Reperfusion therapy is the most useful part of the treatment for patients suffering from an acute coronary syndrome. Start time of reperfusion therapy is an important factor which influenced positively on the number of days of hospitalization, and readmission, the risk of reinfarction, as well as both, short and long-term mortality. Today, several models of reperfusion therapy are available: thrombolytic treatment (pre-hospital or in-hospital setting), primary percutaneous coronary intervention (primary PCI or pPCI) or a combination of both. pPCI is preferred, as soon as possible, in centers with experienced teams, especially for patients in shock, or those with contraindicated fibrinolytic therapies. We will compared, very shortly, the daily practices in 4 countries (Czech Republic, Austria, Croatia, Serbia), where (well) developed primary PCI hospital networks works efficiently for a years, with the current situation in Bosnia and Herzegovina. Our goal is to describe the easiest and quickest way of establishing the primary PCI network in Bosnia and Herzegovina. By combining the efforts of both Entities of Bosnia and Herzegovina will be possible in the forthcoming period, that B&H becomes a participant in the Stent for life initiative. Key words: Acute coronary syndrome, primary percutaneous coronary intervention network, stent for life initiative.

1. INTRODUCTION
Reperfusion therapy is the most useful part of the treatment for patients suffering from an acute coronary syndrome (ACS). Start time of reperfusion therapy is an important factor which influenced positively on the number of days of hospitalization, and readmission, the risk of reinfarction, as well as both short and long-term mortality. Today, several models of reperfusion therapy are available: thrombolytic treatment (pre-hospital or in-hospital setting), primary percutaneous coronary intervention (primary PCI or pPCI) or a combination of both. pPCI is preferred, as soon as possible, in centers with experienced teams, especially for patients in cardiogenic shock, or those with contraindicated fibrinolytic therapy.

The same recommendations are for the cases of unstable or recurrent angina associated with dynamic ST deviations, cardiac failure, life-threatening arrythmias, or hemodynamic instability (1). Although the European Cardiac Society (ESC) for acute heart attack has made detailed guidelines for the Primary PCI treatment of ACS, this treatment in many countries is not implemented (GRACE, EuroHeart Survey). So, thrombolysis is most common reperfusion therapy in many European countries. Also, a large percentage of patients do not receive reperfusion treatment at all.

Data collected from National societies of cardiology/working groups of emergency and interventional cardiology are:

- A national STEMI and PCI registers
- Epidemiology and treatment of STEMI
- The number of PCI and primary PCI procedures and number of PCI centers.

All those data (2, 3) showed that the situation is better in countries where primary PCI is applied in the majority of acute coronary syndromes, like the countries of Western and Central Europe. In order to improve the situation of other countries EAPC, EuroPCR, ESC Working Group on acute cardiac care with Euromedic, made the project “Stent for Life”. Project objectives are:

- increase the use of primary PCI over 70% of STEMI,
- to reach 600 primary PCI per million/per year,
- to provide 24/7 primary PCI services.

We will, very shortly, describe and compare the daily practices in 4 countries (Czech Republic, Austria, Croatia, Serbia), where more or less, developed primary PCI hospital networks works efficiently for a years, with the current
situation in Bosnia & Herzegovina.

Our goal is to describe the easiest and quickest way of establishing the primary PCI network in Bosnia and Herzegovina.

2. CZECH REPUBLIC

Czech Republic (CZ) has an area of 78,866 km², the population (in 2008) was 10,467,542, with GDP US$ 24,093. The development of PCI centers after PRAGUE 1 and PRAGUE 2 studies (4) (from 1997-2002) was very fast. CZ is divided into 14 regions, 22 primary PCI center with 24/7 system. Almost no thrombolytic therapy was applied (1% thrombolytic, pPCI 92%, 7% medical treatment).

Three criteria were for thrombolysis:

- patients who were admitted within 12 h. from the onset of symptoms who refuse invasive procedures,
- patients with no arterial access,
- logistical problems (technical problems in the cath lab, weather problems etc).

About 7% of patients did not receive reperfusion therapy, mainly due to late presentation (> 12 hours from the onset of symptoms) and because of the cessation of symptoms and ST elevation.

