

# THE ROLE AND PLACE OF THE ROMANIAN REGISTRY ON CARDIAC ARREST IN A MORE EFFICIENT MANAGEMENT OF RESUSCITATION

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**Abstract:** The existence of the International Liaison Committee on Resuscitation (ILCOR) has permitted the collaboration regarding resuscitation at an international level. The first definitions and recommendations regarding the report of cardiac arrest cases were developed in 1991 for the Out of Hospital Cardiac Arrest, and in 1997 for the In Hospital Cardiac Arrest. The Utstein definitions, which are in their revised and commonly adopted shape by the work group of ILCOR in 2002, at Melbourne, were translated and are available for anyone who wants to involve in the resuscitation study. Several registries of cardiac arrest are presented in this paper, The European registry of the cardiac arrest, the Belgian, the Swedish, the German, the Spanish, the Dutch, the French, and the registries from the United States of America. Last but not least, the Romanian Registry of the Cardiac Arrest is presented as it represents an initiative of the Romanian National Counsel of Resuscitation. The perspectives of a unique European register for the cardiac arrest has inspired this initiative, which has as a base the example of other European registers and the Utstein reporting model. In the first stage, the register participation was limited to the Emergency Departments of the Emergency Hospitals. Because the European purpose was to develop a smooth system of reporting the cardiac arrests that took place out of hospital, an integration of the pre-hospital events has followed, by collaborating with the Ambulance Services. Other characteristics, as the graphic representation of the Register data, are in progress of development, testing and implementing.

The existence of the International Liaison Committee on Resuscitation (ILCOR) has permitted the collaboration regarding resuscitation at an international level. In June 1990, the representatives of the American Heart Association (AHA), European Resuscitation Council (ERC), Heart and Stroke Foundation of Canada (HSFC) and the Australian Resuscitation Council (ARC) have participated in a reunion hosted by Laerdal Foundation, in Utstein Abbey, for discussing the naming problems and the lack of standardization in the national languages of the cardiac arrests related events.(1) This was the first significant meeting for the collaboration of the professional organizations with dedicated resuscitation activity. Many other similar meetings have followed. Having as a base the existence of some cardiac arrest registries, a new unitary European initiative of reporting and analysis of the out of hospital cardiac arrest was built, with perspectives in expanding the research regarding the in hospital cardiac arrests.

### Utstein definitions

The first definitions and recommendations regarding the report of the cardiac arrest cases were developed in 1991 for the Out of Hospital Cardiac Arrests (OHCA) (2), and in 1997 for the In Hospital Cardiac Arrest (IHCA).(3) These initiatives have introduced and developed the idea of standardization in reporting cardiac arrest events, but they prove to be hard to be used because of the many parameters that were enclosed. In 2002, during the Melbourne meeting of the ILCOR work group that was dedicated to this problem, the Utstein definitions were revised, based on the view of the published data and the

experience of the cardiac arrest registries.(4) The group objective was the development of an easy to use pattern for reporting the cases of cardio-pulmonary resuscitation. By implementing this initiative, a uniform data gathering could be facilitated, and based on the analysis of this data, some recommendations could be elaborated for developing the activity of the emergency medical systems, and also the possibility of comparing results from different systems for identifying the opportunities of raising the efficiency in emergency interventions. There also has been shown a reporting model of the followed main data.

The Utstein definitions, which are in their revised and commonly adopted shape by the work group of ILCOR in 2002, at Melbourne, were translated and are available for anyone who wants to involve in the resuscitation study.

### The European registry of the cardiac arrest

Because the European Resuscitation Council (ERC) has the target to improve the access to and the results of resuscitation efforts in Europe, it has built a work group for setting up the European Registry of Cardiac Arrest (EuReCa), already having the examples of the existing and functional registries from several European countries. EuReCa is desired to be a tool that makes it easier to get relevant results for the target, through:

- identifying the differences in understanding the Utstein definitions, for correcting it and applying unvarying definitions in all the participating regions;
- achieving some valid comparisons of the processes and

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- results obtained in different regions or states;
- identifying the weak points in the survival chain, on a local, regional and national level, and correcting them
- evaluating some potential improvements for the existing procedures;
- evaluating the adjustments made to the running guides;
- obtaining proofs for encouraging the growth in financial support for the system improvement and evaluation;
- building a scientific cooperation network on a national and international level in the cardiopulmonary resuscitation field.

The only criteria of inclusion was the existence of an active register that picks information related to resuscitation attempts of the cardiac arrests that happened out of hospital.(5)

Five of the ERC members agreed to include their registers in EuReCa: Andalusia (Spain), Belgium, Germany, Northern Netherlands (Netherlands) and Sweden. Other countries, including Romania, have shown interest in following this initiative.

