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Out-of-hospital Cardiac Arrest in the Republic of Crimea: Analysis of Epidemiology and Practice of Care

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INTRODUCTION Efficient organization of measures aimed at decreasing mortality from out-of-hospital cardiac arrest (OHCA) warrants a clear understanding of OHCA epidemiology and performance of the prehospital care system in such cases. The study was aimed at performing respective analysis and identifying the ways for improving prehospital management of OHCA in the Republic of Crimea.

MATERIAL AND METHODS Annual data from the Crimean OHCA and Resuscitation Registry for 2018 were utilized. All OHCA cases attended by emergency medical services (EMS) with attempted cardiopulmonary resuscitation (CPR) were included, regardless of cardiac arrest etiology or patients' age (n=419). For ensuring conformity and comparability of the study results, data collection and analysis were executed in correspondence with the statements of the Utstein recommendations.

RESULTS The overall incidence of EMS-attended OHCA in the Republic of Crimea was 673.3 per 100,000 population per year, the incidence of OHCA with attempted CPR – 21.9 per 100,000 population per year, the proportion of CPR attempts out of all OHCA cases – 3.3%. Mean patient age was 66.9 years, and 52.7% were male. The etiology was cardiac in 42.5% cases. In 71.8% cases OHCA was witnessed by EMS, in 25.5% – by a bystander before EMS arrival. Bystanders initiated CPR in 5.7% cases. The initial rhythm was asystole in 80.4% of all cases. When excluding EMS-witnessed cases, the mean EMS response time was 13 min. 5.0% patients had a sustained return of spontaneous circulation at hospital admission. Survival was associated with lower EMS response time (p=0.027), administration of shock (p<0.001) and advanced airway management with endotracheal tube or laryngeal mask (p=0.047).

CONCLUSION High incidence of OHCA, low rates of CPR commencement and low rates of survival from OHCA in the Republic of Crimea determine the necessity of implementing a comprehensive program to improve prehospital care in the region. Considering the critical relevance of early intervention in OHCA and the revealed low bystander CPR rate, the measures for involving community into the process of prehospital care should form the basis of this program.

Keywords: out-of-hospital cardiac arrest, cardiopulmonary resuscitation, first aid, emergency medical services, prehospital care, registry, Utstein, epidemiology, mortality

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OHCA – out-of-hospital circulatory arrest
RSBC – restoration of spontaneous blood circulation
CPR – cardiopulmonary resuscitation
ECG – electrocardiography
EMC – emergency medical care
EMS –emergency medical service
SD – standard deviation

INTRODUCTION

The high mortality rate in the Russian Federation, including among people of working age, is a significant socio-economic problem [1, 2]. Reducing mortality is one of the key strategic objectives of the health care system [3].

Death in most cases occurs in out-of-hospital circumstances [4]. Out-of-hospital circulatory arrest (OHCA) is characterized by a high incidence and low probability of a favorable outcome [5]. Survival with OHCA, as a rule, does not exceed 7% [6].

The experience of countries with a developed health care system, nevertheless, shows that the implementation of measures aimed at improving the efficiency of prehospital care can significantly reduce mortality in OHCA [7–9].

At the same time, a rational choice of measures to optimize prehospital care, as well as a reliable assessment of the effectiveness of organizational changes, are impossible without a comprehensive study of the epidemiology of OHCA and the existing practice of providing care in the corresponding geographic region [10].

The purpose of the study was to analyze the epidemiology of OHCA, the process and effects of the provision of prehospital care for OHCA in the Republic of Crimea and to identify priority measures aimed at improving the effectiveness of this type of care and reducing mortality.

MATERIAL AND METHODS

A retrospective analysis of data describing cases of OHCA with cardiopulmonary resuscitation (CPR), which are recorded in the Crimean register of OHCA and CPR (Engl. Crimean Out-of-Hospital Cardiac Arrest and Resuscitation Registry, COHCARR; further - Register). The period covered by the study is from January 1 to December 31, 2018.