Health insurance covered the cost per procedure (10 insurance companies).

In 2001, Czech Society of Cardiology has prepared the National Cardiovascular Program in cooperation with the Czech government. This document regulates the procedure about patients with acute myocardial infarction, the number of cardiologists, primary PCI and PCI and non PCI cardiac centers. Also included information about emergency medical services (EMS) with order to transport STEMI patients in PCI centers directly. Two emergency telephone numbers (112, 115) are available 24 hours weekly (24/7). Dispatchers specially trained for emergency situation with ACS, activate the emergency medical service. Every ambulance is equipped with 12-channel ECG recorder, defibrillator and drugs such as aspirin, clopidogrel, opioid, beta blocker, NTG, unfractionated heparin, oxygen, intubation kit and apparatus for artificial ventilation. Teletransmission ECG is not widely used in the CZ. If a diagnosis of STEMI is established clopidogrel 600 mg, 500 mg aspirin, 5000 IU iv heparin were given and patient was transported to the nearest primary PCI center, accompanied by an emergency medical services (EMS) physician (primary transport). Transportation time should not exceed 90 minutes, distance is never greater than 100 km and generally is less than 50 km. Air transport offers no time advantage and is rarely used in CZ. EMS physician contact the cardiologist on duty and cath lab stuff is activated (usually one interventional cardiologist and one nurse). When it is necessary stuff from intensive care unit participate as well. Interventional cardiologist is “on call” and must come within 30 min. Basically a nurse is available 24/7. The patients are transported directly to cath lab table. If a patient not arriving with EMS (e.g. taxi, private car) after diagnosing of ACS, will be transported directly to the PCI center (secondary transport). After pPCI patient are moved from the cath lab to the coronary care unit, where he stayed one to two days, where the monitors ECG, lab monitoring (troponin) and ECHO of the heart will be performed. Patients from non PCI hospitals are transported back to their local non PCI hospital (tertiary transport). Patients with NSTEMI, IM with cardiac failure, life-threatening angina or ST depression in the similar manner are moved to primary PCI centers. Uncomplicated NSTEMI ACS patients are first admitted to the nearest hospital.

PCI centers receive a fixed compensation for STEMI and primary PCI for whatever material used (stent, balloons, etc). The local hospital receives payment for the remaining hospital stay. There are no difference in reimbursement of procedures based on time (i.e. day, night, weekends or holidays). No limit are set on the number of pPCI procedures in STEMI patients. Those pPCI procedures are very economically attractive for hospitals. Health insurance companies play a significant role in this process. It is important for PCI centers to have contracts with these insurance companies. 24/7 pPCI service are “condition sine qua non” for any PCI centre to have a contract with insurance companies (2).

3. AUSTRIA

Austria has a population of 8,356,707 (2009), with GDP US$ 338,839, estimated area of 83,872 km², 75% mountainous area (like B&H), but most Austrians living in urban areas. In the past five years the original networks for STEMI patients has been developed in Vienna and many of other major cities. Due to geographic reasons, there are still regions that use thrombolysis as the primary reperfusion modality. However in the major cities the most frequently used reperfusion therapy is pPCI (80% of patients in Vienna). There are 23 primary PCI center with 24/7 service. Cooperation exists between local hospitals, EMS and PCI centers. There are annually meetings where they discuss the current problems of transportation and pPCI network organization.

In 2002. started Vienna model for diagnostic and triage of patients with acute STEMI, with only one pPCI 24/7 centre in Vienna (The Allgemeines Krankenhaus der Stadt Wien- AKH). During 2003 it was organized Vienna Ambulance System (VAS), and organized other pPCI centre for night and weekends. The third step was to provide guidelines for thrombolytic therapy in pre- and in-hospital setting, where it should only be used if pPCI is unlikely to be available within recommended time intervals.

