Study on the Resuscitations Performed in the Emergency Department of the Clinical Emergency County Hospital from Târgu Mureș in 2009

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Objectives: The study assesses the results of the cardiac arrest resuscitations performed by the medical staff of the Emergency Department of The Clinical Emergency County Hospital from Târgu-Mureș in the year 2009.
Method: We conducted a prospective study between 01.01-31.12.2009, including the cardiac arrest cases occurred in the ED or brought with ongoing resuscitation from the pre-hospital setting. For the statistical study we used SPSS program, version 17; the $\chi 2$ tests and p values were determined to compare the data.
Results: We had a total of 186 cases of cardiac arrest, representing 0.47% of the total 39.074 patients assisted in the ED in 2009. The gender distribution of the cases showed a higher incidence in male (61%) and the most affected age groups ranged between 60–80 years. The patients with cardiac arrests presented various diagnosis: the highest incidence is acute coronary syndrome 32 patients (17%), followed by sepsis/MSOF 20 (11%), pneumonia/asthma 17 (9%), pulmonary embolism 17 (9%), stroke 13 (7%), etc. We have resuscitated successfully 42 patients, representing 22.58 % of the total 186 cases. All 42 patients were transferred to the hospitals departments. Out of the hospitalized patients, 25 died later on the wards and 17 (40.47%) survived and were discharged home, 6 from the Intensive Care Department and 11 from the Coronary Unit.
Conclusions: The results are comparable with the reported international data. The cases with cardiac arrest due to acute coronary syndrome, ventricular rhythms and those witnessed and treated early in the ED are having a better outcome.

Keywords: cardiac arrest, resuscitation, survival, acute coronary syndrome, ventricular rhythms

Introduction

The Emergency Department (ED) of the Clinical Emergency County Hospital from Târgu Mureş is involved in the resuscitation of cardio-respiratory arrests occurred in the department or brought in by ambulances and private cars, from the pre-hospital setting. The aim of the study is to evaluate the early and late outcome of the resuscitations performed in the ED and to compare the results with the international data recently reported.

Method

We performed a prospective study between 01/01–12/31/2009, to evaluate the activity of the ED in the cardiac arrest pathology. The included patients in the study were: cardiac arrest cases occurred in the ED, those brought to the department with resuscitation manoeuvres and those resuscitated in pre-hospital by the Mobile Intensive Care Ambulance – SMURD, belonging also to the ED. The cardiac arrest cases resuscitated in the pre-hospital setting by other ambulances were not included in the study, only if the patients repeated the cardiac arrest episode later in the ED, involving our staff. The data collection was done on a special chart, inspired from the Utstein recommendations on reporting cardiac arrest resuscitation results [1–3]. Resuscitation was performed by applying the guidelines of the European Resuscitation Council and American Heart Association (AHA) from 2009 [4–6]. For statistical study we used SPSS software, version 17, the χ^2 test and p values were determined to compare the obtained data.

Results

We had a total of 186 cardiac arrests cases in the ED, representing 0.47% of the total of 39,074 cases assisted in 2009. The gender distribution of the cases showed a higher incidence in men than women, 61% vs. 39% respectively.

Regarding the distribution of cases by age group, we noticed the maximum incidence in the 60–70 and 70–80 years age groups with 40 patients each (22%), followed by the 50–60 years group with 38 patients (21%). Twenty patients (11%) were aged over 80 years and 18 (10%) between 40–50 years. Under the age of 50, the incidence of cardiac arrest cases varied between 1–4%. In infants the percentage was higher than in young children and adolescents, with 2% vs. 1% respectively (Fig. 1).

The distribution of cases by months of the year shows that the maximum incidence was in February with 25 cases, followed by November with 22 cases; the month with the fewest patients, only 6, was June (Fig. 2).

The initial cardiac arrest rhythms at arrival were: asystole in 105 cases (57%), pulseless electrical activity (PEA) in 62 (33%) and ventricular rhythms (VF/VT) in 19 patients (10%).