The five founder registries represent a population of almost 34.9 million of habitants. Two registers, Belgium and Andalusia, are recording every intervention and attempt of resuscitation on a national and regional level, offering in this way, a complete and smooth cover up. Other two registers, Sweden and Netherlands, cover up only particular regions of their countries. The German resuscitation registry records national level information, but the participating centers cover up only 9% of the total population.

All the five registers have defined the inclusion criteria, as per recommendations. None of them has age limit and all of them are recording the cause of the cardiac arrest. Belgium and Andalusia are recording all the cases that are handled by the emergency medical services, Andalusia and Netherlands are mentioning the reason for not attempting the resuscitation if that occurs, Andalusia, Netherlands and Sweden are using very well defined criteria for interrupting the resuscitation manoeuvres. Information regarding the patient hospitalization is available in all the registers, but only Andalusia, Netherlands and Sweden are recording details for the hospital discharge. Andalusia and Netherlands are also reporting the survival after 1 year from the resuscitation.

### ***The Belgian registry of cardiopulmonary resuscitations***

In 1982 The Belgian Society of Intensive Care founded a work group for researching cardio pulmonary and cerebral resuscitation. The work group made a registration sheet of some selected data in case of cardiac arrest, peri-arrest situations and post resuscitation care. This type of reporting was implemented with the help of a test project in three hospitals, then, in 1983, in seven hospital units equipped with mobile intensive care units.(6)

The presented sheet at that time was including demographic data, the cardiac arrest factors, the cardiac arrest rhythm, the place of the event, the intervention time lapse, the way and the type of the drugs administration, the manoeuvres that were made and post resuscitation evolution data.

The analysis of the Belgian registry data have unveiled several observations, like the significance of the pre arrest factors for the distance results in cardio pulmonary resuscitation (7), or the significance of the time passed between the cardiac arrest and the firsts vital support manoeuvres.(8)

Also, because of the gathered data through the Belgian Registry of Cardio Pulmonary Resuscitation has shown the fact that the non-medical people get there faster, or they are even witnesses to cardiac arrests with ventricular fibrillation/ventricular tachycardia without a pulse, would be

relevant the idea of implementing external and automatic defibrillators with public access, with the aim of raising the survival rate for cardiac arrest that occurs outside the hospital.(9)

### ***The Swedish registry of the cardiac arrest***

The Swedish Registry on Cardiac Arrest (SCAR) started working in Sweden 1990. This register was initiated thanks to collaboration between the ambulance services and The Swedish Society of Cardiology. Was used a unitary way of reporting, and remote data was gathered through the Deceased National Registry.(10)

SCAR is one of the 90 Swedish national registries, that is referring to various healthy issues on a national level. At this moment, all the medical services from Sweden are reporting data about OHCA through a web platform, in unitary and ruled way. This register is taking the advantage of government funds that are regional and national. The population that is being served by the Swedish emergency medical services is around 9.5 million.

### ***The German Resuscitation Registry***

The German Resuscitation Registry (GRR® - Deutsche Reanimationsregister) started to work in Germany in 2007. This is a modern instrument used to collect, analyze, evaluate and compare the results of the resuscitation attempts in the pre-hospitalization environment and in hospital in Germany. Based on this data, an annual report is being pulled which reveals the quality of the emergency services that run in Germany.

The German Resuscitation Registry is administered by the German Society of Anesthesia and Intensive Care (Deutschen Gesellschaft für Anästhesiologie und Intensivmedizin - DGAI).

The German Resuscitation Registry has as a base the Utstein recommendations for reporting the cardiac arrests. The collected information is about the patients that suffered a cardiac arrest inside or outside the hospital, regardless of the moment when the manoeuvres started, or if the manoeuvres were executed by trained agents or by the persons who are there for the first aid, and no matter which is the result.

The collected data is anonymous and there is never made any kind of affiliation between patients or the units where they came from. The access to these details is limited through the policy of confidentiality between doctor and patient. The information is structured through 3 reporting sheets. The first sheet, called "Erstversorgung" (First Aid) is for reporting the event itself. The next two are for the post event monitoring, "Weiterversorgung" (Continued Supply), and for the long term evolution, "Langzeitverlauf" (long time running).(12)

### ***Spain: Andalusia***

The Andalusian registry is a quality management system, built in a very well defined region of Spain, representing 8 million citizens (the total population of Spain is 46.9 million). Here are registered all the interventions of the emergency medical system, for the out of hospital cardiac arrests. The register is set up by the public health organization and financed through the general reimbursement of the emergency medical system costs. The information is registered in electronically, online, by the dispatcher and interconnected accordingly and afterwards matched with the details received from the hospital. Quality assurance is made by a designated work group.(5)

