Bachelor thesis

Boundless Trauma Care Central Europe (BTCCE):

Cross-Border Trauma Care Cooperation and its Legal Embeddedness in France, Germany and Luxembourg

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1 Introduction

Trauma is a major cause of death and disability worldwide. Its prevalence and the associated death rate vary between countries, but everywhere a high proportion of young people are affected (Tulchinsky & Varavikova, 2009). In the EU27, in the age group of 15 to 24 one death occurs every thirty minutes (European Commission, 2013a) and the worldwide average of life years casualties of fatal accidents lose is 35 (DGU, 2006). Globally, this loss of life years amounts to approximately 5 million deaths per year (Peden, McGee & Sharma, 2002).

While primary prevention aims at preventing incidents resulting in trauma, the purpose of secondary prevention is the reduction of negative consequences shortly after the incident (Tulchinsky & Varavikova, 2009). To achieve the latter, timely and high quality treatment at the scene and in specialised hospitals is crucial (Pedan et al., 2002, Tulchinsky & Varavikova, 2009, p. 208f.). Evidence has shown that the setup of trauma systems in a country or region is an effective mean of secondary prevention, as they increase survival rates and reduce long-time disability (MacKenzie, Rivara, Jurkovich, Nathens, Frey, Egleston, Salkever & Scharfstein, 2006, DGU, 2006).

Recently, border regions in particular are recognised as subjects for regionalisation of trauma systems, as a trauma care provider located near the border is often closer to people from a neighbouring country than their own national health services are. Thus, fastest treatment might not always be available from a victim's home country but support from services across the border could be beneficial (Post, 2004). Potentially benefitting from such cooperation, 37 per cent of all inhabitants in the European Union (EU) live in border regions. This is why the role of cross-border trauma networks seems significant to European public health officials (European Commission, 2011).

Some European regions already made first efforts towards transnational trauma system cooperation, one of those being the Euregio Maas-Rhine (EMR) at the edge of Belgium, Germany and the Netherlands. There, the project group 'Euregio Maas-Rijn Interventie in geval van Crisis' [Euregio Maas-Rhine Crisis Intervention] (Emric+) has become active to increase trauma service cooperation in its area (Ramakers, Bindels & Wellding, 2007). Together with partners from the EMR, France, Luxembourg and the federal states in the west

of Germany, Emric+ has initiated the development of a central European trauma network (Emric+, 2013). The goal of this paper is to outline trauma-related legislation and agreements at national and regional level in the mentioned countries, focusing on the area alongside Rhineland-Palatinate, Saarland and Baden-Württemberg in particular. Furthermore, their implications for future cooperation in secondary trauma prevention and the readiness of stakeholders to engage in such are a central focus of the research. This includes factors that could promote or hinder the establishment and strengthening of cross-border trauma care cooperation in the three countries. The outcome of this study will become the basis on which to build and link Europe-wide cooperation agreements in the field of trauma care.

2 Background

2.1 The burden of trauma

"Trauma, or external injury, is a broad category that includes accidents, poisonings, suicide, homicide, and violence. In many countries, trauma is the leading cause of death because of its greater frequency among the young and the middle-aged. It is often the leading cause of years potentially life lost (YPLL) in most developed countries and has become a major focus of intervention in modern public health program development."
(Tulchinsky & Varavikova, 2009, p. 208f.)

Nine per cent of the world's deaths and 12 per cent of the world's burden of disease have been found to result from injuries of all kind (Peden, McGee & Sharma, 2002). According to the World Health Organisation (WHO), road traffic accidents were the first, second or third leading cause of worldwide death in the age groups 5 to 44 in 2004 (WHO, 2009). In the same year an estimate of 1.3 million people died globally due to road traffic accidents alone and up to 50 million people may have been injured, with a predicted fatality increase of almost 100 per cent until 2030 (WHO, 2009). The attributable economic burden due to road traffic injuries ranges between 1 to 3 per cent of gross national product in low-income countries (WHO, 2009) and 2 per cent in high-income countries, and additionally puts pressure on households, as often young and productive persons die (WHO, 2004). In the European Union (EU) this has been calculated to result in approximately EUR 250 billion in 2012 (European Commission, 2013b). Death rates resulting from road traffic accidents are considered low in the EU when comparing them to rates in African, South Asian and Latin American countries. Only 10 per cent of all deaths occur in high-income countries and while the overall burden of disease due to road traffic accidents is expected to rise, experts predict a 27 per cent reduction of related deaths in high-income countries (WHO, 2004). This predicted trend also represents past achievements in EU road safety measures (European Commission, 2010). Although these figures seem to shed good light on most EU countries, in total almost 28,000 deaths from road accidents continued to occur in the EU in 2012 (European Commission, 2013c).

The above figures only consider accidents in road traffic, but do not amount for domestic accidents, sports and leisure accidents, and accidents at work and school (DGU, 2006).

Eurostat has included all forms of accidents in its statistics and shows worse tendencies. In total, accidents amounted for 22 deaths per 100,000 Europeans in 2010 and up to threefold numbers in the newer EU Member States (MS) (Eurostat, 2012). Mortality and morbidity from fall-related injuries in the EU were found extremely high compared to other countries. Twenty-seven per cent of all fatalities due to falls occurred in Europe in 2000 (Peden, McGee & Sharma, 2002). The leading cause in trauma-related mortality remains road traffic in Europe, while the other categories make up for 95 per cent of all accidents occurring. The latter are a major cause of morbidity and disability rates, but their impact is often underestimated when only mortality is analysed (DGU, 2006). The significance of these facts becomes obvious when considering that in 2004, one in ten Germans was subject to an accident (DGU, 2006). Not yet included in these findings are trauma from poisonings and injuries resulting from violence, mentioned by Tulchinsky and Varavikova (Tulchinsky & Varavikova, 2009). Regarding self-inflicted violence, suicide rates in Europe were also found to be high at the beginning of the millennium compared to other parts of the world (Peden, McGee & Sharma, 2002). Figure 1 shows that the mortality due to injuries is not only disproportionately high in the younger age groups on worldwide average, but in Western Europe as well (Figure 1).

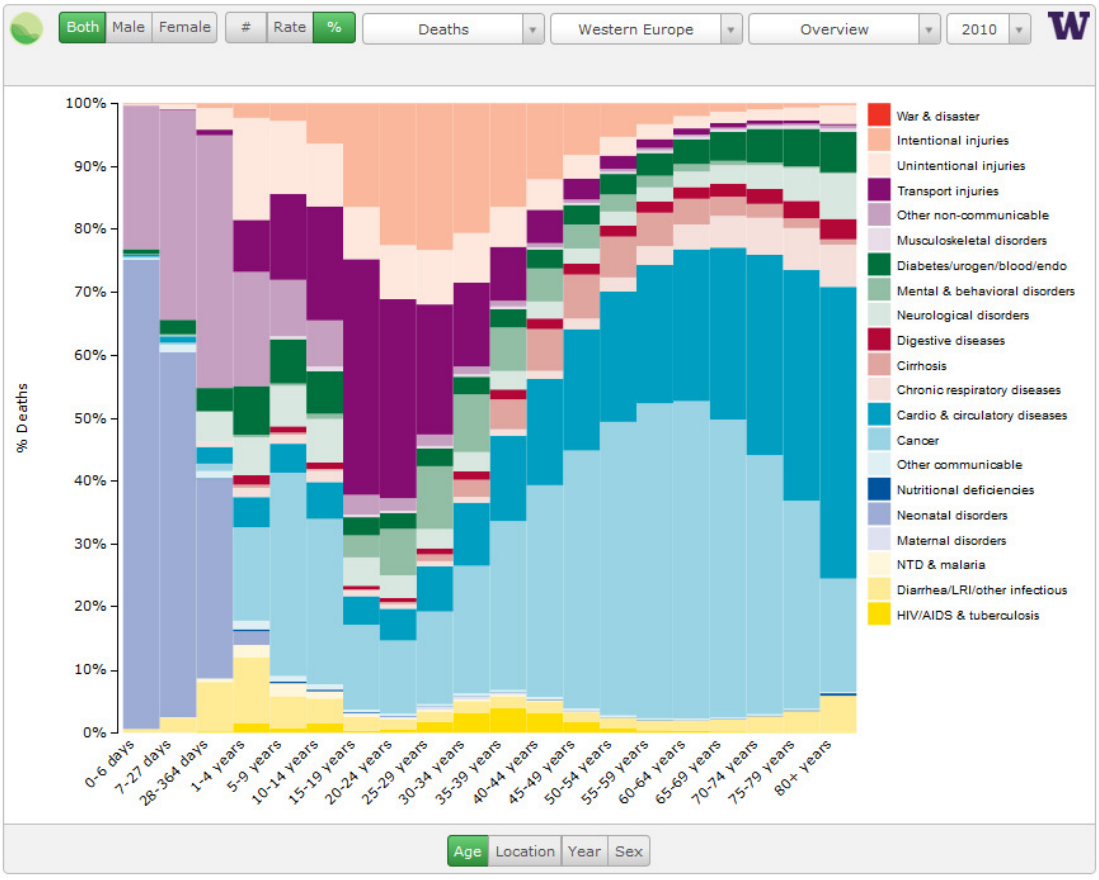

FIGURE 1: GBD CAUSE PATTERN S (INSTITUTE FOR HEALTH METRICS AND EVALUATION, 2013)

In the graph, the top three colours (as the category 'War and disaster' is not displayed) represent injury-related deaths in proportion to other causes of death in Western Europe. In the age groups 1 to 54 years these have a share of 10 per cent or more and from the ages 15 to 29 even greater than 50 per cent (Figure 1). This is in line with findings from the European Commission that "[e]very half an hour a young person aged 15-24 dies of a fatal injury in the EU27" (European Commission, 2013a) and the fatality due to injury in this age group is nearly two times the fatality of all other causes of death together (European Commission, 2013a).

It is important to mention that these figures solely amount for trauma in terms of injuries and that the broader category of emergency adds further patients due to heart attacks and other acute health conditions (Tulchinsky & Varavikova, 2009). Adding up all types of injuries, an American study found that among fatal victims on average 35 life years are lost after trauma (DGU, 2006). The European Commission identified trauma to be the fourth leading cause of death within the EU (European Commission, 2013a). It becomes obvious that the burden of trauma constitutes a significant emergency and public health issue and that it deserves future consideration (Tulchinsky & Varavikova, 2009).

2.2 EU relevance and intentions

The importance EU bodies ascribe to trauma and the related burden of disease and deaths is well expressed by the recently used term "injury epidemic" (European Commission, 2013a). Coming back to the very popular example of road traffic, the European Commission identified road safety as a topic still lacking in the EU today. It aims at halving the number of road fatalities in the period of 2011 to 2020 (European Commission, 2010). Objective 6 of the 'Policy orientations on road safety 2011-2020' has the heading, "Improve emergency and post-injuries services" (European Commission, 2010), and suggests action, "such as exchange of good practices, development of intervention guides, a common approach to the definition of major and minor injuries, promotion of the creation of mixed rescue units between Member States, etc. " (European Commission, 2010). It originates from the European Commission's finding that in the EU road traffic-related injuries do not decrease on the same level fatalities did in the last decades (Figure 2).

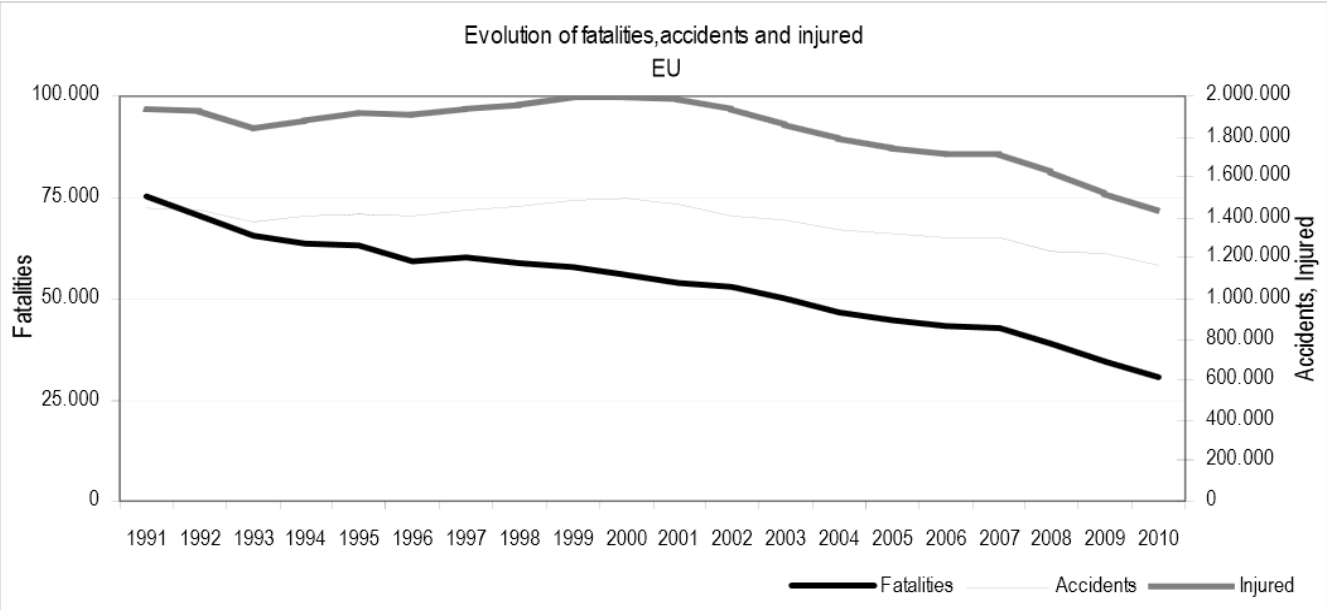

FIGURE 2: EVOLUTION OF FATALITIES, ACCIDENTS AND INJURED EU (EUROPEAN COMMISSION, 2010)

Figure 2 shows that from the beginning of the 1990s until 2010, fatalities related to road accidents could be reduced by almost two third, while roughly one fifth of accidents and one fourth of injuries could be prevented in the same period of time. This illustrates that future prevention efforts should not only aim at fatality, but also morbidity and disability reduction (Figure 2).

