patient groups and disease patterns such as strokes or heart attacks.

Trauma patients would benefit from uniform guidelines in European countries on two aspects. Firstly, emergency care provision across borders needs to be regulated in order to eliminate legal uncertainties concerning the import and export of narcotic substances, exercise of profession, different competences, liability issues, data protection and the use of blue lights and sirens uniformly. Secondly, differences in EMS systems and procedures need to be at least mutually recognised. It is essential to know what kind of support one can expect from the neighbouring countries, what the competences and standards are, as well as how units are alerted in case of large-scale incidents.

Employees could be educated at workshops. In particular, the differences within Germany itself in all these aspects complicate homogeneous agreements on national level. Regional discussions about uniform procedures concerning advanced notifications and patient-handovers might improve the current situation. As digital documentation will evolve in European countries at some point in the future via tablets for example, this will be a possibility to equalise documentation and display givens in different languages. Until then, multilingual documentation sheets could help to overcome the language barrier. Language will always be an obstacle at the scene, all the more with increasing numbers of immigrants in Europe. English courses for all employees might help with communication problems; further, courses in the language of the bordering country would be most likely beneficial. Multilingual dictionaries might be helpful in communicating with patients. Euregional training days can serve as a good possibility to meet personnel from other countries in a non-stressful atmosphere, learn about the different systems and procedures as well as about the regulations, which have been agreed on in the specific Euregio. Moreover, personal meetings between
stakeholders and professionals from EMS, dispatch centres, hospitals and rehabilitation centres are crucial for fostering professional relationships and discussing regional difficulties and progress on a regular basis. Setting up euregional offices might be helpful in coordinating the collaboration. Teleconsultation systems could improve the provision of cross-border healthcare as the current problematic of lacking physicians at the scene could be overcome by being able to obtain orders from a professional with the same level of competences from further away.

In this study, only health care providers have been interviewed, the believes and wishes of patients are only guesses, therefore a study about patients’ perceptions about cross-border emergency care should be carried out in the future in order to determine problems patients experience and include suggestions in further considerations. In addition, policy makers, insurance companies and rehabilitation centres should be included in the research to gain a deeper insight in political processes, reimbursement agreements in Europe and get first-hand information from rehabilitation centres as this study could not provide in-depth knowledge about the process of rehabilitation of trauma victims. Because of the range of trauma standards present in Europe, an analysis should be included in the BTCCE research to determine exact differences and outcomes of the various programmes.

Interest in emergency care collaboration is existent; therefore, policy makers should acknowledge the need for European regulations in order to improve trauma care. Cross-border collaboration might not be necessary to the same extent in all border regions. Nonetheless, there are regions, where cooperation is needed but inhibited by the above mentioned means. This situation is unbearable for the Europe of today.
Bibliography


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Appendices

1. Interview questions for stakeholders

*English version*

**Interview questions for rescue service operators**

**Starting point:**
*Trauma patients shall get the best care, regardless of place and time. Additionally, the patients shall be transported to the best resourced hospital nearby, in which case borders should be irrelevant.*

0) *Do you agree with this statement?*

1) How does trauma care in general look like in your region?
   a. B: Serve certain algorithms or standards as basis? (PHTLS, ATLS, ETC)

2) B: What does the education of your paramedics look like? / How are your paramedics educated? (general education and/or special trauma courses)

3) How does a trauma operation get disposed? Who decides in which hospital the patient will be taken?

4) Is your region a member of a trauma network?

5) B: Which legal basis does exist for trauma care provision in your region?
   a. Are there any aspects about cross border cooperation?

6) Which contractual agreements are necessary in order to cover legal requirements regarding the use of blue lights and sirens, importation and exportation of narcotic substances, exercise of profession, competencies etc.?

7) How does the cost transfer and the payment of operations work?
   a. Do all costs get refunded?
   b. What is the role of insurance companies?

8) Are there collaborations (contracts and/or operational agreements) about cross border emergency care or trauma provision in your region?
   a. How did collaborations come into existence? (regional, national, EU-level)
   b. Which levels of the trauma care chain are involved?
   c. How is the cooperation financed / funded?
   d. Are there collaborations for catastrophes?
   e. Is the cross-border cooperation institutionalised?
9) How often do cross border rescue operations happen in your region?  
   a. How often do they involve a trauma patient?