There was no statistically significant correlation between the gender of the patients and the age groups, p = 0.076, however it is to be noticed that in the 50–60 years age group, the number of men reached the maximum incidence. In women, the maximum number of cases ranged between 60–70 years and over 80 years the incidence between sexes was equal. In the 20–30 and 40–50 years age

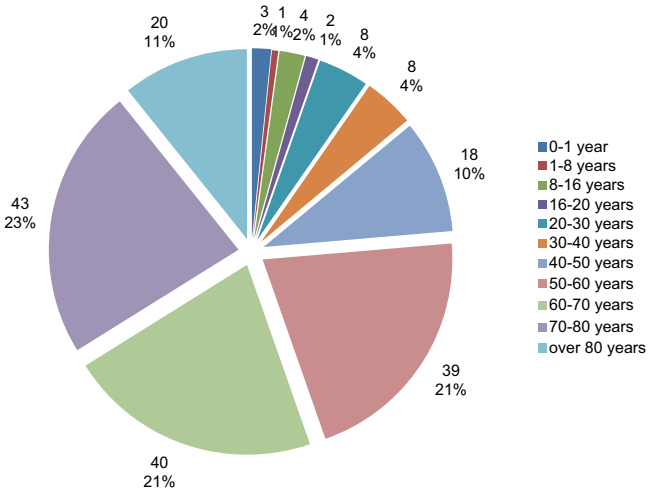

Fig. 1. Distribution of the cardiac arrest cases by age groups

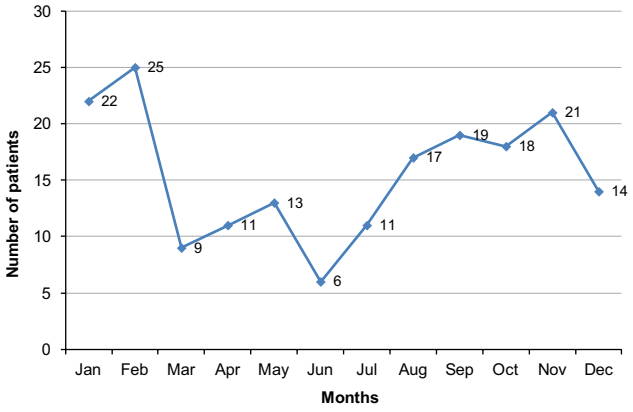

Fig. 2. Distribution of the cardiac arrest cases on months of the year

groups, the male gender appears to be more exposed to cardiac arrest (Fig. 3).

The patients were brought to the ED by: the Mureş County Ambulance Service – 89 patients (47.8%), SMURD – 82 patients (44.1%), SMURD helicopter – 6 patients (3.2%), first aid team with fire fighters – 2 patients (1.1%) and 3 patients were brought in (1.6%) with private cars. A number of 4 patients (2%) were brought to the ED from other counties with their local ambulance facilities (Fig. 4).

The level of consciousness at arrival to the ED was assessed with the Glasgow Coma Scale (GCS). A number of 128 patients arrived with a GCS of 3, another 22 patients were found with a GCS between 4 and 8, 23 patients with a GCS of 9–14 and 13 cases had a GCS of 15 at arrival.

There was no statistically significant correlation between patient gender and the GCS, p = 0.377, but we noticed that at low scores, the number of men was higher, while for GCS of 14 and 15, the ratio was reversed (Fig. 5).

The evaluation of the moment of the cardiac arrest onset led to the following results:

1. A number of 46 patients, representing 25% of the total of 186, were brought to the ED with CPR in progress. We included in this category the cases resuscitated at the scene, but which repeated the cardiac arrest episode during transportation.
2. Twenty-six patients, representing 14% of the cases underwent the cardiac arrest episode in the ED, in less than one hour from arrival.
3. Twenty-four patients (13%) presented the cardiac arrest episode in 1–6 hours after arrival.
4. Thirty-eight patients (20%) presented the cardiac arrest late, at more than 6 hours after arrival in the ED. These were patients with severe condition, treated in the ED and not hospitalised early on wards.
5. A number of 26 patients (14%) were resuscitated successfully in the pre-hospital setting by the SMURD teams and din not repeat the cardiac arrest episode in the ED.
6. Twenty-six patients (14%) were resuscitated in the pre-hospital setting by SMURD teams, but repeated the cardiac arrest in the ED later, over 6 hours after arrival (Fig. 6).