Therefore, the objective resulted in an own Commission Staff Working Document 'On the implementation of objective 6 of the European Commission's policy orientations on road safety 2011-2020 – First milestone towards an injury strategy', aiming to reduce the annual 1.5 million EU road injuries and their consequences (European Commission, 2013b). In the document, the European Commission entails that first aid, emergency services, and rehabilitation are to play big parts in this aspiration and it clearly recommends to take on "cross-border cooperation within the health sector" (European Commission, 2013b).

2.3 Improving outcomes with trauma systems

To reduce the harm imposed on the population, trauma can be effectively prevented at three levels, which are primary prevention, secondary prevention and rehabilitation (Tulchinsky & Varavikova, 2009, p. 209). Whenever primary prevention, such as policies and safety

regulations on driving behaviour has failed, secondary prevention is needed in the form of emergency care providing victims with high quality treatment. Secondary prevention includes the treatment at the site of the accident and the transportation to an adequate trauma care provider as fast as possible (Tulchinsky & Varavikova, 2009). This level of prevention includes first aid and emergency services, which the European Commission puts a focus on in injury prevention (European Commission, 2013b). Finally, rehabilitation or tertiary prevention provides trauma survivors with training to minimize long-term disability resulting from injuries (Tulchinsky & Varavikova, 2009).

In terms of secondary prevention a high number of deaths in the first hours after trauma and even some late deaths could be easily prevented with the right and timely treatment (Sasser, Varghese, Kellermann & Lormand, 2005). This is in line with the findings by Sampalis et al. (1998), showing that the risk to die from major trauma was increasing by 5 per cent with every minute the pre-hospital time was prolonged in the setting of Quebec (Sampalis et al., 1998). In a Spanish setting, deaths were found to decrease by one third if the response time of emergency care services was lowered from 25 to 15 minutes (Sánchez-Mangas, García-Ferrrer, de Juan & Arroyo, 2010). In another study, the risk to die after life-threatening trauma has been found to decrease by 25 per cent if patients are treated in trauma centres as compared to hospitals without a specialised trauma unit (MacKenzie, Rivara, Jurkovich, Nathens, Frey, Egleston, Salkever & Scharfstein, 2006). Quality and availability of trauma care, however, vary within and across countries due to geographical factors, differences in emergency care systems and the lack of uniform care provision facilities (DGU, 2009). An effective mean to standardise quality and availability of emergency care is the regionalisation or integration of trauma systems (Sampalis et al., 1998).

2.4 Regionalised trauma systems

"Trauma care systems have been defined as the co-operation of pre-hospital, in-hospital, and rehabilitation facilities within a defined geographic area. Their goal is to provide traumatically injured patients with the best possible care (adjusted to the severity of their injuries) in the fastest possible way. This care is provided by designated trauma centers with different levels of care."
(Hofmann, Sellei, Peralta, Balogh, Wong, Evans, King & Pape, 2012)

The regionalisation of trauma systems refers to a defined region, in which the complete trauma care organisation is harmonised and all players in pre-hospital and in-hospital trauma care cooperate and are managed below one common roof (Sampalis, 1998). According to the European Commission's recommendations, such cooperation should not only take place within the boundaries of one country, but might stress across countries instead (European Commission, 2013b).

2.5 The added value of cross-border healthcare

"[T]hough European health systems are all trying to do similar things, they do them in very different ways. This makes Europe a giant "natural laboratory" for health systems, with enormous potential for countries to learn from each other. European cross-border health care is the key to unlocking that potential, by facilitating the transfer of expertise and knowledge, by improving choice for patients, and by enabling greater efficiency in providing health care through cross-border cooperation."
(European Observatory on Health Systems and Policies, 2011)

A lack of such cooperation in cross-border trauma care raised concern in the past decade, as life alongside European borders is interwoven in many other aspects already (Post, 2004). Depending on where hospitals are located, accident victims would often best be transported to a hospital in another country if only accounting for the distance and the time that could be saved. Sometimes not only the closest hospital, but even the best specialised one might be very near to the casualty but across the border (Post, 2004). Next to this potential of better patient outcome, cross-border trauma cooperation is perceived to possibly improve health system efficiency alike (Pohl-Meuten, Schäfer et al., 2006). Advantages experts deemed possible are the potential to improve standards and procedures, the harmonisation of systems, a better reaction to and cooperation during large-scale incidents and cost reduction (Pohl-Meuten, Schäfer et. al, 2006). To overcome the limitations of health systems in concerned areas, countries need to establish networks with the purpose of cooperation alongside their borders (Emric+, 2013). This is not an easy task as health system regulations and laws usually differ, often significantly (Fries et al., 2006; Pohl-Meuthen, Schlechtriemen, Gerigk, Schäfer & Moecke, 2006). Difficulties might occur, for instance because some countries require the

attendance of doctors on board of ambulances, while others regard nurses or other specially trained personnel on the ambulance as sufficient (Post, 2004).

Nonetheless, central Europe offers enough, often highly populated border areas where inhabitants could benefit hugely from a trauma care service offered to them in the neighbouring country (Fries et al., 2006). In total, 37 per cent of the European population lives in border regions (European Commission, 2011) and already about two decades ago the European Commission identified 40 Euregios within the EU which could benefit from cross-border cooperation (Hermans & den Exter, 1999). 'Euregios', also called 'Euroregions', can be defined as regions around national borders, where local stakeholders of all involved countries decided to cooperate in terms of loose agreements or binding law. The networks created through this cooperation usually cover some million inhabitants and an area that stresses across 50 to 100km in all directions (Perkmann, 2003).

So far, research on the effectiveness of regionalising trauma networks often did not focus precisely on international bordering regions, but either on ways of organising trauma care within countries or without making a difference between national and cross-national regions. In the latter way, American, Canadian and Italian studies have shown that the regionalisation of trauma networks led to a decrease of deaths by 50 per cent among the treated severely injured persons and 20 per cent among most severely injured persons compared to before (DGU, 2006). For the regionalisation of emergency care in Germany, the reduction of mortality among accident victims could be shown to decrease by almost 10 per cent from 2007 to 2008 (Kühne, Mand, Siebert, DGU-AKUT & Ruchholtz, 2009). Also in the Australian state of Victoria fewer fatalities due to trauma occurred after the establishment of a regionalised trauma system (Cameron, Gabbe, Cooper, Walker, Judson & McNeil, 2008). Another well-known, non-European example of regionalised trauma care is Canada. From 1990 to 1998, the pre-hospital time after trauma could be reduced from 62 to 44 minutes in Quebec (World Health Organisation, 2010) and the mortality rate of severely injured persons has shown to decrease from 51.8 to 8.6 per cent within ten years (Liberman, Mulder, Lavoie & Sampalis, 2004). The costs for the Canadian trauma care improvement were low and the project was considered to work in other settings as well (World Health Organisation, 2010). This explains and justifies a general trend in regionalisation of health care matters, particularly in the field of secondary trauma prevention.

In Europe, some known attempts to cooperate in trauma care across borders have been taken in Germany, which established a national trauma network in 2006. Under the TraumaNetzwerk® initiative, hospitals and trauma centres are certified and connected within the country, adding a few larger trauma centres opposite its national borders (DGU, 2006). At the regional level stakeholders also take steps towards cross-border cooperation. The Euregio Maas-Rhine (EMR) at the edge of Belgium, Germany and the Netherlands is one such region, where dispatch centres, ambulances, hospitals and even rehabilitation facilities cooperate effectively (Ramakers, Bindels & Wellding, 2007). Trauma care providers in this region came to the conclusion that also other border regions might have similar cooperation or, if not, could benefit from the development of such. This is why the project group 'Euregio Maas-Rijn Interventie in geval van Crisis' [Euregio Maas-Rhine Crisis Intervention] (Emric+) and partners from hospitals in Belgium, France, Germany, Luxembourg and the Netherlands signed a letter of intent to investigate, develop and improve cross-border cooperation in the field of trauma care alongside their borders under the 'Boundless Trauma Care Central Europe' (BTCCE) project. These efforts, the participants believe, could result in a Europe-wide trauma network one day, guaranteeing high quality treatment for trauma victims and reaching better health outcomes for patients. Currently, the project is in its investigation phase. Its purpose is to identify cross-border agreements in central Europe and overcome the numerous legal barriers in the way of cross-border cooperation in the field of trauma care.

3 Theoretical model

The underlying theoretical approach of the study was that systems are not stable, but change over time (Manson, 2000). Different systems theories have been developed to map the evolution of systems. Built on their basic idea, systems theories have led to a more recent and academically more accepted claim on changing systems, 'complexity theory', which focuses on the relationships of a system's components (Manson, 2000). It was used to explain how trauma care providers are interrelated so that an adequate level of trauma care quality can be reached and maintained. 'Aggregate Complexity', which is also called 'systems of linked components complexity', "attempts to access the holism and synergy resulting from the interaction of system components" in social structures (Manson, 2000). It was used to explore and explain how not only trauma care providers within one country work together, but how trauma patient care might be improved and potentially harmonised by cooperation efforts across national borders. As systems in various countries function differently, the organisation and structure of trauma care within the respective countries was taken into account.

In the Aggregate Complexity theory (ACT) the following six factors are identified as being the key to explain how systems work: Relationships, internal structure, environment, learning and memory, emergence, and change and evolution (Manson, 2000). These six factors were applied to the research and will be explained as follows.

Relationships

Relationships between components of a system, it is said, are much more important than each component itself, as they lead to information or resource exchange within a system (Manson, 2000). Relationships are complex and not all components fulfil the same functions. Hence, not a whole system can be regarded as following one unique goal and be explained by individual relationships, but sub-systems are identified according to the aims components follow. Usually, but not necessarily, such sub-systems and their relationships function within one territory (Manson, 2000). It was thus perceived interesting to identify the components of a system which includes all trauma care providers, but also how they and their work are interconnected in each country and region. The sub-systems of interest were the different levels of the trauma care chain, namely dispatch centre, pre-hospital care, in-hospital care and

rehabilitation. Where it was seized logical, also other distinctions within the national trauma care structures were included.

Internal structure

The internal structure of a system is important, with all components contributing to that system in different ways and by different strengths and often working in a defined hierarchy. Components can belong to various sub-systems at one time, for instance a family, an organization they work for and a sports club, in which they fulfil different functions (Manson, 2000). The structure of trauma care within the countries and regions was regarded important following that logic, also to understand the impact of the relationships outlined.

Environment

A system's components influence the surrounding environment and vice versa. Similar sub-systems can often be distinguished according to their differing environments, which affect the way a sub-system needs to adapt and interact (Manson, 2000). Both national trauma care structures and cooperative establishments could be imagined to differ according to their trauma care organisation because they need to fit the demands raised by environmental factors. Environmental factors could be the geography and infrastructure of a region or parts of the health systems, such as funding. National legislation affecting trauma care was regarded as part of the environment, as well. The larger, shared environment of all countries involved in this study is the EU and its respective legal basis.

Learning and memory

Learning refers to the ability of a sub-system to reflect on past experiences of interactions and environments and to apply this knowledge on future situations. In most cases, there are enough components within a sub-system to handle new interactions with the environment, as some abilities from former interactions can be used (Manson, 2000). It could be assumed that experienced persons working in the field of trauma care would share their knowledge on trauma care in their region, but also on factors which may be important for establishing or strengthening cooperation between two regions. Furthermore, the existing regional and national regulations on cross-border trauma care are regarded to have the potential to serve as an example for other regions. The examples might trigger or simplify cooperation processes and enable trauma care quality improvements across borders in the future.

Emergence

Interactions among system components might lead to a greater ability of the sub-system than the simple addition of all components' separate abilities. When interactions of components with their environment take place, other components of the sub-system react to these interactions and the possibly changed environment. These reactions and the extent of the change cannot be exactly predicted beforehand, so that one interaction needs to follow the other and thus creates a slow evolution of the sub-system within a period of time, referred to as 'emergence' (Manson, 2000). Also for trauma care systems it was seized possible that new cooperative working procedures in one link in a chain would in the long term imply a change in the others. This refers to different levels of trauma care within one country, but also to the fact that countries may have influence on how each other's national trauma care structure may continue to function in the future. Drastic changes of the whole systems were not seized realistic. Hence, next to searching for transnational profound and legal agreements, also local and provisional cooperation establishments should be considered.

Change and evolution

Lastly, three types of transition are outlined which influence the evolution of a system, namely self-organization, dissipative transition, and self-organised criticality. 'Self-organization' refers to the system's ability to change its internal structure and thus the interaction with the environment. 'Dissipative transition' occurs when the system is reorganised because environmental factors change and the former structure cannot anymore function as good as it did before. The term 'self-organised criticality' implies that after a long time of no restructuring, the reorganization of the system happens "almost too rapid for the system to accommodate but [is] necessary for its eventual survival" (Manson, 2000). It was assumed that countries, regions and even smaller entities within the regions differ in their types of transition in the way that not all have the idea to engage in trauma care cross-border cooperation at the same time. Some self-organising countries, regions or smaller entities of a trauma care structure might have taken the initiative to change a system within one country or region early as compared to others. They might have come up with the idea not due to environmental needs, but because of their own interest to impact their interaction with the environment. Dissipative transition was similarly assumed to be found, as the regions' environments were not estimated to remain stable over a long period of time. It was thought that as soon as a region becomes aware that its trauma care quality or efficiency could be improved due to environmental transformations, a dissipative transition would subsequently take place. Self-organised criticality could be imagined to occur in some countries which's trauma systems do not keep up with the harmonisation efforts of other countries or the whole

EU and thus need to change rapidly when EU or national legislation enforces the change upon them. As many factors play into these categories and not all could be gathered within the extent of this study, the three types of transition were not supposed to be distinguished completely. Nonetheless, a difference in how long and how intense cooperation in the different regions exists was presumed to be found.