10) Is cross border cooperation of rescue services necessary in your region?  
   a. From the public authorities’ point of view (in Germany: Träger Rettungsdienst / in the Netherlands: RAV)? From the citizens’ point of view?  
   b. Do you personally think, that patients could benefit from increasing cooperation across borders and experience better and quicker care provision?

11) How does an emergency call from the bordering country get forwarded?  
   a. In our region it happened, that an emergency call reached the dispatch centre of the bordering country, when it was made with a mobile telephone. Has something like this happened in your region before? How is the emergency called handled then?  
   b. What are other problems when answering an emergency call in the border region?  
   c. How does the emergency service from the bordering country get alerted?  
   d. How does an advance notification to the foreign hospital take place?

12) What are your experiences with cross border trauma operations?  
   a. How do the different members of the trauma care chain work together? (dispatch centre, emergency service, hospital)  
      • How does the patient handover in the emergency room take place?  
   b. Positive  
      • Which benefits do you see in cross border collaborations of emergency care and/or trauma care?  
   c. Negative  
      • What kind of problems emerge?  
      • Which obstacles do you think hinder cross border emergency care cooperation?  
      • Which disadvantages do you see in cross border collaborations of emergency care and/or trauma care?

13) What does the referral process from hospital care to rehabilitation look like?  
   a. Are there any patients being transferred across the border?

14) Do you see any differences in cross border cooperation in air rescue and on the ground level?  
   a. If yes, what are these differences?  
   b. Do other conditions/requirements for cooperation result from this?

15) Do you use uniform or adapted (to neighbouring regions) reports or systems in order to improve the quality of cross border trauma care provision?

16) Can you imagine your region as part of an European trauma network?  

⇒ The hospitals in Oldenburg, Groningen, Münster, Enschede, Nijmegen, Aachen, Maastricht, Liège, Luxembourg, Homburg and Strasbourg have already claimed their interest and committed themselves to get involved for a European trauma network in the context of BTCCE.
17) Are you interested in developing a prospective European-wide trauma network? 
(In order to improve the quality by exchanging best-practices and by uniform 
(quality-)standards) \( \rightarrow \) letter of intent!

18) Do you have any suggestions for literature, stimuli, recommendations about this topic?
   a. Did we overlook something?
   b. Any critique?

German version

Interview Fragen für Rettungsdienstbetreiber

Ausgangspunkt:
Traumapatienten sollen die bestmögliche Versorgung erhalten, unabhängig von Zeitpunkt und Ort (auch wenn dieser in einem Grenzgebiet liegt). Außerdem sollen sie zum nächstgelegensten Krankenhaus transportiert werden, das geeignet ist für die Behandlung des Trauma-Patienten, unabhängig von Landesgrenzen.

0) Sind Sie mit diesem Ausgangspunkt einverstanden?

1) Wie sieht die Traumaversorgung allgemein in Ihrer Region aus?
   a. D&B: Werden bestimmte Algorithmen, Standards verfolgt? (PHTLS, ATLS, ETC)

2) D&B: Wie sind Ihre Rettungsdienstmitarbeiter ausgebildet? (zum Beispiel RS, RA oder auch spezielle Trauma-Kurse)

3) Wie wird ein Traumaeinsatz in Ihrer Region disponiert? Wer entscheidet in welches Krankenhaus gefahren wird?

4) Ist Ihre Region Mitglied in einem Traumanetzwerk?

5) B: Welche gesetzlichen Grundlagen liegen der Trauma-Versorgung in Ihrer Region zugrunde?
   a. Sind Aspekte zur grenzüberschreitenden Zusammenarbeit darin enthalten?

6) Welche vertraglichen Regelungen sind erforderlich, um den rechtlichen Erfordernissen zum Beispiel hinsichtlich der Inanspruchnahme von Sonderrechten, Einführen von Betäubungsmitteln, der Berufsausübung, Kompetenzen etc. Rechnung zu tragen?

