

Study on the Pre-hospital Cardiac Arrest Resuscitations Of the Mobile Intensive Care Ambulance Teams From Tîrgu Mureş, Romania, in 2009

Copotoiu Sanda-Maria¹, Bratu Simona²

¹ Department of Anesthesiology and Intensive Care, Clinical Emergency County Hospital, Tîrgu Mureş, Romania

² UPU-SMURD, Clinical Emergency County Hospital, Tîrgu-Mureş, Romania

Objective: To analyze the results of the resuscitation efforts of the SMURD medical teams, in pre-hospital, in 2009.

Methods: We conducted a prospective study between 01/01/2009 – 12/31/2009. We included in the study all the cases with cardiac arrest at the arrival, those that occurred during transport and all the CPR attempts performed together with the first aid teams. For the statistical study we used SPSS program version 17, χ^2 test and p values were determined to compare the data obtained.

Results: In 2009, the team had 250 cardiac arrest cases, 16.7% of the total of 1490 calls. Resuscitation was performed on 67.6% of patients. The good outcome of the resuscitation was statistically correlated with the distance to the case $p = 0.01$. The acute coronary syndrome was responsible for 27% of the cardiac arrest cases, severe trauma for 11%. The initial cardiac arrest rhythm was in 83.2% of cases asystole. BLS was performed, before the arrival of the team, to a number of 41 patients, bystander CPR representing only 2.36%. The SMURD team resuscitated a number of 58 patients in pre-hospital, 34.32% out of the 169 that had CPR, 41 died in the Emergency Department and 17 were hospitalized; 4 patients were discharged in good condition.

Conclusions: The early resuscitation outcome is good, comparable with the international data reported, the rate of late survival is smaller. The proportion of ventricular rhythms with a good prognosis is lower, which correlates with longer distances traveled to the scene and less involvement of the population in BLS.

Keywords: cardiac arrest, resuscitation, first aid teams, Basic Life Support, dispatch

Introduction

The mobile intensive care ambulances, type C1, belonging to SMURD, with a team made up by an emergency physician, one nurse and paramedics are treating patients in life threatening situations since 1990, in the area of Mureş County. We wanted to evaluate how the team responds in pre-hospital cardiac arrest situations and to analyze the results of their resuscitation efforts in 2009.

Methods

We conducted a prospective study for a period of one year, between 01/01/2009 – 12/31/2009, in order to evaluate the activity of the SMURD team. We performed resuscitation and filled in a special chart, created previously, in order to obtain all the data available.

For the statistical study we used SPSS program version 17, χ^2 tests and p values were determined to compare the data obtained.

We included in the study all the cases with cardiac arrest at the arrival, those that occurred during transport and all the CPR attempts performed together with the first aid teams, with paramedics, belonging also to the SMURD structure.

Results

In 2009, the team was called to a number of 250 cardio-respiratory arrests, representing 16.7% of the total of 1490 cases. We attempted resuscitation maneuvers in 169 pa-

tients, representing 67.6% of total cardio-respiratory arrests. We did not perform CPR for 81 (32.4%) patients, because they had no indication, or the time from the onset of cardiac arrest and the team's arrival was too long.

Regarding the gender distribution of pre-hospital cardiac arrest cases, we noticed a predominance of male patients, with 176 cases (70.4%) versus 74 female patients (29.6%).

Distribution of cases by age groups shows a maximum incidence in the 50–60 years group with 52 patients, followed by the 60–70 years group with 50 cases and the 70–80 years group with a number of 43 cases. The lowest percentage was observed in infants, with 4 cases. The total number of patients with cardiac arrest under the age of 30 years was 33.

