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Department of Health Care and Population Protection

Paramedics´ Competencies Comparison in the European Union

Bachelor Thesis

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Study branch: Paramedic

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Comparison of paramedics' Competencies in the European Union

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Comparison of paramedics' Competencies in the European Union

Guidelines:

The focus of this bachelor thesis is a comparison between competencies given to paramedics across the European Union. The theoretical part will describe paramedics' competencies in individual states of the European Union, which can differ due to varying educational systems. The thesis will also describe the structure of pre-hospital care systems in the countries of the European Union. The practical part of the thesis will be focused on comparing paramedics' competencies and the methods of pre-hospital care in individual countries of the EU, with a possible implementation in the Czech healthcare system.

Bibliography / sources:

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In Kladno 2021

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Štěpán Kolář

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ABSTRACT

The focus of this bachelor thesis is a comparison between competencies given to paramedics across the European Union. In theoretical part I describe a structure of prehospital system in individual bigger states of European Union. It also states what education is required to work in ambulances for the emergency rescue services. Practical part of bachelor thesis is focused on comparison of paramedics' competencies and their necessary education. Several tables are included, which provide a summary of the competencies of selected countries for easier understanding and comparison. In the last part of the bachelor thesis are comparative graphs, for a better and more comprehensive overview. This part of thesis also contains an explanation of some of the differences in the functioning of the pre-hospital system with possible implementation for the Czech healthcare system.

Keywords

paramedic, paramedics competencies, structure of pre-hospital treatment in the European Union, conditions for work of paramedic in the European Union

ABSTRAKT

Bakalářská práce se zaměřuje na srovnání kompetencí záchranářů v Evropské Unii. V teoretické části je popsaná struktura přednemocničního systému jednotlivých větších států Evropské unie. Rovněž je zde uvedeno, jaké vzdělání je nutné pro práci v sanitkách pro záchranné služby. Praktická část bakalářské práce je zaměřena na srovnání kompetencí zdravotníků a jejich potřebného vzdělání. Zahrnuto je několik tabulek, které poskytují shrnutí kompetencí vybraných zemí pro snazší porozumění a porovnání. V poslední části bakalářské práce jsou komparativní grafy pro lepší komplexnější přehled. Tato část práce také obsahuje vysvětlení některých rozdílů ve fungování přednemocničního systému s možnou implementací pro české zdravotnictví.

Klíčová slova

záchranář, kompetence záchranářů, struktura přednemocniční léčby v Evropské Unii, podmínky pro práci zdravotnických záchranářů v Evropské Unii

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1 Introduction

Paramedics competencies in the European Union are different in all countries. It is caused mostly by their educational system for paramedics whose length of study corresponds to conferred competencies. Other factor is also different history of the countries. In this bachelor is summarized emergency medical crew structure, paramedics competencies and necessary education for paramedics in selected countries of the European Union. I chose this topic, because it has not been processed until now, there is no summary of paramedics' competencies. From this reason I create charts, which contains information about competence to administer drugs, competencies to do some performance and necessary education for paramedics.

2 Aims

The main aim of this bachelor thesis is to compare paramedics' competencies in selected EU countries. To Achieve that, will be created a table, which contains information about the competencies in individual tasks, what paramedic can perform. The goal is to point out the different competencies of paramedics in the EU countries with different structures of the rescue service with the subsequent of a possible implementation for the Czech Republic. The focus is not only for comparison competencies, but also on evaluation of advantages and disadvantages of a wide range of competencies.

3 Current Situation in EU countries

There are exactly 27 countries in the European Union. For better clarity, it is necessary to divide these states into several groups. There are several options for division, but for this work it seems most advantageous to use geographical division. From a geographical point of view, Europe can be divided into 5 groups: Central, Southeast, Southern, Western and Northern. Central European countries include the Czech Republic, the Slovak Republic, Poland, Germany, Austria and Hungary. Southeast European countries include Romania, Bulgaria, Croatia, Slovenia. Southern European countries include Greece, Cyprus, Malta, Italy, Spain, Portugal. Eastern European countries include France, countries of BENELUX (Belgium, Netherlands, Luxembourg) and Ireland. Northern European countries include Denmark, Sweden, Finland, Latvia, Estonia, and Lithuania. In this will be explained explain prehospital system of EU countries, which have population over 4,5 million, because the processing of all EU countries would exceed the scope of the bachelor's thesis and it would not be possible to sufficiently describe and explain prehospital systems and it is not possible to sufficiently describe and explain prehospital systems in abbreviated form.

3.1 Czech Republic

The paramedic in the Czech Republic is called *zdravotnický záchranář*. First emergency medical treatment institutions were founded in the second half of 60's. Air medical service in the Czech Republic works from 1987 (Šín, Štourač, Vidunová, 2019).

3.1.1 Necessary Education

Section 18 of the Act No. 96 / 2004 Sb. about conditions of acquisition qualification to exercise non-medical health care profession says, that vocational competencies for the work of paramedic's can be reached by completion:

- accredited medical bachelor's study field for the training of paramedics
- three years or more of study on vocational school (which is superstructure for secondary school) in field a certified paramedic, if the study of first grade was launched no later than in school year 2018/2019
- secondary school in field of paramedics, if the study of first grade was launched no later than in school year 1998/1999
- vocational competencies for the work of paramedic's can be also reached by nurses with specialization for intensive care, who were members of the emergency medical crew for at least 5 years (Czech Republic, Act. No. 96 / 2004 Sb.)

In general it means, that if someone would like to become a paramedic in Czech Republic nowadays, he has only one choice – to go to study university, specifically bachelor's study for paramedics, which lasts 3 years.

There is an opportunity to sign up for a specialization course in Emergency Medicine after three years of full-time practice. The course lasts a total of 652 hours. (Zdravotnický záchranář pro urgentní medicínu, 2018)

3.1.2 Emergency Medical Service Crew Structure

There are 4 types of crews in the Czech Republic:

- **RZP** (*Rychlá zdravotnická pomoc*) is the most used ambulance car. The crew is made up of two people. There are two paramedics, or a paramedic and a driver who has completed a credited qualification for ambulance drivers.
- **RLP** (*Rychlá lékařská pomoc*) represents a crew of three members. A paramedic, a driver with completed credited qualification for ambulance drivers and a doctor with an attestation from anaesthesiology, surgery, internal medicine, general medicine, paediatrics, resuscitation, or emergency medicine.
- **RV** (*Rendez-Vous system*) means a car with a doctor and a paramedic. This car has no space for patients, so it's always necessary to cooperate with another vehicle or helicopter to be able to transport the patient to the hospital.
- **LZS** (*Letecká záchranná služba*) represents air medical rescue. There is a pilot (one or two), a doctor and a paramedic on board (Šín, Štourač, Vidunová, 2019).

3.2 Slovak Republic

A paramedic in the Slovak Republic is called *zdravotnícky záchranár*. The beginning of emergency medical treatment institutions is the same like in the Czech Republic because the Slovak and the Czech Republic was one country until 1993.

3.2.1 Necessary Education

Necessary education for the work of *zdravotnícky záchranár* is very similar to necessary education in the Czech Republic. In 1998 the Czech Republic cancelled the option to study the secondary school for paramedics, and in 2018 the option to study at vocational school for certified paramedics was cancelled too. Slovak Republic also quit option to become a paramedic just from secondary school and the only way to become a paramedic is to study and get a bachelor title on university (which lasts 3 or 4 years), or to study vocational school (Slovak Republic, Act No. 578/2004).

3.2.2 Emergency Medical Service Crew Structure

Emergency medical service crew structure in the Slovak Republic is very similar to Czech Republic. There are four types:

- **RZP** (*Rýchla zdravotná pomoc*) is the most used ambulance car. There are two paramedics or a paramedic and a driver with credited qualification course.
- **RLP** (*Rýchla lekárska pomoc*) has two paramedics and, also a doctor. One of those paramedics can be replaced by a driver.
- **MIJ** (*Mobilná intenzívna jednotka*) is a mobile intensive care unit, and it consists of two persons, a paramedic, and a doctor with specialization from anaesthesiology and emergency medicine with at least three years of experience.
- **VZZS** *(Vrtuľníková záchranná zdravotná služba)* is an air medical rescue. There is a doctor, a paramedic, and a pilot on board (Slovak Republic, Decree No. 287/2005).

3.3 Poland

A paramedic in Poland is called *ratownik medyczny*. Emergency medical treatment was led by the Polish Red Cross until 1948 – 1951, then it was run by the state (Abramek, 2001).

Air medical service has been operating in Poland since 1975, but it did not acquire its current form until 2000 (History of Polish Medical Air Rescue, 2020).

3.3.1 Necessary Education

Necessary education is very similar to Czech Republic, from this reason Czech students have possibility to use the program Erasmus and study one semester there. Act no 191-1410/2006 says, that for the job of a paramedic it is necessary to meet the following requirements:

- To graduate on accredited medical bachelor's study for paramedics
- To graduate on a vocational school (same length as bachelor's study) (Poland, Act No. 191-1410/2006)

3.3.2 Emergency Medical Service Crew Structure

There are 3 types in Poland, if we do not count a veterinary and transport ambulances:

- **P type ambulance** *(podstawowe)* is the basic most used ambulance car. It mostly consists of a crew of two paramedics. If the paramedics are not allowed to drive an ambulance, the crew may be composed of three members (two paramedics and a driver).

- **S type ambulance** *(specjalistyczne)* is a specialized ambulance car with a doctor and two paramedics. In the past it was also called R type due to frequent interventions on resuscitation (Poland, Act No. 191-1410/2006).
- **N type ambulance** *(neonatologiczne)* is a neonatological vehicle which serve as transport for new-born babies and infants up to one year of age (Jakie są rodzaje karetek w Polsce, 2019).
- **LPR** *(Lotnicze Pogotowie Ratunkowe)* represents the air medical rescue. There is a paramedic or a nurse, a doctor, and one or two pilots on board (Medical air transport team characteristic, 2020).

3.4 Germany

Prehospital treatment in Germany started around 1891 in Hamburg. In 1983 the first legal norms came into force. They regulated the activities of the pre-hospital care providers (Braunschmidt, 2019). The air rescue service in Germany has been working from 1970 (50 Jahre Luftrettung, 2020).

3.4.1 Necessary Education

In Germany, schools for paramedics (called *Notfallsanitaeter)* last three years from 2014. Before year 2014 the professional training of paramedics lasted just two years. Paramedics, who completed their education before 2014 had to add the third year of education, or (if they have worked on an ambulance for 5 or more years) they can just pass the final exam without one year of study. They must accomplish both until 2021 (Germany, Act about profession of paramedic from 22.5.2013).

There is also a job called *Rettungssanitäter* in Germany. Content of this work is very similar to an average Emergency medical technician. *Rettungssanitäters* have

lower competencies, than *Notfallsanitaeter,* due to shorter qualifying course which last just 3 months (Ausbildung Rettungssanitäter, 2021).

3.4.2 Emergency Medical Service Crew Structure

Germany consists of 16 states. Emergency medical service crew structure may differ in some of them. Among the most used types of ambulance vehicles are:

- **RTW** *(Rettungswagen)* is the most common type of an ambulance car. A crew consists of two paramedics or a paramedic with a driver, who has finished certified course.
- **NAW** *(Notarztwagen)* is an ambulance car with two paramedics and a doctor. One of the paramedics may be replaced by a driver.
- **NEF** *(Notarzt-Einsatz-Fahrzeug)* is a SUV-vehicle with a doctor and a paramedic. There is no place for patients, so this car uses Rendez-Vous system (it meets RTW at the place of intervention, TRW then transports the patient to the hospital.)
- **ITW** *(Intensiv-Transport-Wagen)* is a car for the transport of patients from ICU to other hospital. The car is big enough for a regular hospital bed. There is a paramedic and a driver, rest of the crew can be made staff from the hospital, depending on patient's condition (Germany, Act No. 2120-3).
- **RTH** (*Rettungshubschrauber)* represents the air medical service. There is a doctor, a pilot, and a paramedic on board (Unsere crew, 2020).