The moment of initiation or continuation of cardiac massage in the ED correlates statistically with age (Table I), p = 0.026 and the doctor's diagnosis, p = 0.001 (Table II). The evaluation of the data obtained in Tables I and II led to the following conclusion:

1. Resuscitation was not performed for 12 patients, representing 6% of all cases. This was the category of patients brought in by private cars or ambulances, with nurses, who were not intitled to declare death in the

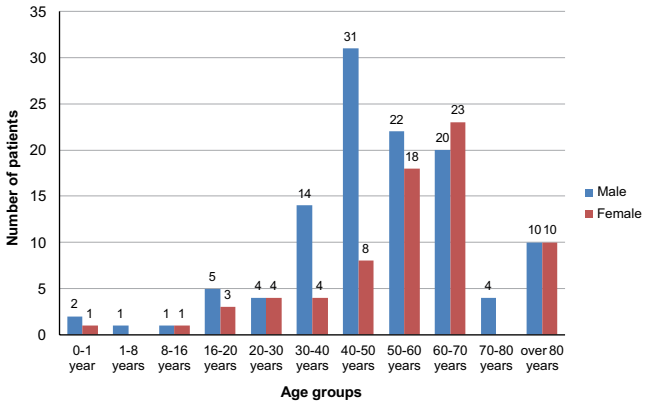

Fig. 3. Distribution of the cardiac arrest cases depending on age and gender

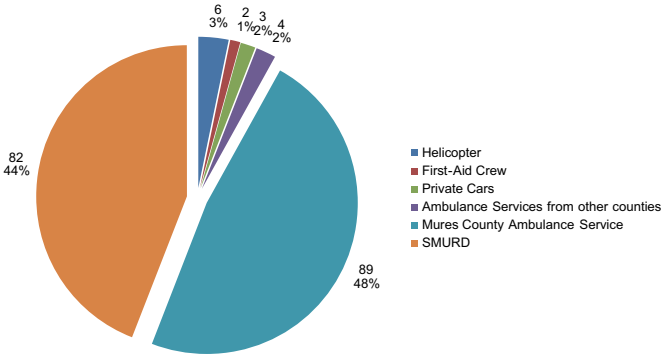

Fig. 4. Distribution of the cardiac arrest cases depending on the means of transport that brought the patients to the ED

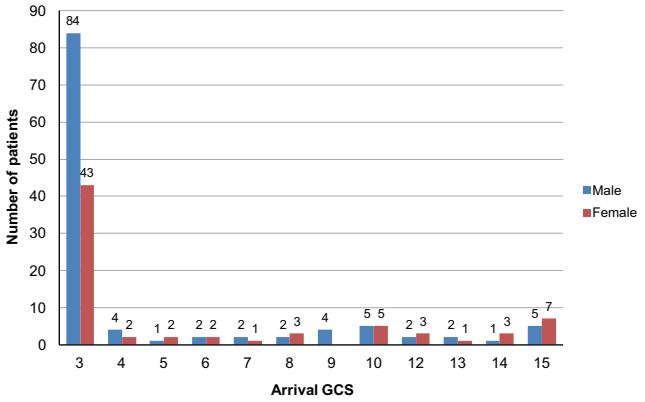

Fig. 5. Glasgow Score (GCS) in arriving, UPU patients, male and female comparison

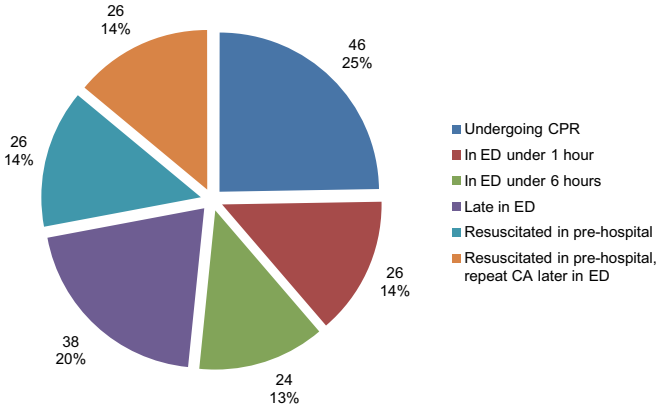

Fig. 6. Distribution of the cases by the moment of onset of the cardiac arrest

absence of a physician. Most of these patients were aged over 70 years and carried the burden of co-morbidities: extended stroke, pneumonia, COPD, pulmonary embolism, malignancy, etc. (Table I, II).