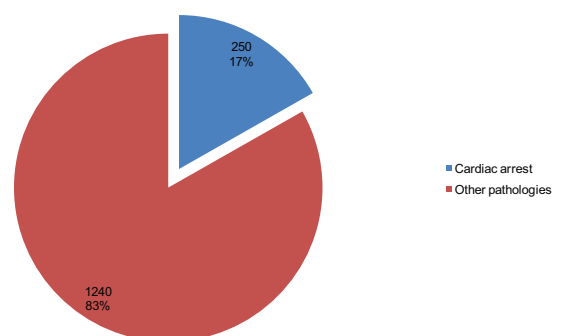


Fig. 1. Incidence of cardiac arrests in pre-hospital, in 2009

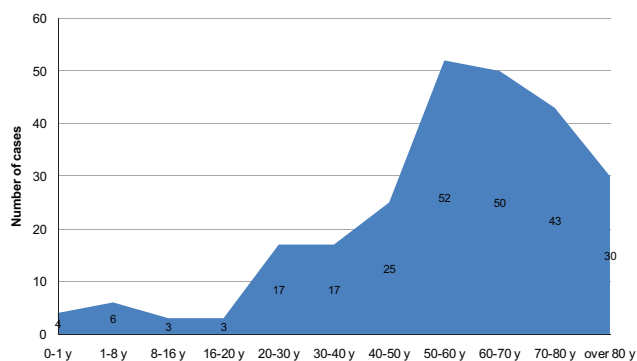


Fig. 2. Distribution of the cases of cardiac arrest by age

The number of cardiac arrest cases from the urban area (the town Tîrgu Mureş and the suburbs) was higher than those from the rural areas (the rest of the county), 151 cases (60.4%) vs 99 cases (39.6%).

We had a maximum number of cardiac arrest calls in April (11.2%), followed by August, May, September (each 10.4%) and March (9.6%), and a minimum in November (5.2%). There is no tendency for seasonal distribution of cases ($p = 0.905$).

Regarding the number of kilometers traveled by the ambulances to the place where the cardiac arrest occurred, we observed that in urban areas most of the cases were at a distance of 1–6 km and in rural areas at 6–15 km. There were a number of 20 calls, where the distance was longer, over 30–50 km.

Time of arrival was also calculated because it is important for successful resuscitation and we noticed that in urban areas, in almost all the cases (133 patients) it was 0–5 minutes. In rural areas time of arrival was an average of 10–20 minutes and was correlated with the distance.

To assess the accuracy of the Integrated Dispatch 112 in collecting information from callers, we analyzed the presumed diagnosis transmitted to the ambulances team. We noticed that in most cases, in urban and rural areas, cardiac arrest call was given as: unconscious patient – 115 cases out of 250 (45%), cardiac arrest (32%), hanging or suicide (5%), accident or trauma (10%) and other different rea-

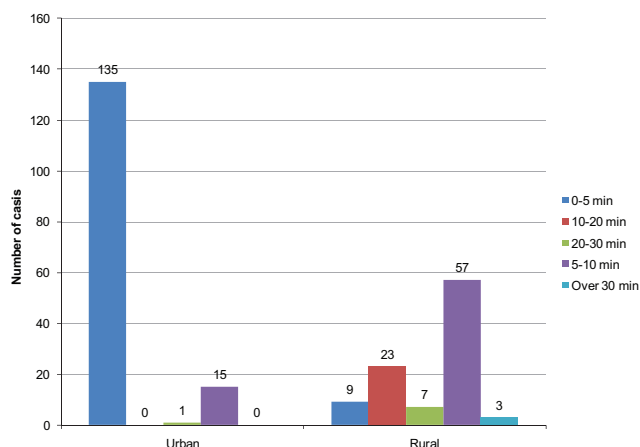


Fig. 4. Distribution of cardiac arrest cases depending on the time of arrival, in urban and rural areas