Among the little-used types of vehicles, we can also include rescue motorcycles (*Notarzt-einsatz-motorrad* in German) driven by doctors (CDU will Notärzte auf Motorrädern, 2016).

3.5 Austria

The development of healthcare took place during the reign of Maria Theresa. The rescue service began in 1811 after several hundred people died in a large fire due to the absence of ambulances. In 1897, the first rescue school was established in Vienna (Andreaus, 2009).

Austria was the first country in EU, which began to use motorcycle to provide the first aid. Motorcycles have been in operation here since 1981 (Geschichte des ÖRD, 2021).

3.5.1 Necessary Education

In Austria we can divide non-medical healthcare employers, which work in ambulances on *Rettungssanitäter* and *Notfallsanitaeter*. The difference between these professions is in the length of study and in their competencies. For the job of *Rettungssanitäter* it is necessary to finish a course which last 260 hours (100 hours of theory and 160 hours of practice). Abbreviated training course can be given to medical students, people trained as nursing assistants and people with a degree in nursing (Austria, Act on the education, activities, and occupation of health professionals).

Notfallsanitaeter is taken as an extension of the job *Rettungssanitäter*, therefore, to start training as *Notfallsanitaeter* one must have completed a course for *Rettungssanitäter.* The training itself lasts 480 hours. After the training there are two courses to extend competencies: the Course Drug Science, which lasts 40 hours and the Course Vein Access and Infusion, which last 50 hours. After those courses and at least 500 hours of work as member of emergency team, there is an option to complete the Ventilation and Intubation specialization, which lasts

110 hours (Austria, Act on the education, activities, and occupation of health professionals).

3.5.2 Emergency Medical Service Crew Structure

Emergency medical crew structure in Austria is very similar to Germany. In Austria vehicles KTW, RTW, NAW and NEF are used. Their crew is the same like in Germany. The RTH (air medical service) is also used (Austria, Regulation of the General Rescue Service). One of the Austrian ambulances can be seen in attachment No. 2.

3.6 Hungary

The beginning of emergency medical treatment dates to the second half of 19th century. Originally there was only voluntary service operating in Budapest. Individual regional centres were established in 1960's. Thanks to the regional centres, emergency medical treatment was more efficient. From those years emergency began to develop rapidly, and it was developing until 2005, when each from the 7 regional emergency systems took responsibility for their own region (Hungarian rescue history, 2021).

3.6.1 Necessary Education

There are two different position for the work of paramedic in Hungary, which vary in competencies, duration, and difficulty of study. They are:

- ***Mentőápol*** *Mentőápol* has lower competencies. It is synonym to Emergency medical technician (EMT). It is necessary to study two years of a vocational school for the work of EMT.

- ***Mentőtiszt*** You have to study university (three or four years) to get a bachelor title and become *mentőtiszt*. As a *mentőtiszt* you have bigger competencies (Hungary, Decree No. 5/2006).

3.6.2 Emergency Medical Service Crew Structure

There are many types of crews in Hungary. The most used are:

- **MGK** (*Mentőgépkocsi)* Its ambulance car with crew is made of a driver and *mentőápol*. This vehicle does not have big amount of rescuing equipment due to low competencies of the crew. It is used for transport of patients between hospitals and for interventions when the patient has stable vital function.
- ***Esetkcosci*** is a vehicle with three-members crew. A paramedic (*mentőtiszt)* or a doctor (it is more likely that there will be a paramedic), EMT (*mentőápol)* and a driver. This vehicle is used for interventions of patients, who have endangered vital functions.
- ***Rohamkocsi*** (ROKO) has always a doctor on board. The rest of crew is made of *mentőápol* and a driver. ROKO is sent resuscitations and other interventions with the highest priority (see attachment No. 3).
- **MOK** *(Mentőorvosi kocsi)* is a car with a doctor and a paramedic as a driver. This car also uses Rendez-Vous system, and it is not able to transport patients.
- **M.I.C.U.** is the abbreviation for the mobile intensive care unit. It is used mostly for transport between the hospital, but in case of emergency it can be used even in terrain. The crew has the same composition as ROKO.
- **Motorcycle** *(Mentő-motorkerékpár)* Due to the size of this vehicle, it can get faster to place of intervention than other vehicles. There is a doctor, or a paramedic with special attestation.

- ***Mentőhelikopter*** is an air rescue service. The crew is made of a doctor, one or two pilots and a paramedic (Hungary, Decree No. 5/2006).
- **Pediatric ambulance** (*Gyermekrohamkocsi* and *Gyermek MOK)* They are vehicles with specialization for pediatrics. The crew of this vehicles is made of a doctor with attestation from pediatrics and a paramedic with specialization. *Gyermekrohamkocsi* is a normal ambulance car, *Gyremek MOK* is using Rendez-Vous system (Magyar Gyermekmentő Alapítvány, 2019).

3.7 Romania

In 1990 Romania has approached the current form as it is today. This year started new service called SMUR. This service worked on a volunteer basis from the beginning. In 1991 SMUR gets first resuscitation ambulance as a gift from Germany. In 1993, the organization began to expand, and their name was changed to SMURD *(Serviciul Mobil de Urgenta, Reanimare si Descarcerare)* which means the mobile emergency resuscitation and the rescue service (see attachment No. 5). The whole emergency system in Romania was developed mainly thanks to countries like Germany, the Netherlands, the United Kingdom, the USA, and France, which supported the Romanian emergency pre-hospital care (Istoric, 2016).

3.7.1 Necessary Education

Alex Nitu, an advanced paramedic, employer of SMURD of Romanian city Arad, explains, that there are 3 types of paramedics in Romania. Their competencies differ due to different time of the courses, which is necessary to undergo to get the paramedic position. Training for basic paramedic lasts 1 month. For medium paramedic it is necessary to become a basic paramedic at first and then to do two

months training. For the position of an advanced paramedic it is necessary to become a medium paramedic at first and then finish the course, which lasts 6 months. All paramedics are primarily firefighters. It is not possible to become a paramedic in Romania, if you are not a firefighter (A. Nitu 2021, personal communication, 24 April).

3.7.2 Emergency Medical Service Crew Structure

The most used types of crews in Romania are:

- **AP** *(prim ajutor fără capacitate de evacuare a victimei)* is a rescuing vehicle which cannot transport patients. The crew is made of two paramedics, one of them is a driver, or the crew has a driver like the third member of crew.
- **PA-T** *(prim ajutor cu capacitate de evacuare a victimei)* is an ambulance car type B2, which can transport patients. The crew is made of three people. Two paramedics and an intervention commander, who is a paramedic with specialization.
- **EMU-A** *(echipaj medical de urgență cu asistent*) is also car type B2, the crew consists of a paramedic and a nurse with specialization for pre-hospital care.
- **EMU-M** *(echipaj medical de urgență cu medic)* is ambulance car type B1 or C2, there is a doctor, a nurse with specialization for pre-hospital care and, a paramedic.
- **TIM** *(terapie intensivă mobilă)* is the mobile intensive care unit which uses car type C1 There are four members on board. A doctor, a nurse with specialization from pre-hospital care, a paramedic and a driver.
- **TIM-NN** *(terapie intensivă mobilă nou-născuți)* has the equipment for treatment and transport of new-born babies. There is a doctor with attestation from neonatology, anaesthesiology or emergency medicine with special training in the provision of urgent medical care of new-born

babies, a nurse with specialization for new-born babies care and a driver who has done course of the first aid.

- **ESA, EAA** *(echipaj de ambulanţă și de salvare aeriană)* are two air medical services. Their crew is made of two pilots, a doctor and, a nurse with attestation (Romania, Decree No. 1500).

3.8 Bulgaria

Bulgaria is the only country in EU which does not have the air medical service. This condition lasts from 2019 until now. Until 2019 the air medical service was kept by private companies, but due to fact that it was not used very often, companies did not have enough profit, so they have ceased operation and sold the medical helicopters. From that year, army helicopters sometimes cooperate with rescuing ground units, but it has many disadvantages. The army helicopter is much heavier and does not have the medical rescuing equipment, so it cannot be used for example in the mountains, the arrival time is much longer too (Михайлова, 2019).

The government confirmed the purchase of rescue helicopters and established of the air rescue bases last year. The project is in progress. The term for its implementation is 36 months (Информация относно процедура по закупуване на медицински хеликоптери, 2020).

3.8.1 Necessary Education

There are four levels of education for a paramedic in Bulgaria. For the work of a paramedic in the emergency system it is necessary to have the third or the fourth level. The third level of education can be reached for example in course from Bulgarian Red Cross, which lasts 960 hours. People who are interested in

this course, must pay it by themselves. It costs almost 1,300 € (Обучение на парамедици, 2020).
The fourth level of education last two years on university. Mostly they work in an ambulance with specialization for resuscitation (Bulgaria, Regulation No. 1 from 7.4.2016).

You can also work like a paramedic with third level of education, if you get certification from emergency medicine and have studied one of those schools:

- Bachelor of nursing
- Bachelor of midwifery
- Bachelor of Medical Assistant
  (Bulgaria, Regulation No. 12 from 30.12.2015)

3.8.2 Emergency Medical Service Crew Structure

Bulgaria has the ground vehicles, which are divided into two groups: medical and premedical. The difference between these two groups is that medical one has always a doctor on board.
Medical vehicles are:

- **B type** is a vehicle made of two doctors and one driver, who can be replaced by a paramedic or an emergency worker.
- **C type** is a vehicle for resuscitation. There is a three-member crew. A doctor with specialization, an emergency worker, and a paramedic or a driver.

Premedical vehicles are:

- **A1 type** is a vehicle for transport of one patient. The crew is made of a driver and a paramedic.
- **A2 type** is a vehicle for transport of more than one patient. The crew is same as in vehicle type A1.

- **B type** is made of two paramedics or a paramedic, an emergency worker, and a driver.
- **M type** is a motorcycle. It is driven by a paramedic. It is used to reach the place of intervention faster. It cannot transport patients.
  (Bulgaria, Regulation No. 12 from 30.12.2015)

3.9 Greece

In Greece, the emergency medical service is managed primarily by Εθνικό Κέντρο Άμεσης Βοήθειας (EKAB), which is the name for the National Emergency System. The company was founded in 1985 and it has been growing ever since that time. It currently has its bases in twelve cities in Greece (Οργανισμός, 2016).

3.9.1 Necessary Education

The prerequisite for studying paramedics is to have a driver's license and to have completed secondary education. The study is managed by the institute of vocational education (Greek abbreviation IEK - *Ινστιτούτο Επαγγελματικής Κατάρτισης*). Study time at school I.E.K. is a total of five semesters divided into four semesters of theory and laboratory training in the total amount of up to 1,200 hours (Ειδικότητα :Διασώστης – Πλήρωμα Ασθενοφόρου, 2018).

3.9.2 Emergency Medical Service Crew Structure

For National Emergency System (EKAB) works those types of vehicles:

- **KIM** (*Κινητές Ιατρικές Μονάδες*) means the mobile medical service. This term includes ambulances with doctors and certified paramedics. This type of an ambulance intervenes if the patient is in an unstable state and there is a risk of failure of his vital functions (Κινητές Ιατρικές Μονάδες, 2016).
- **Ambulance for new-borns** (*Μεταφορές Νεογνών*) serves primarily for the safe transport of mothers during imminent childbirth. This ambulance has a mobile incubator (Μεταφορές Νεογνών, 2016).
- **Motorcycles** (*Μοτοσυκλέτες Ταχείας Ανταπόκρισης*) They have been operating since 1996. They were originally ridden by doctors, later they were replaced by paramedics (Μοτοσυκλέτες Ταχείας Ανταπόκρισης, 2016).
- **ΥΕΙΒΑ** (υπηρεσία επείγουσας ιατρικής βοήθειας αερολιμένα) stands for air rescue service. The crew is made of doctors and paramedics or nurses (Διεθνής Αερολιμένας Αθηνών, 2016).

