

CROATIAN AGENDA: IMPLEMENTATION OF WAR EXPERIENCE TO MEDICAL DISASTER MANAGEMENT

**Antoljak T, Kovač T, Lovrić Z, Rotim K,
Mihaljević S, Pekez-Pavliško T, Dobrić I**
Committee for Implementation of Croatian Trauma System¹

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Abstract

At the very start of independence in 1991 Croatia was faced with military and paramilitary aggression of former Yugoslavian federal army. Since there was no aid from abroad, we had to lean on our own capabilities to solve increasing health demands among soldiers and civilians. Initially, NATO doctrine has been modified and Mobile Surgical Teams composed of civilian medical staff were supporting army units at the first battleline. Special services were developed for other public health problems and their activities were coordinated by Headquarter for medical crisis. Excellent results were achieved despite adverse political and economical circumstances.

In recent time, there is a growing public interest for disaster preparedness. Our plans for such situations are guided in two directions. First of them is building Croatian trauma system in four steps following recommendations from western countries, especially European Union. This is supposed to be a prompt answer to medical crisis within certain geographical area. Other direction is re-establishing Headquarter for medical crisis at the national level, including all services and potential hierarchy. Our war experience suggests that this is a straightforward and easily changeable model allowing quick adaptation. When too excessive demands are put on local capabilities and resources during the crisis, this might be an excellent back-up solution.

Introduction

In former Yugoslavia military medicine was completely separated from civilian system. Ex federal army developed all segments of health services, including emergency and disaster medicine as well as hospitals of highest rank. Military physicians were privileged in terms of professional training and working conditions. The whole organization was generously financed by the state.

¹ Dpt of Traumatology, Clinics of Surgery
Clinical Hospital Center Zagreb, Kišpatićeva 12
10000 Zagreb, Croatia
phone +385-91-531-0001
e-mail: tonisav.antoljak@vip.hr

On May 30th 1990 the Croatian parliament was constituted after first democratic elections in our history. Less than three months later (August 16^h 1990) Serbian paramilitary units started to obstruct free transport of people and goods by placing huge wooden obstacles on main roads in the middle part of Croatia. Until May 1991 there were over 200 terrorist attacks with explosive devices and over 100 assaults with fire-weapons, thus resulting in 16 Croatian citizens killed and 56 more wounded. Under protection of federal army Serbian rebels proclaimed secession of the middle part of Croatia on May 22nd 1991. Six days later, on May 28th 1991, first brigades of future Croatian army were recruited from regular police force, though they were practically unarmed at the beginning. Open aggression of ex Yugoslavian military forces started on July 3rd 1991 including tank attacks, but European Union declared embargo on export of weapons to whole territory of ex Yugoslavia on July 5th 1991. Until the end of 1991, 45% of Croatian land was under constant attacks of heavy weapons and 95% of targets were civilian. Finally, Croatia was internationally recognized on January 15th 1992 (Croatian memorial documentation center of Patriotic war, 1991; Patriotic war in city of Karlovac, 1991; Ljubičić et al, 2006).

Regarding health care needs, increasing military aggression brought huge problems to unarmed Croatia:

- Migration of 500 000 people from occupied territories to Zagreb and other big cities
- Traffic isolation of southern part of Croatia and uncertainty of travelling, including emergency medical service cars
- Considerable loss of health care infrastructure and supplies on occupied territory as well as because of blockade of military medical warehouses on unoccupied territories by ex Yugoslavian army
- Escape of medical professionals abroad and, to much lesser amount, to Serbian rebels
- Constant lack of finances for medical needs. Croatia was completely unarmed in 1991 and all money had to be invested in buying weapons. Because of international embargo we were forced to buy weapons at international black market for triple prices (Ljubičić et al, 2006).

Under such adverse circumstances whole structure of health care in Croatia had to adapt to war conditions.

Group of physicians unofficially met in Zagreb on August 18th 1990, only two days after first action of Serbian paramilitary forces. During the next month they made an inventory of available medical supplies and initiated plans for medical aid to other parts of Croatia (Ljubičić et al, 2006). On December 19th 1990 they were appointed to Headquarter of health care with departments for preventive medical actions, toxicology and re-distribution of medical supplies.