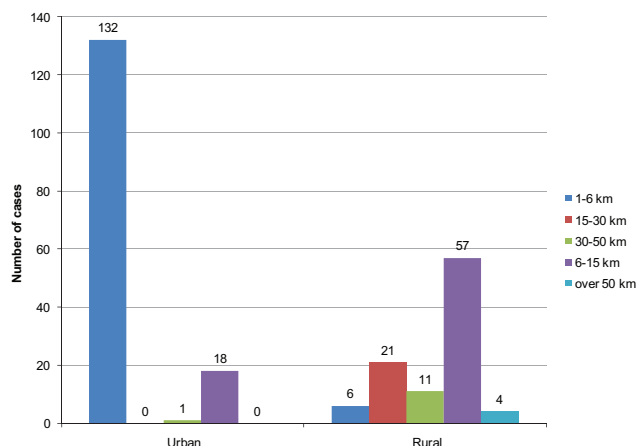


Fig. 3. Distribution of cardiac arrest cases depending on the distance made by the ambulance to the scene

sons (8%). The request was forwarded as cardiac arrest in 32% of cases, a fairly large proportion, considering the fact that the population can not correctly assess vital signs and many times the person calling does not provide too many clear informations ($p = 0.003$).

We have found that the resuscitation outcome is depending on the distance to the scene and the time of arrival. The highest number of successful resuscitations were in the group of patients situated at a distance of 1–6 km; there was only one patient resuscitated at long distance, 30–50 km, this patient had CPR performed early by the first aid team and continued till our arrival. In the group of patients that had cardiac arrest at a distance of 6–12 km, there are cases solved successfully and also patients who deceased, in an equal proportion, while over 50 km we did not have a single resuscitated patient. The successful CPR was highly correlated with the short distance to the case ($p = 0.01$) and with the short time of arrival ($p = 0.066$).

We evaluated the presumed diagnosis of the patients, established by the emergency physician. The study showed that acute coronary syndrome (ACS) was responsible for 27% of the cardiac arrest cases, other heart diseases, except ACS for 15%, severe trauma 11%, malignant tumors 8%, acute respiratory failure, pulmonary embolism and sudden death, each for 6%.

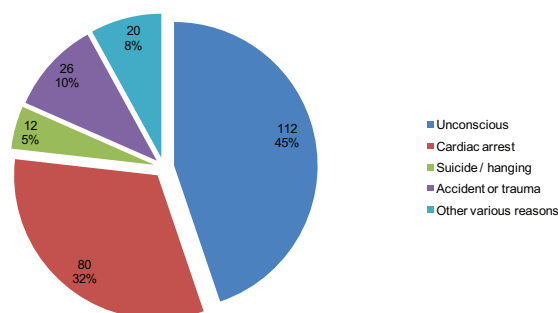


Fig. 5. Distribution of cases depending on the presumed diagnosis transmitted by the dispatch in cases of cardiac arrests

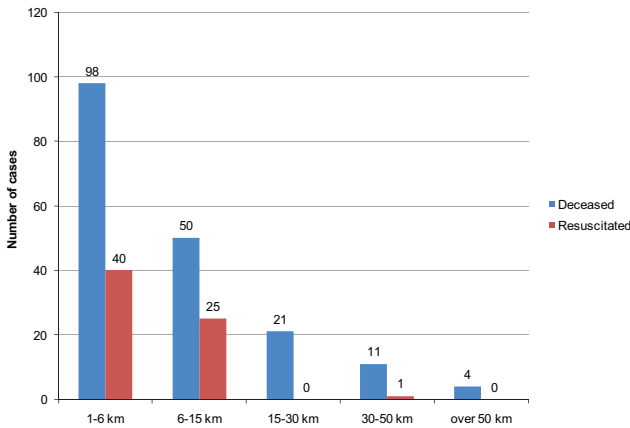


Fig. 6. Result of CPR depending on the distance to the cardiac arrest place

The initial cardiac arrest rhythms were: asystole in 83.2% of the cases, ventricular rhythms VF/VT in 7.2% and pulseless electrical activity (PEA) in 9.6%. We did not find any statistically significant correlation between the initial cardiac arrest rhythm and patients' gender ($p = 0.428$), age groups ($p = 0.919$) and not even with the place of the cardiac arrest, urban or rural ($p = 0.147$).

The patients pupils were midriatic and non-reactive in 227 patients, indicating severe hypoxia; only 23 patients showed intermediate-reactive pupils, which were statistically correlated with the time of arrival to the case ($p = 0.051$), with the initial ventricular rhythms ($p = 0.001$) and with urban areas ($p = 0.022$).