The register was established on the basis of the Crimean Republican Center for Disaster Medicine and Emergency Medical Care (CRCDM and EMC) as a tool for collecting, systematizing, analyzing and reporting data on the epidemiology of OHCA and the practice of providing prehospital care at OHCA in the Republic of Crimea. The register covers the entire population of the Crimean Peninsula, with the exception of the population of Sevastopol, which as of January 1, 2019 corresponds to 1.91 million people [11].

Information on all cases of OHCA with CPR undertaken is subject to collection in the Registry, regardless of the expected etiology, age and gender of patients. The source of the data is the primary documentation of the EMC – EMC call cards (accounting form 110 / u) and local CPR protocols. All Register data are depersonalized, which excludes the possibility of establishing a connection between the OHCA case and the patient's personality.

In order to ensure the reliability and comparability of data, the Register is organized and operates in accordance with the provisions and definitions of the international recommendations of Utstein on the unified reporting of information about OHCA [12, 13].

A detailed description of the design and methodology of the register, including a list of data elements to be collected, will be provided in a separate publication.

The indicator of the total number of deaths in the Republic of Crimea outside the hospital for 2018 was provided at the request of the authors by the Office of the Federal State Statistics Service for the Republic of Crimea and the city of Sevastopol.

Statistical analysis. Data presented using descriptive statistics methods. To describe quantitative variables, mean values with standard deviation (SD) and median were used, to describe qualitative variables – indicators of frequencies and shares. Checking quantitative variables using the Kolmogorov-Smirnov test showed a significant difference in their distribution from the normal form. To compare quantitative variables, the Mann-Whitney U-test was used. To determine the relationship between qualitative variables, either the chi-square test or Fisher's exact test was used. Communication tightness was assessed using Phi coefficient. Differences were regarded as statistically significant when the value $p<0,05$. The software package was used for statistical data processing IBM SPSS Statistics 23.0 (IBM Corporation, США).

RESULTS

In 2018, in the territory of the Republic of Crimea, emergency medical personnel recorded 12,872 cases of OHCA (unpublished data from the CRCDM and EMC), which is 69.5% of the total number of cases of out-of-hospital death (n = 18,516) registered in the region. In 12,302 cases (95.6%), circulatory arrest occurred before the ambulance team arrived at the scene.

CPR was performed by EMC in 419 cases, which corresponds to the level of resuscitation activity (i.e. the share of CPR cases in the total number of OHCA cases registered by the EMC), equal to 3.3%.

With the population of the Republic of Crimea as of January 1, 2019 – 1 911 800 people [11], the total frequency of OHCA cases recorded by EMCs was 673.3 cases per 100,000 population per year, while the frequency of OHCA cases with CPR was 21.9 per 100,000 population per year. Below are the results of an analysis of OHCA cases with CPR.

The average age of patients was 66.9 years (SD = 17.1, median – 69 years) with the proportion of male patients 52.7% (n = 221); 64.7% of cases (n = 271) were registered in cities, and 35.3% (n = 148) – in rural areas.

Based on the diagnosis established by the EMC staff, OHCA was most often used in cardiac pathology (Fig. 1). In accordance with the definition of Utstein recommendations, 92.8% of OHCA cases (n = 389) belong to the broad category of “medical causes” (causes associated with diseases), which include heart disease and other causes of OHCA besides trauma, asphyxia, drowning, electrical injury and poisoning, as well as cases when the cause remained unknown [13].

Circulatory arrest most often occurred when the patient was at home (Fig. 2).