In Austria there are two phone numbers (112, 144). EMS with doctor makes diagnoses and triage. They are equipped with 12-lead ECG monitor, defibrillator. Cath staff (intervention cardiologist, two sisters and a radiological technician) is activated by the ambulance physician. Teletransmission is not readily available, but just begun in Salzburg and Styria. Routinely prehospital medication for STEMI patients include: Aspirin (250–500mg iv), unfractionated heparin bolus up to 4000 IU or 60 IU/kg. Clopidogrel is done at discretion of the doctors, but mostly is given in the hospitals. Patients are transported directly to the cath lab. The patient remains in the coronary care unit for two days and then transported to local hospitals. Clopidogrel is now recommended...
for 1 year period after pPCI procedures. Despite of mountain terrains the longest distance to the first PCI center is less than 120 km. Helicopter transport is dependent on the weather. If prehospital thrombolysis is done, PCI will be done within 24 h. NSTEMI patients were hospitalized at the nearest hospital. They received aspirin, clopidogrel, and low molecular weight heparin (enoxaparin). After stabilization coronary angiography has to be performed within 72 h. In Austria, the health system is organized similarly to the Czech Republic (2).

4. CROATIA
The Republic of Croatia, has an area of 56,594 km², and estimated population in 2008. of 4,489,409 citizens, with a GDP per capita of USD 17,703 in 2009, is an economically less-developed Western country. They have 12 PCI centers, 9 pPCI centers with 37 seniors interventional cardiologists, and 26 juniors, with 40 interventional cardiologists for pPCI procedures. Total numbers of PCI is 5200/year, and PCI 1250/million/year, total number of pPCI is 1580, and pPCI 380/million/year (data for 2009). Fibrinolysis is preferred reperfusion treatment in 5%, medical therapy in 25%, and pPCI in 70% of ACS patients (5). Emergency medical services are organized differently (as unique emergency service in 4 towns for 17% of whole territory or 40% of population). EMS is provided by some hospital or family doctor services. Main problems are late arrivals to the hospital, EMS and transportation problems. Because of geography, there are still a lot of regions that use thrombolysis as the primary reperfusion modality (islands). There is no unique call centre or unique emergency number. In this moment World Bank credit is in realization for standardization of the state emergency medical service. They expect better organization in future period of five years. They do not know percentage of actual mortality and real percentage of AMI (5). Many new cath labs are opened recently without experienced staff involved in PCI net (low volume PCI centers and non experienced operators). Successful initiative are early organization of the pPCI network (during 2005) covering more than 50% of patients in first years. Croatian society of Cardiology started with initiatives for special state budget for pPCI network. Recently Working group for interventional cardiology started with National PCI registry which will include all Croatian pPCI patients. Every two years Working group for interventional cardiology organized one meeting where they discuss the current problems of transportation and pPCI network organization (5).

5. SERBIA
Serbia, has an area of 88,361 km², and estimated population in 2008. of 7,900,000 citizens, with a GDP per capita of USD 5,382, is an economically less-developed country. They have 17 PCI centers, 5 pPCI centers with 64 seniors interventional cardiologists, and 27 juniors, with 64 interventional cardiologists for pPCI procedures. Total numbers of PCI in 2009. is 9225/year, and PCI 1168/million/year, total number of pPCI is 2460, and pPCI 311/million/year (5). Fibrinolysis is preferred reperfusion treatment in 33%, medical therapy in 48%, and pPCI in only 19% of ACS patients (5). Serbia Cardiac society assigned STENT FOR LIFE declaration during the ESC Congress in Barcelona, 31st August of 2009. They predicted 40% increases of pPCI procedures in 2010. (from 311/million/year to 439/million/year). Since February 2007 in Serbia cardiologists used very good flow chart for ACS data collection. Unfortunately, different local databases existed in different PCI centers. Priority is provide additional cath lab especially in PCI centers with only one Cath Lab and open new PCI centers to solve problems with inadequate number of cath lab, which are overloaded with elective PCIs. Emergency medical services, except in Belgrade, are not well organized and more than 50% come directly (e.g. private car, taxi) to PCI hospital. Chest pain-call EMS time is to long (> 110 min). EMS call-EMS arrival time is > 30 minutes, but goal is < 8 min. Also, distances from county hospital to nearest PCI centers are very long. EMS rarely administered clopidogrel (only 12, 7%), and also aspirin (13, 1%). In Belgrade EMS started with prehospital thrombolysis (Tenecteplase). In Serbia there are one specific phone numbers (069+ mobile phone numbers of word “INFARKT”= 069 4692758) and its direct phone line to cath lab of Clinical Center of Serbia. Every year working group for interventional cardiology organized BASICS meeting (Belgrade Summit of Interventional Cardiologists) where they discuss the current problems in interventional cardiology (5).