3.10 Italy

It all begins with the 1947 decree attributing emergency services to the Italian Red Cross. Unfortunately, the single operations call centre did not exist until 1990 It has been launched on the basis of massive protest in Italy in response to the 1980 terrorist attack in Bologna, in which 85 people died and more than 200 were injured. This made Bologna the first city in Italy with the efficient emergency service very similar to nowadays system. It lasted two years to spread this reorganization to whole country (Canova, 2017).

3.10.1 Necessary education

Annalena Rainer and Haubser Lisa, Italian paramedics from the White Cross of city Vipitento, say that in Italy are 3 levels of paramedics. The first level of a paramedic is used just for interhospital transports. The course for the first level of a paramedic lasts 6 months. The second level can be reached by accomplishing a course, which lasts 10 months. The last third level of a paramedic can be reached by studying for one and half – two years (A. Rainer, L. Haubser 2021, personal communication, 30 April).

3.10.2 Emergency Medical Service Crew Structure

The types of ambulances can be divided into two categories. First is type A, which includes first aid vehicles. In type B are vehicles, which are used just for transport of patients.

Vehicles type A are further subdivided into three types:

- **MSB** *(Mezzo di Soccorso di Base)* is the basic rescue vehicle. It is used for intervention of patients, who are not in danger of death. The crew is made of paramedics. The number of crew members can vary, depends on the region where MSB is located (see attachment No. 6).
- **MSA** *(Mezzo di Soccorso Avanzato)* is the name for ambulances providing the advanced life support. There is a paramedic, a nurse with specialization, a doctor or both on board (I mezzi di soccorso, 2016).
- **HEMS** *(Elisoccorso,* Helicopter Emergency Medical Service*)* is the air medical service, the crew consists of pilots, a doctor, and a nurse. There are no paramedics on a board (Elisoccorso H.E.M.S. , 2021).

3.11 Spain

There are no paramedics in Spain. Only doctors, EMTs and nurses work in Spanish ambulances. (González, Delgado, Reyes, 2017).

3.11.1 Necessary Education

For the work of EMT (*Técnico en Emergencias Sanitarias* in Spanish) is necessary to finish the course which lasts 2000 hours (Spain, Decree No. 1397/2007). For the work of nurse in ambulance it is necessary to study 3 or 4 years at university (Spain, Act No. 44/2003).

3.11.2 Emergency Medical Service Crew Structure

Medical crew structure can vary due to different rules of individual regions. Basic types are:

- **USVA** (*Unidades de Soporte Vital Avanzado*) or (*UVI móvil*) is an ambulance for patients who are in danger of life. This car can be used also like mobile I.C.U.. The crew is made of a doctor, a nurse with specialization and *técnico de emergencia* (EMT) as a driver.
- **USVB** (*soporte vital básico*) are ambulances for the basic life support. This car is used for cases, which are not so serious. The crew is made of two EMT-B, one of them is a driver.
- **VIR** *(Vehículo de Intervención Rapida)* There is EMT or a nurse as a driver and a doctor. This car has the similar equipment like UVI móvil, but it cannot transport patients. It uses Rendez-Vous system (Parque de vehículos Ambulancias, 2018).

- **SAR** *(Servicio Aéreo de Rescate)* is the air medical service, which was launched in 1995. Next to pilots there is a nurse with specialization and a doctor (Lopéz, 2012).

3.12 Portugal

The Portuguese emergency system is secured by INEM (National Institute of Medical Emergency, *Instituto Nacional de Emergência Médica* in Portugese), which is the state organization established by the Ministry of Health. This company works from 1981. Around 1990 it started operating the SUV-car (*Viatura Médica de Emergência e Reanimação*) with a doctor and a nurse on board, which made Portugal one of the first countries which uses the Rendez-Vous system (O INEM, 2017).

3.12.1 Necessary Education

Portugal does not have paramedics, and non-medical healthcare employers are two types: nurses and EMTs *(Técnico de Emergência Pré-hospitalar* in Portuguese). For the work as a nurse, you must study the accredited medical bachelor's study field for nurses, which lasts four years (Carvalho, 2019).

3.12.2 Emergency Medical Service Crew Structure

Portugal has many types of crews, but among the most used are these five types and the air rescue service. The driver is always EMT, if he is not on board, it is a nurse. Types of crews are:

- **Motorcycle** *(Motociclo de Emergência Médica)* works from 2004. It uses R-V system, the driver is EMT (see attachment No. 7).

- **AS** *(Abulância de Soccoro)* has three-member crew. This car is used for interventions, where patients vital function is stable. There is no doctor on board.
- **AEM** (*Abulância de Emergência Médica)* is used for serious interventions, there is a doctor, a nurse and EMT on board (Portugal, Decree No. 260/2014).
- **SIV** *(Abulância de Suporte Imediato de Vida*) This vehicle is designed to intervene in serious cases, such as resuscitation and it has two-member crew. The crew consists of EMT and a nurse (see attachment No. 8).
- **VMER** *(Viatura Médica de Emergência e Reanimação)* is SUV car, which mostly cooperates with SIV. There is a doctor and a nurse. It is used for fast transport of a doctor to place of intervention, this car cannot transport patients.
- **HEM** *(Helicóptero de Emergência Médica)* The air rescue service has the crew made of a pilot, a nurse and a doctor. Nurses and doctors must have many years of practice from ground pre-hospital care (Meios de Emergência, 2017).

3.13 France

In terms of pre-hospital treatment, France has always been a very progressive country and many of the inventions were born here. Many sources even state that France was the first country in Europe to start using rescue vehicles during the Napoleonic Wars. In 1792 Paris developed a system in which the necessary equipment to rescue the drowning people was deployed in several places along the Siena river. To motivate the Parisian population, financial rewards were paid to all those who tried to rescue. The system worked relatively successfully. Since then, the development of the pre-hospital service has always been slightly ahead

of other states. The first air medical service was launched in a certain form between the First and Second World Wars (Bassez, 2011).

3.13.1 Necessary Education

French pre-hospital system uses firefighters in ambulances for primary treatment. For more sophisticated interventions *ambulanciers* (equivalent for EMT), nurses and doctors are used. For the work of an *ambulancier* is necessary to do course which last 630 hours.

For the work of a nurse in the emergency ambulance it is necessary to study for 3-5 years (Les soins médicaux urgents en France, en Allemagne et en Suisse, 2017).

3.13.2 Emergency Medical Service Crew Structure

The structure of the emergency medical service in France is quite complicated due to combination of public and private ambulances. First, it is necessary to introduce SMUR (*Service mobile d'urgence et de reanimation*). SMUR is the mobile emergency and the resuscitation service in translation. As the name implies, these vehicles are used for interventions in resuscitation and other more difficult cases. SMUR has the base directly in hospitals. Other companies provide only the basic life support and are located outside the hospital. The third part of the emergency medical service is made by firefighters, who can provide the basic life support and transport patients to the hospitals. The crews of SMUR are:

- **VLM** (*véhicule léger médicalisé*) which is an ambulance car with a doctor and a nurse or EMT. This vehicle cannot transport patients and it uses R-V system.

- **Resuscitation ambulance** (*ambulance de reanimation*) is specially designed for the treatment of demanding cases and the intensive care. It is made of a doctor, a nurse, and a driver with EMT course.
- **Air rescue** (*hélicoptère*) these are helicopters of private companies or SMUR helicopters (HéliSmur). The crew is made of a pilot, a doctor, and a nurse **(**Les Soins médicaux urgents en France, en Allemagne et en Suisse, 2017).

3.14 Belgium

The Belgian 112 is the responsibility of the Department of Health and it is funded by the federal government. The mobile emergency and the resuscitation service is a part of emergency care, which is managed by hospitals or hospital associations and it is linked to emergency departments in acute care hospitals (Le système de santé belge, 2021).

3.14.1 Necessary Education

Doctors, *ambulanciers* (drivers), nurses and firefighters work in the Belgian emergency system. The most similar competencies to an average EU paramedic has a nurse. There are two ways to become a nurse in Belgium.

- To study university and get the bachelor title, the whole study lasts 4 years
- To study the vocational school (after the high school) which lasts 3 and half year (Études infirmier ou infirmière en Belgique, 2017).

3.14.2 Emergency Medical Service Crew Structure

Belgium has quite similar emergency system to France. In Belgium SMUR (*Service mobile d'urgence et de reanimation*) is also used, it provides interventions with doctors, if it is necessary.

Type of vehicles are:

- **Basic ambulance** *(L'ambulance)* is staffed by two *ambulanciers*. If it is necessary, they can ask for the help of a SMUR vehicle with a doctor or firefighter.
- **VIM** *(Véhicule d'intervention médicalisé*) is a SMUR vehicle and it is staffed by a doctor and a nurse. It has base in hospital (Deck, 2010).
- **PIT** *(Paramedical Intervention Team)* is a team that serves to relieve the burden of SMUR. The crew of this vehicle consists of a doctor and a nurse.
- **CMH** *(Centre Médical Héliporté)* is an air rescue service. The crew is made of a doctor, a pilot, and a nurse (Infirmier·ère spécialisé, 2019).

3.15 Netherlands

First ambulances in Netherlands appeared as early as the year 1907. From the beginning their purpose was just to transport patients to the hospitals. Their treatment started in hospitals. As in other countries, a tragic accident had to take place in the Netherlands in order to identify significant shortcomings in existing ambulances. In Netherlands it was a train accident, which happened in 1962. In 1971, a law was passed which states, among other things, that the ambulance

must be at the place of intervention within fifteen minutes. In 1992, the nurses began to be part of the ambulance crews (Geschiedenis ambulance, 2018).

3.15.1 Necessary Education

There are no paramedics in Netherlands. In addition to the doctor, there are two positions in Dutch ambulances. They are *Ambulanceverpleegkundige (*AVP, emergency nurse, which has competencies similar to average paramedic) and *ambulancechauffeur* (ACH, ambulance driver). There are 3 options to become an *Ambulanceverpleegkundige*. They are:

- To make a course, which lasts 23 days, if you are already a nurse with specialization for intensive care, emergency department, or anaesthesiology
- To make a course, which lasts 12 months, if you have done at least nursing course
- To make a course which lasts 18 months, if you have never worked or studied in healthcare before

  (Wat doet een Ambulanceverpleegkundige, 2020)

3.15.2 Emergency Medical Service Crew Structure

Netherlands has many regions, due to different emergency organisations in every region types of crews can vary depends on the region and organization, which operates emergency rescue.

The most common vehicles in Netherlands are:

- **Basic ambulance** *(Reguliere ambulance)* is the most used rescue vehicle with a driver and *Ambulanceverpleegkundige.*
- **Transport ambulance** *(zorgambulance)* is a vehicle, which serve mostly as transport ambulance. There is a driver and caretaker on board.

- **Solo-ambulance** *(solo ambulance)* is a normal car, with *Ambulanceverpleegkundige* on board. Due to its size, it cannot transport patients. It uses R-V system.
- **Motorcycle** *(motorambulance)* also uses R-V system. The driver is mostly *Ambulanceverpleegkundige.*
- **M.I.C.U.** *(Mobiele Intensive Care Unit)* is a special car for transport of patients where is the risk of failure of vital functions. The crew depends on the situation.
- **Air rescue service** *(traumahelikopter)* has 4 bases in Netherlands. There is always a doctor on board (Wagenpark, 2019).