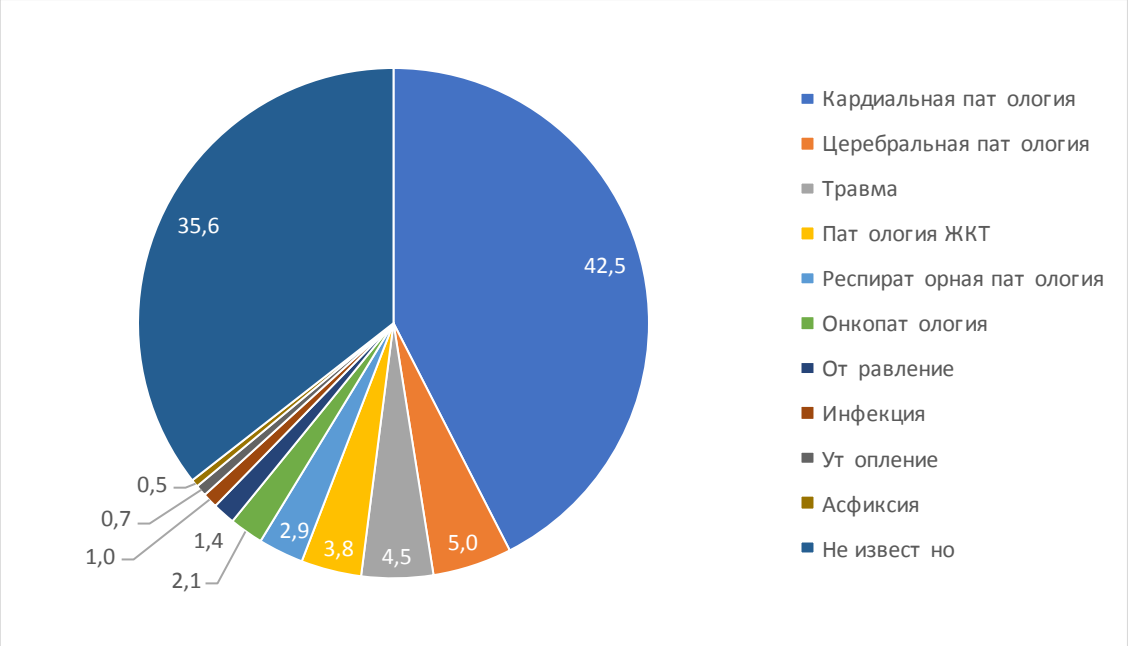

Fig. 1. Percentage distribution of out-of-hospital cardiac arrest cases with undertaken cardiopulmonary resuscitation, depending on the etiology of the circulatory arrest