2. For a number of 40 patients, representing 22% of the total cases, resuscitation was started in the pre-hospital setting and continued in the ED. The group includes cases that were initially successfully resuscitated in the pre-hospital setting, but repeated the cardiac arrest during transportation. These patients belong to all age groups, in decreasing order: maximum between 60–70 years, followed by 16–20 years, 40–50 years and pediatric groups. The conditions associated with cardiac arrest were: cirrhosis, cardiac diseases, severe stroke, trauma, pulmonary embolism, etc. (Table I, II).
3. Resuscitation was initiated in the ED, at less than an hour from arrival in 26 patients, representing 14%. This category of patients belongs to all age groups and their pathologies were: cirrhosis, stroke, acute coronary syndrome (ACS), pulmonary embolism, malignancy, arrhythmias, renal failure, etc. (Table I, II).
4. Resuscitation was initiated late in the ED for 50 patients (27%). This was the largest group, especially with elderly patients. Their diagnosis was: respiratory failure due to pneumonia/COPD, sepsis, hemorrhagic stroke, drowning in water, suicide/hanging, etc. (Table I, II).
5. Resuscitation was performed only in the pre-hospital setting in 34 patients, representing 18%. This category of patients belongs to different age groups, most commonly between 20–60 years and was diagnosed with cirrhosis, stroke, severe trauma, acute abdomen, ACS, etc. (Table I, II).
6. Resuscitation was performed in the pre-hospital setting and later in the ED when the cardiac arrest reoccured in 24 patients (13%). The conditions were: severe lung damage, stroke, ACS, cirrhosis, etc. (Table I, II).

The patients with cardiac arrest presented various diagnoses: the most frequent diagnosis was ACS in 32 patients (17%), followed by sepsis/MSOF in 20 (11%), pneumonia/COPD/asthma in 17 (9%), pulmonary embolism 17 (9%), hemorrhagic stroke 13 (7%), severe trauma and malignancy, in equal proportions, in 12 patients each (6%) (Fig. 7).

The time interval spent by the patients with cardiac arrest in the ED is presented in Figure 8. One can easily see that the highest proportion of the patients, a number of 52 (27%) stayed within one hour, followed by a number of 19 patients each (10%) that stayed in the ED for 4–6 and 6–12 hours. Sixteen patients, representing 9% of the total number of cardiac arrest cases stayed in the ED between 12 and 24 hours. A number of 15 patients each (8%) were

Table I. Correlation between age groups and the moment of onset of cardiac resuscitation

Age groups	Cardiac compressions were not performed	Cardiac compressions in pre-hospital and continued in ED	Cardiac compressions in the ED, less than 1 hour after arrival	Cardiac compressions in the ED, late	Cardiac compressions was performed only in pre-hospital	Cardiac compressions in pre-hospital and late in the ED
0-1 year	0	2	1	4	0	1
1-8 years	5	1	0	6	0	1
8-16 years	2	1	2	5	2	5
16-20 years	0	3	2	12	2	1
20-30 years	0	5	0	0	2	1
30-40 years	0	10	6	2	10	4
40-50 years	1	7	5	3	0	1
50-60 years	2	2	3	1	4	0
60-70 years	1	5	2	2	1	1
70-80 years	0	0	0	2	1	0
over 80 years	0	1	0	4	0	4

Table II. Correlation between the diagnosis of patients and the moment of onset of cardiac resuscitation