3.16 Ireland

Ireland is one of the few countries where you will not find doctors in ambulances. For this reason, the staff of the national rescue service is given slightly more competencies than paramedics in other EU countries, where a doctor is a part of the ambulance team (Recruitment Information Pack, 2016).

3.16.1 Necessary education

There are three working positions in Irish ambulances. The Intermediate Care Operative (who serves mostly as a driver and has similar competencies as an average Emergency medical technician), a paramedic and an advanced paramedic. The paramedic training programme is a two year of full-time programme. Advanced paramedic has higher competencies and for this position it is necessary to have at least two years of experience like a paramedic (Recruitment Information Pack, 2016).

3.16.2 Emergency Medical Service Crew Structure

There are three types of ground vehicles and air rescue service. They are:

- **Emergency Ambulance** is the most used ambulance. The crew is made of paramedics or advanced paramedics.
- **Rapid Response Vehicle** (RRV) is staffed by one paramedic or an advanced paramedic. It uses R-V system, the paramedic can treat a patient while an ambulance is on the way.
- **Emergency Motorcycle Response Unit** are used in cities, due to its size they can reach the place of intervention faster (Emergency care, 2015).
- **Emergency Aeromedical Service** is a service provided by The National Ambulance Service in conjunction with the Irish Air Corps and the Department of Defence. The helicopters are staffed by the Air Corps flight crew and the advanced paramedic (Emergency Aeromedical Service, 2015).

3.17 Denmark

Denmark has like other Northern European countries quite high living standard. Due to smaller size of the country it has just four bases of the air rescue service. (Baser, 2020) United air rescue service for whole country works in Denmark from 2014 (Historie, 2020).

3.17.1 Necessary Education

Except a doctor, there are three types of positions in Danish ambulances. They are *ambulanceassistent*, *ambulancebehandler* and *paramediciner*. *Ambulanceassistent* works like a driver of the ambulance and has the lowest competencies. For

the work of *ambulancebehandler* it is necessary to study for 4 years and 7 months. (Ambulancebehandler, 2020) The highest education is *paramediciner* and lasts 12 weeks, but for this course is necessary to work like *ambulancebehandler* for at least 3 years (Hvem rykker ud på et 1-1-2 opkald, 2020).

3.17.2 Emergency Medical Service Crew Structure

There are 3 basic types of crews and air rescue service:

- **Ambulance** is the most common rescue car in Denmark. The crew is made of two members. It is mostly *ambulancebehandler* with *ambulanceassistent.*
- **Emergency vehicle** (*Akutlægebil*) is used for interventions, where patient's vital functions are not stable. The crew is made of at least one paramedic on board (Beredskabstyper, 2020).
- **Vehicle with a doctor** (*akut medicinsk bil*) is a SUV-car with the doctor. It uses R-V system (Jørgensen, 2020).
- **Air rescue service** (*Akutlaegehelikopter*) has a pilot, a doctor and a *paramediciner* with specialization on board. It is interesting that the *paramediciner* helps both the doctor and the helicopter pilot (Besætning, 2018).

3.18 Sweden

Before the 1980s, the rescue service was considered a purely transport service with a very limited capacity to treat the injured at the scene of an accident. During the 80s and 90s, there was a gradual increase in basic competence, training and organization of pre-hospital care, due to the low population density and the large area of the country, which causes a longer time for the vehicle to arrive at the hospital. The air rescue service has two parts. The first part is for rescue on

land, the crew is made of healthcare employers. The second part is the air rescue service used for rescue on water, it has no healthcare employers on board (Björnstig, 2004).

3.18.1 Necessary Education

Doctors, nurses, and Emergency medical technicians called *ambulanssjukvårdare* work in Swedish ambulances. Necessary education for the work of *ambulanssjukvårdare* lasts 1 year (Ambulanssjukvårdare, 2021). To work as a nurse in the ambulance it is necessary to study 3 years at university. After the university and some practice in the pre-hospital care there is possibility to do specialization (Fakta om ambulanssjukvården, 2020).

3.18.2 Emergency Medical Service Crew Structure

If we do not count transport ambulance, which serves just for transport of patients between hospitals, or between their home and hospital, there are 5 types of crews in Sweden. They are:

- **Emergency ambulance** (*Akutambulans*) is a basic emergency vehicle for the most of interventions. There is a nurse and *ambulanssjukvårdare* on board. In some vehicles it is also possible to find just two nurses.
- **Emergency car** *(Jourläkarbil*) is a car with doctor on board. The second member of a crew is *ambulanssjukvårdare.* This vehicle is used for interventions, where the patient has unstable vital functions. It uses R-V system.
- **PAM** (*Psykiatrisk Akut Mobilitet*) is a psychiatric ambulance. The crew consists of *ambulanssjukvårdare* and one or two nurses trained in the psychiatric care.

- **Air rescue service** (*Mediflight*) serves for rescue on the land. The crew is made of a pilot, a nurse and a doctor.
- **MICU** (*Intensivvårdsambulansen)* is the mobile intensive care unit, which serves primarily for transport of patients between hospitals. The crew is made of *ambulanssjukvårdare,* a nurse and a doctor or an anaesthesiology nurse from hospital, where patient transported to (Ambulansen, 2021).

3.19 Finland

Finland has a relatively large area and a low population density per square km, which can cause a longer arrival time of ambulances than in other EU countries with a higher population density.

3.19.1 Necessary Education

A paramedic in Finland is called *ensihoitaja.* There are two types of paramedics in Finnish ambulances. *Perustason ensihoitaja* (a basic paramedic in translation) and *Hoitotason ensihoitaja* (an advanced paramedic in translation). *Perustason ensihoitaja* has lower competencies, and requires the bachelor title, which lasts 2 years to get. *Hoitotason ensihoitaja* has bigger competencies and it requires qualification of a paramedic and qualification of a nurse. For that reason, this study can last 2-4 years, depending on the student. It is also finished with the bachelor title on university (Ensihoitaja, 2019).

Decree No. 585/2017 on emergency medical service says, that every emergency basic ambulance should have at least one *Hoitotason ensihoitaja* (Finland, Decree No. 585/2017).

3.19.2 Emergency Medical Service Crew Structure

Finland uses firefighters trained in the first aid if there is not enough rescue vehicles to make it easier for doctors and paramedics. Thanks to firefighters they can fully concentrate on interventions in more serious cases.

Types of crews are:

- **First respond unit** *(Ensivasteyksikkö)* is made of firefighters with the course of the basic life support. It is not used very often. The first respond unit does not participate in the transport of the patient, only in ensuring his vital functions on place of intervention.
- **Basic ambulance** *(Perustason ambulanssi)* is the most common vehicle in Finnish emergency system. The crew has two members and both of them are *Perustason ensihoitaja.* This vehicle is used for interventions where patient's vital functions are supposed to be stable.
- **Advanced ambulance** *(Hoitotason ambulanssi*) is a vehicle for more sophisticated interventions. The crew is made of at least one advanced paramedic. The second person on board is another advanced paramedic, or a basic paramedic.
- **Unit with doctor** *(Lääkäriyksikkö)* has a doctor on board. This category also includes the air rescue service (Varsinais-Suomen ensihoitojärjestelmä, 2017).

4 Methods

Mainly data collection was used to process the bachelor's thesis. The information analysis method was applied. Sources of information for this bachelor's thesis are legislative documents, websites that belong to organizations involved in providing the first aid and personal communication with local paramedics. These EU countries are compared in this bachelor thesis: the Czech Republic, the Slovak Republic, Poland, Germany, Austria, Hungary, Romania, Italy, and Ireland. It is impossible to process all EU countries well, because the quantity of the information obtained would prevent us from a high-quality and sufficiently detailed comparison and description, in an attempt at quality processing of all countries of EU, the maximum permitted length of the bachelor's thesis would certainly be exceeded. Due to the current pandemic situation, the conditions for obtaining information in foreign countries were considerably limited. The Slovak Republic, Poland, Germany, and Austria were selected to compare the competencies of Czech paramedics with neighbouring countries. Romania was selected as a representative of Eastern Europe, Italy as a representative of the Southern Europe and Ireland as a representative of the Western Europe. These countries were selected as representatives of the areas because they are within driving distance of the Czech Republic. The competencies of most EU countries are not easily traceable, from this reason a personal visit was chosen to obtain information from local rescuers. Information from Hungary was obtained on the journey to Romania. In Ireland, as an English-speaking country, information was obtained by telephone. A comparative method is used for comparing paramedics' competencies. The competencies listed in the table and then compared have been selected based on the judgment that they have clear definitions in legislative documents, and that they will vary most.

5 Results

5.1 Paramedics' competencies

The competencies of paramedics can be divided into tasks that can be performed without professional supervision and without the indication of a doctor, tasks that can be performed only on the indication of a doctor, tasks that can be performed with written authorization and tasks for which the paramedic has no competence. These competences are not always strictly defined in legislative documents. In practice, for example, some smaller tasks can be performed by the paramedic, but he has no competence to do them. It usually depends on the agreement with the doctor, and the paramedic is often exposed to the risk of criminal prosecution in the case that something goes wrong.

Governments of some countries has the competencies of paramedics in legislative documents, unfortunately, not all of them are searchable. From this reason I had to visit many countries if I wanted to gain information about paramedics' competencies directly from paramedics in current countries. Because of this thesis I have visited Germany, Hungary, Romania, Austria, and Italy. Thanks to this decision, I had an opportunity to compare not just their competencies, but also a quality of their bases for paramedics and their pre-hospital system, which was described to me personally by emergency employees.

5.1.1 Competencies in the Czech Republic

The Czech paramedic is allowed to do these things without professional supervision and without indication of a doctor: monitor and evaluate vital signs, initiate and perform cardiopulmonary resuscitation using manual resuscitation bags, including cardiac defibrillation after electrocardiogram recording, provide

peripheral venous or intraosseous entry, apply crystalloid solutions and perform intravenous administration of glucose solutions, perform laboratory tests for pre-hospital care, perform the first wound treatment, including stopping bleeding, ensure or perform safe rescue, positioning, immobilization, transport of patients, provide care for the body of the deceased, receive, control and store medicaments and medical devices, perform urgent procedures during the ongoing birth and the first treatment of the new-born, provide telephone instruction to provide the first aid and introduce and maintain inhalation and oxygen therapy. On the indication of the doctor the paramedic may secure airways with the available equipment, provide instrumental ventilation with parameters specified by the doctor, take care of the airways of patients even with the artificial lung ventilation, administer medicinal products, including blood derivatives, assist in the initiation of transfusion products and treat the patient during administration and terminate it, perform catheterization of the bladder of women and girls over 10 years of age and collect biological material for examination. The paramedic in the Czech Republic can also work as a nurse on ICU or Anaesthesiology and Resuscitation Department.

An advanced paramedic (*zdravotnický záchranář pro urgentní medicínu*) has higher competencies, without professional supervision and without indication by the doctor he/she is allowed to provide airways with available equipment for patients over 10 years during CPR, use the devices for automatic cardiac massage and the administration of the necessary medicaments for resuscitation and collect biological material for examination. Without professional supervision based on the indication of the doctor he/she is allowed to perform measurements of vital functions, including invasive methods, perform external pacing, take care of the patient's airways even with the artificial lung ventilation, including suction from the lower airways, insert a gastric tube and perform gastric lavage (it can be performed even in unconsciousness if the patient is older than 10 years and has

secured airways) and perform extubation of endotracheal cannula. He/she is allowed to administer transfusion products with professional supervision from the doctor (Czech Republic, Decree No. 55/2011).