Initial protocols about control and safety of drinking water, control of conserved food as well as about immunization, nourishment and other daily needs for refugees were published on January 24th 1991. Due to increased demands later on Headquarter of health care established additional five departments (for mobile surgical teams, evacuation and treatment of wounded persons, psychiatry and information & investigation) as well as six services (for administration, medical tactics, repair of medical equipment, transport, distribution of drugs and security) (Ljubičić et al, 2006). Very soon, NATO textbook was translated to Croatian language (Prodan et al, 1991) and many seminars and courses about first aid (Hebrabg et al, 1991) were made for non-medical and medical providers. All activities were based on the hard work of enthusiastic medical personnel who were “civilians in the military uniform with police symbols” (Ljubičić et al, 2006).

Mobile surgical teams were established on February 4th 1991. Each team consisted of five members: two physicians (surgeon, anesthesiologist), two nurses (surgical and

anesthesiological) and a driver (Puntarić and Brkić, 1995). First intervention in the field was on March 31st 1991 when Croatian police officer Josip Jović was killed (Ljubičić et al, 2006). Until the end of the war mobile surgical teams have been always present near the first battle-line supporting professional brigades, i.e. 50 m behind during attack phasis and 100 m behind during retreat phasis.

On January 3rd 1992 first cease-fire was signed between Croatian army and Serbian forces. Meanwhile, Headquarter of health care reorganized treatment of wounded persons at four levels (Vučkov et al, 1998; Marcikić et al, 1998; Ilić et al, 1998; Janković et al, 1998):

- Level I: educated soldiers and medical technicians giving first aid at the battle-line
- Level II: physicians who were located not far off the battle-field. Their responsibility was to make initial triage and to solve medical emergencies
- Level III: civilian ambulance services or war hospitals equipped with surgical teams
- Level IV: hospitals for definitive treatment of injured persons.

Further improvements were introduced in May 1992 when Level I providers were detached from the authority of Headquarter of health care and incorporated in regular army units (Ljubičić et al, 2006).

In 1995 Croatian army performed few decisive operations when most part of Croatia was liberated. Those were: “Flash”, “Summer 95” and “Storm”. In all of them medical support to combat units was excellent (Petričević et al, 1998; Tonković et al, 1997; Lovrić et al, 1997; Janković et al, 1997) and regular health care for civilians was re-established in a couple of days (Ljubičić et al, 2006).

Finally, during the whole period of war in Croatia there were no tetanus diseases or epidemics (Atias-Nikolov, 1995), including poisoning of food and water (Plavšić et al, 1992). Sporadic infectious diseases were recognized on time and adequately cured (Ljubičić et al, 2006; Tiljak 1996). Among 25 000 wounded persons, only few of them had gas gangrene and only 800 amputations of extremities were performed (Jovanović et al, 1999; Rukavina, 1998; Maričević and Erceg, 1997; Hančević et al, 1992; Turčić et al, 1995). Dedication and commitment of civilian health care personnel was able to compensate inexperience in war medicine, lack of finances and lack of firm military organization (Puntarić and Brkić, 1995).

Theory and Method

In recent time there is a growing public interest for disaster preparedness in Croatia. Literature suggest that a disaster respond is best provided through an extension of already existing trauma system (American Trauma Society, 2002). Croatia still hasn't got one, although we are investing some effort to make it. This article is arguing two questions:

- Do we need Croatian trauma system at all?
- If the answer on the first question is positive, one should think over if our war experience should be incorporated?

Crude numbers of deaths per year due to external cause of injury and poisoning (ICD 10: V01-Y89) in Croatia were obtained from Croatian National Institute of Public Health (Croatian National Institute of Public Health, 2006). Because in ex Yugoslavia separate statistics for Croatia and other ex Yugoslavian republics was not reported before 1985, this was the starting year for the purpose of the present study. Latest data for Croatia reached year 2005.

Risks during transport have gained recently great interest in Europe (Consultation Paper On a 3rd Road Safety Action Plan 2002-2010, 2001; Commission of the European Communities, 2001; Commission of the European Communities, 2003). In Croatia police statistics is the only one offering details regarding time of death of transport accidents victims during three

periods: on the scene, during transport and in the hospital up to 30 days (Ministry of Internal Affairs, 1995-2006). Data were analyzed and compared with other studies.