	Cardiac compressions were not performed	Cardiac compressions in pre-hospital and continued in ED	Cardiac compressions in the ED, less than 1 hour after arrival	Cardiac compressions in the ED, late	Cardiac compressions was performed only in pre-hospital	Cardiac compressions in pre-hospital and late in the ED
Non-traumatic acute abdomen / infections	0	2	1	4	0	1
Hemorrhagic stroke	5	1	0	6	0	1
Stroke	2	1	2	5	2	5
Bronchopneumonia / COPD / Asthma	0	3	2	12	2	1
Cardiac failure / Dilated cardiomiopaty	0	5	0	0	2	1
Cirrhosis	0	10	6	2	10	4
Disectie aorta	1	7	5	3	0	1
Aortic dissection	2	2	3	1	4	0
Non-traumatic hemorrhagic shock	1	5	2	2	1	1
Hypothermia	0	0	0	2	1	0
Acute Coronry Syndrome	0	1	0	4	0	4
Drowning	0	1	0	0	1	2
Renal failure	0	0	1	1	1	0
Toxic	0	0	0	0	2	0
Sepsis / MSOF	0	0	0	0	1	0
Hanging / Suicide	1	0	0	5	3	0
Pulmonary embolism	0	1	0	1	0	1
Severe trauma	0	1	1	2	2	1
Malignant tumors	0	0	2	0	2	0
Arrhythmias	0	0	1	0	0	1

treated in the ED within 1–2 and 2–3 hours. Thirteen patients (7%) stayed less than 10 minutes in the ED, while a number of 25 cases (14%) stayed for more than one day (Fig. 8).

A number of 144 (76%) patients with cardiac arrest died in the ED, but there were 42 patients (22.58%) who were transferred alive to different departments of the hospital, especially to the ICU I, where 22 cases (22%) were further treated. Three patients were transported for immediate surgical treatment to the operation room and 14 cases (14%) to coronary units for angiography (Fig. 9).

The epidemiologic study on the ED cardiac arrest cases in the year 2009 highlighted that less than a quarter of the patients with cardiac arrest attended the hospital wards – 42 cases, representing 22.58% of the total of 186. A number of 17 patients survived and were discharged home (40.47%). Eleven patients, out of the total 17 (64.70%) were cardio-respiratory arrests after ACS or severe arrhythmias (Fig. 10).

Discussions

Data from the literature, published by the European Resuscitation Council during the implementation of the new protocol in 2010, showed that 40% of the cardio-respiratory arrests in patients over 75 years are due to ACS [7]. In our study just 32 patients, representing 17% of the total of 186 were registered as ACS. International data on hospital resuscitation of cardiac arrests reported by the European Resuscitation Council Guidelines for Resuscitation in 2010, shows that in Europe, the discharge rate of cardiac arrests is 10.7% at all rhythms and 21.2% for FV [7,8]. Similar data published by the American Heart Association shows a survival rate of 8.4% on all cardiac rhythms and 22% for ventricular rhythms [9]. A Canadian study, which evaluated cardiac arrests for a period of 10 years, reported a survival rate of 38% of hospital resuscitations [10]. The effectiveness of resuscitation in the ambulance and helicopter is proved, as shown in a study published in the journal Resuscitation in 2007 [11]. Thus we recommend to the teams of paramedics and nurses to perform CPR during transpor-