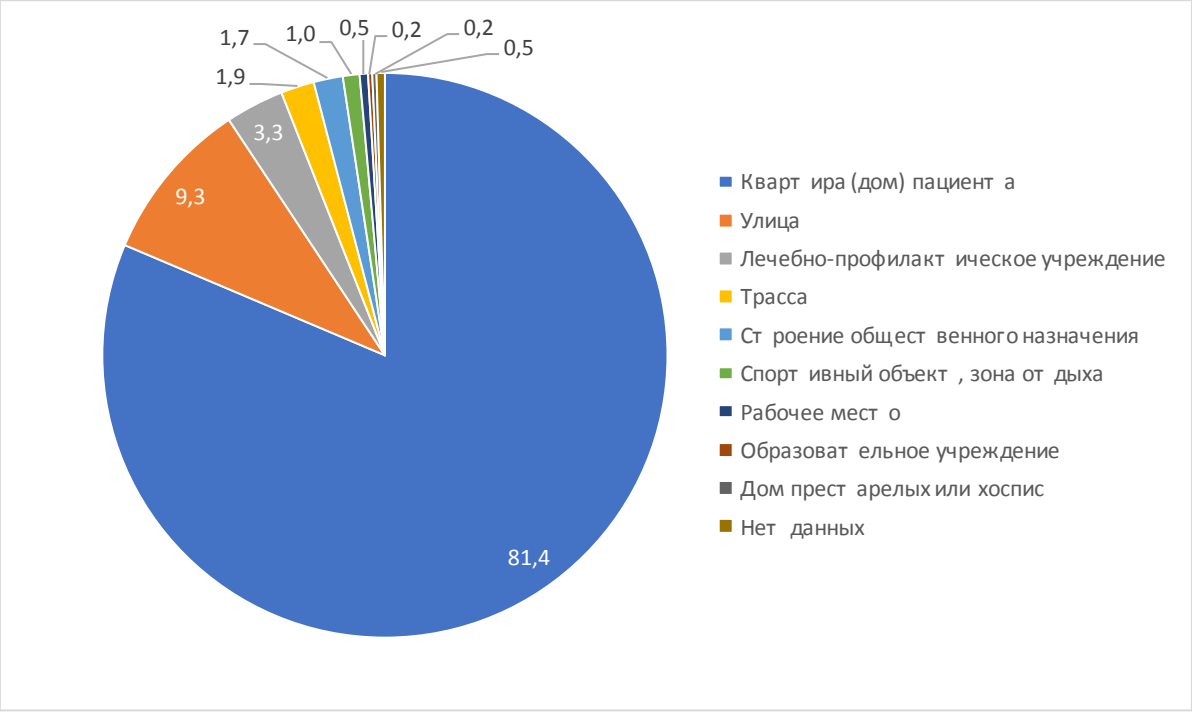

Fig. 2. Percentage distribution of out-of-hospital cardiac arrest cases with undertaken cardiopulmonary resuscitation, depending on the location of the circulatory arrest

In the presence of the ambulance brigade, OHCA developed in 71.8% of cases (n = 301), in the presence of witnesses before the arrival of the ambulance – in 25.5% of cases (n = 107), and without witnesses before the arrival of the ambulance – in 1.7% of cases (n = 7) (no data in 1.0% of cases, n = 4). Of the cases of circulatory arrest that developed in the presence of eyewitnesses before the arrival of the EMS, in 22.4% of cases (n = 24) in the primary documentation, the fact of CPR by witnesses was recorded (5.7% of the total number of cases of OHCA with resuscitation undertaken). Most often (45.8%; n = 11), bystanders performed chest compressions and artificial respiration, less often (20.8%; n = 5) - only compressions; in 8 cases (33.3%), the volume of CPR was not described in the primary documentation.

CPR by eyewitnesses to circulatory arrest was found to be correlated with the patient's male sex, younger age, and the development of OHCA in the public space (Table 1). When CPR was performed by witnesses, patients were 2.1 times more likely to have a potentially defibrillable rhythm according to the primary electrocardiographic (ECG) assessment, and patients survived 2.7 times more often (hereinafter, survival means the

presence of spontaneous circulation at the time of patient transfer to hospital staff). The corresponding statistically significant relationship for the sample of the present study was not confirmed (Table 1).

Table 1

Relationship between demographic indicators, circumstances of OHCA development and the outcome of OHCA with CPR performed by bystanders of circulatory arrest

Parameters	Bystander CPR		No bystander CPR		p value	Phi
	n	%	n	%		
Gender					0.024	-0.110
- male	18	75.0	203	51.4		
- female	6	25.0	192	48.6		
Age, years	55.7		67.5		0.001	n/a
Location					0.828	0.011
- city	15	62.5	256	64.8		
- countryside	9	37.5	139	35.2		
Location					< 0.001	0.203
- patient's apartment (house)	12	50.0	329	83.7		
- public space	12	50.0	64	16.3		
Primary ECG rhythm					0.068	0.100
- defibrillable	7	29.2	54	14.0		
- non-defibrillable	17	70.8	332	86.0		
Survival					0.111	-0.085
- yes	3	12.5	18	4.6		
- no	21	87.5	377	95.4		

Notes: CPR – cardiopulmonary resuscitation; ECG – electrocardiogram; n/a – not applicable

In 80.4% of cases (n = 337) OHCA, according to ECG data, asystole was initially detected, in 2.9% of cases (n = 12) – pulseless electrical activity, in 14.6% (n = 61) cases – potentially defibrillable rhythm: ventricular fibrillation (n = 60; 14.3%) or pulseless ventricular tachycardia (n = 1; 0.2%) (no data: n=9; 2,1%).

Defibrillation was performed by the ambulance staff in 15.3% of all cases of OHCA with CPR (n = 64) and in 82.8% of cases of OHCA with a potentially defibrillable rhythm according to the primary ECG (n=53).