On the level of international statistics we operated with European health for all database (WHO Regional Office for Europe, 2007), which provides age-standardized death rate (SDR) from external causes of injury and poisoning (ICD 10: V01-Y89) as well as SDR from motor vehicle accidents (ICD-10: V02-V04, V09, V12-V14, V19-V79, V82-V87, V89). In this database, SDR were calculated using the direct method i.e. they represent what the crude rate would have been if the population of a certain country had the same age distribution as the European standard population. Comparison was made for Croatia, average of European Union (including new members since May 2004) and two European countries with mature trauma systems (the Netherlands and Great Britain).

Results

Crude numbers of deaths per year due to external causes of injury and poisoning (ICD 10: V01-Y89) in Croatia are presented in tables 1, 2 and 3 for three periods: 1985-1990 (before the war), 1991-1995 (during the war) and 1996-2005 (after the war) (Croatian National Institute of Public Health, 2006).

Table 1. Crude number of deaths per year due to external causes of injury and poisoning (ICD 10: V01-Y89) in Croatia for 1985-1990 (Croatian National Institute of Public Health, 2006).

Year	1985	1986	1987	1988	1989	1990
N ^o	3841	3641	4104	4178	4095	4381

Table 2. Crude number of deaths per year due to external causes of injury and poisoning (ICD 10: V01-Y89) in Croatia for 1990-1995 (Croatian National Institute of Public Health, 2006).

Year	1991	1992	1993	1994	1995
N ^o	7325	6346	4538	3715	3847

Table 3. Crude number of deaths per year due to external causes of injury and poisoning (ICD 10: V01-Y89) in Croatia for 1996-2005 (Croatian National Institute of Public Health, 2006).

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
N ^o	3295	3119	3173	2939	2905	2742	2707	2859	2870	2878

In the period 1985-1990 Croatia has lost 24 240 citizens because of injuries. During the war our losses were 25 771 and in eleven years of peace after the war we have lost nearly 30 000 people. All together, during past 21 years Croatia has lost nearly 2% of its population only because of injuries.

Police statistics (Ministry of Internal Affairs, 1995-2006) about mortality in transport accidents in Croatia is presented in table 4. This is a trimodal distribution with death peaks on the scene, during transport and in the hospital up to 30 days.

It is obvious that overall mortality due to transport accidents in Croatia is gradually decreasing. More important are two other facts:

- Share of hospital mortality to overall mortality has not significantly decreased during past 10 years and remained constantly over 25%
- Share of mortality in prehospital setting was between 72-80%.

On the international level we made a comparison between Croatia on one side and average European Union (including new members since May 2004) and two European countries with

mature trauma systems (the Netherlands and Great Britain) on the other. Age-standardized death rate (SDR) from external causes of injury and poisoning (chart 1) as well as SDR from motor vehicle accidents (chart 2) were employed.

Chart 1. Age-standardized death rate (SDR) from causes of external injury and poisoning for Croatia, average of EU, the Netherlands and Great Britain (WHO Regional Office for Europe, 2007).