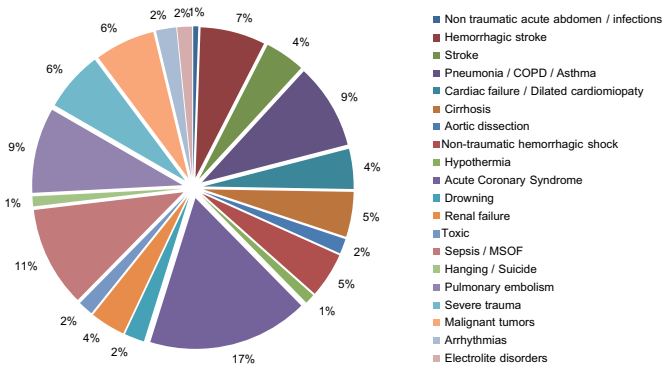

Fig. 7. Distribution of cardiac arrest cases by diagnosis

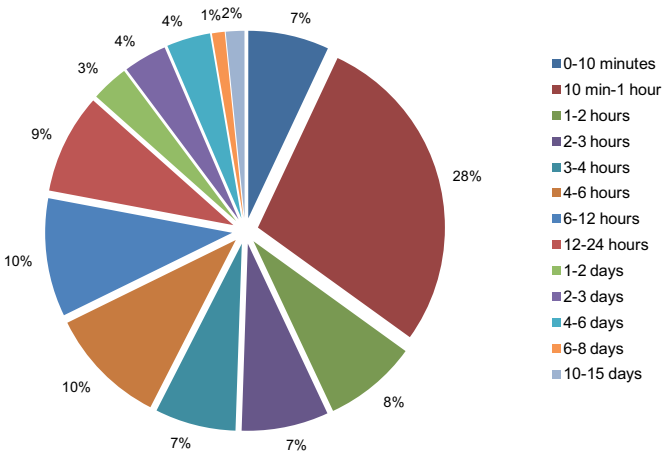

Fig. 8. Distribution of cardiac arrest cases depending on the time spent in the ED

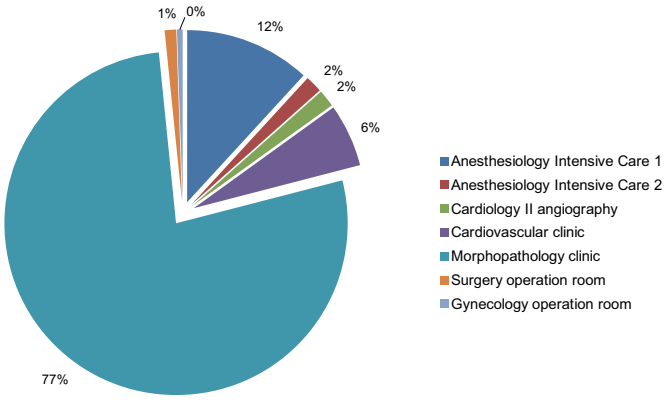

Fig. 9. Distribution of patients depending on the place of transfer from ED

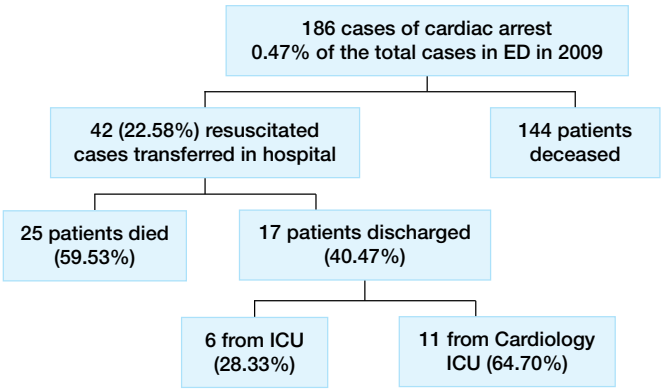

Fig. 10. Results of the cardiac arrest resuscitations performed by the ED staff in 2009

tation. The statistical data published in literature show large differences from one region to another [12–14]. It appears that a good outcome is related with the level of the hospital where the patients with cardiac arrest are admitted, mainly if thrombolysis and angioplasty are possible [15–19].

Conclusions

1. The cardio-respiratory arrest cases did not represent a large proportion of the patients assisted by the ED in the year 2009.
2. The gender distribution of the cardiac arrest cases shows a higher incidence in men compared with women. Cardiac arrest in men occured at a younger age and is due to acute coronary syndrome and traumatic injury. Women with cardiac arrest are older and suffer of chronic pathology.
3. The number of cardiac arrest cases brought in by the Local Ambulance Service and SMURD were almost equal as number.
4. A high number of patients were transported to the ED with ongoing resuscitation manoeuvres.
5. There was a large number of patients who presented cardiac arrest late in the ED, after six hours from the moment of arrival. These were elderly patients with severe pathology, incompatible with life and were not transferred on wards because of shortage of accommodation places and because they did not qualify as a priority.
6. Almost all patients who were resuscitated, were hospitalised in the ICU I Department, the remaining cases in the Interventional Cardiology Departments.
7. Cases of cardiac arrest with short residence time in the ED are those that had ACS and trauma patients requiring emergent surgical treatment.
8. The patients discharged home in good condition were especially those with ASC.
9. The early and late outcome results of the resuscitations performed in the ED are comparable with the international data published recently.
10. The cases with ACS, with ventricular basic rhythms and those witnessed and treated early in the ED enjoy a better outcome.

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