Airway patency was provided by instrumental methods in 93.1% of cases (n=390). Of these cases, in 78.5% (n = 306) the oropharyngeal airway tube was used, in 13.6% (n = 53) – a laryngeal mask, and in 7.9% (n = 31) – an endotracheal tube.

Adrenaline and (or) amiodarone were administered in 88.1% of cases (n = 369): adrenaline - in 87.8% (n = 368), amiodarone – in 8.8% cases (n=37). Drugs were injected into a peripheral vein (n = 360; 97.5%), intraosseous (n = 4; 1.1%) or endotracheally (n = 4; 1.1%) (no data: n=1; 0,3%).

In cases of OHCA developed before the arrival of the ambulance (n = 118), the average time from receiving a call to the arrival of the ambulance at the scene (response period) was 13.2 minutes (SD = 12.8; median – 11.0 minutes), before defibrillator shock (n = 29) – 11.6 minutes (SD = 5.8; median – 11.0 minutes), before vascular access and the first dose of adrenaline (n = 106) – 17.8 minutes (SD = 14.4; median 15.5 minutes). With OHCA, which developed in the presence of emergency stuff, the average time to the discharge of a defibrillator (n = 32) was 3.0 minutes (SD = 5.2; median – 2.0 minutes), before providing vascular access and the introduction of the first dose of adrenaline (n = 239) – 2.7 minutes (CO = 2.9; median – 2.0 minutes).

With the development of OHCA before the arrival of the EMS, the average response time in urban and rural areas differed slightly (12.7 minutes and 14.3 minutes; p=0,054). There were significant differences in the response period between cases of OHCA with the initially identified potentially defibrillable (12.0 minutes, SD = 7.6; median – 10.0 minutes) and non-defibrillable (18.0 minutes, SD = 19.3; median – 13, 0 minutes) heart rate (p=0,006).

Restoration of spontaneous circulation (SBC) was observed in 23 patients (5.5%) with OHCA. Twenty-one patients (5.0%) after successful CPR were referred with spontaneous circulation to hospital staff. Of these, 8 patients (38.1%) had ventricular fibrillation as the primary ECG rhythm in OHCA, 11 (52.4%) had asystole or pulseless electrical activity (no data: n=2; 9,5%).

In cases of OHCA, which occurred in the presence of witnesses, with a primary identified potentially defibrillable heart rate (5.7%, n = 24), restoration of spontaneous circulation (RSC) was observed in 2 patients (8.3%), and both patients survived.

A relationship was established between survival and a shorter response period, the presence of a potentially defibrillable rhythm according to the primary ECG data, defibrillation and airway management using sealing devices (laryngeal mask or endotracheal tube) (Table. 2). There is a tendency towards a higher survival rate with the development of OHCA in the city. At the same time, the outcome of OHCA turned out to be independent of the gender and age of patients, the development of OHCA in the presence of an emergency team, and the use of adrenaline (Table. 2).

Table 2

The relation among demographic indicators, circumstances of OHCA development and indicators of care with the outcome of OHCA

Parameters	Survival		Lethal outcome		P value	Phi
	n	%	n	%		
Gender					1,000	-0.002
- male	11	5.0	210	95.0		
- female	10	5.1	188	94.9		
Age, years	64.7		67.0		0.710	n/a
Location					0.058	0.101
- city	18	6.6	253	93.4		
- countryside	3	2.0	145	98.0		
Location					1 000	-0.005
- patient's apartment (house)	17	5.0	324	95.0		
- public space	4	5.3	72	94.7		
Development of OHCA					0.805	0.022
- in the presence of the ambulance team	16 5	5.3 4.2	285 113	94.7 95.8		
- before the arrival of the ambulance team						
Response period, min *	5	6.2	113	13.5	0.027	n / a
Primary ECG rhythm					0.003	-0.169
- defibrillable	8	13.1	53	86.9		
- non-defibrillable	11	3.2	338	96.8		
Defibrillation					< 0.001	0.237
- yes	11	17.2	53	82.8		
- no	10	2.8	345	97.2		
Adrenaline injection					0.305	-0.048
- yes	17	4.6	351	95.4		
- no	4	7.8	47	92.2		
Placement of an endotracheal tube or laryngeal mask					0.047	0.104
- yes	8	9.5	76	90.5		
- no	13	3.9	322	96.1		