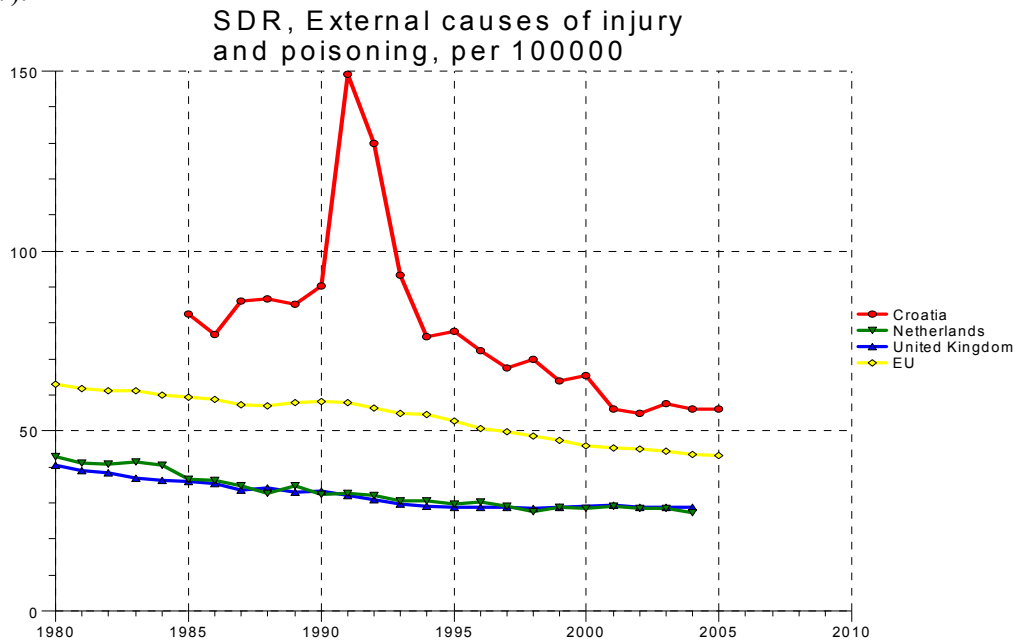
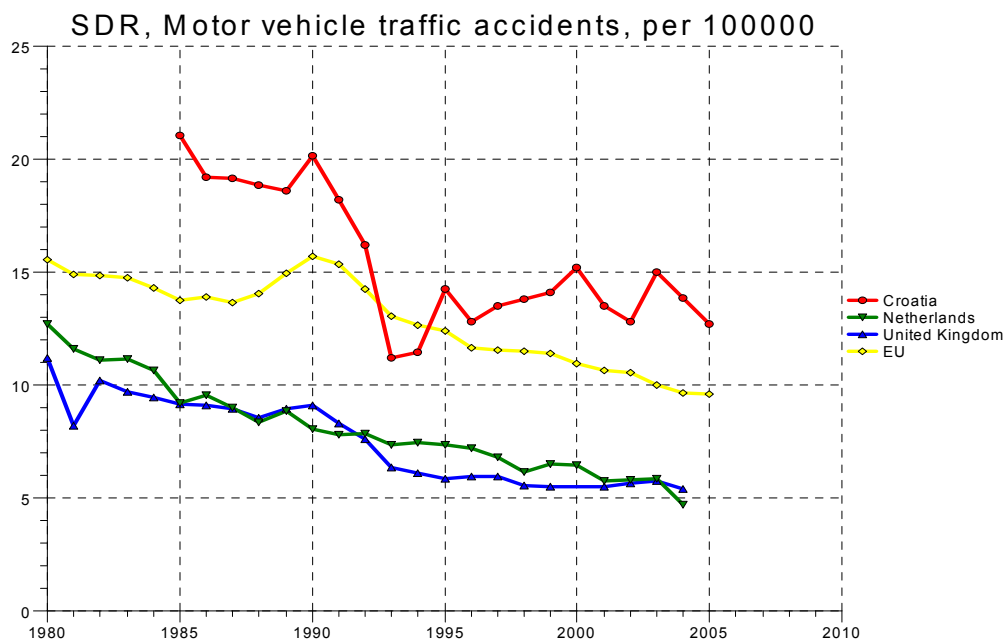


Chart 2. Age-standardized death rate (SDR) from motor vehicle accidents for Croatia, average of EU, the Netherlands and Great Britain (WHO Regional Office for Europe, 2007).



Death rate because of external causes of injury and poisoning is decreasing in EU and countries with a mature trauma system. Croatian statistics demonstrates the same trend with exception of war period. On the other hand, in 2004 risk to die in Croatia because of injury is

still 30% higher than in EU and nearly doubly higher than in the Netherlands or Great Britain (chart 1).

Deaths in motor vehicle accidents are more specific than deaths due to all transport accidents. Therefore, trend regarding SDR of motor vehicle victims over last thirteen years in Croatia is completely opposite from trend regarding number of deaths in transport accidents according to police statistics. In 2004 risk to die in a motor vehicle accident in Croatia is 40% higher than in EU and nearly treble higher than in the Netherlands or Great Britain (chart 2).

Discussion

Trauma care in Croatia is organized according to old German/ Austrian model. Treatment of injured patient in the field is provided by prehospital emergency medicine service which has no communication with hospitals. In majority of hospitals emergency services are fragmented i.e. there are separate departments for internal, neurological, psychiatric diseases etc. So, injured patients are brought to surgical emergency department and treated by surgeons. If vital parameters are critical, patient is transported directly to intensive care unit where anesthesiologist make initial resuscitation (intubation, ventilation, central i.v. lines) and after that surgeons perform operations like thoracic drainage, laparotomy, external fixation etc. Accordingly, emergency medicine in Croatia is not an independent specialty and it is acting only in prehospital setting.