6. BOSNIA AND HERZEGOVINA
Bosnia & Herzegovina (B&H) has an area of 51,129 km², with GDP US $ 6,525 (2009) is an economically poorly-developed country. It has an estimated population of 4,613,414. There are 5 PCI centers. Most of the patient with STEMI receive thrombolysis (40%) and medical treatment (> 50%), only a very small number (< 10 %) are treated by pPCI procedures (3).

6.1. Political situation in B&H
B&H has a three main level of governments. Council of Ministers is highest political state level with 9 ministries. Two entities also have governments:
Government of Federation of Bosnia and Herzegovina (Vlada Federacijske BiH) with 17 ministries, 9 departments, 5 offices and services and one special federal bodies.
Government of the Republic of Srpska (Влада Републике Српске) with 16 ministries, 7 representative offices and 2 offices and services of the Republic of Srpska,
There are two ministries of health on entities government level. Also in Federation of B&H egisted ten Federal Cantons with their Cantonal Ministries of Health.
Complex political situation is main (but not medical) problem for pPCI network and firstly have to be solved. Political consesus about organization of the pPCI should be achieved. Unfortunately, until now none of those structures supported the establishment of pPCI.

6.2. Public campaign and patients awareness about pPCI
As much we do for our citizen’s education a lot more should be done. The greatest problem is late presentation of patients with chest pain. The relevant information in a public campaign has
to be presented firstly through newspapers, and after on TV and radio as well. As fast as possible, public campaign in order to increase the number of citizens with cardiopulmonary resuscitation skills, has to be started.

6.3. The emergency medical services

The emergency phone number for all emergent medical situations in B&H is not established yet. Most of the patients are arrived in hospital with EMS. EMS must be able to reach patients within 30 minutes anywhere in B&H. So, every patient suffering from ACS very quickly begins to receive medical attention, after the onset of symptoms.

Awareness of the emergency number combined with rapid EMS response will result with great success of the pPCI reperfusion strategy.

EMS is provided by some hospital or family doctor services. Main EMS problem is loss of time in transportation coming from unorganized EMS, and majority of patients are still first transported to the local hospital with no cath lab facilities. This problem can be overcome after reorganization of EMS as a part of B&H pPCI network organization.

6.4. Activity of the Association of Cardiologists of B&H

Four years ago, only two PCI center (Sarajevo and Tuzla) existed in B&H. Last three years has been opened three new PCI centers (private one in Tuzla, one in Banja Luka and the newest PCI centre in Mostar). Now, National Cardiology society of B&H acquired conditions to establish pPCI network in B&H. Bosnian Cardiac Society and the Ministry of Health have to organize a campaign on “chest pain and emergency telephone number” awareness. The relevant information has to be presented firstly through newspapers, and after on TV and radio as well.

There is no national PCI registry and unique ACS call centre number.

6.5. Collaboration of B&H Cardiac Society and Ministry of Health

For starting with organization of pPCI network the best strategy is organization of small, local pPCI network., with good local database. First big step is shortness of time from starting of chest pain to first medical contact. Transportation from one well organized county hospital, with good personal relations between colleagues, to the nearest pPCI centre is good beginning for solving EMS problems. After successful year other colleagues will join. B&H Cardiac Society and Ministry of Health should immediately organized National registries for ACS (or AMI) which will describe the incidence, treatment and outcome of hospitalized patients with potentially dangerous illness (STEMI, NSTEMI, IAP) and serve to improve system, and also is a good tool for quality control. B&H Cardiac Society and Ministry of Health should organize campaign on “chest pain and emergency telephone number” awareness. This also include a public campaign to inform population about pPCI and to become clear that pPCI confers a significant additional survival benefit.