Notes: * – excluded cases of OHCA developed in the presence of EMS. ECG – electrocardiogram; EMS – emergency medical services; n/a – not applicable; OHCA – out-of-hospital circulatory arrest

DISCUSSION

The results of this study describe the epidemiological profile of OHCA, the process and effects of care for OHCA in the population inhabiting the Republic of Crimea, and allow determining priority areas for optimizing care in the region. In addition, the results obtained serve as an important signal indicating the extreme seriousness of the OHCA problem and the need to take urgent measures aimed at an organized fight against this problem on the scale of this subject of the Russian Federation and, possibly, the state as a whole.

The total frequency of OHCA cases registered by the ambulance workers in the Republic of Crimea is many times higher than the indicators presented in foreign scientific literature (Table. 3) [5, 14, 15]. The absence of a unified system of epidemiological control of OHCA in Russia and the lack of domestic research in this area complicate the interpretation of this observation. [16]. The most likely explanation for such significant differences in the incidence of OHCA is a significantly higher level of morbidity and mortality, primarily from cardiovascular pathology, in Russia as compared with economically developed countries. [17].

Table 3

Key characteristics of OHCA cases with undertaken CPR according to current and foreign studies

Indicators	Present research	Australia and New Zealand (Beck et al., 2018) [14]	England (Hawkes et al., 2017) [19]	European Union (Gräsner et al., 2016) [5]	United Arab Emirates (Ong et al., 2015) [23]	USA (Benjamin et al., 2018) [15]	South Korea (Ong et al., 2015) [23]	Japan (Ong et al., 2015) [23]
Total incidence of OHCA recorded by EMSs (cases per 100 000 population annually)	673.3	102.5	n/d	84.0	n/d	110.8	n/d	n/d
Frequency of OHCA with CPR attempted (cases per 100 000 population annually)	21.9	47.6	53.2	49.0	n/d	57.3	n/d	n/d
Average age, years	66.9	n/d	68.6	66.5	49.7	n/d	63.5	71.7
Male gender, %	52.7	68.0	58.7	66.3	82.7	n/d	65.6	57.9
Location of OHCA - patient's apartment (house),%	81.4	n/d	83.3	69.4	54.3	n/d	64.9	63.0
OHCA with a potentially defibrillable primary rhythm on the ECG,%	14.6	27.9	20.6	22.2	19.8	19.8	15.4	7.5
OHCA in the presence of EMS,%	71.8	15.4	13.0	11.9	3.5	n/d	6.8	7.1
OHCA in the presence of bystanders,%	25.5	41.5	35.3	54.3	45.9	n/d	46.5	33.5
CPR attempted by bystanders,%	5.7	41.0	39.5	47.4	10.5	40.7	40.9	40.2
RSC,%	5.5	33.4	n/d	28.6	n/d	n/d	n/d	n/d
Survival,%	5.0	27.7	25.8	25.2	7.9	n/d	20.4	27.3
Those who survived to be discharged from the hospital or alive 30 days after hospitalization, %	n/d	12.1	7.9	10.3	3.0	10.8	8.5	5.2

Notes: CPR – cardiopulmonary resuscitation; ECG – electrocardiogram; EMS – emergency medical service; n/d – no data; OHCA – out-of-hospital circulatory arrest; RSC – recovery of spontaneous blood circulation; UAE – United Arab Emirates; USA – United States of America

The proportion of cases of circulatory arrest with undertaken resuscitation in the total number of cases of OHCA recorded by EMS was slightly more than 3%. For comparison, the same indicator according to the North American ROC register reaches 57% [18]. A significantly higher frequency of CPR for OHCA than in Crimea was recorded in Europe, Australia, and New Zealand (Table. 3) [5, 14, 15, 19].