In all acute hospitals surgeons and anesthesiologists are promptly available. We have well organized radiology, laboratory services and blood bank. On the other hand, our clinical hospitals are nominated because of their bond with medical schools and not because of their excellency in treatment of patients at the first place. There are no regulations about responsibilities of district hospitals, so they are developed very individually. Any kind of accreditation of hospitals in Croatia has been never made.

During past 21 years Croatia has lost 79 498 people or nearly 2% of its population only because of injuries. This study demonstrated that risk to die in Croatia because of injury is 30% higher than in EU and nearly doubly higher than in countries with mature trauma system (the Netherlands or Great Britain). Risk to die in a motor vehicle accident in Croatia is 40% higher than in EU and nearly treble higher than in the Netherlands or Great Britain. Analysis of trimodal death peaks after transport accidents also demonstrated that share of mortality in prehospital setting after transport accidents was constantly between 72-80% during past 15 years. This gives a lots of worry, because such an inefficiency ranks Croatia among countries with unorganized health care. For example, in low-income country (Ghana) there is no formal emergency medical service and prehospital mortality because of injuries amount to 81%. In Mexico, as in many other middle-income countries, there are only basic ambulance services, at least in the urban areas, and the proportion of deaths occurring in the field is 72%(Mock et al, 1998). Finally, share of hospital mortality after transport accidents has not significantly decreased during past 10 years and remained constantly over 25%, despite other improvements in medicine. This may indicate passive attitude of hospital management and surgeons regarding treatment of injured victims (Mitchel et al, 1994; Mitchel and Wolferth 1995).

In “National Health Strategy 2006-2011” Croatian government declared that there is a strong need to improve current way of treatment of injured persons in Croatia (Government of Republic of Croatia, 2006). Main goal in this area is to integrate prehospital, hospital and interhospital segment of trauma care in one system and to develop standards of treatment. Accreditation and categorization of hospitals is stressed out, including the need for nomination of trauma centers as units of trauma system. Special focus was given on better medical treatment of victims in road traffic accidents, but improvements in disaster preparedness are also required (Government of Republic of Croatia, 2006).

On May 22nd Ministry of Health and Social Welfare appointed Committee for Implementation of Croatian Trauma system with broad responsibilities. According to international experiences (American Trauma Society, 2002), the Committee developed basic definition: «A trauma system is an organized, coordinated effort in a defined geographic area that delivers the full range of care to all injured patients and is integrated with the local public health system». The main components of the trauma system are: prehospital care, acute (hospital) care, post-hospital care and injury prevention (American Trauma Society, 2002).

The Committee also adopted the methodology for implementation of Croatian Trauma System:

- Enhancing knowledge of health care professionals
- Organization of trauma units within hospital emergency bays
- Organization of trauma centers
- Organization of trauma system(s).

Since May 22nd 2006 few important tasks have been:

1. Project was presented for the first time at the 4th Congress of Croatian Surgeons in Zadar (May 24th-27th). Opinion of the audience was split.
2. Committee organized the 1st Conference on Croatian Trauma System in Trakošćan (October 15th-17th). There were 70 participants, mainly leaders in traumatology (sub-specialization very similar to trauma orthopaedics with five years of training in general surgery as a prerequisite), but also leaders in anesthesiology and prehospital emergency medicine. The conference resulted in unanimous support to the project from all participants and especially from Croatian Society of Surgeons, Croatian Society of Anesthesiologists, Croatian Society of Emergency Medicine Physicians, Croatian Society of Orthopaedics and Traumatologists, Society of Croatian Patients and Croatian Society of War Veterans.
3. The Committee also established good contact and cooperation with Croatian Red Cross, Croatian Auto Club Organization, Medical Headquarter of Croatian Army and Croatian Mountain Rescue Service.
4. ITLS (BTLS) course was introduced to Croatia in 2004 with capacity of 1-2 courses per year. After ITLS course was incorporated in “Project for Implementation of Croatian Trauma System” we made 10 provider courses, each with 30 students, and two instructor courses. At the moment we have a network of 40 instructors and instructor candidates. Plan for 2007 is to make 14 courses.
5. Croatian Society of Surgeons received written approval from American Society of Surgeons regarding introduction of ATLS course to Croatia. Initial training of course coordinator, course director and educator is in progress
6. Arrangements for Croatian trauma registry are made and full implementation is expected in September 2007.
7. Ministry of Health and Social Welfare also established Committee for reorganization of emergency medical service in Croatia. After analysis of experiences from abroad the Committee made a draft version of curriculum for specialization in emergency medicine.