4 Goal and research questions

4.1 Goals

This study belongs to the BTCCE-project's investigation phase. Subject to the study were investigations in the region Saar-Lor-Lux(-Rhine), stressing across parts of Saarland, Rhineland-Palatinate, France and Luxembourg, and the Oberrheinkonferenz [Upper Rhine Conference], including Rhineland-Palatinate, Baden-Württemberg and their bordering parts of France.[2] The goal was to identify trauma care related laws and regulations at the national and at the federal level for the regions involved. With the help of this analysis and a review of the respective health systems, the project group Emric+ and its partners want to develop a cross-border network in the field of trauma care between the three countries. Its aim is to make trauma care faster and more efficient in the concerned regions. The study of existing cross-border agreements in this field promised to amend the policy research in a helpful way for reaching this objective.

4.2 Research questions

The research goals have led to the formulation of the following research question and sub-questions:

Is there a basis in the specific regions to establish or strengthen cross-border cooperation in order to improve quality and efficiency in trauma care?

a) How is trauma care structured in Saarland, Rhineland-Palatinate, Baden-Württemberg, Luxembourg and France?
b) Under which legislation is trauma care governed in the different regions and how does it operate?
c) What cross-border cooperation exists already in the area of interest and what is the respective legal basis?
d) How could the future development of a European-wide trauma care system be promoted?

[2] Northern Switzerland belongs to this region as well. However, it does not belong to the research area and will not be considered in this study.

5 Research methods

In order to conduct broad research and find a valid and complete answer to the research questions, a mix of research methods has been used. The employed methods were

1) Policy Analysis,
2) Literature Review, and
3) Interviews.

These three methods were expected to give an overview of what has already been done in the field of research, what the recent situation is and how cross-border cooperation in trauma care could be approached to achieve more efficient and quality care in the future.

The research was part of the Emric+ project, which coordinates cross-border cooperation in the area of crisis intervention, including emergency services (Emric+, 2013). Its project coordination and management was done from the Euregiobureau Public Safety and Health in Maastricht, the Netherlands. Additionally, interviews took place at the interviewees' workplaces in Aachen (Germany), Heerlen (the Netherlands), Homburg (Germany), Luxembourg (Luxembourg), Maastricht (the Netherlands) and Strasbourg (France). These cities are located in the Euregios EMR, Saar-Lor-Lux(-Rhine), and Oberrheinkonferenz, which form part of the BTCCE project area.

5.1 Policy analysis

The five regions (German federal states Rhineland-Palatine, Saarland and Baden-Württemberg, France and Luxembourg) were analysed in terms of their health system structure, laws and regulations in the specific field of trauma care. Additionally, studying the legislative basis for cross-border medical treatment on EU level was regarded as necessary to put the five health systems in a shared context. This is important, as all countries of interest are members of the EU and thus influenced by EU law significantly. However, as the EU only provides a limited set of health regulations, combining supranational, national and – in the case of Germany – federal law were identified as essential for reaching the goal of the

research. These different legal backgrounds were investigated through searching the webpages of health ministries on national and regional level and by further searching for information on the Euregios' websites. If these did not provide a list of relevant trauma care laws or cross-border agreements, the common search engines were used to expand the search to the whole internet. This strategy was also used to double-check whether the information found was complete and up to date.

5.2 Literature review

Existing collaborations in the field of trauma care at the national and cross-border level were identified by conducting a literature review.

The online databases used in the literature review were: Eurostat, the EU Bookshop, WHO and the OECD. Scientific literature was searched in: PubMed, Summon Serial Solutions, SpringerLink, the Cochrane Library, Access Medicine, and the Maastricht University library. Separately, relevant journals and a book were subject to intense literature review. These were 'The Journal of trauma management & outcomes', 'The Journal of Trauma: Injury, Infection, and Critical Care', and 'The Journal of Trauma and Acute Care Surgery'. Additional information was found in smaller websites of national, regional and even local service providers in the field of trauma care and on the webpages of the concerned countries and regions. These could provide data at the regional level and helpful links to other webpages which could not be found in larger public databases.

The keywords used in the literature review were: Emergency care; trauma care; cross-border emergency care; cross-border trauma care; regionalisation; cross-border regionalisation; cross-border health; patient mobility; EU trauma; EU emergency; INTERREG; euregio; Euregio Meuse-Rhine; prehospital secondary trauma prevention; ATLS; PHTLS; Pamina; Oberrhein; Oberrheinkonferenz; trinationale Metropolregion Oberrhein; Saarland/ Alsace/ Elsass/ Rheinland-Pfalz/ Rhineland-Palatinate/ Luxembourg/ France/ Frankreich/ Lothringen/ Lorraine/ Baden-Württemberg/ Saaar-Lor-Lux/ Oberrhein/ Oberrheinkonferenz/ Pamina/ EuregioMaas-Rhein/ Euregio Meuse-Rhin/ Euregio Maas-Rijn/ Euregio Maas-Rhine/ European Union/ EU + cross-border health/ emergency/ trauma/ Notfallmedizin/ Trauma/ grenzüberschreitende Hilfeleistung/ cross-border trauma/ cross-border emergency/ cross-border pre-hospital care/ cross-border acute care/ grenzüberschreitend Trauma/

grenzüberschreitend Notfall. The Boolean operators 'AND', 'OR' and 'NOT' were used to combine terms.

Literature published in the following languages was included in the search: English, German and French. Texts published before the year 2000 and texts referring to disaster instead of trauma were excluded from the review.

5.3 Interviews

The information provided by the literature review and policy analysis has been complemented by integrating primary sources in the form of interviews (Varvasovszky & Brugha, 2000). In order to get the most reliable data the method used for selecting interviewees was *purposeful sampling*. This probability sampling method implies that a study population representing the average countries' population might not lead to useful data as compared to the sole inclusion of individuals who have special knowledge in the study field (DiCicco-Bloom & Crabtree, 2006). For the purpose of this study interviewees should be experienced in the field of cross-border trauma care. Analysing stakeholders and their points of view was considered "so as to understand their behaviour, intentions, inter-relations and interests; and for assessing the influence and resources they bring to bear on decision-making or implementation processes" (Varvasovszky & Brugha, 2000).

Stakeholders participating in the research were: Professor Dr. P. Brink, head of the traumatology department at the Maastricht University Hospital (Akademische Ziekenhuis) in Maastricht, Professor Dr. H.-C. Pape, who is the chairman of orthopaedic and trauma surgery at the Aachen University Hospital (Universitätsklinikum) in Aachen, Dr. J. Jansen who is the head of the Dutch medical emergency service in Southern Limburg, Professor Dr. T. Pohlemann, the head of trauma, hand and reconstructive surgery at the Saarland University Hospital [Universitätsklinik des Saarlandes] in Homburg, Dr. P. Mörsdorf, who is assistant physician at the Saarland University Hospital [Universitätsklinik des Saarlandes] in Homburg, Professor T. Gerich, head of orthopaedic and trauma surgery at the Luxembourg hospital [Centre Hospitalier de Luxembourg] in the city of Luxembourg, Dr. C. Ferretti, working as anaesthetist at the Luxembourg hospital [Centre Hospitalier de Luxembourg], and Dr. A. Meyer, who works as a medical professional in physiology at the Hautepierre Strasbourg Hospital [Hôpital de Hautepierre Strasbourg]. Aachen, Maastricht and Southern Limburg all

belong to the region of the EMR, Luxembourg and Homburg are located in Saar-Lor-Lux-(Rhine) and Strasbourg is located in the Oberrheinkonferenz.

The interview was conducted using semi-structured questionnaires in a face-to-face meeting at the interviewees' work setting. The questionnaire used was based on the 'Impediments to trans-border rescue efforts' [Hindernisse für grenzüberschreitende Rettungseinsätze] study by the German Federal Highway Research Institute [Bundesanstalt für Straßenwesen] (Pohl-Meuthen, Schäfer et al., 2006) and then amended in collaboration with the project partners to suit the study needs (Appendix I). The interviewees were asked to state their opinion, experience and knowledge on existing and planned cross-border cooperations in the field of trauma care. Additionally, the levels of the trauma care chain, legal arrangements, financial means, uniformity of treatment standards, just as barriers and promoting factors to trauma cooperation were addressed in the interview questions. Interviewees were expected to add value to the research with their own ideas and background from practical experiences. Furthermore, they were asked whether they could recommend additional literature or persons which should also be interviewed or otherwise considered in the research process.

5.4 Method for interview analysis

As trauma care and the form of cooperation in the concerned regions seem to diverge widely, the simple tool of "quote research" has been used for analysis instead of employing complicated and possibly incomplete categorisation and coding schemes (Folkestad, 2008). Likewise, the interviews' content has been integrated in the findings of the literature review and policy analysis to add or verify the information provided by these two methods.

6 Results

6.1 The structure of trauma care in France, Germany and Luxembourg

Relevant for the study and understanding of cooperation agreements among EU countries is to outline their national structures of trauma care regulations, first. Factors that have been looked at are the existence of national and regional trauma systems, the organisation of the trauma care chain and its integral parts, funding mechanisms and the governmental structure on which legal measures are taken.

Structure of governance in trauma care

In general, health systems and trauma care can be distinguished in their oganisational structure to be central or federal (Pohl-Meuten, Schäfer et al., 2006). In France, all regulations are decided on the national level and are then enforced in the country's sub-regions (Pohl-Meuten, Schäfer et al., 2006). France itself is structured into 22 regions, which are then divided into 96 departments (Pohl-Meuten, Schäfer et al., 2006). In each department, the Prefect [prefet] is the person who represents, implements and coordinates the central French health system (Meyer, private communication, May 8, 2013). As Luxembourg has less than 500,000 inhabitants and also geographically does not present a large country no sub-structures beside cities and villages exist there (Gerich, private communication, May 8, 2013). The organisation is thus also central (WHO, 2008). Germany, in contrast, is divided into 16 federal states [Bundesländer] which all have their own power in some legislative branches. Emergency care is one of the branches solely regulated by the federal states without the higher consent on national level. The different ways to organise emergency care at the national level compared to federal level in France and Germany are reported to have led to difficulties in the past (Pohl-Meuten, Schäfer et al., 2006).

Trauma systems

In Germany the Deutsche Gesellschaft für Unfallchirurgie [German accident surgery association] (DGU) implemented the TraumaNetzwerk® [Trauma Network] in 2008 and thus established a country-wide trauma system for hospitals. Participating hospitals need to fulfil high and uniform quality standards which are controlled during the mandatory certification

process by DIOcert[10]. Additionally, the DGU organises and requires the participation of joint trainings based on the globally acknowledged concept of Advanced Trauma Life Support [ATLS]. To identify quality deficits for future improvement the DGU further postulates the use of the TraumaRegister^{QM}, which is a tool to monitor country-wide trauma patient data (DGU, 2009). Hospitals are categorised into locally, regionally and interregionally certified trauma centres based on which resources they provide to coordinate trauma care. A few non-German hospitals participate in this initiative, of which two are located in Luxembourg (Gerich, private communication, May 8, 2013). Luxembourg's hospitals, however, did not form an own national trauma system (Gerich, private communication, May 8, 2013). In France, the only known trauma system is the Northern French Alps Emergency Network stressing across three departments. There are no known attempts to create a country-wide system (Meyer, private communication, May 8, 2013).

The organisation of dispatch centres

French dispatch centres are distributed sub-regionally and only a few are interconnected. Also in Germany, their distribution is sub-regionally but they are commonly interconnected (WHO, 2008). Due to the country's small size there is only one dispatch centre responsible for Luxembourg's emergency care coordination (WHO, 2008). According to Ferretti (private communication, May 8, 2013) and Meyer (private communication, May 8, 2013), in French dispatch centres physicians are present. According to Meyer they know which capacities and how many hospital beds are available. Furthermore, Ferretti (private communication, May 8, 2013) mentions that the ambulance personnel and that of dispatch centres is the same in France and they swap their positions regularly to increase both levels' interconnectivity. Just like the representation of doctors in dispatch centres, also this interchange of personnel is not the standard in Luxembourg (Ferretti, private communication, May 8, 2013; Pohl-Meuten, Schäfer et al., 2006). Similar arrangements for Germany have not been found.

Ambulances

The French ground-based ambulances are mostly public and under the responsibility of each department. The mobile intensive care units called 'SAMU[11]' always have physicians on board, while their local subsidiaries SMUR[12], and the private service ASU[13] do not. Emergency services from the fire brigade host physicians only at some places and hours. All

[10] DIOcert works on behalf of the DGU and verifies the required quality criteria for shock rooms, standard procedures of hospital treatment, and defined transferral criteria in the early treatment phase.
[11] Abbreviation for: Service d'Aide Médicale Urgente [urgent medical aid service]
[12] Abbreviation for: Service Mobile d'Urgence et de Réanimation [mobile emergency and ressuscitation service]
[13] Abbreviation for: Ambulance Service Urgence [ambulance emergency service]

other public ambulance personnel are paramedics, while the ASU is part of the 'Protection Civile'. This is a first emergency response unit organised by the population which only intervenes in minor incidents. In more serious emergencies, often the different services cooperate in a rendezvous system[14] (Meyer, private communication, May 8, 2013).

In Germany, usually private ambulance services are used, as it is not required for German hospitals to have own ambulances. Often, they are not located at the hospital, but near the fire brigade or elsewhere. This is why also the rendezvous system is used in Germany, as the physicians often arrive in separate vehicles coming from the hospitals. The private companies are, hence, well integrated in the trauma care system and routinely used. In case two different service providers arrive at the scene simultaneously, they cooperate well and both are paid (Pape, private communication, March 14, 2013).