Its mean that close cooperation between National society of cardiology and the Government / Ministry of Health in achieving the appropriate implementation of primary PCI programs is absolutely necessary.

6.5. Network and infrastructure

One primary PCI center is going on around 0.5 million inhabitants (0.3-1 million). Regional networks must have a coordinating body that will organize annual meetings, ensuring protocol. In all of this should be respected local hospitals and their cardiologists. We should establish a service 24 / 7 PCI hospitals. Hospitals which cannot organize a system of 24 / 7 should not be part of a network. Non PCI hospitals must provide cardiologists with a 24 / 7 service for the provision of adequate care AMI patients. Without close relations with EMS / local hospitals (an agreement with local hospitals, medical education program for EMS teams etc.) pPCI network couldn’t be established (4).

Our proposal for pPCI network in B&H include four region with five pPCI centre: Sarajevo with Zenica and Travnik region and eastern part of the RS, Tuzla with District Brčko and north-east part of RS, Banja Luka the
largest region with region of Bihać, and finally Mostar, as a main PCI centre in Herzegovina (Figure 1).

6.6. Different organizations of the cath labs
There are variations in organization and model of cath lab team structures. Most economical one is interventional cardiologist on call, a nurse constantly in Cath. Lab (24/7), and if necessary other staff from intensive care and coronary units. So, two extra people have been paid out of regular working hours. An expanded team consists of one senior interventional cardiologist plus interventional cardiologist in training plus two nurses and one technician. Thus, five extra staff members are paid out of working hours. A nurse should be a permanent on-site preparation (materials, etc), while other crew members could come within 30 minutes of the call.

6.7. EMS, transportation and time delays
EMS should transport the patient directly to the Cath. lab within 90 min. If the PCI is not the first hospital, then usually for transport in PCI hospital are lost 30-60 min. If the patients is transported in the intensive care unit of the PCI center and forwarded to the cath lab another 20-40 minutes are lost (4).

6.8. Finance
In these cases funding is not a problem. If using International Refined Diagnosis Related Group system, where each diagnosis and treatment has a specific code and corresponds to the payment of insurance companies. Extra payment for staff’s off hours in local places, to motivate the same or increases the number of staff who will rotate, has to be established.

7. CONCLUSION
Well organized pPCI network influenced positively on the number of days of hospitalization, and readmission, the risk of reinfarction, as well as both short and long-term mortality. A shorter symptom-to-balloon time was associated with improved coronary flow, an increased likelihood of subsequent left ventricular systolic ejection fraction >40%, and greater 3-year survival in patients with ST-segment elevation myocardial infarction treated with pPCI (6).

For well organized Primary Percutaneous Coronary Interventions network in B&H we proposed:
Agreement between Two Ministries of Health is very important, but also contract/agreement with the insurance company/companies and the Public Health fund in both entities.
National Cardiology programs, protocols and guidelines for Prehospital and hospital treatment, transport, the number of PCI centers (primary), with the number of staff will described the needs, requirements or recommendations on national level to combining and coordinating the efforts of all stakeholders in this program.

Public opinion must be familiar with the symptoms of AMI and unstable AP, the role of time in treatment (every minute is important).
The experienced EMS team has shown that well-trained nurse can excellently serve to triage and transport patients with AMI. Training is more important than structure. The team must be equipped with equipment for resuscitation; it is necessary medication, 12-channel ECG.

An expanded team for pPCI procedures with one senior interventional cardiologist plus interventional cardiologist in training plus two nurses plus one technician. Thus, five extra staff members are paid out of working hours.

Our proposal for pPCI network in B&H include four regions with five pPCI centers. Sarajevo with Zenica and Travnik and eastern part of the Republic of Srpska, two pPCI centres in Tuzla with District Brčko and north-east part of RS, Banja Luka pPCI centre with the largest B&H region including region of Bihać. Finally the newest PCI centre in Mostar, as a main PCI centre in Herzegovina.

REFERENCES
3. Data collected from Working Group for Interventional Cardiology of B&H National society of Cardiology.