It is obvious that many efforts have been invested in this project. Our next steps will be to prescribe capacities for trauma bays and to introduce verification and accreditation processes for trauma centers of different categories.

On the other hand, we have some doubts about plans for medical disaster management. There are strong recommendations from USA that “a disaster respond is best provided through extension of existing resources within a trauma system. The best strategy for a community to prepare for disasters is to create a strong trauma system infrastructure that will deal daily with

injuries and have the capacity to efficiently expand to respond to the demands of an unconventional or natural disaster” (American Trauma Society, 2002). At this point, few facts more about trauma system should be emphasized. Based upon a new organization of preexisting knowledge through Advanced Trauma Life Support Course (ATLS), the entire trauma system is driven by the tenet that severely injured patients should be triaged to the appropriate trauma facility (American College of Surgeons, Committee on Trauma, 1993) because the nearest and most convenient hospital may not be the most appropriate one for the type of care that is needed (European Transport Safety Council, 1999). In this model, nonphysicians, such as emergency medical technicians or paramedics, initiate emergency care in the field and transport critically injured patients to hospital-based emergency departments, where emergency physicians provide definitive emergency care. Finally, the true value of a trauma system is reflected in the seamless transition between each phase of care (American Trauma Society, 2002).

It is well known that disaster puts excessive demands on resources, capabilities and organizational structure on health care institutions (American College of Surgeons, 1997). It seems that trauma system becomes frail when hospitals are damaged or when the external systems supplying hospitals with key services and resources needed for the organization to function are disrupted (Millin et al, 2006; Rodriguez and Aguirre, 2006). The recent lessons from Hurricane Katrina indicate that health professionals still need to do more to protect public in times of national disasters (Kunreuther, 2006; Logue, 2006).

At this moment, we do not believe that physicians should wait in hospitals for patients during disasters. War in Croatia was a man-made disaster of massive proportions. These days Croatia was completely unarmed, unrecognized by international community, traffically spilt into two parts, one third of land was occupied, 500 000 refugees were searching their shelter, medical supplies were either robbed by Serbian paramilitary forces or blocked by ex federal army and there were no finances for medical needs (Ljubičić et al, 2006). Under such huge pressure and without previous experience in military medicine Croatian health care professionals have created firm organization under Headquarter of health care. Despite adverse conditions, there were no tetanus diseases or epidemics (Atias-Nikolov, 1995), including poisoning of food and water (Plavšić et al, 1992), sporadic infectious diseases were recognized on time and adequately cured (Ljubičić et al, 2006; Tiljak, 1996), among 25 000 wounded persons only few of them had gas gangrene and only 3% amputations of extremities were performed (Jovanović et al, 1999; Rukavina, 1998; Maričević and Erceg, 1997; Hančević et al, 1992; Turčić et al, 1995). In Croatia there was an unique situation when highly educated specialists (surgeons and anesthesiologists) were constantly available at the first battle-line giving medical support to soldiers. They were acting as «civilians in military uniforms and with police symbols» (Ljubičić et al, 2006).

When too excessive demands are put on local capabilities and resources during the crisis, re-establishing of Headquarter of health care might be an excellent back-up solution for Croatia.

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Biography

Tonisav Antoljak, MD, Mr.sci. was born in 1960 in Croatia; is married and I has two children, who has up to now published 40 scientific articles and reviews and attended more than 30 congresses in Croatia and abroad. His is also a co-author of 59 chapters in textbooks of surgery for students of medicine at the School of Medicine in Zagreb and School of Medicine in Osijek. In addition he is one of the editors of two textbooks of surgery used at the Schools of Medicine in Zagreb and Osijek.

Croatian ministry of health and social welfare appointed him as the chairman of Committee for realization of Croatian trauma system in May 22, 2006 and since Jun 2006 I am the chairman of Committee for introducing ATLS to Croatia, appointed by Croatian Society of Surgeons.

He is a member of Croatian Medical Association, Association of Croatian Surgeons, Croatian Association of Traumatologists, Croatian Association for Biomechanics and European Federation of Orthopedics and Traumatologists (EFORT). He is also the member of international association of traumatologists “Gerhard Küntschner Kreis” since 1995. Secretary of this association Mr. Klaus Klemm, MD, invited me personally to join them.