In Luxembourg, each hospital has its own ambulances and physicians are required to be present all the time. All hospitals are responsible for the emergency care within an agreed area. Beside the hospital based ambulance sector, a second branch of pre-hospital care in Luxembourg is the Protection Civile. Members of the Luxembourgish Protection Civile are usually employees or farmers, who are on stand-by and can leave their primary job in case of an alert (Gerich, private communication, May 8, 2013; Pohl-Meuten, Schäfer et al., 2006).

In-hospital trauma care

In all three countries, patients entering the emergency departments do officially not need to fulfil any requirements and are treated without a proof of their identity or insurance (WHO, 2008). The Luxembourgish hospitals were partly criticised because they do not employ enough experienced physicians and never have a team of trauma physicians present in the hospital. While the German emergency is based on such a team, in Luxembourg physicians stay available at home on call. This means that from the beginning when a patient enters the hospital, the present physician needs to decide whether they call their colleagues and wait for them or treat the patient alone (Pohlemann, private communication, May 7, 2013). Information on trauma teams was not available for France.

Helicopters

In France, the air rescue services are regulated nationally due to its central governance structure. Each department has at least one helicopter, bigger departments may have more

[14] 'Rendezvous' means that one service provides the physician, while another can be first at the site of the accident, provides first aid and medication and also often serves as the transport facility.

(Meyer, private communication, May 8, 2013). The French helicopter reported to fly in German regions of interest is located in Strasbourg. (Rth.info, 2013). Another helicopter near the French-German border is situated in Nancy (Pohl-Meuten, Schäfer et al., 2006). Germany has 50 helicopters, each covering an area of 50km in all directions. The areas of two neighbouring helicopters always overlap, so that the whole country is covered (Pape, private communication, March 14, 2013). In the German study regions, helicopters are situated close to the border in Wittlich, Saarbrücken, Ludwigshafen, Karlsruhe, and Freiburg (ADAC-Luftrettung-GmbH, 2012). There is only one private helicopter service in Luxembourg called 'Luxembourg Air Rescue' (LAR) which has officially been integrated into the national emergency service. It provides three helicopters, of which one is mainly used for cross-border rather than in-land flights (Luxembourg Air Rescue, 2013).

Rehabilitation

In France, trauma patients rely on their hospital services or organise rehabilitation services themselves. In Germany a social service [sozialer Dienst] is responsible for finding the most adequate rehabilitation facility (Mörsdorf, private communication, May 7, 2013). Moreover, Germany hosts so called 'case managers', who evaluate on the health status of a patient and then engage in finding timely and effective rehabilitation measures (Pape, private communication, March 14, 2013). According to Pape, there is no requirement for hospitals to employ case managers, but he estimates that about 80% of German hospitals do so (Pape, private communication, March 14, 2013). Similar information has not been found for Luxembourg.

Crisis Management

All three countries lay down special regulations for crisis management, which implies an emergency which exceeds everyday routine and capacity and may require the need of additional forces. If governments officially declare a crisis a 'national crisis', in all three countries the Ministry of the Interior takes over responsibility from the emergency services. In order to have a plan ready and be prepared for fast action, all countries have concluded on international agreements and protocols in the area of emergency medical services with each of their neighbouring countries (WHO, 2008).

6.1.1 National Trauma Care Legislation

The trauma care organisation in France, Germany and Luxembourg follows a different set of legal documents and arrangements. Air rescue and ground ambulances are usually covered

separately, just as the personnel's training and quality control may show up in different law texts. During this study only the main laws were outlined which relate to the organisation and general provisions of emergency medical care in the three countries.

In France, emergency care is regulated by the 'Decree of 22 May 2006 (ref. 2006-576) on Emergency Medicine'[17] and the 'Decree of 22 May 2006 (ref. 2006-577) on the technical setting applicable on Emergency Medicine's structures' (WHO, 2008). Germany does not provide one single legal basis, but it has 16 different laws according to the federal states called 'emergency medical service laws of the federal states'[18] (WHO, 2008). Luxembourg's emergency care regulations are laid down in the 'Grand-ducal decree from the 29th of August, 1979 on the establishment of standards based on which hospitals participating in emergency care need to respond'[19], the 'Grand-ducal decree from the 20th of June, 1980 on the creation of emergency care units by the civil protection'[20], and the 'Emergency Medical Aid Law' from the 27th of February, 1986[21] (Pohl-Meuten, Schäfer et al., 2006). Following, these laws have been analysed for whether they provide the conditions for cross-border cooperation.

6.2 Legislation on Regional Cross-border Trauma Care Cooperation

The basis to conclude agreements in trauma or more widely in health care are bilateral or multilateral agreements on the cooperation of territorial entities and (regional) public bodies between each country with its neighbouring states. Also funding based on social security is regulated by such agreements. Grounded on these agreements, further regional arrangements can be made. France, Germany, Luxembourg and Switzerland all signed the Karlsruhe Convention[22] for that purpose in 1996 (Pohl-Meuten, Schäfer et al, 2006). Additionally,

[17] Original title: Décret n° 2006-576 du 22 mai 2006 relatif à la médecine d'urgence et modifiant le code de la santé publique
[18] Original title: Rettungsdienstgesetze der Länder
[19] Original title: Règlement grand-ducal du 29 août 1979 établissant les normes auxquelles doivent répondre les établissement hospitaliers qui participent au service d'urgence
[20] Règlement grand-ducal du 20 juin 1980 portant création d'unités de secours de la protection civile
[21] Original title: Loi du 27 février 1986 concernant l´aide médicale urgente
[22] Original title: Das Karlsruher Abkommen. Übereinkommen zwischen der Regierung der Bundesrepublik Deutschland, der Regierung der Französischen Republik, der Regierung des Großherzogtums Luxemburgs und dem schweizerischen Bundesrat, handelnd im Namen der Kantone Solothurn, Basel-Stadt, Basel-Landschaft, Aargau und Kanton Jura, über die grenzüberschreitende Zusammenarbeit zwischen Gebietskörperschaften und örtlichen öffentlichen Stellen

countries or federal states might further include the cross-border issue in the retrieved legislation on health or trauma care, what has been outlined as follows. Before, the basis for such cooperation on supranational level was reviewed.

6.2.1 International and EU Legislation

Hard Law

On European level, the most recent legislation on cross-border health care is the 'Directive 2011/24/EU of the European Parliament and of the Council of 9 March on the application of patients' rights in cross-border healthcare', referred to as 'Patients' Rights Directive' (European Parliament & the Council of the European Union, 2011). This directive regulates reimbursement and other entitlements of patients in other countries than their home country. As a legal framework, the directive uses the right to free movement of persons within the European Union and the principle of non-discrimination based on nationality. Together they imply that health care and cost reimbursement should not be denied to any EU citizen in any MS. Moreover, patients from other MS must not be treated on unfavourable terms compared to nationals from the MS of treatment (European Parliament & the Council of the European Union, 2011).

The only exceptions to these two principles may be planned treatment that involves overnight hospital stays or "highly specialised and cost-intensive medical infrastructure or medical equipment" (European Parliament & the Council of the European Union, 2011). Also excluded are treatments that would endanger other persons, for instance because the chosen country of treatment does not provide enough capacities to treat their own citizens and those from abroad. Chapter III, Article 7 additionally states that reimbursement of cross-border treatment only needs to take place for costs up to the limit of what the same treatment would have cost in the patient's home country. Any costs exceeding these might, but do not necessarily need to be accounted for. Referring to the medical follow-up, Chapter II, Article 5 demands that even if a patient was treated in another MS, their home country must offer the follow-up the same way as if the treatment had taken place on their own territory (European Parliament & the Council of the European Union, 2011).

Chapter IV refers to the cooperation of MS in healthcare. According to Article 10, 1. MS are required to shape their quality and safety standards to ensure that the directive can be implemented and followed adequately. Second, it recommends MS to "facilitate cooperation in cross-border healthcare provision at regional and local level as well as through ICT and other forms of cross-border cooperation" (European Parliament & the Council of the European Union, 2011). Third, it suggests that neighbouring countries in particular may establish agreements with the aim of cooperative "cross-border healthcare provision in border regions" (European Parliament & the Council of the European Union, 2011). The provisions laid down in the Patients' Rights Directive are all mandatory and need to be implemented in the MS' national law before October 25, 2013 (European Commission, 2013d).

Soft Law

In 1996, the 'declaration on Regionalism in Europe' has been passed by the 'Assembly of European Regions'[23] (Assembly of European Regions, 1996). Baden-Württemberg and the French region Alsace are members, while the other regions involved in this study have not signed the declaration (Assembly of European Regions, 2013).

The declaration is a framework promoting cooperation among European regions. It suggests that the regions shall have the power to take decisions for their territory without the approval of the state. Furthermore, regions shall be entitled to public funding through support from the EU. The declaration is not binding, but it shall rather stress how "political and social stability" (Assembly of European Regions, 1996) can be achieved through cross-border cooperation and regionalism (Assembly of European Regions, 1996).

6.2.2 Legislation in France, Germany and Luxembourg

France

The decree on emergency medicine refers to networks for emergency support. In the case of emergency it allows for participation in networks both with public and private health institutions. The territory of cooperation, according to the decree may be sub-regional, regional or interregional. Cross-border collaboration is explicitly included. Furthermore, it is stated who is allowed to participate in such networks: 1. medical professionals providing continuous care, 2. special health care providers ordered by SAMU, 3. pharmacists and 4.

[23] The assembly's members are not necessarily whole countries, but often only some regions of a country.

social and socio-medical institutions, particularly accommodation services for elderly people. A more precise agreement shall be established and coordinated within the regions by the respective Agence Régionale de l'Hospitalisation directors (Legifrance, 2006, Art. 2, § 2).

Baden-Württemberg (Germany)

The Baden-Württemberg emergency medical service law clearly states that cross-border agreements shall be made if seized useful for the emergency service's effective operation. Nevertheless, 'cross-border' in this context does not necessarily refer to national borders, but also involves borders with other federal states within Germany (Gesetz über den Rettungsdienst, 2010, § 14).

Rhineland-Palatinate (Germany)

In Rhineland-Palatinate the law on emergency medical service only vaguely mentions cross-border trauma care. Paragraph 21 (4) states that all ambulances from other countries have the same rights in Rhineland-Palatinate which German ambulances have. The law further states that adjacent dispatch centres must support each other if they have capacities to do so without limiting their own work. However, dispatch centres in other countries are not clearly mentioned (Landesgesetz über den Rettungsdienst sowie den Notfall- und Krankentransport, 2007, § 7 (7)). Finally, the law states that patient transport shall only take place when the departure and destination place both are located within the operation territory. Exceptions are made when a patient is taken back from treatment in another country or when there is an additional agreement made (Landesgesetz über den Rettungsdienst sowie den Notfall- und Krankentransport, 2007, § 26 (2)).

Saarland (Germany)

The law on emergency medical service in Saarland shortly refers to cross-border cooperation, claiming that regulating cross-border cooperation in emergency care is the responsibility of the federal state. Furthermore, it adds that the 'Rettungszweckverband'[24] would contribute to some agreements. This refers to all agreements which have an impact on the area or ground-based personnel of the emergency services in Saarland. Whether 'cross-border' refers to other countries, only, or also involves other German federal states, that is not mentioned (Feuerwehrschule des Saarlandes, 2004, clause 2 § 6a).

[24] the 'Rettungszweckverband' is the regional emergency services association

Luxembourg

Links to cross-border practice could not be found in the Luxembourgish emergency care legislation.

6.3 Cross-border Agreements in Trauma Care

6.3.1 National Cross-border Agreements

Framework agreement France-Germany

On July 22, 2005, the 'framework agreement between the government of the Federal Republic of Germany and the government of the French Republic on cross-border cooperation in health care'[25] has been signed. It defines the aim of ensuring the timeliest possible emergency treatment, next to the aims of best practice exchange and the optimisation of health care provision and its organisation though shared personnel and equipment (Bundesgesetzblatt, 2006, Article 1). It furthermore makes clear that the concerned regions are Baden-Württemberg, Rhineland-Palatinate, Saarland, Alsace and Lorraine, which should each implement the agreement through their respective health care and safety agencies (Bundesgesetzblatt, 2006, Article 2). Both emergency care and non-emergency patient transportation are subject to the framework (Bundesgesetzblatt, 2006, Article 3). Through the framework agreement, the recognition and competence of both countries' emergency service personnel on the other country's territory is ensured, as well as the countries shall encourage and put in place measures so that the emergency services can most easily cross borders (Bundesgesetzblatt, 2006. Articles 4-5). The countries' social security systems should reimburse cross-border treatment according to the EU legislation on social security (Bundesgesetzblatt, 2006, Article 6). Furthermore, the liability issue is clarified and the establishment of a joint commission is agreed upon. The commission shall meet at least once a year to evaluate and improve the cooperation. For all other explanations the framework agreement refers to the respective administrative agreement (Bundesgesetzblatt, 2006).

Administrative agreement France-Germany

[25] Original title: Rahmenabkommen zwischen der Regierung der Bundesrepublik Deutschland und der Regierung der Französischen Republik über die grenzüberschreitende Zusammenarbeit im Gesundheitsbereich

The ‘administrative agreement between the federal ministry of health of the Federal Republic of Germany and the minister for health and solidarity of the French Republic on the implementation arrangements of the framework agreement of July 22, 2005, on cross-border cooperation in health care’[26] came into force on March 9, 2006. It defines which aspects of cross-border care should, but not necessarily need to be covered in succeeding regional regulations. For emergency care, these refer to the communication, availability and liability of the dispatch centres and pre-hospital care services (Deutsch-französische Zusammenarbeit, n.d./2013).