In the overwhelming majority of cases of OHCA, emergency medical personnel at the initial examination of the patient reveal signs of biological death [20], and this is the main reason for the low resuscitation activity in the region.

The chances of survival with OHCA decrease every minute by an average of 7–10% [21]. In our study, the average response time of the EMS to OHCA was 13 minutes, which is much worse than the indicators in countries with a developed prehospital care system – 5–8 minutes [14, 18, 22] and this fact indicates a low chance of a favorable outcome in such cases. The relatively low percentage of OHCA cases with potentially defibrillable heart rate according to the primary ECG data (Table 3) [5, 14, 15, 19, 23] also indicates a tendency towards a late onset of care and a low probability of successful resuscitation [22].

Delayed assistance may be due, on the one hand, to the inability of OHCA witnesses to recognize the problem timely, to call an ambulance and start providing first aid before the arrival of the ambulance, and, on the other hand, to the long response time of the ambulance service, in particular, due to the lack of available ambulance teams, insufficient efficiency of the dispatch service of the EMC and high congestion of transport routes [22, 24].

Immediate care by witnesses of circulatory arrest using basic CPR significantly slows down the process of extinction of life (the chances of survival are reduced by 3–4% per minute), which increases the likelihood of an emergency room arrival and medical care before irreversible death occurs [22].

According to our data, the proportion of OHCA cases where CPR attempts were made by witnesses is significantly lower than in majority of countries demonstrating high survival rates for OHCA (Tab. 3) [5, 14, 15, 19, 23], and it is comparable to that recorded in China (6%) [25]. The limited involvement of the domestic population in the process of providing first aid and the low level of readiness of potential eyewitnesses to provide assistance are confirmed by the results of several sociological studies [26–28].

In the present study, the dependence of the survival of patients with OHCA on the provision of first aid by witnesses was not statistically significantly confirmed, which was probably due to the limited number of observations. At the same time, extensive foreign experience has been accumulated, indicating that CPR by eyewitnesses is a key factor on which the outcome of OHCA depends, and the adoption of measures aimed at attracting the population to provide care can increase the survival rate of OHCA by two or more times [9, 29, 30].

Priority measures to optimize first aid for OHCA, the effectiveness of which has been proven, include: the creation of a mass training system for the population of basic CPR [31], the implementation of public access programs to defibrillation [8], organization of remote dispatch support for first aid [32, 33]. Moreover, the provision of CPR instructions by telephone by emergency dispatchers is considered the most effective and least costly way of attracting eyewitnesses to resuscitation in OHCA [34]. An important area is also a general increase in the motivation of the population to provide assistance, in particular, by improving the regulatory framework governing issues related to the provision of first aid [35].

In addition to ensuring the effectiveness of the first aid stage, the adoption of measures aimed at shortening the response period and improving the quality of CPR performed by ambulance teams can increase the effectiveness of the provision of emergency medical services in cases of OHCA in the Republic of Crimea.

The efficiency of the EMC in cases of OHCA depends on a number of factors, including such as yet unresolved health problems, such as the staff shortage existing in the EMC system, a shortage of usable vehicles, insufficient efficiency of the outpatient-polyclinic health care unit and the associated large number of unreasonable calls [24, 36]. The solution of these problems is necessary, but requires complex organizational changes, including at the federal level, and is a long-term prospect.

At the same time, it is advisable to carry out additional analysis aimed at identifying the main potentially modifiable factors that affect the speed of the EMC response in cases of OHCA in the region. The results of such an assessment can form the basis for planning appropriate measures to improve the provision of EMC, including measures to optimize control and operational management of the emergency ambulance crews by the operational dispatch departments of the emergency response.

The most important determinant of the effectiveness of CPR delivered by healthcare providers is the quality of training [31]. To maintain and improve the knowledge and skills of basic and advanced CPR, in addition to planned refresher courses, additional short courses can be carried out using modern simulation equipment [31]. Additional training can increase the efficiency and correctness of the implementation of the resuscitation complex, as well as increase the frequency of performing extended CPR manipulations in practice, which have a significant impact on the survival of patients with OHCA (including the installation of a laryngeal mask and tracheal intubation).