We wanted to see if basic life support maneuvers (BLS) performed by other people, before the ambulance's arrival, had visibility on results and we noticed that for the majority of patients, 209 of the total 250, no resuscitation attempts were carried out before the ambulance's arrival.

BLS was performed, before the arrival of the intensive care ambulance to a number of 41 patients (24.26% out of the 169 that had CPR): 4 performed by bystanders, 16 by first aid teams with firefighters, 13 by regular ambulance staff, and 8 by the general practitioner. Bystander CPR accounted for only 2.36%, which is a low rate.

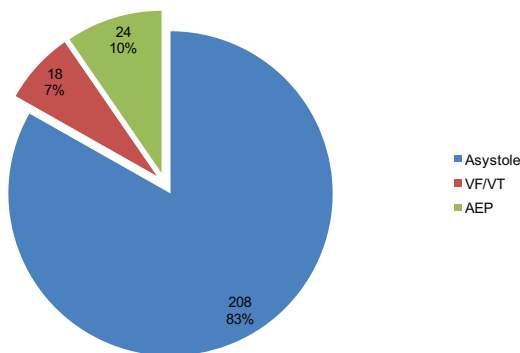


Fig. 8. Distribution of the cases according to the initial cardiac arrest rhythm

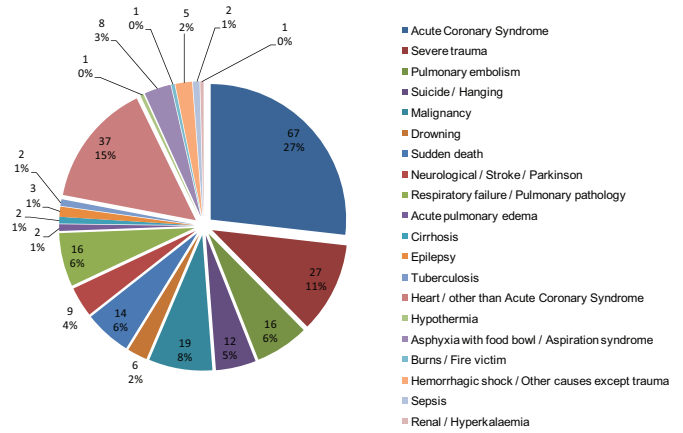


Fig. 7. Distribution of cases of cardiac arrest according to the doctors diagnosis

To assess whether BLS maneuvers performed before the arrival influence the outcome, we made a correlation with pupil size, but we obtained a $p = 0.212$, which is not statistically significant.

One goal of the study was to evaluate the utility of the firefighters first aid teams, situated in isolated areas, trained to perform BLS, ventilation on bag and mask, comby-tubes and defibrillation using semiautomatic devices. The first aid teams assisted early 16 cases of cardiac arrest, at 9 they performed bag and mask ventilation, in 7 they inserted comby-tubes and in 5 early defibrillations were done. The first aid teams successfully resuscitated, before the SMURD arrival, one case. After the team with doctor arrived, another 2 patients were returned to life. There was no statistically significant relation between the patients age and the type of ventilation performed by first aid team, $p = 0.124$. The outcome of resuscitation was not correlated with the type of ventilaton used by the firs aid teams $p = 0.881$ or the defibrilations done previously before the doctors arrival $p = 0.548$. The fact that they can be the first to perform early BLS in isolated and remote areas of the county, regardless of the patient's chance, make these crews useful.