6.3.2 Regional Cross-border Agreements

Baden-Württemberg and France

The cross-border cooperation between Baden-Württemberg and France is covered in two agreements, namely the ‚Agreement on cross-border cooperation in the area of emergency services in Alsace and Baden-Württemberg’[27] signed on February 10, 2009, and the ‘Additional agreement between the director of the URCAM Alsace and the regional councils of Karlsruhe and Freiburg on the financial arrangements of the agreement on cross-border cooperation in the area of emergency services in Alsace and Baden-Württemberg from 10th February, 2009’[28]. The agreements determine which information of cross-border patients the emergency service needs to lay down and how cost-intensive the different services of both countries are. Furthermore, the administrative agreement’s requirements are met (Agence Régionale de Santé Lorraine, n.d. a/2013). Meyer (2013) reports that ambulances bring patients from Germany to Strasbourg on regular basis while in the other direction it is rather uncommon. In general, Meyer perceives the cohesion of ambulance services and dispatch centres on both sides of the border as very strong (Meyer, private communication, May 8, 2013).

[26] Original title: Verwaltungsvereinbarung zwischen dem Bundesministerium für Gesundheit der Bundesrepublik Deutschland und dem Minister für Gesundheit und Solidarität der Französischen Republik über die Durchführungsmodalitäten des Rahmenabkommens vom 22. Juli 2005 über die grenzüberschreitende Zusammenarbeit im Gesundheitsbereich

[27] Original title: Vereinbarung über die grenzüberschreitende Zusammenarbeit im Bereich der Rettungsdienste Elsass/ Baden-Württemberg

[28] Original title: Ergänzungsvereinbarung zwischen dem Direktor der URCAM Alsace und den Regierungspräsidenten Karlsruhe und Freiburg über die finanziellen Modalitäten der Vereinbarung über die grenzüberschreitende Zusammenarbeit im Bereich der Rettungsdienste Elsass/ Baden-Württemberg vom 10.2.09

Additionally, the Oberrheinkonferenz has established an expert committee on cross-border health care provision. The committee shall serve as an information point to answer individual questions on cross-border health care. It stays in constant contact with health care providers and purchasing players in order to keep their information pool up to date. One task of the committee is the active development of emergency care in the whole Oberrheinkonferenz. Financial, judicial, technical and functional questions are all addressed and issued in the interplay with relevant stakeholders. This resulted in the establishment and constant analysis of a real-time hospital bed database, which is in particular used in intensive care and which is thought to promote cross-border emergency care in the region (Fischbach, 2012).

Rhineland-Palatinate and France

On February 10, 2009, the ‚Agreement on cross-border cooperation in the area of emergency services in Alsace and Rhineland-Palatinate'[31] has been signed. It states that the agreement mainly applies to the first response to medical emergencies and the patient's support until the admission to the hospital (Agence Régionale de Santé, n.d. b/2013, Article 1). Dispatch centres shall engage in cross-border cooperation if it can save medically relevant time, when an emergency physician can reach the patient faster from across the border, or when only ambulances from the other country can ensure fastest arrival at the next adequate health care facility (Agence Régionale de Santé, n.d. b/2013, Article 3). Technical connections of the dispatch centres, as well as joint advanced education and training are promoted in order to ease the communication between both countries' personnel (Agence Régionale de Santé, n.d. b/2013, Article 7). Concerning the choice of an adequate hospital, the agreement claims that patients shall always be treated at the closest hospital within the country in which the emergency occurred, except where another hospital's specialisation is needed or the patient requires urgent treatment and a hospital in the other country is closer (Agence Régionale de Santé, n.d. b/2013, Article 8). A commission shall support and evaluate the cross-border emergency care as stated in the framework agreement. Further tasks of the commission are the development of operational protocols, the reconcilement of both countries' personnel's education and qualification, the predefinition of equipment and the development of strategy plans (Agence Régionale de Santé, n.d. b/2013, Article 12). According to Article 9 financial aspects shall be part of another, separate agreement (Agence Régionale de Santé, n.d. b/2013, Article 9).

[31] Vereinbarung über die grenzüberschreitende Zusammenarbeit im Bereich der Rettungsdienste Elsass/ Rheinland-Pfalz

Beside this broad agreement, some more specific initiatives between Rhineland-Palatinate and French regions or even between cities within those regions were found. There is an agreement between Saarland, Rhineland-Palatinate, Lorraine and Luxembourg on the treatment of most severely injured burn patients. To cooperate in emergency care which requires helicopter use, the German cities of Mainz, Wittlich and Saarbrücken, the French city of Nancy and Luxembourg have reached an agreement in 2005. Furthermore, the working group 'health' of the regional commission Saar-Lor-Lux-Rhineland-Palatinate-Wallonie has been set up in 2006. Among other health and health care issues, it also deals with emergency care and services (Krumm, 2009). The French city of Wissembourg and the German ambulance station Bad Bergzabern in Rhineland-Palatinate cooperate, so that German ambulances and personnel are stationed at the Wissembourg hospital and are joined by French physicians in the case of an emergency during the night. At this local level, all involved stakeholders have agreed to the cooperation already before the French-German framework agreement existed. German standards and protocols are used in Wissembourg and even the health care insurance tolerates and reimburses the joint emergency service (Pohl-Meuten, Schäfer et al, 2006).

Saarland – Luxembourg

For Saarland and Luxembourg, all but the first agreements apply which have been identified for the region Rhineland-Palatinate and France (Krumm, 2009).

In addition, the TNW Saar-(Lor-)Lux-Westpfalz by the DGU initiative has been established in 2009 and is thus the first of the DGU networks which operates across German borders. Already before the DGU network has been established, the Luxembourgish helicopter service LAR operated in Saarland. In 2005, the helicopter 'Air Rescue 3' has officially become responsible for air-based emergency care in Saarland and Rhineland-Palatinate (Luxembourg Air Rescue, 2013). In general, Mörsdorf (2013) evaluates the cooperation of Saarland with Luxembourg as good (Mörsdorf, private communication, May 7, 2013). Ferretti (2013) who is not involved in the DGU initiative remarks that cross-border cooperation in Luxembourg usually refers to helicopter services or non-emergency patient transports. What he did not experience, he says, is that during the last years an ambulance coincidentally was located so close to the border that it went over to Germany to provide timely treatment. Thus, the cross-border issue in everyday practice rather comes up for the provision of secondary treatment, but first aid is usually provided by the country in which the accident takes place. An exception do only form large-scale incidents. There, French, German and Luxembourgish emergency services all come together and divide the patients among each other. However, what Ferretti

also says is that most cross-border cooperation concerns not trauma but other forms of ill-health (Ferretti, private communication, May 8, 2013).

Saarland – France

The agreement on most severely injured burn patients used in Rhineland-Palatinate and Luxembourg also includes both Saarland and Lorraine. Also, the working group "health" is an initiative within the whole Saar-Lor-Lux-Rhineland-Palatinate-Walonie region and thus presents itself as a basis for Saarland and France to cooperate in emergency care (Krumm, 2009). In addition to those, Lorraine and Saarland concluded on the '11th June, 2008, cooperation agreement on cross-border emergency services between Lorraine (Agence Régionale d'Hospitalisation Lorrain) and Saarland (Ministry of the Interior and Sports)'[32] as an answer to the French-German framework agreement from 2005. Cooperation shall take place in cases when valuable time can be saved for an emergency patient, emergency physicians from the other country might reach the patient faster, ambulances from the other country might take the patient faster to a health care provider, or in exceptional cases to support their own national emergency service. Moreover, the regions agree on joint advanced education and training in addition to what the framework agreement stipulates. For implementing and evaluating the cooperation and for facilitating the removal of potential difficulties a steering group is responsible. Another expert committee focuses on uniform operation protocols, harmonisation of the personnel's qualification and education, determination of the equipment used and the development of strategy plans. Also, it prepares the annual evaluation of the steering committee. Explicitly excluded from the agreement are reimbursement and funding, which shall be addressed in a separate agreement. This, however, could not be found for the regions of Lorraine and Saarland (Saarland, 2008). In practise, Mörsdorf sees difficulties to even cross the border to France with an ambulance or helicopter (Mörsdorf, private communication, May 7, 2013). Pohlemann (2013) agrees, as he even experienced that less seriously injured patients were transferred from one ambulance into another at the French-German border (Pohlemann, private communication, May 7, 2013).

[32] 11.6.2008 Kooperationsvereinbarung über das grenzüberschreitende Rettungswesen zwischen Lothringen (Agence Régionale d'Hospitalisation Lorrain) und dem Saarland (Ministerium für Inneres und Sport)

6.4 Difficulties in establishing and strengthening cross-border trauma care cooperation

The data collection through literature, legislation and stakeholders views showed that collaborations on cross-border trauma care is not yet fully established and used. Therefore, factors which could hinder cooperation were searched and will be provided as follows.

Political commitment

Political reasons seem to be a main preventive factor in the establishment of cross-border trauma cooperation. In France, for instance, physicians are often perceived as willing to cooperate but at the same time restricted by their regional authority, the prefect (Pohlemann, private communication, May 7, 2013). Also Meyer (2013) agrees that the French political structure and organisation often create obstacles, but he does not feel any serious limitations imposed by French or German authorities (Meyer, private communication, May 8, 2013). More general, the different legal basis underlying health and trauma care as described in the previous sub-chapters are felt to hinder cross-border cooperation (Pape, private communication, March 14, 2013).

Communication

There are several reasons why communication between two countries can be problematic. The first is language: not only those developing and implementing a health care network need to talk to each other, but also in the everyday routine all concerned people need to ensure that language does not lead to miscommunication (Brink, private communication, February 28, 2013; Meyer, private communication, May 8, 2013; Pape, private communication, March 14, 2013; Pohlemann, private communication, May 7, 2013). This relates to communication between the health care staff and the patient (Zentrum für europäischen Verbraucherschutz, 2013). However, also among different service providers in the trauma care chain talking a common language is very essential to ensure the right information transfer (Brink, private communication, February 28, 2013). Sometimes, not only the missing ability but rather the willingness to talk another language can become a threat to cooperation (Jansen, private communication, March 19, 2013)

The second problem in communication might arise due to technical discrepancies, such as different radio frequencies the emergency services use (Pohl-Meuthen, Schlechtriemen et al., 2006; Jansen, private communication, March 19, 2013; Pohlemann, private communication,

May 7, 2013). This is of particular importance when a helicopter from abroad tries to land and the police needs to instruct the pilot. To remove this obstacle, Saarland already tests to use the same digital radio France uses (Mörsdorf, private communication, May 7, 2013). Third, in order to communicate health care providers need to have each other's telephone numbers and be aware whom they could turn to (Brink, private communication, February 28, 2013; Pape, private communication, March 14, 2013). A lack of personal contacts and joint education and training events across the border and across the different levels of the trauma care chain could likewise easily hinder the cooperation development. Not only professional networking, but also emotions like trustfulness and familiarity seem to play a role, here (Pape, private communication, March 14, 2013). However, communication could also be misleading if the countries' health care personnel does not know each other's health system adequately (Gerich, private communication, May 8, 2013).

Financial issues

A reason for many care providers not to engage in setting up cross-border networks might be the lack of financial stimuli. Usually hospitals do not make any financial gain through cross-border health care, so they might rarely provide time frames for the physicians to establish such networks. Likewise, physicians would need to spend their free time or even private money on collaboration efforts (Zentrum für europäischen Verbraucherschutz, 2013). Also governmental structures might not take the initiative because the priority of cross-border care might be low as compared to cost saving strategies (Zentrum für europäischen Verbraucherschutz, 2013). Moreover cooperation efforts in trauma care might become difficult if in one country providers are paid by tax-based public money, while in the other country the health insurance must pay. Patients crossing the border would in that case be paid by foreign taxes or by a foreign health insurance, as the own might not have regulations for emergency care reimbursement (Brink, private communication, February 28, 2013). Missing insurance participation in general is perceived to stand in the way of cross-border networks (Pape, private communication, March 14, 2013).

Cultural barriers

When the cultures in two countries or regions differ, very likely also the perception and idea of the ideal health care provision and organisation might widely differ. If countries regard their own health system as better than others this easily leads to a lack of respect towards the other country's work and quality. It might reduce the willingness to accept compromises or even to cooperate with a neighbouring country (Brink, private communication, February 28,

2013). Very strongly, Pohlemann focused on the different levels of freedom physicians in France and Germany have. French physicians seem to commonly follow politicians' instructions, even if these restrict their daily operation as a physician. This, Pohlemann states, would not be possible in Germany at all, because physicians there attach much importance to their liberal treatment (Pohlemann, private communication, May 7, 2013).

Infrastructural criteria

Infrastructural criteria are mentioned as a reason for why cross-border health care is not similarly promoted everywhere. A good example for this is the border region close to Strasbourg. There, Strasbourg presents itself very urban with highly developed health care infrastructures, whereas the German counterpart, the district of Ortenau, is scarcely populated and the next comparable hospital is located in 80km distance in Freiburg (Zentrum für europäischen Verbraucherschutz, 2013). Also Meyer (2013) reports this issue, claiming that it makes cross-border cooperation rather uninteresting for the French population in that area, as it simply does not see the need to collaborate with its neighbour Germany. He nevertheless adds that this might very likely be different in other regions, where Germany provides better health care resources close to the border (Meyer, private communication, May 8, 2013). Difficulties might also occur when one country only uses very limited health capacities and their use in a neighbour country could simultaneously endanger the emergency system in the first (Jansen, private communication, March 19, 2013).

Concerning the infrastructure of France in general, the electronic toll stations at highways constitute a difficulty. French ambulances have a vignette, which lets them automatically pass highways without the need for extra electronic payment at every toll station. German ambulances, however, do not have such vignettes and likewise face a barrier when they want to cross the border (Mörsdorf, private communication, May 7, 2013; Pohlemann, private communication, May 7, 2013). Gerich (2013) adds is that Luxembourg is in a specific situation because it is a small country with only 500,000 inhabitants, which everyday faces a flow of 150,000 commuters from abroad who work in Luxembourg. Most times, those commuters prefer that the helicopter brings them to a hospital in their home country if time is not pressing (Gerich, private communication, May 8, 2013) What might also shape individual regions' or whole countries' trauma care needs are very rural, mountainous areas or forests, very densely populated large cities and a high amount of heavy trafficked roads due to differences in accident occurrence and in availability of timely emergency care (Pohlemann, private communication, May 7, 2013).