### ***Netherlands: Northern Netherlands***

This regional register for the cardiac arrest is part of a scientific project that deals with the study of the resuscitation manoeuvres and their results, which takes place in a very well defined region, with 2.4 million citizens (the total population of Netherlands is 16.5 million). The register is organized at the

level of an academic center and it is financed by industrial sponsors and scientific organizations. The information regarding a possible cardiac arrest are communicated through telephone by the paramedic to the leading center that records the details regarding the emergency protocols that were applied and their results, including the re-evaluations made after the hospital discharge. They are also recording the electronic data from the AED/defibrillator, including the cardiac rhythms, the time marks, the number of the shocks applied, and so on. The quality control is stiff.(5,13)

### ***France: The Parisian Register of the out of hospital cardiac arrest***

In France, in case of out of hospital cardiac arrests, emergency medical teams, with a doctor involved, make the interventions. In Paris, the patients with the return of spontaneous circulation (ROSC) are being taken care in special centers with all the facilities of an intensive care unit. Having all these facilities was developed a strategy of early diagnosis for these patients.(14)

The Parisian Region out of Hospital Cardiac Arrest (PROCAT) register works in Paris since 2003, and contains data which refers to out of hospital cardiac arrests (OHCA). The emergency system involved in this project provides services for a population of 5 million citizens during day time and approximately 2.5 million during night time. The data is recorded in the Utstein style, includes demographic data, information related to the event itself, but also morbidity data or risk factors. The data obtained through this registry is defining a region with a very well organized emergency intervention system because of its collaboration between doctors and firemen, with very well defined protocols and excellence multidisciplinary centers, which can provide care and post resuscitation investigations as per the "gold standard" (PCI, CT, therapeutic hypothermia).(15) In this way, the data that was published based on this register can represent an important research start.

The emergency system from the France's Northern Alps has initiated a registry for the cardiac arrest for the region that is served medically by the system. The data has been collected prospectively, from 2004 to 2011, in Utstein style, and the obtained data was communicated. This registry refers exclusively to the out of hospital cardiac arrests.(16)

### ***The United States of America***

In the United States of America, there are running at least three registers for reporting the cardiac arrests:

*The National Registry of Cardiopulmonary Resuscitation (NRCPR)* is a multicenter register, that collects details regarding the in hospital cardiac arrests.

*The Resuscitation Outcomes Consortium (ROC) Epistry Cardiac Arrest* was conceived as a registry that includes all the cardiac arrest cases where the 911 emergency services was called, and which are in the geographic area of the 8 American states and 3 Canadian participating regions.

*The Cardiac Arrest Registry to Enhance Survival (CARES)* was created as a tool of identification of the cardiac arrests that took place out of hospital, to monitor the performances of the emergency medical services in case of cardiac emergencies and to evaluate their results through hospital discharges reports.

One out of every three, three registries were built based on a standardized system of emergency medical services and of a smooth legislation, which permits setting up studies with high statistical value, and make valuable comparisons between different regions of the North America.(5)

*The National Registry of Cardio Pulmonary Resuscitation (NRCPR)* was developed by the American Heart

Association (AHA) volunteers specialized in cardiology, emergency medicine and intensive care and was launched on January 1<sup>st</sup> 2000. NRCPR is functioning as a prospective study, observational and multiregional and under the aegis of AHA. The main purpose of NRCPR is providing an instrument for raising the performances of the resuscitation services. It permits to the participating hospitals to track the characteristics, the treatment and its results for the patients that had a cardiac arrest in hospital. A central register facilitates the data management and based on it, are generated quarterly reports, which allow comparisons between regions and participating hospitals, the development of important studies with high statistical value, the review of the resuscitation guides based on proofs. NRCPR is providing clear definitions for every element, which permits a multiregional reporting of the cases based on uniform criteria.

The NRCPR limits are including the fact that, despite being so many, the participating hospitals may not be representative for the entire US territory, not only through the disposed facilities but also through the way of dealing with the interventions in case of cardiac arrest. Also, there is not any designated process for tracking the patients on a long term after hospital discharge. Even more, although the medicated treatment used during interventions is being tracked, NRCPR does not evaluate the accuracy of the therapy decision, dosage and use of medication and the succession of the steps during the applied manoeuvres.(17)

*The Resuscitation Outcomes Consortium (ROC) Epistry Cardiac Arrest* was conceived as a prospective study which is based on a registry that includes all the cardiac arrest cases (no matter what age) which were reported to the 911 emergency system, and which have showed up in the geographic area of the 8 participating American states (Alabama, Dallas, Iowa, Milwaukee, Pittsburgh, Portland, San Diego, Seattle/King County) and 3 Canadian regions (Ottawa, Toronto, British Columbia), the headquarters being located at the University of Washington. Are also included the air requests, if these took place in a covered area by an ROC participant terrestrial service.