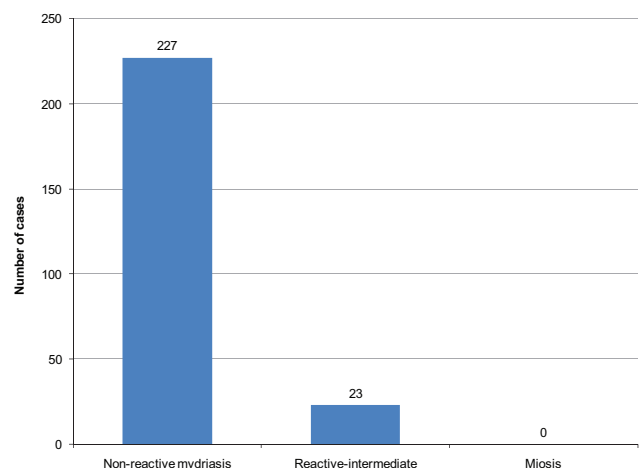


Fig. 9. Distribution of cardiac arrest cases according to their pupil size

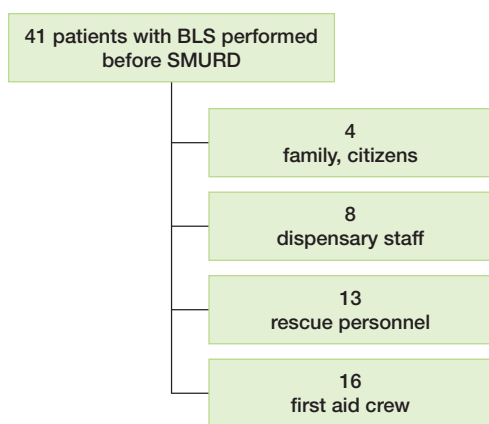


Fig. 10. Distribution of the cardiac arrest cases according to the BLS performed before the specialized teams arrival

The SMURD team resuscitated in pre-hospital, in 2009, a number of 58 patients (23.2% out of the total 250 cardiac arrests and 34.32% out of 169 that had CPR performed). All these patients were transferred to the Emergency Department of the Clinical Emergency County Hospital of Tîrgu Mureş, which is also part of the SMURD structure.

The early outcome of the resuscitations performed in pre-hospital was good, 34.32 % of the patients were brought back to life (58 patients out of the 169 with CPR performed). Out of the 58 resuscitated patients, a number of 41 repeated the cardiac arrest in the Emergency Department and only 17 (29.31%) were hospitalized. Only a number of 4 patients, representing 23.53% of the total of 17 patients hospitalized, were discharged home. (that represents 6.90% of the total 58 successfully resuscitated patients and 2.37% out of the 169 where CPR was performed). The discharged patients are: a woman 22 years with epilepsy, two men with ACS and one after an attempted suicide by hanging.

Discussion

Data from the literature, published by the European Resuscitation Council (ERC), during implementation of the new protocol in 2010, shows that 40% of cardiac arrest cases, in patients over 75 years are due to ACS; in the SMURD study this percentage was only 27%.

Data reported from 37 European communities suggest that the incidence of pre-hospital cardiac arrests is 38 per 100,000 inhabitants, and for VF 17 per 100,000 inhabitants. If we relate the number of cases of cardiac arrest in which we were involved in Mureş County, with approximately 500,000 inhabitants, we get a higher rate of 50 per 100,000 inhabitants [1].

Survival rate reported for Europe by the ERC, for all cardiac arrest rhythms is 10.7% and 21.2% for VF [1,2].

Recent studies reported, after analyzing data from 10 different regions of North America, on a total of 20,520 cardiac arrests, that in 58.0% of cases CPR were performed, 22.9% had initial rhythm of VF/VT and 4.6%