5.1.2 Competencies in the Slovak Republic

The paramedic in the Slovak Republic is allowed to do these things without professional supervision and without indication of the doctor: take a basic medical history from the patients, relatives and witnesses, assesses the state of health, monitors, evaluates and records vital functions, perform the first wound treatment, including stopping bleeding, initiate and perform CPR, use an automatic and semi-automatic external defibrillator, provide peripheral venous access, or intraosseous access, and administer saline, use equipment for airways protection during artificial lung ventilation, administer oxygen therapy and inhalation therapy, record and evaluate ECG, perform a basic neurological examination and make a diagnosis of stroke, perform urgent procedures during the ongoing birth and the first treatment of the new-born, insert a nasogastric tube, perform catheterization of the bladder of women, collect biological material including blood collection for diagnostic purposes, position and immobilize the patient, use a magnet for inadequate implantable cardioverter and treat amputate suitable for replantation. With the written authorization the paramedic is allowed to administer crystalloid solutions, colloidal solutions, concentrated glucose solution during hypoglycemia, adrenaline and other drugs intravenously and intraosseously during CPR, adrenaline i.m. during anaphylactic shock, non-opiate analgesics, antipyretics per rectum, per os or i.v., anticonvulsants per rectum or i.m. during convulsive condition, anxiolytics per os, corticoids per rectum or i.m., absorption coal, antihypertensives in

hypertension, nitrates per os or sublingually, antiplatelet agents per os in acute coronary syndrome, beta-2-mimetics by inhalation, antiemetics i.m. and antihistamines i.m. during anaphylaxis. The paramedic gains the written authorization on the basis of examination, its validity is 5 years.

The paramedic is allowed to administer adrenaline i.v. or i.o. during anaphylactic shock, anticonvulsants i.v. or i.o., during convulsive condition, diuretics i.v. or i.o. during pulmonary edema, corticoids i.v. or i.o., antiemetics, antispasmodics and antihistamines i.m. or i.v., bronchodilators and antiasthmatics by inhalation, magnesium sulfuricum i.v. during eclampsia and heparins i.v. in acute coronary syndrome.

In addition, the paramedic with the title from university is, on the basis of the written authorization, allowed to administer diuretics i.v. , bronchodilators i.v., antidotes i.m., i.v. or i.o., atropine i.v., and magnesium sulfuricum i.m. or i.v (Slovak Republic, Decree No. 321/2005).

5.1.3 Competencies in Poland

The Polish paramedic is allowed to do these things without indication of the doctor: initiate and perform CPR, position as immobilize (fractures, or full body of patient), release the airways and secure them with oropharyngeal and nasal airways, laryngeal mask, laryngeal tube, coniopuncture and in the event of sudden circulatory arrest, the paramedic may perform endotracheal intubation under direct laryngoscopy. Without indication he/she is also allowed to administer oxygen therapy and inhalation therapy, use an automatic and semi-automatic external defibrillator, perform percutaneous cardioversion and pacing, provide access to the vascular bed intravenously or intraosseously, take

blood for laboratory tests, administer some medications (see table), perform decompression of tension pneumothorax by pleural puncture cavities, measure the blood glucose level and then adjust it, treat wounds, stop bleeding and assist with urgent procedures during the ongoing birth.

Under the supervision of the doctor the paramedic is allowed to use the orotracheal intubation in other cases, than during sudden circulatory arrest, perform bladder catheterization, insert a nasogastric tube, perform gastric lavage and assist with smaller chirurgical procedures (Poland, Act No. 587/2016).

5.1.4 Competencies in Germany

German pre-hospital system is not provided globally by the state, but by many organisations, like German Red Cross and others. Stefan Liedtke, the employer of German Red cross of city Traunstein, which provides pre-hospital emergency system for the city and surroundings explains, that there are 4 positions in German ambulances. *Rettungssanitäter Helpher, Rettungssanitäter, Notfallsanitaeter* and a doctor.

Helpher Rettungssanitäter has the lowest competencies. The course for the position of *Helpher Rettungssanitäter* lasts 1 month. He/she is usually a driver of the ambulance, which is mostly just for inter-hospital transport. He/she cannot perform intravenous cannulation, use supraglottic aids or administer medicaments. Even oxygen should not be used by *Helpher Rettungssanitäter* without an indication of a doctor. He/she may perform the basic life support and defibrillation with AED, like anyone else, who does not work in healthcare. The second type is *Rettungssanitäter.* For this position it is necessary to become *Helpher rettungssanitäter* and then make a course, which lasts 3 months plus one

week. In addition, he/she is allowed to administer oxygen and perform intravenous cannulation.

If we do not count the doctor, the highest competencies has *Notfallsanitaeter.* He/she is allowed to perform intravenous cannulation, use supraglottic aids. He/she is allowed to do a lot of performances only with direct supervision of the doctor. They are endotracheal intubation, intraosseous access and administration almost all medications (physiological saline, glucose, adrenaline, amiodarone, antidotes, nitrates, opiate and non-opiate analgesics, benzodiazepines, diuretics or atropine. (S Liedtke 2021, personal communication, 29 April).

5.1.5 Competencies in Austria

Despite the same language, there are significant differences in pre-hospital care between Austria and Germany. Henrik Maszar, the *Notfallsanitaeter* from Vienna Emergency Medical Service, explains, that all training courses are made by companies, which provide pre-hospital care. He also says, that non-medical professions in ambulance can be divided into 4 or 5 types. The first type is basic *Rettungssanitäter.* He/she is allowed to administer oxygen therapy, initiate and perform CPR, defibrillate, use an automatic external defibrillator, or stop bleeding. Competencies of a basic *Rettungssanitäter* are very limited. From this reason, he/she works mostly in ambulances for inter-hospital transports.

Next positions are *Rettungssanitäter* level 2 and *Rettungssanitäter* level 3. The time of training for those positions always depends on the need of the employer who acquires new employees of this type. The condition is to work for the company as a basic *Rettungssanitäter. Rettungssanitäter* level 2 is allowed to use supraglottic aids. *Rettungssanitäter* level 3 is allowed to use supraglottic aids and perform intravenous cannulation, also he/she is allowed to administer medicaments, like

physiological saline, glucose, adrenaline and amiodarone during CPR, antidotes, nitrates and benzodiazepines during an epileptic seizure.

Notfallsanitaeter has the highest competencies, ff we do not count the doctor. He/she is allowed to perform intravenous or intraosseous cannulation, use supraglottic aids, defibrillation and catheterization of the bladder. He/she is also allowed to administer physiological saline, glucose, adrenaline and amiodarone during CPR, benzodiazepines during the epileptic seizure nitrates.
If the *Notfallsanitaeter* has finished special training, he/she is also allowed to administer non opiate analgesics and perform endotracheal intubation (H. Maszar 2021, personal communication, 25 April).

5.1.6 Competencies in Hungary

In theoretical part of this thesis, I divided Hungarian paramedics to *mentőápol* and *mentőtiszt,* but Hungarian emegrency structure is more sophisticated. Kristof Ottulsak, the employer of the emergency system of Budapest explains, that in Hungary pre-hospital emergency system there are 3 types of professions, a basic *mentőápol (mentőápol alapvető)*, an advanced *mentőápol* (*mentőápol fejlett*) and *mentőtiszt*. For the basic *mentőápol* it is necessary to get special two months training. His/her competencies are very low. The advanced *mentőápol* has higher competencies. For this position it is necessary to study a vocational school for 2 years. *Mentőtiszt* has the highest competencies, almost like doctors.

Due to the short training course, the basic *mentőápol* cannot perform intravenous or intraosseous cannulation, use supraglottic aids or administer any medicaments. He is only allowed to administer the oxygen and perform basic life support including defibrillation. The advanced *mentőápol* is also allowed to

provide peripheral venous or intraosseous entry, use supraglottic aids, record and evaluate ECG, perform CPR including defibrillation and administer adrenaline during CPR, but only one time. He/she cannot administer amiodarone, even during CPR. He/she is allowed to secure airways by supraglottic aids. He/she cannot perform coniopuncture or endotracheal intubation or catheterization of the bladder. He/she is allowed to administer physiological saline, glucose, non-opiate analgesics, benzodiazepines and nitrate, but just sublingualy.

Mentőtiszt has very similar competencies like a doctor, doctor is from this reason often replaced by *Mentőtiszt* on board of Hungarian ambulances. He may preform intravenous cannulation, provide intraosseous access, use supragottic aids, perform endotracheal intubation, coniopuncture, defibrillation, catheterization of the bladder (but there is no equipment for catheterization in Hungarian ambulances). He may administrate drugs like adrenaline, amiodarone, hysiological saline, glucose, non-opiate analgesics, opiate analgecics, diuretics, benzodiazepines, antidotes, oxygen, atropine, and nitrates (sublingualy or i.v.) (K. Ottulsak 2021, personal communication, 25 April).

5.1.7 Competencies in Romania

Romanian training is much shorter than schools or courses for paramedis in other countries. Alex Nitu, an advanced paramedic, an employee of SMURD of Romanian city Arad, explains, that there are two types of ambulances in Romania. The first type (we can call it hospital ambulances) are ambulances, which are often sent to smaller cases or to cases, where it is not necessary to cooperate with firefighters (see attachment No. 4). Those ambulances work for hospitals and their employees are *ambulantiers* (equivalent to EMT), nurses and

doctors. There are no paramedics on board. These ambulances are used for interventions like resuscitations, unconsciousness, for patients with abdominal pain and other cases with only one patient.

The second type of ambulances are ambulances of SMURD (*Serviciul Mobil de Urgenta, Reanimare si Descarcerare*, see attachment No. 5). Their crew is made of firefighters, who became paramedics. Alex Nitu says, that SMURD is like the SWAT team for the emergency pre-hospital care. They are used for bigger interventions, like big fires, traffic accidents, terrorist attacks and others. SMURD and hospital ambulances can cooperate. Paramedics of SMURD has 3 levels. Basic, medium and advanced. All courses are quite short in comparison to other countries. It is because they do not need a training focused on hospital problems, just training in the emergency medicine. Other reason is that they have to be firefighters, to become a paramedic, so they gain also from firefighters' knowledge. Their training is very intensive.

A basic paramedic cannot perform intravenous cannulation, but he/she is allowed to use supraglottic aids. He is also allowed to perform CPR, defibrillate and administer oxygen to a patient. A medium paramedic is also allowed to record and evaluate ECG, perform intravenous and intraosseous cannulation, use supraglottic aids, perform endotracheal intubation, administer physiological saline, glucose, adrenaline during CPR (but he/she cannot administer amiodarone during CPR), non-opiate and opiate analgesics, benzodiazepines, atropine and nitrates. An advanced Romanian paramedic is allowed to perform coniopuncture, administer amiodarone, diuretics and antidotes (A. Nitu 2021, personal communication, 24 April 2021).

5.1.8 Competencies in Italy

Annalena Rainer and Haubser Lisa, Italian paramedics from the White Cross of city Vipitento, explain, that Italy pre-hospital system is provided from more than half by the Italian Red Cross and the rest is provided by the Italian White Cross. They also explain, that there are 3 types of paramedics in Italy. All of them have quite low competencies in comparison to paramedics from other EU countries.

The first level of paramedic is used just for interhospital transport, the training for his position lasts 6 months. He/she is only allowed to perform CPR, defibrillate and administer oxygen to patients. The second level of paramedic has 10 months of training and his/her competencies are the same, like competencies of the first level paramedic. The difference between them is that the second level paramedics has their own car for providing the first aid, but due to their low competencies, they usually only transport patients with serious problem to the hospital, or call an ambulance with a doctor, who has (the only one from pre-hospital emergency system) competencies to perform cannulation, intubation and administer medication.

The highest level of paramedic works in ambulances as an assistant of a doctor. The school for this position lasts from one and half year to two years. He/she is allowed to perform the basic life support including the CPR, defibrillate and administer oxygen to patients He/she is also allowed to prepare all the medication, but just with supervision of the doctor. He/she cannot give any medication to patients, it can be done just by a doctor (A. Rainer, L. Haubser 2021, personal communication, 30 April 2021).