ROC was developed between September 15<sup>th</sup> 2004 and November 30<sup>th</sup> 2005 by an interdisciplinary work group. Where it was possible, all the elements definitions were derived from the specific literature; where no definition was found, was created one.(18)

*The Cardiac Arrest Registry to Enhance Survival (CARES)* was created as a way of identification of the cardiac arrests that took place out of hospital, of monitoring the performances of the emergency medical services in the cardiac emergencies and evaluation of these results through reporting the hospital discharge. The system was launched in 2005 in Atlanta, and afterwards has met a fast spread on the entire US territory. CARES picks information from three sources: the 911 dispatch, EMS (Emergency Medical Services) and the hospitals that receive the patients, which interconnects these three sources to settle in a single register.

CARES elaborates periodic reports, which are utilized for identifying the local epidemiology of the cardiac arrest and helps the participating medical centers to evaluate the performances of the emergency medical services and their activity in managing the cardiac arrests that took place outside the hospitals.

The CARES limits are linked to the way the information is kept, way which makes impossible the long term tracking of the patients. Also, the absence of a known etiology for the cardiac arrest makes it difficult to frame the patients into the study. Generally speaking, is considered that any cardiac arrest that took place out of hospital, has a cardiac reason, if there are not identified other obvious causes, as major trauma,

asphyxia, electrocution, substances overdose or drowning. Because the necropsy is being made only in a very small percent of the cases, in most of the times is almost impossible to detect an exact cause of the cardiac arrest.(19)

This data regarding the functional registries of the cardiac arrest in the United States of America was captured from the free access official web pages, made especially for these programs.(20-22)

### **Romania: the web application model**

The Romanian Registry of the Cardiac Arrest (RRSC) represents an initiative of the Romanian National Council of Resuscitation. The perspectives of a unique European register for the cardiac arrest (EuReCa) has inspired this initiative, which has as a base the example of other European registers and the Utstein reporting model.

The purpose of such registry is the continuous development of the results in the resuscitation field and the quality appraisal obtained with a unitary pattern of procurement, reporting and processing of the information related to the cardiac arrests that occurred unexpectedly, not only out of hospital but also in the departments that deal with emergencies or in unmonitored wards. RRSC wants to consolidate the existing relations between the emergency services that run out of hospital, in hospital and the other sections that are part of the Romanian sanitary system and that record and use data related to the cardiac arrests. By putting together all the information from these systems, the users will be able to have a wider view for the way of applying the resuscitation guides and protocols and their usage efficiency. Last but not least, the information merge between systems will be useful to identify the weak links in the "survival chain", on a local, regional and national level for improving them based on patterns proven to be efficient.

The collecting, processing and reporting system is represented by a database with limited access, developed and maintained by a team of the Romanian National Resuscitation Counsel's members and the informatics improvement is dealt by the informatics section from the Babeş-Bolyai University in Cluj Napoca.

The register participants have access to detailed recordings of its activity and anonymous recording of the other participants' activity.

In the first stage, the register participation was limited to the Emergency Departments of the Emergency Hospitals. Because the European purpose was to develop a smooth system of reporting the cardiac arrests that took place out of hospital, an integration of the pre-hospital events has followed, by collaborating with the Ambulance Services.

The existence of such register could support three premises of great importance for a more efficient health system: the medical research (for the cardiac arrest causes, the resuscitation protocols, etc.), the clinic management (analyze the trends, determinate the financial and medical employment needs for providing the prevention and the treatment) and the training not only for the medical employees but also for the general population in order to recognize the imminence of such tragic event and to be able to take action for the benefit of the cardiac arrest victim.

For these premises to be accomplished there is necessary to develop few programs that would be able to resolve access problems that compete to the same resource, security data, confidentiality data and portability data.

In May 2010, there was launched the first informational solution for RRSC, in the Access program. This was tested with the help of the gathered data from the Emergency Department of the "St Pantelimon" Emergency Hospital and was concluded that is a system hard to use, with a

complex interface.

The second version of RRSC was created with the collaboration of the Faculty of Mathematics and Informatics from the Babeş-Bolyai University of Cluj-Napoca and uses the systems PHP 5.3.3 and MySQL 5.1, Java Script and ZipArchive. This system permits additional documentation for the existing cases in the database by saving media files (for example imagistic investigations). The compatibility with this feature is possible with the system HL7, and the integration with the Chameleon application. This informational solution makes possible the manual input of the data through an easy to use interface. The system is working according to the law of personal data protection. The database is using different types of variables, allows the implementations of the statistical analyze elements and it is equipped with a search engine. The data is input by an operator and validated by the administrator of the register unit.

Other characteristics, as the graphic representation of the Register data, are in progress of development, testing and implementing.

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