7) Wie funktioniert die Kostenübernahme, Bezahlung von Einsätzen?
   a. Werden die gesamten Kosten erstattet?
   b. Welche Rolle spielen die Krankenkassen?
8) Gibt es Kooperationen (Verträge und/oder operative Absprachen) zu grenzüberschreitender Zusammenarbeit allgemein (oder grenzüberschreitender Traumaversorgung im speziellen) in Ihrer Region?
   a. Wie sind die Kooperationen zustande gekommen? (regional, national, EU-level)
   b. Welche Level der Traumakette sind daran beteiligt?
   c. Wie wird die Kooperation finanziert?
   d. Gibt es Kooperationen, Vereinbarungen für MANV-Lagen?
   e. Ist die grenzüberschreitende Zusammenarbeit institutionalisiert?

9) Wie häufig finden in Ihrer Region grenzüberschreitende Rettungseinsätze statt?
   a. Wie viele davon sind Trauma-Einsätze?

10) Ist grenzüberschreitende rettungsdienstliche Zusammenarbeit in Ihrer Region notwendig?
   a. Aus Sicht der Rettungsdiensträger und Hilfsorganisationen? Aus Sicht der Bürger?
   b. Denken Sie persönlich, dass Patienten von mehr grenzüberschreitender Zusammenarbeit profitieren und eine bessere, schnellere Versorgung erhalten könnten?

11) Wie wird ein Notruf aus dem Nachbarland weitergeleitet?
   a. In unserer Region kann es passieren, dass ein Notruf, welcher mit einem Mobiltelefon in einem Grenzgebiet abgesetzt wird, die Leitstelle des Nachbarlandes erreicht.
      Ist Vergleichbares bei Ihnen auch schon einmal vorgekommen? Wie wird der Notruf dann abgearbeitet bzw. weitergeleitet?
   b. Gibt es sonstige Probleme beim Annehmen eines Notrufes in der Grenzregion?
   c. Wie wird der Rettungsdienst aus dem Nachbarland alarmiert?
   d. Wie geschieht eine Voranmeldung im ausländischen Krankenhaus?

12) Welche Erfahrungen haben Sie bei grenzüberschreitenden Trauma-Einsätzen gemacht?
   a. Wie arbeiten die einzelnen Ketten-Mitglieder zusammen? (Leitstelle, Rettungsdienst, Krankenhaus, Rehabilitations-Einrichtung)
      i. Wie läuft die Übergabe in der Notaufnahme ab?
   b. Positiv
      i. Welche Vorteile sehen Sie bei grenzüberschreitender Kooperation im Rettungsdienst und/oder bei der Traumaversorgung?
   c. Negativ
      i. Welche Probleme treten auf?
      ii. Welche Hindernisse bestehen Ihrer Meinung nach für grenzüberschreitende rettungsdienstliche Kooperation?
      iii. Welche Nachteile sehen Sie bei grenzüberschreitender Kooperation im Rettungsdienst und/oder bei der Traumaversorgung?

13) Wie verläuft der Überleitungsprozess vom Krankenhaus in eine Rehabilitations-Einrichtung?
14) Gibt es Ihrer Meinung nach Unterschiede bei grenzüberschreitender Zusammenarbeit in den Bereichen bodengebundener Rettungsdienst und Luftrettung?
   a. Wenn ja, worin bestehen diese Unterschiede?
   b. Ergeben sich daraus andere Kooperationsbedingungen?

15) Benutzen Sie in Ihrer Region uniforme oder an benachbarte Regionen angepasste Protokolle oder Systeme, um die Qualität der (grenzübergreifenden) Traumabehandlung zu verbessern?

16) Können Sie sich Ihre Region als Teil eines europäischen Traumanetzwerkes vorstellen?

Die Kliniken in Oldenburg, Groningen, Münster, Enschede, Nijmegen, Aachen, Maastricht, Lüttich, Luxemburg, Homburg und Straßburg haben bereits ihr Interesse gezeigt und möchten sich für ein europäisches Traumanetzwerk im Rahmen von BTCCE engagieren.

17) Hätten Sie Interesse an der Entwicklung eines zukünftigen, Europa-weiten Traumanetzwerks? (zur Qualitätsverbesserung durch best-practice Austausch und mit uniformen (Qualitäts-) Standards)

18) Haben Sie für uns Literaturvorschläge, Anregungen, Empfehlungen zum Thema?
   a. Haben wir etwas übersehen?
   b. Kritik?