Motivation

The current perception of health care provision in many countries seems to be restricted to the own region or even only the health care institution. Many providers lack the idea and do not see an added value in cooperating with the neighbouring country or potentially even investing in shared health care resources (Zentrum für europäischen Verbraucherschutz, 2013). Furthermore, the organisational and administrative burden for cooperation partners might be higher. An example for this is the certification process of the TNW, which involves both costs and strict adherence to provided rules (Mörsdorf, private communication, May 7, 2013) A lack of interest over the long term could be observed in many French trauma care providers (Mörsdorf, private communication, May 7, 2013).

Competition

In many countries, not only a lack of motivation but a general non-interest due to competition among the hospitals and physicians might prevent health care networks to be build up (Zentrum für europäischen Verbraucherschutz, 2013; Gerich, private communication, May 7, 2013). If networks exist, it might also happen that ambulances do not stick to the agreed rules, but bring the patients to their own country even if a foreign hospital might be closer. This could easily become the case in countries with an over-supply of health care providers or where hospitals work for profit (Brink, private communication, February 28, 2013). Competition is high in Germany when you compare the country to France (Zentrum für europäischen Verbraucherschutz, 2013). In the border area of Luxembourg and Germany, Trier has been reported to try to admit as many patients as possible, while also in Luxembourg physicians and all but one hospital work privately and for-profit, so that at least easily treatable injuries try to be kept (Gerich, private communication, May 28, 2013).

Lack of transparency

What might also stand in the way of cross-border cooperation is the fact that usually no single institution or organisation is in charge of all health issues in that field, but that a number of stakeholders and legal arrangements are involved. Thus, many unnoticed grey areas may exist or people might not be aware of arrangements. Areas that are often affected might be the health insurance and reference persons on both sides of the borders (Zentrum für europäischen Verbraucherschutz, 2013). This has become obvious when German patients in Strasbourg should be referred and transported to Germany for their remaining treatment. There, the organisation and financial side was problematic when publicly insured patients had no

voluntary contracts with the German ADAC[33] or DRK[34] (Meyer, private communication, May 8, 2013). The same difficulties are reported for French citizens who have their first treatment in Germany and want to be transferred to France, then. Nevertheless, this issue is already subject to current discussions and might be improved, soon (Mörsdorf, private communication, May 7, 2013). Also, common complaints bodies might not exist or be known (Jansen, private communication, March 19, 2013).

Fear

Both physicians and health authorities might fear the unknown or the workload and problems they might encounter during developing health networks. Therefore, it easily becomes common practice to only refer to the neighbouring country if the own health provision and competencies are felt to need improvement (Zentrum für europäischen Verbraucherschutz, 2013). This has also been observed in Rhineland-Palatinate and Saarland (Gerich, private communication, May 8, 2013). Another issue health authorities in general might fear is patient mobility. If people often cross borders for health care, it might become difficult for them to keep track of and control their population health or health care funding (Zentrum für europäischen Verbraucherschutz, 2013). Lastly, also some countries might be aware that their health system is working worse than others and they might fear they could be judged and held responsible for bad quality (Brink, private communication, February 28, 2013).

6.5 Future Outlooks in Cross-border Trauma Care Based on the Perceptions of People Involved in Trauma Care Provision

An impact the establishment of a cross-border trauma care network could have is the quality improvement of some countries which today are behind compared to other countries (Brink, private communication, February 28, 2013). At the same time, getting to know each other and each other's trauma care operation might increase the respect for and tolerance of other structures. Personal contacts should thus be promoted to enable the network establishment (Brink, private communication, February 28, 2013; Pohlemann, private communication, May 7, 2013). One idea how to realise this aim is offering cross-border advanced education and training events for physicians and the ambulance personnel, but also for physicians among themselves. At the same time when contact is established, also the awareness of cross-border

[33] Der Allgemeine Deutsche Automobil-Club e.V. [General German automobile association]
[34] Deutsches Rotes Kreuz [German Red Cross]

initiatives such as the BTCCE-project might increase (Pape, private communication, March 14, 2013).

During the setup of cooperation agreements and the creation of a trauma network, the determination and standardisation of treatment regimes and cooperation procedures should be one central aim. Otherwise, each cross-border transferral might result in ever new discussion and the significance of language differences might become burdensome (Ferretti, private communication, May 8, 2013). A suggestion towards uniform standards is the Europe-wide introduction and use of ATLS (Pape, private communication, March 14, 2013). Furthermore, English as a working language can reduce communication problems. Around Strasbourg, liaison officers who perfectly speak French and German work at the police and could be similarly used in trauma care (Meyer, private communication, May 8, 2013).

In order to make cross-border cooperation easier and additionally increase trauma services' efficiency, the use of telecommunication is promoted (Meyer, private communication, May 8, 2013; Pohlemann, private communication, May 7, 2013). Thus, questions on whether an additional surgeon or the transferral to a specific hospital might be needed can be answered from physicians also when they are not at the same place like the patient. In Saarland, a cheap and well-working tool has been created, which is now continuously more used not only in trauma care, but also in other health care sectors. An advantage of this system is that it has been created with the consent of data protection officials (Pohlemann, private communication, May 7, 2013).

One further factor that should not be left disregarded is the political and cultural barrier of countries which are not used to work together with their neighbours. France is one such country which might need further consideration and stronger cooperation efforts than more open-minded countries do (Pohlemann, private communication, May 7, 2013).

The perceived best strategy to build up networks is the bottom-up approach. Best, according to Brink (2013) one should first include relevant and willing stakeholders at the professional level in demonstrative regions. Personal contacts seem to be a reliable basis with which to start (Brink, private communication, February 28, 2013). Second, after cooperation has started, the professionals should collectively turn to the national and supranational political level and to insurances to extend the network and receive funding (Brink, private communication, February 28, 2013; Pape, private communication, March 14, 2013; Pohlemann, private communication, May 7, 2013). As an argument for his preference, Brink

concluded that political decisions often take their time and do not always take the opinions and ideas of single people into account. However, if governments were to be shown that certain concepts indeed can improve patient care, they have no possibility than to implement those. There, Brink sees a simplification of processes in health care as compared to other sectors, as “the main goal is the patient” (Brink, private communication, February 28, 2013). Furthermore, politicians need to be shown that gaps in trauma care quality exist and inconsistencies along national borders can be found. Another strategy of argumentation Pohlemann suggests focuses on the German car industry, which should simultaneously come up with ways to prevent road traffic deaths when it exports high numbers of vehicles (Pohlemann, private communication, May 7, 2013).

In addition, Pape stresses how important the improvement of cross-border reimbursement procedures by the health insurance is. A uniform accounting system and a European form sheet are ideas he mentions in this context. However, as the collaboration with the insurance might be difficult to reach, he supposes that it would be best to first take the hurdle on EU level and then impose orders on the insurance with the EU’s help (Pape, private communication, March 14, 2013). In the setting of Luxembourg, it is important to additionally involve the health ministry, as no hospital has the right to sign agreements alone. However, Gerich perceives that no further extension to the EU-level would be needed in this case, except for financial support (Gerich, private communication, May 8, 2013).

7 Discussion

In the following chapter, the results obtained through the literature review, policy analysis and interviews were analysed. On the background of Manson's ACT the results were structured to answer the research questions. The theory's six factors have been used to draw a conclusion on the current status of cooperation between France, Germany and Luxembourg. Furthermore, factors which could promote or hinder future collaboration were identified and led to concluding remarks and recommendations.

7.1 The Regions' Trauma Care Structures as a Basis for Cross-border Cooperation – relationships and internal structures

The overview of the national health systems' basic structures has offered some insights as to which parts of trauma care in France, Germany and Luxembourg might be more compatible with those of their neighbouring countries than others. Regarding the organisation of health care, the federal approach in Germany hands over the decision making process on trauma care to the federal states, while the central organisation in France and Luxembourg requires consent on national level (Pohl-Meuten, Schäfer et al., 2006; WHO 2008). Luxembourg is such a small country that its way of organisation does not seem to be important and ways to establish cooperation might easily be found. France and Germany, however, could only sign cross-border trauma care agreements on national level according to France, and only on federal level according to Germany. The internal structures as part of the 'Aggregate Complexity' theory thus seem not to encourage concert system developments between France and Germany. For Luxembourg, the situation here seems rather neutral due to its size.

Differences also occur in the organisation of trauma hospitals. These are officially interconnected in a trauma system in Germany as the only of the three countries. The DGU initiatives TraumaNetzwerk® and TraumaRegister^{QM} stress across the whole country and in some regions even across Germany's national borders. Specialisations and capacities of other hospitals are thus well known (DGU, 2009). Two Luxembourgish hospitals are involved in the TNW initiative, but neither Luxembourg nor France has implemented a comparable own

system beside one known regional French attempt. The French trauma system seems not to plan an extension to the national level, yet (Gerich, private communication, May 8, 2013; Meyer, private communication, May 8, 2013). It only creates the basis for well established relationships, as outlined in the ACT, in a limited way which does not impact the cross-border regions in this study.

The perception of weak relationships is emphasized also by the fact that most French dispatch centres are not connected with each other (WHO, 2008). Relationships to the hospitals are rather established by employing physicians in the dispatch centres, so that up to date contact to the hospital and knowledge of its available capacities exists in France (Meyer, private communication, May 8, 2013). This relationship and interconnectivity among the French substructures is furthermore promoted as the dispatch centre and ambulance personnel are mixed and fulfil both jobs in shifts, what might be strengthening the French internal trauma care structure (Ferretti, private communication, May 8, 2013). Only the relationship between hospitals and rehabilitation institutions is not as well established in France as it is in Germany. There, a social service organises fast and adequate transferral to rehabilitation, often with the support of case managers (Mörsdorf, private communication, May 7, 2013; Pape, private communication, March 14, 2013). Again, for Luxembourg only few conclusions can be drawn due to size. However, it is known that no physicians work at the dispatch centre and some emergency physicians working in the hospital prefer to have direct contact to the ambulances instead of the dispatch centre (Ferretti, private communication, May 8, 2013; Pohl-Meuten, Schäfer et al., 2006). The internal structures within France, Germany and Luxembourg seem to differ in that aspect of their trauma care organisation widely.

Another divergent aspect of the internal trauma care structures in the three countries is the organisation of ambulances. While Germany mainly involves private ambulance services located apart from hospitals (Pape, private communication, March 14, 2013), both France and Luxembourg have a private and a public branch. The private ambulances in these two countries called ‘Protection Civil’ involve voluntary citizens who serve as first responders. Their primary job, however, usually entails other functions. The public ambulances organised by hospitals are called SAMU (Meyer, private communication, May 8, 2013; Gerich, private communication, May 8, 2013; Pohl-Meuten, Schäfer et al., 2006). In France, they get additional support from services at the fire brigade. The services often work in a rendezvous system and cooperate widely. Relationships are thus well established (Meyer, private communication, May 8, 2013). In Luxembourg, however, competition seems to prevail rather

than cooperation between SAMU and Protection Civil. This might weaken the internal structure of Luxembourg's trauma care. In Germany, cooperation has been reported to be good and the hospitals and private ambulance services also work together in a rendezvous system (Pape, private communication, March 14, 2013).

What makes the French, German and Luxembourgish trauma care structures compatible is their underlying understanding that no person should need to have a proof of their identity or insurance to enter hospitals in case they require urgent medical aid (WHO, 2008). Although this common characteristic of the internal structures provides a good basis for cooperation, the relationships within the hospitals seem to diverge among the three countries. In Luxembourg, the on call availability of emergency physicians provides less strengthened relationships than the German structure does. In Germany, also among different wards the personnel knows each other because the emergency physician teams need to be present in hospitals around the clock (Pohlemann, private communication, May 7, 2013). Information to compare these countries to France on that issue was not available.

The internal structure of the air-based emergency service in the three countries also seems not to differ widely. As helicopters can quickly reach far destinations, they could effectively be used in cross-border care and similar internal structures seem to be an advantage. In Luxembourg, only one private helicopter service offers three helicopters for the air rescue, which, however, is much for the small country. One of the three helicopters solely works internationally, so that a good basis for cross-border cooperation is offered at that stage (Luxembourg Air Rescue, 2013). In France, helicopters are nationally organised and each department has one or more available according to their size (Meyer, private communication, May 8, 2013). Strasbourg's helicopter service flies cross-border (Rth-info, 2013), while for the helicopter in Nancy this is not reported (Pohl-Meuten, Schäfer et. al, 2006). Also in Germany, air rescue is regulated rather centrally and involves many helicopters to make sure that the whole country can be timely reached (Pape, private communication, March 14, 2013). In the border region, helicopters are situated in Wittlich, Saarbrücken, Ludwigshafen, Karlsruhe, and Freiburg but they are officially not in charge across the border (ADAC-Luftrettung-GmbH, 2012).

What is already regulated and matched in terms of internal structure are the countries' joint plans and provisions in case of national crisis. Protocols and agreements are defined in that area and the internal structures all seem to fulfil the system requirements needed for

cooperation (WHO, 2008). According to Ferretti, these regulations are used in large-scale incidents and the health care provision and distribution of patients among all countries' emergency care providers works well (Ferretti, private communication, May 8, 2013).

Although huge gaps seem to exist between France and Germany, Meyer does not perceive any limitations imposed by their internal structures and health authorities. The relationship of French and German dispatch centres and the pre-hospital services between Alsace and Baden-Württemberg Meyer reports as very tight and well working, so that regular cooperation exists (Meyer, private communication, May 8, 2013). What Pohlemann outlines as an effect of the different internal structures, is that in Germany, physicians are more likely to follow new ideas even if that means they need to disregard laws or authorities. In France, he says, physicians would not have that freedom and closely stick to the rules and pathways imposed by the governmental or hospital authorities (Pohlemann, private communication, May 7, 2013). While in Luxembourg relationships within the country are perceived weak, the country's small size seems to reduce the effect its internal structure might have on compatibility with the other two countries.