Domestic publications describing the process and effects of care in cases of OHCA are few. An earlier analysis of OHCA cases accompanied by an emergency call in the administrative center of the Republic of Crimea – Simferopol (01.12.2015-29.02.2016) showed a similar incidence of OHCA (674 cases per 100,000 population per year) with greater resuscitation activity (8.6%), but complete failure of resuscitation measures [20].

The work of V.B. Shumatov et al. (2006) presents the results of the analysis of the dynamics of the resuscitation activity of the EMS and the survival rate of patients with OHCA in cases of calling the EMS in Vladivostok (1999–2004) and Yakutsk (2004–2005) [37]. As a result of the implementation of a set of measures, including the improvement of the training base and the training process for the emergency medical personnel, the improvement of material and technical support, the optimization of the placement of the ambulance brigades, the obligatory examination of OHCA cases, the resuscitation activity at the OHCA in Vladivostok increased from 13% to 27%, the time to EMS arrivals decreased from 18 minutes to 11 minutes, and the number of CPR survivors increased from 4% to 10%. In Yakutsk, resuscitation activity increased from 5% to 13%, the time before the arrival of the ambulance decreased from 20 to 8 minutes, while the proportion of survivors increased from 0% to 9%. The other two articles describe further positive dynamics of the survival rate in Yakutsk (up to 27% in 2007) [38, 39]. The descriptive nature of the observations presented in these publications does not allow us to assess the reliability and severity of the relationship of positive effects with the implementation of specific measures, but in general, this experience indicates the possibility of a significant increase in the effectiveness of resuscitation care for OHCA in a relatively short time.

If we extrapolate the incidence of OHCA and the survival rate recorded in this study to the population of the Russian Federation (146.8 million people as of 01.01.2019) [2], it can be assumed that 988,000 cases of OHCA occur annually in Russia, of which at least 939,000 (95%) are fatal. Rational transformations of the prehospital care system, including measures aimed at optimizing first aid and emergency care in OHCA, can provide an increase in resuscitation activity and significantly increase survival in OHCA, which will save tens of thousands of lives every year. To assess the feasibility and effectiveness of the measures being implemented, a unified well-functioning system of objective epidemiological control and monitoring of the effectiveness of care for OHCA is required – the federal register of OHCA cases [16].

LIMITATIONS

The sample of this study is limited by the number of observations within the Republic of Crimea and the calendar year. The results obtained cannot be considered representative for the general population of the Russian Federation. A larger number of observations will provide an increase in the statistical power of the study, which can reveal new relationships and (or) increase the statistical significance of the identified differences.

During the period covered by the study, to collect information about cases of OHCA and provide assistance for OHCA, the primary documentation of the EMS was used, which did not have fields for mandatory registration of the fact of participation of witnesses in the provision of assistance. Such information was indicated by employees when describing the circumstances of the incident. It cannot be ruled out that in some cases the relevant information has been omitted from the description, so the true prevalence of care may be underestimated. On April 30, 2019, a new CPR protocol was approved by the order on the Emergency Service of the Republic of Crimea, which provides for the mandatory registration of the fact of CPR by witnesses of OHCA.

Currently, the registry does not include information on the hospital stage of care for patients who have undergone OHCA, which does not allow assessing a number of important outcome indicators, including the proportion of patients who survived to be discharged from the hospital or were alive 30 days after hospitalization.

FINDINGS

The results of the study indicate a high incidence of OHCA, low resuscitation activity and high mortality in out-of-hospital circulatory arrests observed in the Republic of Crimea. High mortality is associated with late treatment. It is required to implement a comprehensive program to optimize prehospital care with the obligatory inclusion of activities aimed at involving the population (potential witnesses of cases of out-of-hospital circulatory arrest) in the first aid process. The model of the Crimean register of cases of out-of-hospital circulatory arrest and cardiopulmonary resuscitation can be used to create a unified system for monitoring the epidemiology of out-of-hospital circulatory arrests, control and optimization of care for OHCA in the Russian Federation.

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