5.1.9 Competencies in Ireland

Competencies of the paramedic in Ireland are given by Pre-Hospital Emergency Care Council (PHECC). The emergency medical technician (EMT) can provide the basic life support including the use of automated external defibrillators, basic and advanced airway management use of bag-valve-mask, ECG & SpO2 monitoring, glucometry and the basic trauma care which includes splinting and spinal immobilisation. The EMT may administer Aspirin, Entonox, EpiPen, Glucagon, Glucose gel, GTN, Naloxone, Oxygen, Paracetamol, Ibuprofen and Salbutamol. Paramedics' competencies include in addition the insertion of nasopharyngeal airway, 12 - lead ECG, peak flow meter, cessation of resuscitation, tourniquet application, manual defibrillation, and spinal injury decision.

The paramedic is allowed to administer Adrenaline, Midazolam, Clopidogrel, Hydrocortisone, Ipratropium Bromide and Ticagrelor and other medication, which may use an EMT. The advanced paramedic is allowed to provide endotracheal intubation, intravenous cannulation, intraosseous cannulation, needle thoracocentesis, and needle cricothyrotomy. The advanced paramedic is allowed to administer the medications permitted for a paramedic and 23 additional medications for acute emergency medical and traumatic conditions from cardiac arrest to hypovolaemia (Pre-Hospital Emergency Care and Scope of Practice, 2017).

Table No. 1: Necessary education of paramedics

Country	Name of the position	English name	Necessary education	Type
Czech Republic	Zdravotnický záchranář	Paramedic	3 years	University
	Zdravotnický záchranář pro urgentní medicínu	Paramedic for emergency medicine	+ 2 years practice and 652 hours	Training
Slovak Republic	Zdravotnícky záchranár	Paramedic	3 years	Vocational school
	Zdravotnícky záchranár (Bc.)	Paramedic (Bc.)	3-4 years	University
Poland	Ratownik medyczny	Paramedic	3 years	University
Germany	Rettungssanitaeter helfer	Driver	1 month	Training
	Rettungssanitaeter	Paramedic	3 months + 1 week	Training
	Notfallsanitäter	Emergency paramedic	3 years	Training
Austria	Rettungssanitaeter level 1	Driver	3 months	Training
	Rettungssanitaeter level 2	Driver/EMT	depends on company	Training
	Rettungssanitaeter level 3	Driver/EMT	depends on company	Training
	Notfallsanitäter	Emergency paramedic	+ 2,5 years	Training
	Notfallsanitäter mit spezialisierung	Emergency paramedic with specialization	+ 200 hours	Training
Hungary	Mentőápol alapvető	Basic EMT	2 months + graduation	Course
	Mentőápol fejlett	Advanced EMT/Paramedic	2 years	Vocational school
	Mentőtiszt	Paramedic	4 years	University
Romania	Nivel paramedic 1	Paramedic level 1	1 month	Training
	Nivel paramedic 2	Paramedic level 2	+ 3 months	Training
	Nivel paramedic 3	Paramedic level 3	+ 6 months	Training
Italy	Paramedico A	Paramedic A	6 months	Training
	Paramedico B	Paramedic B	10 months	Training
	Paramedico C	Paramedic C	1,5-2 years	Vocational school
Ireland	Intermediate Care Operative	Intermediate Care Operative/EMT	160 hours + 2 days	Training
	Paramedic	Paramedic	2 years	Training
	Advanced paramedic	Advanced paramedic	2 years +2 years of practice	Training

Here is a table with information about the name of the paramedic profession in the country and information about the length of education required for the position. The darker is the colour of the health care provider of the selected country, the greater his/her competencies are, and thus the educational requirements compared to other positions in the same country.

Next 2 tables show competencies of paramedics, which differ the most. the first table focuses on individual procedures, the second table shows the competencies for the administration of various drugs.

Table No. 2: Abbreviations and Explanations

E.M.	Emergency Medicine
E.M.	Emergency
I.C.O.	Intermediate Care Operative
IND	the procedure can only be performed at the doctor's indication
SUP	the procedure can only be performed under the supervision of a doctor
WC	the procedure can only be performed with a written confirmation
WC + I	can only be performed with a written confirmation at the doctor's indication
EPI	can only be used during an epileptic sequence in progress
1*	can be used only one time during CPR
S.L.	can only be used sublingual
*	can only be performed on women and girls older than 10 years
**	can only be performed only during CPR for the older 10 years
***	can only be performed on women

Table No. 3: Competencies for Performance of Paramedics

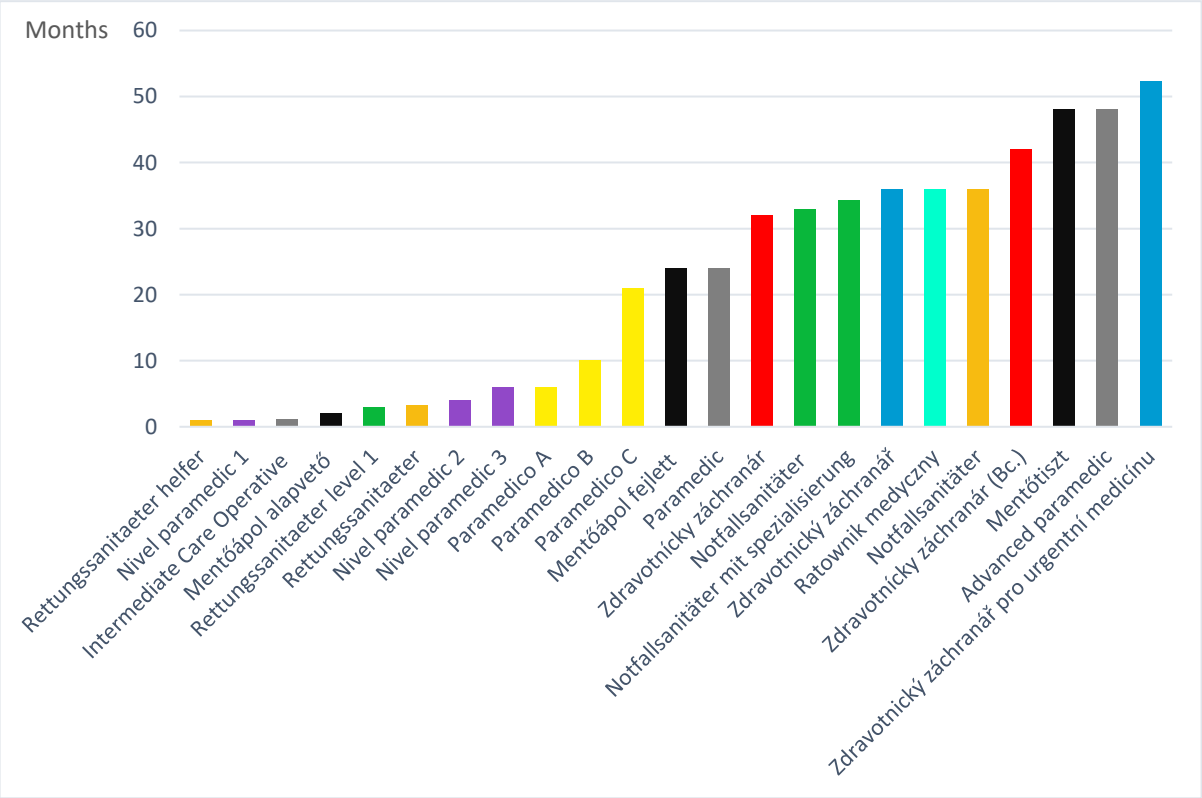
COUNTRY	Name of the job	intraosseous access	intravenous cannulation	use of supraglottic aids	endotracheal intubation	coniopuncture	defibrillation	catheterization of the bladder
Czech Republic	Paramedic	YES	YES	YES - IND	YES - IND	YES - IND	YES	YES - IND *
	Paramedic for E.M.	YES	YES	YES**	YES**	YES**	YES	YES
Slovak Republic	Paramedic	YES	YES	YES	YES	YES	YES	YES***
	Paramedic (Bc.)	YES	YES	YES	YES	YES	YES	YES***
Poland	Paramedic	YES	YES	YES	YES	YES	YES	YES - SUP
Germany	Driver	NO	NO	NO	NO	NO	NO	NO
	Paramedic	NO	NO	NO	NO	NO	YES	NO
	Emergency paramedic	YES - IND	YES	YES	YES - IND	NO	YES	YES
Austria	Driver	NO	NO	NO	NO	NO	YES	NO
	Driver/EMT	NO	NO	YES	NO	NO	YES	NO
	Driver/EMT	NO	YES	YES	NO	NO	YES	NO
	E. paramedic	YES	YES	YES	NO	YES	YES	YES
	E. paramedic with spec.	YES	YES	YES	YES	YES	YES	YES
Hungary	Basic EMT	NO	NO	NO	NO	NO	YES	NO
	Advanced EMT/Paramedic	YES	YES	YES	NO	NO	YES	NO
	Paramedic	YES	YES	YES	YES	YES	YES	YES
Romania	Paramedic level 1	NO	NO	YES	NO	NO	YES	NO
	Paramedic level 2	YES	YES	YES	YES	NO	YES	NO
	Paramedic level 3	YES	YES	YES	YES	YES	YES	YES
Italy	Paramedic A	NO	NO	NO	NO	NO	YES	NO
	Paramedic B	NO	NO	NO	NO	NO	YES	NO
	Paramedic C	NO	NO	NO	NO	NO	YES	NO
Ireland	I.C.O./EMT	NO	NO	NO	NO	NO	YES	NO
	Paramedic	NO	NO	YES	NO	NO	YES	NO
	Advanced paramedic	YES	YES	YES	YES	YES	YES	NO

Table No. 4: Competencies for Drugs Administration

COUNTRY	Name of the job	physiological saline	glucose	adrenaline in CPR	amiodarone in CPR	non-opiate analgesics	opiate analesics	diuretics	benzodiazepines	antidotes	Oxygen	atropine	nitrates
Czech Republic	Paramedic	YES	YES	YES - IND	YES - IND	YES - IND	YES - IND	YES - IND	YES - IND	YES - IND	YES	YES - IND	YES - IND
	Paramedic for E.M.	YES	YES	YES	YES	YES - IND	YES - IND	YES - IND	YES - IND	YES - IND	YES	YES - IND	YES - IND
Slovak Republic	Paramedic	YES	YES	YES - WC	YES - WC	YES - WC+I	YES - WC+I	YES - WC+I	YES - WC+I	YES - WC+I	YES	YES - WC+I	YES - WC+I
	Paramedic (Bc.)	YES	YES	YES - WC	YES - WC	YES - WC+I	YES - WC+I	YES - WC+I	YES - WC+I	YES - WC	YES	YES - WC	YES - WC+I
Poland	Paramedic	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Germany	Driver	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Paramedic	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
	Emergency paramedic	YES	YES	YES - IND	YES - IND	YES - IND	YES - IND	YES - IND	YES - IND	YES - IND	YES	YES - IND	YES - IND
Austria	Driver	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
	Driver/EMT	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
	Driver/EMT	YES	YES	YES	YES	NO	NO	NO	YES - EPI	YES	YES	NO	YES
	E. paramedic	YES	YES	YES	YES	NO	NO	NO	YES - EPI	YES	YES	NO	YES
	E. paramedic with spec.	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hungary	Basic EMT	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
	Advanced EMT/Paramedic	YES	YES	YES	NO	YES - 1*	NO	NO	YES	NO	YES	NO	YES - S.L.
	Paramedic	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Romania	Paramedic level 1	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
	Paramedic level 2	YES	YES	YES	NO	YES	YES	NO	YES	NO	YES	YES	YES
	Paramedic level 3	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Italy	Paramedic A	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
	Paramedic B	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
	Paramedic C	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO
Ireland	I.C.O./EMT	NO	YES - G	NO	NO	YES	NO	NO	NO	YES	YES	NO	NO
	Paramedic	YES	YES	YES	NO	YES	NO	NO	YES	YES	YES	NO	YES
	Advanced paramedic	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

The chart below shows a length of the necessary education in months for the position of the paramedic in EU countries. Most of the EU countries have many levels of paramedics, this chart shows all of them. All these types of pre-hospital employees (except for the doctor), who work in ambulances are sorted not by countries, but by the length of their necessary education. This graph does not take time into account, which is often necessary to spend like an employee of the ambulance to reach the opportunity to do a highest training. From this reason we must take the results of the graph with reserve.