7.2 Trauma Care Legislation and their Link to Cross-border Cooperation

According to the ACT, two environmental factors necessary for the trauma care systems' joint development were found most striking. The first one was the geographic proximity which has been the underlying condition of the study area and the second was the legal environment. What France, Germany and Luxembourg all have in common is the signing of the Karlsruhe convention. Thus, they all declare their readiness to cooperate across borders, to acknowledge each other's public bodies and to find common funding mechanisms based on social security schemes (Pohl-Meuten, Schäfer et al., 2006).

A shared environment for EU countries has further been facilitated by a recent enhancement of patients' rights. Based on the 2011/24/EU directive all MS are obliged to grant EU citizens treatment from October 25, 2013 independent in which MS the person lives. Emergency care, which is non-planned treatment, is clearly included except for the follow-up treatment in rehabilitation facilities, except for the need of organ transplantations and except for situations in which other persons might be endangered. This means that the regions need to treat patients

from neighbouring countries as long as they have enough capacities left for their inhabitants. However, they may refer the patient back to their home country for organ transplantation or rehabilitation if not other regulated in regional agreements. Moreover, reimbursement of cross-border treatment needs to cover only those costs the insurance would have paid for the same or comparable treatment in the patient's home country. Likewise patients might not have their full cross-border trauma care costs reimbursed if it was cheaper in their home country. A need for additional cost-reimbursement arrangements might thus be needed between the regions. To settle further agreements on cross-border health care cooperation is also an advice mentioned in the directive (European Parliament & the Council of the European Union, 2011). Additionally, for Baden-Württemberg and Alsace this promoting environment is strengthened due to the Declaration on Regionalism in Europe by the Assembly of the European Regions (Assembly of European Regions, 2013).

A promoting environment for cross-border trauma care cooperation has also been found in the countries' national and regional legislation. The French decree on emergency medicine includes the encouragement to coordinated cross-border cooperation networks (Legifrance, 2006). In Baden-Württemberg the emergency medical service law states that cross-border cooperation shall be supported as long as this increases the effectiveness of emergency services (Gesetz über den Rettungsdienst, 2010).

The environment in Rhineland-Palatinate seems less promoting from the legal point of view, as its emergency medical service law only includes some minor issues which could be related to cross-border cooperation. The strongest argument is that German and non-German ambulances have the same rights in Rhineland-Palatinate. It is furthermore mentioned that adjacent dispatch centres should offer each other support as long as they can simultaneously maintain their own territory's emergency service availability. Finally the law allows for cross-border patient transport only if a patient returns from treatment in another country or if additional agreements are made (Landesgesetz über den Rettungsdienst sowie den Notfall-und Krankentransport, 2007).

In Saarland, the 'Rettungszweckverband' has the responsibility to work out cross-border cooperation agreements which might have effects on the territory or ground-based personnel of the Saarland emergency services (Feuerwehrschule des Saarlandes, 2004). Further statements related to cross-border cooperation could not be found, thus creating a rather vague environment for cross-border care. What the three German regions have in common, the

extent of 'cross-border' is not clear as the laws do not provide a definition. Whether they restrict this word to national or federal state borders can and cannot be interpreted to include both. These laws may hence increase the likeliness of cross-border trauma care cooperation differently in the German regions, potentially depending on other factors of the ACT.

For Luxembourg, no reference to cross-border emergency care cooperation could be found in its legislation. The environment on which to develop shared trauma systems with other countries thus seems to be neutral beside the common framework of the EU legislation. However, what might be a promoting factor, there, is the small size of the country. Some emergency services might work more efficient if they were shared between Luxembourg and its surrounding countries and had thus regular practise and experience.

7.3 Existing Cross-border Cooperation in the Different Regions

The different internal structures of France and Germany could easily stimulate the development of separate rather than joint trauma care systems. On this background the 2005 conclusion of the French-German Framework agreement and the related administrative agreement by both national governments seems an unexpected, but very positive achievement in the countries' cross-border cooperation. It established the possibility for French and German regions to conclude regional cooperation agreements in the field of emergency and non-emergency patient transportation. Through the framework agreement the recognition of both countries' emergency services personnel and the facilitation to operate in each other's territories are ensured, just as they address the liability issue. With the foundation of a shared commission it further promotes the constant evaluation and strengthening of the cooperation between both countries. In line with the Patients' Rights Directive, cross-border treatment shall be reimbursed by each country's social security system. Exact regulations on reimbursement, however, are left to agreements between the regions (Bundesgesetzblatt, 2006). The administrative agreement further adds that communication, availability and liability should be covered through the regional agreements for both dispatch centres and pre-hospital services (Deutsch-französische Zusammenarbeit, n.d./2013).

According to the ACT's factor of 'emergence', system developments occur slowly and a modification in one aspect usually implies changes in other parts of the system (Manson, 2000). Indeed, in 2009 Baden-Württemberg and Alsace signed the 'Agreement on cross-border cooperation in the area of emergency services in Alsace and Baden-Württemberg' and the 'Additional agreement between the director of the URCAM Alsace and the regions councils of Karlsruhe and Freiburg and the financial arrangements of the agreement on cross-border cooperation in the area of emergency services in Alsace and Baden-Württemberg from 10th February, 2009' in response to the French-German framework and administrative agreement (Agence Régionale de Santé Lorraine, n.d. a/2013). Additionally, through the Oberrheinkonferenz expert committee on cross-border health care provision, emergency care in the whole Oberrheinkonferenz is further developed and financial, judicial, technical and functional questions can be addressed and answered (Fischbach, 2012). The cooperation, however, seems to be mainly used by Germans treated in France in the area of Strasbourg. There, also the French helicopter operates in Germany (Meyer, private communication, May 8, 2013). Whether the situation differs in the southern border area could not be found.

The emergence of regional agreements based on the framework and administrative agreement between France and Germany can also be observed between Rhineland-Palatinate and Alsace. In 2009 they agreed on the 'Agreement on cross-border cooperation in the area of emergency services in Alsace and Rhineland-Palatinate'. Additionally to requirements of the framework and administrative agreement, joint advanced education and training of the personnel is recommended to increase functionality of the cross-border cooperation. Furthermore, the agreement claims that the joint commission shall develop operational protocols, recognise and manage the education and the quality of both countries' personnel, develop strategy plans and predefine the equipment used (Agence Régionale de Santé, n.d. b/2013). In this region, the framework agreement thus resulted in a fast development of further operation plans for the joint trauma care system, which is in line with the 'emergence' factor of the ACT. Financial reimbursement, however, is not part of the agreement and might need further attention according to the rules set out in the Patients' Rights Directive.

According to the 'change and evolution' concept defined in the ACT, also arrangements independent from France's and Germany's framework agreement could be found. The agreement between Saarland, Rhineland-Palatinate, Lorraine and Luxembourg on the treatment of most severely injured burn patients is a good example for this. As not all trauma hospitals have their own burn departments, a common destination for severe burn patients

increased cooperation and trauma care efficiency (Krumm, 2009). Beyond that the German cities of Mainz and Wittlich in Rhineland-Palatinate and Saarbrücken in Saarland, the French city of Nancy in Lorraine and Luxembourg cooperate in helicopter emergency services (Krumm, 2009) The Luxembourgish helicopter 'Air Rescue 3' became responsible to fly cross-border only, resulting in regular cross-border cooperation (Luxembourg Air Rescue, 2013).

Furthermore, the working group 'health' of the regional commission Saar-Lor-Lux-Rhineland-Palatinate-Wallonie has been set up in 2006, already before the regional agreements between France and Germany had been established. Emergency care and services is one of the working group's responsibilities (Krumm, 2009). More small-scale is the extent of an agreement between the French city of Wissembourg and the German ambulance station Bad Bergzabern in Rhineland-Palatinate to work together during nights. At this local level, all involved stakeholders have agreed to the cooperation already before the French-German framework agreement existed. German standards and protocols are used during the cooperation and even the health care insurance tolerates and reimburses the joint emergency service (Pohl-Meuten, Schäfer et al, 2006). This makes very clear how on a small scale 'self-organisation' in terms of the ACT took place, while in other agreements 'change and evolution' appeared to depend on former developments which is suggested by the theory's factor 'emergence'.

Beyond the above cross-border arrangements which include Saarland and Luxembourg, also the German initiatives TraumaNetzwerk® and TraumaRegister^{QM} involve hospitals on both sides of their shared border since 2009. Physicians in Saarland perceived the existing cooperation of Luxembourg and Saarland to be strong (Mörsdorf, private communication, May 7, 2013; Pohlemann, private communication, May 7, 2013). However, the experience in the Luxembourgish hospital that is not part of the TNW seems to differ. There, cooperation is related to helicopter rescue and non-urgent patient transportation, only. Furthermore, trauma seemed not to be a central issue of the emergency care cooperation in Luxembourg (Ferretti, private communication, May 8, 2013). More cooperation efforts outside the DGU initiative might thus be needed between Luxembourg and Saarland, as joint system evolution could not be observed beyond burn patient and helicopter cooperation, there.

In Saarland and France, based on the French-German framework and administrative agreement, the '11th June, 2008, cooperation agreement on cross-border emergency services

between Lorraine (Agence Régionale d'Hospitalisation Lorrain) and Saarland (Ministry of the Interiorand Sports)' emerged. Joint advanced education and training are explicitly included in the agreement. The coordination responsibility shall be shared among a steering group and an expert committee, which fulfil the same functions like the expert committee in Rhineland-Palatinate and Alsace. Also like in Rhineland-Palatinate and Alsace, not a part of the agreement between Lorraine and Saarland is the issue of funding.

Furthermore, Saarland and Lorraine are also part of the burn patient cooperation. Independent from the framework and administrative agreement, cooperation is promoted by the working group 'health' in the Saar-Lor-Lux-Rhineland-Palatinate-Walonie region (Krumm, 2009). According to the experience of physicians in the field of trauma care in this region, practically cooperation between Saarland and France, however, seems difficult most times (Mörsdorf, private communication, May 7, 2013; Pohlemann, private communication, May 7, 2013).

Beside these agreements, it has been found that Saarland and Rhineland-Palatinate are both very demonstrative examples for dissipative transition when quality and efficiency could be improved (Gerich, private communication, May 8, 2013). It seems to be common practice to seek support in the neighbouring country only if the own health provision and capacities are felt insufficient (Zentrum für europäischen Verbraucherschutz, 2013). For Baden-Württemberg, the situation has been reported to resemble this dissipative form of evolution (Meyer, private communication, May 8, 2013). Thus, it seems that all regions well responded to their rather promoting environment provided by the existing legislation and adopted cooperation agreements, but they make only limited use of those in practice.

7.4 Hindering and Promoting Factors for Cross-border Trauma Care Cooperation

During the study, stakeholders' experiences from the trauma care sector, as well as their opinion on hindering and promoting factors for the establishment and maintenance of cross-border trauma care cooperation have been collected. These have been outlined in order to understand the opportunities for future cross-border cooperation and as to find out how to improve collaborations by applying the ACT's 'learning and memory' factor.

What has been regarded a hindering factor that should get more attention is political commitment. Beyond the underlying internal structures of countries, also their executive authorities and their readiness to overcome existing barriers seem to have an influence on cross-border cooperation. In France, this factor is of particular significance. There, stakeholders easily face both, problems due to their internal structure and their executive powers (Pohlemann, private communication, May 7, 2013; Meyer, private communication, May 8, 2013). Therefore, Brink, who gained cross-border experiences in the EMR, recommends the establishment of cross-border trauma care networks by the use of a bottom-up approach. In his view, the professionals working in the trauma care hospitals are a good start to promote and extend the idea of such a network across countries and to remove first obstacles, such as funding. Otherwise, he says, political pathways might take too much time and decisions might not always suit the existing needs which emergency services experience. Instead, he suggests the presentation of a ready-made concept to governments, which do not have the possibility to reject it as long as it can improve patient care (Brink, private communication, February 28, 2013) Pohlemann in Homburg agrees that politicians need to be hinted towards the exiting gaps in trauma care quality along national borders. Furthermore, he suggests that a good strategy to raise governmental awareness could also point towards the car industry. Germany is one of the leading export countries and could thus be made responsible for road traffic mortality, so that it should also play a part in trauma care (Pohlemann, private communication, May 7, 2013). According to Gerich, however, the EU involvement might not be needed at all or only for financial contributions, as in Luxembourg, for instance, agreement by the health ministry is the only consent needed (Gerich, private communication, May 8, 2013). On the other hand, in the EMR, EU involvement is perceived useful as MS might rather stick to and trust in EU obligations than small-scale agreements (Jansen, private communication, March 19, 2013).

An obstacle to cross-border trauma care which should be learned from was also found to exist between France and Germany when the cooperation did not result in financial gain or when stakeholders even needed to put own money into the cooperation efforts. Cost saving strategies on governmental level could also lower the priority for cross-border cooperation (Zentrum für europäischen Verbraucherschutz, 2013). If the health insurance did not want to reimburse cross-border treatment, this could become a problem in the EMR in the past (Pape, private communication, March 14, 2013). However, due to the new Patients' Rights Directive this problem should be reduced or ideally abolished. Only where emergency services are paid

by taxes rather than by social security systems, a solution for funding cross-border trauma care might still be needed (Brink, private communication, February 28, 2013).