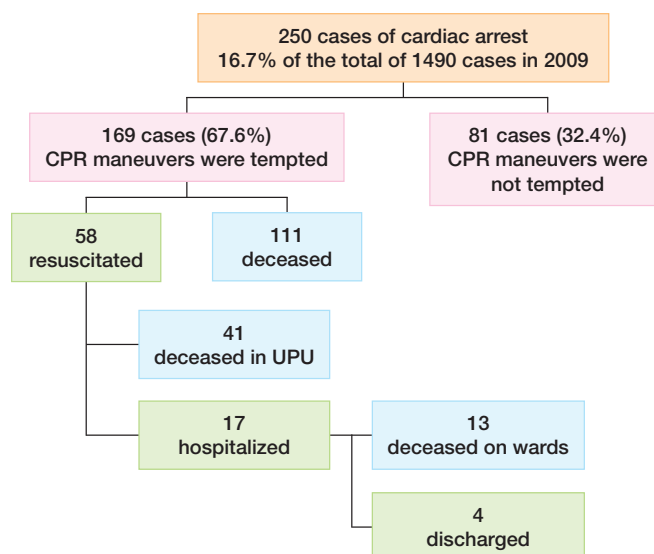


Fig. 11. Distribution of pre-hospital cases of cardiac arrest, depending on the outcome of resuscitation maneuvers

were discharged [3].

Another study, published in the Annals of Emergency Medicine, in 2005, compares the pre-hospital resuscitation carried out in three major U.S. cities and reported the following results: survival without neurological deficit was 1.4% for all rhythms and 6% for FV, in Los Angeles; 3%/8% in Chicago and 2%/6% in New York. The same study showed that BLS maneuvers were performed before the arrival of specialized teams in 28% of cases, in this situation survival rate was 3.2%. The survival rate of the patients who had no BLS performed before the ambulance's arrival, is 1% [4]. Improvement of the chain of survival increased the survival rate of patients with cardio-respiratory arrest [5,6].

The immediate outcome of the resuscitations performed in pre-hospital by the SMURD teams, in the year 2009 (34.32%) is comparable with the international data reported, but the late results are slightly lower (2.37%). The incidence of initial ventricular rhythms (7%) is lower than those reported internationally. That correlates with the longer distances traveled by our ambulances to the scene and the smaller number of cases with BLS performed before the team's arrival.

Conclusions

- ▶ Cardio-respiratory arrest represents a large proportion of SMURD's calls in pre-hospital.
- ▶ CPR outcome depends on the distance and time of arrival to the scene.
- ▶ Dispatch 112, performs a good selection of cases and detects patients with cardio-pulmonary arrest.
- ▶ People should be better trained on how to access the dispatch and what informations to provide.
- ▶ Most cases of cardiac arrest were diagnosed by the physician in pre-hospital as acute coronary syndrome or severe trauma.

- ▶ First aid crews, belonging to SMURD have an important role in CPR maneuvers performed before the arrival of the physician.
- ▶ Intermediate-reactive pupils are correlated with favorable outcome of resuscitation.
- ▶ BLS maneuvers before the arrival of specialized teams, are performed in a few cases, although they are correlated with a favorable outcome.
- ▶ Population and dispensary staff should be better trained in BLS maneuvers.
- ▶ The immediate outcome of the resuscitations performed in pre-hospital by the SMURD teams is comparable with the international data reported, but the late results are slightly lower.
- ▶ The proportion of ventricular rhythms, with a good prognosis is lower, which correlates with longer distan-

ces traveled to the scene and less involvement of the population in BLS.

References

1. Nolan JP, Sips J, Zidmanc DA, Biarentd D, Bossaerte LL, Deakinf C, Kosterg RW, Wyllieh J, Böttiger B – European Resuscitation Council Guidelines for Resuscitation 2010, Section 1. Executive summary, *Resuscitation* 2010, 81: 1219–1276.
2. Atwood C, Eisenberg MS, Herlitz J, Rea TD – Incidence of EMS-treated out-of-hospital cardiac arrest in Europe. *Resuscitation* 2005, 67: 75–80.
3. Nichol G, Thomas E, Callaway CW, et al. – Regional variation in out-of-Hospital Cardiac Arrest Incidence and Outcome. *JAMA* 2008, 300: 1423–31.
4. Eckstein M, Stratton SJ, Chan LS – Cardiac Arrest Resuscitation Evaluation in Los Angeles: CARE-LA, *Annals of Emergency Medicine* 2005, 45(5): 504–509.
5. Rea TD, Crouthamel M, Eisenberg MS, Becker LJ, Lima AR – Temporal patterns in long-term survival after resuscitation from out-of-hospital cardiac arrest. *Circulation* 2003, 108: 1196–1201.