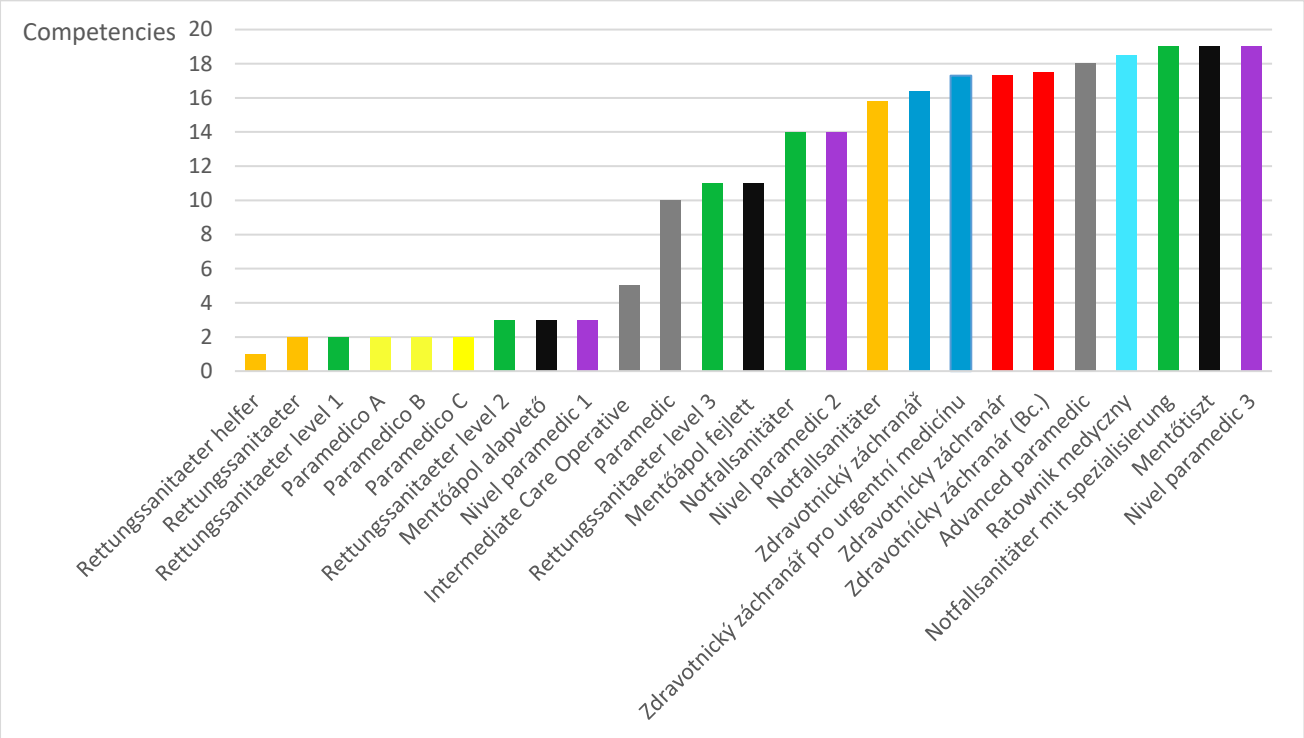
Graph No. 1: The Length of Required Study in Months



- The Czech Republic
- The Slovak Republic
- Poland
- Germany
- Austria
- Hungary
- Romania
- Italy
- Ireland

The chart below shows, how many competencies the paramedics in EU countries have. Only competencies listed in the table in the previous part of this thesis are given. Most of the EU countries have many levels of paramedics, this chart shows all of them. All these types of pre-hospital care employees, who work in ambulances are sorted not by countries, but by the amount of competencies, which they are allowed to perform and which are listed in table of competencies.

Graph No. 2: The Amount of Competencies

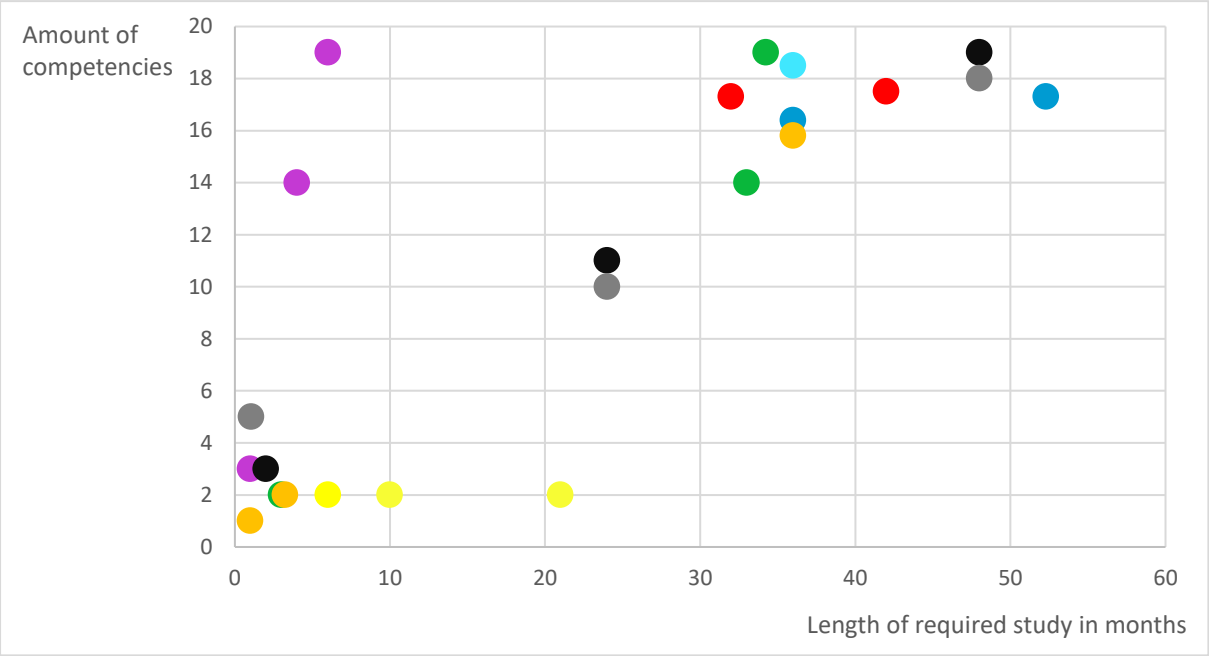


This chart shows only the approximate state of competencies of the rescuers. Only competencies, which are shown in the tables are given here. Every performance, which may be performed by a rescuer is counted for 1 point. Performances, which are allowed to be done by paramedics just with the written confirmation, during CPR to 10 years and older and, or performances, which can

be done on women are counted for 0.9 points. Performances, which may be done with the written confirmation on doctors' indication are counted for 0.8 points.

The third chart shows if the competencies correspond to the necessary time for studying to become an ambulance employee for the current position. X axis shows the duration of the necessary education for rescuers position. The more right is a position, the longer is a qualification course or a school. Y axis shows the amount of competencies which are sorted in the previous part of this thesis. From this chart we can see if the length of paramedics' studies corresponds to the amount of their competencies. This chart also shows some exceptions – an unreasonable length of training or an unreasonable range of competencies. Positions above the light grey bar in the chart have a disproportionately short education comparing with their high competencies. Positions that, on the other hand, are below the light grey bar in the graph, have too low competencies comparing with the length of their education.

Graph No. 3: The Length of Education Depending on the Acquired Competencies



- The Czech Republic
- The Slovak Republic
- Poland
- Germany
- Austria
- Hungary
- Romania
- Italy
- Ireland

In the chart we can notice the Romanian and Italian paramedics, who deviate from the majority average of the graph, which is marked by light grey colour. In Romania it is caused by the different emergency pre-hospital system, which is separated from the usual pre-hospital system, so Romanian paramedics can focus their training mainly on direct rescue. Nursing knowledge is not needed during the course. Also, if someone wants to become a paramedic in Romania there is a condition that he must be employed as a firefighter.

Romanian prehospital system is set up in such a way that Romanian paramedics can hardly get burnout because their job is not from more than half just about transporting patients who do not require any intervention, just need to get to the hospital and a taxi would serve them as well. The Italian pre-hospital health system, in turn, relies on the fact that if rescuers do not have as many competencies, they have less responsibility and therefore less chance of messing up. They decide on a place of intervention, if it is necessary to call a doctor, or just transport patient to the hospital.

6 Discussion

There are two types of pre-hospital systems. It is Anglo-American model and Franco-German model. The Anglo-American model is widely used by many countries, including the United States, Canada, New Zealand, Sultanate of Oman, United Kingdom, Costa Rica, Hong Kong, Iceland, Ireland, Israel, Malaysia, the Netherlands, Nicaragua, the Philippines, Poland, Singapore, South Korea, Taiwan and Turkey according to the Asian Disaster Preparedness Centre it is reportedly growing. The Anglo-American model is one of a 'Scoop and run' nature. It is based on the simple idea of arriving at the patient and transporting them to hospital for all treatments. As most of the diagnostic treatment is at the hospital's ED, the medical doctors remain there, while the emergency medical technicians or paramedics leave to collect the patient. Because the expectation is for the paramedic to bring the patient back to ED for treatment, the majority of times the main form of transport used is land ambulance. As paramedics do not have the qualifications of a doctor, they are not classed under a hospital profession, but rather one that delivers fast emergency care and assist public safety. (Curtis, Ramsdens, 2016, p. 22)

Franco-German model does not appear to be as widely used as the Anglo-American model. Some of the countries, that use the Franco-German model are Germany, France, Austria, Greece, Malta, Finland, Latvia, Norway, Portugal, Russia, Slovenia, Sweden, and Switzerland. The Franco-German model works on the principle of 'stay and stabilise', or 'delay and treat'. This model implies its ability to stay on scene loner. This is because essentially it brings the hospital to the patient. As such instead of a basic trained paramedic assisting the patient, the patient would have an ED equivalent doctor come directly to them. Sometimes the doctor would be anaesthesiologist. The doctor's attempts to treat on scene can help to cut out the hospital altogether. This removes the need for a fleet of road

ambulances. However, when a patient does need hospitalization, they are directly admitted to the appropriate ward by the attending field doctor. If this happens, the lack of a road ambulance means they need to utilise other modes of transport such as helicopters and the coastal ambulance. This model may be seen to incorporate advanced life support (ALS) model. It is seen as modelling the 'stay and stabilise' theory. It has ALS-qualified personnel who can perform the same level of care as the BLS personnel and more. On the top Basic Life Support, the ALS team can perform more invasive procedures such as endotracheal intubation, intravenous lines (cannulation), begin fluid replacements and perform chest decompression, as well as have the ability to use many medications. (Curtis, Ramsdens, 2016, p. 22)

Competencies of paramedics correspond to the prehospital emergency system of the current countries. With every competence, which is given to a paramedic, the paramedic accepts not just ability to do some performance, but also the responsibility. The more competencies they have, the more responsibilities they have as well. Also the school or the course for paramedics should have the length corresponding to gained competencies.