Lacking transparency and awareness often seem to be the reason for why emergency services in two countries do not work together. If contact persons, complaint bodies and health insurance arrangements are not known, this affects the readiness to cooperate on both sides of the border (Zentrum für europäischen Verbraucherschutz, 2013; Jansen, private communication, March 19, 2013). This problem has been reported for French patients who should be transferred from Germany to France for their remaining treatment or vice versa (Meyer, private communication, May 8, 2013; Mörsdorf, private communication, May 7, 2013). In general, Pape promotes the clarification of reimbursement regulations in the course of the BTCCE-project. From his experiences in the EMR, he learned that agreements with the health insurance might be hard to reach. It could thus be easier to first aim for approval on EU level and afterwards impose measures on the insurance. His suggestions to increase reimbursement transparency include the development of a uniform accounting system and the use of a European form sheet (Pape, private communication, March 14, 2013).

A hindering factor which has been reported in all regions is communication. Between France and Germany, language largely hampers communication. On the one hand, inhabitants living along the border were sometimes not able to communicate in a common language, on the other hand, however, French people were reported to often not speak German even if they could (Brink, private communication, February 28, 2013; Meyer, private communication, May 8, 2013; Pape, private communication, March 14, 2013; Pohlemann, private communication, May 7, 2013; Jansen, private communication, March 19, 2013). This creates difficulties between patients and emergency care providers, but also among providers from different countries and levels (Zentrum für europäischen Verbraucherschutz, 2013; Brink, private communication, February 28, 2013) Nevertheless, cross-border regions could learn from the example of Strasbourg, where often English is used as the preferred language. In addition, liaison officers who work at the police perfectly speak both French and German and can bridge communicative bottlenecks (Meyer, private communication, May 8, 2013). Another mean to avoid miscommunication based on language could be the use of standardised treatment regimes and cooperation procedures by the emergency services' personnel. Even if the service providers not all have a good level of one common language, the need for discussion might be minimised by such use and much further communication would not be needed (Ferretti, private communication, May 8, 2013). Regions could learn from countries

such as Germany, where ATLS is already used for standardisation (Pape, private communication, March 14, 2013)

If the language barrier could be overcome, still technical discrepancies might hinder the communication between two countries because the emergency services use different radio frequencies (Pohl-Meuten, Schäfer et al., 2006; Jansen, private communication, March 19, 2013; Pohlemann, private communication, May 7, 2013). This is of particular importance when a foreign helicopter tries to land in another country and needs to communicate with the police for their guidance. However, in Saarland this problem has currently led to improvement efforts and also in other regions the determination of one mutual radio frequency could remove that problem (Mörsdorf, private communication, May 7, 2013).

Communicating awareness was a factor mentioned in the EMR in a row of possible obstacles for cross-border trauma care cooperation. It was criticised that often two countries' personnel does not know whom to turn to across the border and how they could get in contact to demand or offer help. Trustfulness and familiarity in each other's quality can thus not be established, as well (Brink, private communication, February 28, 2013; Pape, private communication, March 14, 2013). An easy solution to this would be the promotion of personal contacts, so that stakeholders in the field of trauma care get to know each other and each other's trauma care organisation (Brink, private communication, February 28, 2013; Pohlemann, private communication, May 7, 2013). This could be achieved by providing joint advanced education and training events (Pape, private communication, March 14, 2013). Furthermore, in Saarland physicians learned that for some countries such efforts might need to be more pressing than for others. France is considered a country where intense work is needed, what might be due to the fact that France is not used to collaborate with other countries in certain fields (Pohlemann, private communication, May 7, 2013).

What other regions could furthermore learn from the EMR is the attention attached to culture. In Brink's perception, not only the difference in internal structures of the countries' health care systems are an important factor, but also the culturally grounded confidence that the own quality and efficiency of that system is much better or worse than in other countries. If this belief existed throughout a whole country or region, the trauma care providers were seized less open-minded to share their knowledge or compare themselves to other countries. Even more, a lack of respect towards other countries or towards providers at the same level of the trauma care chain was reported. To tackle this issue, emergency care providers of all levels

should preferably be involved in the cooperation establishment and strengthening (Brink, private communication, February 28, 2013). The different demands for physicians' operational freedoms in France and Germany, which have been reported in Saarland, could also be embedded in the countries' cultures (Pohlemann, private communication, May 7, 2013).

A lack of motivation to cooperate across borders could also insist simply because the idea to cooperate did not come up (Zentrum für europäischen Verbraucherschutz, 2013). If the idea existed the administrative and organisational burden, such as the certification process of the TNW, discouraged a number of stakeholders to cooperate as reported in Saarland (Mörsdorf, private communication, May 7, 2013). Between France and Germany, the workload but also the lack of control over cross-border patient flows was reported to create fear among stakeholders (Zentrum für europäischen Verbraucherschutz, 2013). In Saarland, Mörsdorf memorised that the French interest and involvement in cross-border cooperation first were present, but after a while slowly disappeared (Mörsdorf, private communication, May 7, 2013). More constant efforts and actions to remove doubts might thus be needed, there.

What also restrains stakeholders to cooperate in trauma care across national borders is the competitive character of health care in some regions or countries (Zentrum für europäischen Verbraucherschutz, 2013; Gerich, private communication, May 8, 2013). Experiences in the EMR showed that in regions where an over-supply of health care providers can be found, ambulances, physicians or whole hospitals might not like the idea to pass on patients, even if they could be treated better or faster somewhere else. This might also be the case in for-profit hospitals (Brink, private communication, February 28, 2013). If you compare countries, Germany has been found to show higher competitive behaviour than France (Zentrum für europäischen Verbraucherschutz, 2013). In Luxembourg, all physicians work privately so that this obstacle prevails there, as well (Gerich, private communication, May 8, 2013).

Finally, geographic or infrastructural factors might shape the needs and standards of emergency services in a region. Rural or mountainous areas, just as forests, densely populated cities and heavy trafficked roads are such factors which require special attention (Pohlemann, private communication, May 7, 2013). Additionally, 150,000 commuters travel to Luxembourg every day and should be accounted in the planning of resources, as well (Gerich, private communication, May 8, 2013). The road infrastructure was also reported to cause problems at the French-German border in Saarland, because German ambulances do not have

a vignette that lets them automatically pass the French electronic toll stations installed on highways (Mörsdorf, private communication, May 7, 2013). Also the need for cross-border treatment is different when many trauma hospitals are available in the one country's border region, but across the border in the other country the next hospital is located farer away (Meyer, private communication, May 8, 2013) or very limited trauma care services are available (Jansen, private communication, March 19, 2013). The motivation to cooperate is usually unequal in both countries in such situations. If both countries' bordering regions are very rural, the willingness to cooperate is commonly more equivalent (Zentrum für europäischen Verbraucherschutz, 2013; Meyer, private communication, May 8, 2013).

What might have increased impact on cross-border cooperation in the near future is the innovation in trauma care due to telemedicine. When a physician's advice is needed, telecommunication devices can be used over far distances and also across borders. They could be useful between two hospitals or between the pre-hospital and hospital sector to clarify whether an additional surgeon or transferral is needed (Pohlemann, private communication, May 7, 2013). Likewise, such devices should more be used in the future than they are now (Meyer, private communication, May 8, 2013).

8 Conclusion

In the bordering regions of France, Luxembourg, Baden-Württemberg, Rhineland-Palatinate and Saarland, everywhere some form of trauma care cooperation exists. How intense the cooperation appears and which trauma care chain levels are included differs, just as the starting points of cooperation in the regions differ. Some cooperation developments emerged on the basis of previously existing agreements, while other initiatives occurred independently. Part of the extent to which cooperation takes place in the regions could be explained by regional, national or international law. On regional and national level, it did not promote cooperation everywhere similarly. However, the newly implemented EU Patients' Rights Directive provides a harmonised legal basis, which should ideally lead to increased cooperation in the near future. Another impact on cooperation efforts might have the health and trauma care organisation in the different countries and regions. If their underlying structures and operational arrangements differ too widely, joint regulations for their trauma care operation are hard to reach.

Additional factors which might influence cooperation developments were identified. Lacking political commitment, often due to financial reasons, can prevent joint trauma care development between two regions. Other financial discrepancies, particularly in cost reimbursement might have similar effects. Not necessarily, but very likely competitive behaviour results from financial self-interest, as well, and hinders cooperation between the emergency services of two regions or countries. Furthermore, cross-border regulations lead to cooperative action only if they are transparent and only if awareness among stakeholders and services in the emergency care sector is raised. If that is ensured, still communication by means of technical equipment, language, respect and familiarity among both countries' personnel needs to be achieved so that the cooperation can function well. Cultural barriers might also cause problems in the willingness and ability of trauma care services to cooperate. Finally, the commitment to cooperate differs according to factors of geography and infrastructure and their resulting population needs in the different regions.

What should be mentioned is that many hindering factors have been overcome in the different regions, already, while differences and similarities of these factors for all border regions could be found. The identified factors seem to have only a limited impact on joint system development. Although they all seem to determine how the development is approached they do not necessarily fully hinder or promote cooperation establishments. Rather likely, they

only influence how fast system changes occur and which stakeholders commit themselves to develop joint or harmonised systems. Thus, the existence of some prerequisites within these factors might be sufficient for the establishment of a European trauma care network, in which cooperation across borders can be established and practised every day. The EU Patients' Rights Directive might be one such factor as soon as it will be fully implemented in all countries and thus simplifies and stimulates cooperation efforts.

8.1 Recommendation

The EU Patients' Rights Directive has been identified as one factor which might promote future cooperation in the regions and should be fully implemented in all EU countries, soon. Nevertheless, additionally recommended action to increase cross-border cooperation in trauma care has been derived from this study.

First, it has been found that the German federal medical aid laws leave much room for interpretation of whether 'cross-border' refers only to German federal state borders or national borders, as well. This interpretability could become the basis for further cooperation agreements with Luxembourg and France if used appropriately. Furthermore, the national trauma care organisational structures might become more harmonised if a best practice exchange is stimulated and the interconnectivity and collaboration examples of trauma care services in Germany and France could be transferred to other countries.

Additionally, international standards and operation procedures like ATLS might be introduced in all countries. This might increase efficiency within the countries' trauma care, but also make systems more compatible and transparent for cooperation efforts. Compatibility and transparency also refer to the fact that cross-border trauma care reimbursement still needs consideration in the near future. At the same time, the existence of current cooperation agreements and the possibility to improve efficiency should become more publicly known. If awareness was raised, political, as well as emergency service providers' readiness to cooperate could be increased. As has been suggested by physicians working in trauma hospitals, this should be approached bottom-up, so as to achieve full EU support. To reach this aim, the involvement of further stakeholders of other regions and trauma care levels should be taken in a next step. Furthermore, countries which are politically or culturally little open to cross-border cooperation should be offered particular attention.

Communication barriers should be addressed on all levels outlined as hindering cross-border cooperation. Harmonised technical equipment could remove obstacles, just as joint advanced training and education could limit personal communication problems. Furthermore, the development of operational protocols and standards could limit the need for communication, so that different languages no longer create problems between two countries. An innovation which could be used in cross-border cooperation are telecommunication devices. Saarland could be the forerunner, here, as it already developed a telecommunication tool in accordance with data protection regulations.

Beside these recommendations, best practices from other cross-border regions might be taken into account, as the BTCCE project aims towards the establishment of an EU-wide trauma care network. However, these experiences and best practices might also be useful on a smaller scale in the study regions. In general, the fact that many barriers could be removed in the past suggests that the aim of developping a cross-border trauma care network seems realistic.

8.2 Limitations of the study

An obstacle to the study was the limited availability of interviewees. Including new partners for the interviews was impossible within the limited study time, so that no interviewee from Baden-Württemberg or Rhineland-Palatinate participated. Therefore, this study could not provide personal insights beyond what has been found in public literature and policy texts for the two regions. Also for the other regions, a larger number of interviewees might have added information and could have made the study more objective.

A second limitation is the short study duration. The BTCCE project is planned to operate at least until the year 2015, so that this study does not represent all data of the project. It only outlines the findings of the investigation phase in the southern part of the project area and is mostly related to the hospital level of trauma care. Further studies should cover all project regions and trauma care levels and be terminated after the project's completion.

Furthermore, only limited literature on the topic of cross-border trauma care and on the regions of interest was found. Neither the literature, nor the found policies and laws are claimed to present a complete set of data.

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Appendix

Fundamental questions to cross border trauma care cooperation (general questionnaire to all project partners)

1. Is there an agreement on cross-border trauma care cooperation in your region?

2. On which levels of the trauma care chain does cooperation take place across borders?

    a. What does the referral process from hospital care to rehabilitation look like?

3. How did it come to this cooperation?

    a. Which authorities are responsible for the creation of existing and future collaborations
        i. in your region
        ii. national level
        iii. at EU level?

4. What is the legal basis of trauma care regulation in your region? Can you find aspects of cross border cooperation in these legalities?

5. What has been your experience with cross-border trauma care operations?

6. Are there uniform protocols or systems in place in order to improve the quality of trauma care?

        i. in general

        ii. in operations from the emergency services of the BRD with the neighboring country

        iii. in operations of the emergency services of the neighboring country with the BRD

7. How often do cross-border operations take place in your region?

8. How are these operations financed?

9. What could be a disadvantage of cross-border cooperation in the field of trauma care?

10. What barriers exist for cross-border cooperation in the field of trauma care?

    a. Are there difficulties in communication between

        i. Countries?
        ii. different levels of the care chain?

11. What opportunities could promote the development of cross-border cooperation of trauma care in your opinion?

12. Could you imagine your region being part of a Europe-wide network of trauma care?

13. Would you be interested in the development of a Europe-wide trauma network in the future?

        i. (to improve quality through best practice exchange and uniform/standardised (quality) standards)

14. What was your motivation to participate in the BTCCE-project?

15. Did you read the BTCCE project plan? Do you have any questions or remarks concerning the project plan?

16. Which institutions do you think should we involve in the project?

17. Could you provide us with material or literature on the subject?

Finally, do you have any other suggestions and recommendations on the subject of "cross-border medical assistance". We are also grateful for constructive criticism of this questionnaire, perhaps we have overlooked an important aspect.