All competencies are of great importance and on some occasions they can even save the patient's life. One of the most important performance is to secure patients' airways. Patients' airways can be secured by supraglottic aids (laryngeal masks, Wendel and Guedel airways, laryngeal tube) by endotracheal intubation or by coniopuncture. In my opinion, all employees of European ambulances should be able to secure airways at least with Guedel airway. The highest quality of securing the patient's airways in the unconscious is the orotracheal intubation. During the endotracheal intubation, the patient may need to be premedicated and preoxygenated. The actual intubation procedure is always differently demanding, it always depends on the conditions and the anatomical position of

the patient. Several complications can occur during the procedure, such as the insertion of an endotracheal cannula into the esophagus, which leads to a prolongation of the time when the patient does not receive oxygen. For this reason, it is more difficult to perform endotracheal intubation in comparison to securing airways with supraglottic aids (with supraglottic aids, there is no need to put the aid into the trachea under epiglottis). So in most of the EU countries the competence for the endotracheal intubation is given just to paramedics with the highest possibly education (for example in Austria, Ireland, Romania, or Hungary), or to paramedics just with the indication of a doctor (for example in the Czech Republic). The paramedic in the Slovak Republic is allowed to perform the endotracheal intubation without the doctor´s indication or supervision. Before the doctor arrives on the place of intervention, paramedics, who are not competent for theendotracheal intubation should secure the airways with supraglottic aids, if it is necessary, to avoid the time delays.

Another life-saving performance is the coniopuncture. This performance serves for securing airways to patients with the upper airway obstruction, mostly caused by swelling of the tongue. Again, this is a procedure that, in case of the insufficient experience, can be dangerous for the patient if it is performed by someone who is not properly trained in the coniopuncture. Although this procedure is invasive, it is still maybe easier than performing the orotracheal intubation of an unknown patient in the field. In my opinion, always at least one from the ambulance crew should have the power to perform the coniopuncture. It is a performance that is not performed very often, but should not be underestimated, and all paramedics should be sufficiently prepared for it.

Many rescuers have the competence to secure the airway with supraglottic aids but cannot perform the intravenous cannulation. It suggests that the provision of airways by supraglottic devices should be simpler than the provision of

intravenous access. Ensuring the blood circulation through the intravenous entry gives us the opportunity to administer drugs to the patient with a faster onset than with per os, or to the supplement the patient's blood circulation during the massive bleeding. Often, the intravenous cannulation is just a precautionary measure of the patient in case his condition worsens. If the bloodstream is already collapsed and we must necessarily secure it as soon as possible, there is the possibility of drilling an intraosseous cannula. Drilling an intraosseous cannula carries additional risks, but there are situations where this is the only solution.

Every employee, who work in ambulance in EU countries, should be able to administer at least an oxygen. Another very important drug, in my opinion, is glucose. Glucose is used primarily to treat the hypoglycemic state. Hypoglycemia is one of the possible causes of unconsciousness and can result in death if it is not resolved quickly. If treated at the last minute, the patient can have lifelong consequences. Other medications are certainly also very important, but it is easy to use them to worsen the patient's condition.

Adrenaline and amiodarone are medicaments, which are used mostly during the CPR. Adrenaline is also used in the pre-hospital care for its bronchodilator and vasoconstrictive effects, for example in the case of the anaphylactic shock. The adrenaline administration should be given higher priority than amiodarone in the pre-hospital care due to its more frequent and urgent use. The Hungarian *mentőápol fejlett*, for example, has an interesting solution of competencies regarding the administration of adrenaline. He/she is allowed to administer adrenaline during CPR, but only once. Thanks to this, the patient receives adrenaline without unnecessarily waiting for someone who has the competence to do so. Meanwhile, during ongoing CPR, a doctor or *mentőtiszt* are already called to the place. Both are allowed to administer additional doses of adrenaline or amiodarone.

Another very important group of drugs in pre-hospital care are analgesics. Analgesics can be divided into opiate and non-opiate. Patients who use emergency services often feel pain and this is often one of the main reasons why they call an ambulance. Correctly, the patient should be asked how severe his pain is on a scale from 1 to 10. If the patient gives a value of 5 or more, opioid analgesics may be used. The patient's pain should always be adequately controlled. One of the dangers of the excessive administration of opioid analgesics is hypotension and respiratory depression. Other disadvantages of the excessive pain relief include suppression of the original pain and the difficulty of further examination after transfer to the hospital. A drug called naloxone can be used as an antidote. (Knor, Málek, 2014)

Opioids are often misused for the production of addictive substances and their use, apart from the hospital and the pre-hospital pain relief, is prohibited. For this reason, paramedics usually have competence only for the administration of non-opiate analgesics. It is, for example, paracetamol. Its maximum daily dose is 4 grams, during the intervention 1 gram is usually given, which means that paramedics can hardly get into a situation where they overdose the patient. In case of overdose, N-acetylcysteine is used as an antidote. (Knor, Málek, 2014)

Benzodiazepines are used either to induce anaesthesia or to treat an epileptic seizure. Flumazenil is used as an antidote. (Knor, Málek, 2014) Paramedics should be able to give benzodiazepines at least to treat an epileptic seizure. It is always sufficient for at least one crew member to have such competence. Also, at least one crew member should be able to administer antidotes for cases, where they either need to provide them for an already overdosed patient or they need to provide them for a patient in a condition caused by the wrong amount of medicament.

There is no ideal pre-hospital care structure that works best and can be applied to all EU countries. The ideal structure is individual for each country. Each country has a different terrain, a different number of ambulances in operation, a different average arrival time, or even different typical injuries for different areas. If there is anything what should be tried to improve in the pre-hospital system in the Czech Republic, it is the use of rescue motorcycles. The use of motorcycles significantly reduces the time of arrival in case of traffic jams, so the patient receives the necessary help earlier. The disadvantage is primarily that the motorcycle is not able to transport the patient. An ambulance must be awaited for transport. The second disadvantage is the limited equipment, as the motorcycle provides considerably less storage space than the ambulance. But the question remains, who should drive the rescue motorcycle? In Germany, for example, rescue motorcycles are driven by a doctor. In Portugal, on the other hand, where rescue motorcycles are also used, they are driven by Emergency Medical Technicians. The doctor should be the head of the operation during the intervention. therefore, his abilities are considerably limited when he comes to the scene by a rescue motorcycle. The emergency medical technician, in turn, has a very limited range of services that he can perform if no one else with higher competencies is on site.

Logically, the driver of the rescue motorcycle should be the paramedic. The paramedic is usually used to work alone (unless, for example, the driver's help in transport counts) or in pairs, where his/her colleague is also a rescuer. At the same time, he/she has a significantly wider range of competencies than the Emergency Medical Technician. The idea that the crew of a rescue motorcycle would consist of two people is also worth mentioning. Whether it was a doctor and a paramedic, or two paramedics, the crew could work together and approach the quality of an ordinary ambulance with the same crew. Of course, this crew would only be sent to the most serious cases (due to the greater load on the entire

system, as the rescue motorcycle must be sent first and then must be followed by the ambulance for transport), where every minute can decide if the patient will survive. We can only speculate whether such a model would really work in the Czech healthcare system.

Another interesting thing is the education of Romanian paramedics, who must first become firefighters and only then they can be paramedics-firefighters. The length of the education required is clearly shorter than the education of paramedics in other EU countries. There is not such an emphasis on nursing care in education, which gives them the opportunity to fully concentrate on the emergency medicine during their studies, but at the same time they lose the opportunity to go to work to the hospital as a nurse, as they can in the Czech Republic. However, the Romanian paramedic also avoids the situation when his/her job is more about transporting patients to the hospital who could use a taxi service instead of an ambulance.

The Hungarian pre-hospital system, in turn, uses *mentőtiszt* in ambulances instead of a doctor. His/her competencies are almost at the same level. Studying medicine, which lasts at least 6 years and is followed by at least 4 years of certification (10 years in total) is a long time for someone who is sure from the beginning that he/she will go to work in the pre-hospital system in an ambulance. In contrast, studying for the position of *mentőtiszt* in Hungary lasts only 4 years. If the school is a form of full-time study and students are sufficiently educated during the studies, 4 years should be sufficient.

The equivalent of the Hungarian *mentőtiszt* could also be *zdravotnický záchranář pro urgentní medicínu* (a paramedic for the emergency medicine) for the Czech Republic. The difference is that it is necessary to have a graduated paramedic for the Czech position of the paramedic for the emergency medicine. The study for

paramedics lasts at least three years, then it is necessary to work as a paramedic for at least three years and at least 12 months of them working full-time at the rescue service (Zdravotnický záchranář pro urgentní medicínu, 2018). It suggests that the resulting length of training for the profession of the Czech paramedic for the emergency medicine is longer than for the Hungarian *mentőtiszt*, despite the fact, that *mentőtiszt* has significantly higher competencies.

Although the school tries to bring the operation in the rescue service as close as possible to its students, nothing can replace years of practice. Thanks to the combination of the education from the school and subsequent practice, the paramedic then has an access to courses that expand his/her competencies. The competence to perform the orotracheal intubation and the administration of drugs without the doctor's indication is often considered to be the peak of paramedic competencies. But what if there was another course that would expand the competencies of the paramedic even more and thus fill the gap between the paramedic with specialization and the doctor? For example, in the United States, paramedics have the competence to perform ultrasound examinations (Heegard, Hildebrandt, 2010). This competence could be implemented in the Czech pre-hospital system, it would certainly be great for example in mass accidents in sorting the wounded people.

If the competencies of European paramedics are compared with those of Australian paramedics, it will be found that Australian paramedics have different competencies in drug administration depending on the region. Paramedics in Australia have two levels: the paramedic and the intensive-care paramedic. The Australian paramedic is allowed to secure airways with laryngeal mask, oropharyngeal mask, nasopharyngeal mask endotracheal intubation, cricothyroidotomy and thoracostomy. They are also allowed to perform

intravenous cannulation. The intensive-care paramedic is also allowed to provide the intraosseous access and perform cardioversion (Curtis, Ramsdens, 2016).

Data collection was used for the creation of this bachelor's thesis, mainly in the form of personal communication with local rescuers. This specific method of data acquisition has its advantages and disadvantages. For example, when comparing these results with the results of the bachelor's thesis "Comparison of Paramedics Competencies in the Visegrad Four and Russian Federation" by Vodička (2016), it can be noted that when processing countries (which are also included in this bachelor's thesis) only with the help of legislative documents, some items are undetectable. This is due to the fact, that despite all efforts, certain documents are untraceable or do not contain all the necessary information. During personal interviews, you will usually learn exactly what you are asking. On the other hand, all information from legislative documents is a much more credible source than personal interviews with rescuers, which is a great advantage. Due to different data acquisition methods, the results may differ slightly. Differences in results may be further caused by the fact that Vodička obtained data in 2016, which is 5 years before the creation of this thesis.

7 Conclusion

Aim: The main aim of this bachelor thesis is to compare paramedics' competencies in selected EU countries.

When comparing the competencies of rescuers, it was found that in all examined countries, there are several levels of the education for rescuers and both the job position, and the competencies are derived from them. The Hungarian advanced paramedic has the broadest competencies, quite often directly replacing doctors on board the ambulance. The lowest competencies are given to a German ambulance driver called *Rettungssanitäter Helpher*, which corresponds to the length of his/her education. The greatest differences between the length of education required and the competencies awarded can be found in Italy and Romania. Italian paramedics have almost no competencies and the necessary education for the position of paramedic lasts 2 and a half years. On the contrary, in Romania, a relatively short time is enough to achieve a job as a rescuer with very extensive competencies. The competencies of paramedics from the Czech Republic are somewhere in the middle compared to other countries. It was found that the setting of competencies for rescuers of some countries could be implemented in the Czech pre-hospital systems. Other rescue positions with a wide range of competencies except Romanian advanced paramedic and Hungarian *mentőtiszt* are also *Notfallsanitaeter mit spezialisierung* from Austria and the advanced paramedic from Ireland.

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