Public Opinion on Community Basic Cardiopulmonary Resuscitation Training: a Survey of Inhabitants of the Crimean Peninsula

A.A. Birkun[1]*, Y.A. Kosova[2]

Department of Anesthesiology
[1] **Medical Academy named after S.I. Georgievsky of V.I. Vernadsky Crimean Federal University**
5/7 Lenin Blvd, Simferopol 295051, Russian Federation
[2] **Taurida Academy of V.I. Vernadsky Crimean Federal University**
4 Prospect Vernadskogo, Simferopol 295007, Russian Federation

* Contacts: Aleksey A. Birkun, Cand. Med. Sci., Assistant of the Department of Anesthesiology and Resuscitation and Emergency Care, S.I. Georgiyevsky Medical Academy of V.I. Vernadsky Crimean Federal University, Simferopol. E-mail: birkunalexei@gmail.com

BACKGROUND The chances of fatal outcome in out-of-hospital cardiac arrest are exceeding 90%. However, the early initiation of bystander cardiopulmonary resuscitation (CPR) substantially improves the probability of survival. The study was aimed to determine the extent of community CPR training, level of CPR knowledge, willingness and motivation to learn CPR among the population of the Crimea.

MATERIALS AND METHODS The representative sample of adult residents of the Crimean Peninsula (n=384) has been surveyed by means of individual structured interview from November 2017 to January 2018. The results were analyzed with social statistics.

RESULTS According to the survey, 53% of respondents were previously trained in CPR. The training was performed mainly (82%) at work, school, college/technical school or university, or when acquiring a driver's license. The majority of females, people over 60, unemployed and retired, widowed and those with monthly income lower than 20,000 roubles are not trained. Of previously trained, 44% respondents attended a single CPR course, 72% were trained more than one year ago, 47% of participants had no previous training in CPR, mostly never thinking about the need to go for training. Being dependent from previous CPR training, the knowledge of CPR is generally poor: the proportions of correct answering as of the proper location and rate of chest compressions were 46% and 4%, respectively. Among the respondents, 56% expressed their willingness to attend CPR training. The main motivating factors to attend CPR training were awareness of importance of CPR training, potential health problems in relatives/friends and free-of-charge training.

CONCLUSION The Crimean population is insufficiently and non-uniformly trained in CPR, has limited knowledge of CPR and low motivation to learn. In order to increase the commitment of the community to provide first aid in out-of-hospital cardiac arrest, mass CPR training programs should be implemented with active involvement of the least trained and motivated social strata.

Keywords: cardiac arrest, cardiopulmonary resuscitation, training, survey, first aid, population

CI   — confidence interval
CPR   — cardiopulmonary resuscitation
OHCA — out-of-hospital cardiac arrest
OR   — odds ratio

INTRODUCTION

Throughout the world, the occurrence of out-of-hospital circulatory arrest (OHCA) is high and the probability of its favorable outcome is low [1–3]. As a rule, the survival after OHCA does not exceed 8% [4], and in the absence of timely intervention, the chances of survival reduce by 7-10% every minute [5]. However, in most cases OHCA develops before witnesses, and the immediate onset of resuscitation by presenting people increases the probability of survival by 2-3 times [3, 6].

The incidence of cardiopulmonary resuscitation (CPR) performed by witnesses of OHCA vary widely. Thus, the proportion of cases of resuscitation measures performed by witnesses in the total number of attempts to provide CPR ranges from 6 to 78% in the countries of the European Union [3] and from 11 to 41% in Asian countries [2]. Such a significant difference is largely determined by unequal approaches to teaching the population how to perform CPR [7].

The information on the effectiveness of assistance with OHCA in the Russian Federation is limited to the results of several studies, but generally confirms the low incidence of CPR and high mortality with a wide prevalence of OHCA [8–11]. At the same time, there is no single, effectively functioning system for teaching the population the skills of CPR in Russia today [12–14], and the rational organization of such a system requires knowledge of the actual coverage of Russians by training, the effectiveness of training, the population's readiness for training, and the factors that hinder and facilitate appropriate training. The aim of the study was to obtain and analyze this information on the example of the population of Crimea.

MATERIAL AND METHODS

SAMPLE STUDY

A sociological survey was conducted on the territory of the Crimean Peninsula covering the period from November, 2017 to January, 2018. The total population of 1,893,740 people are represented by people over 18, permanently residing in the territory of the Republic of Crimea and Sevastopol (as of January 1, 2017) [15, 16]. The size of the sample is calculated by the formula:

$$n = \frac{Nt^2p(1-p)}{N\Delta^2+t^2p(1-p)} = \frac{1\,893\,740 \cdot 1.96^2 \cdot 0.5(1-0.5)}{1\,893\,740 \cdot 0.05^2 + 1.96^2 \cdot 0.5(1-0.5)} = 384$$

N is the volume of the general population;

p=0.5 is the general share of respondents with the characteristic value, relative to which the sampling error is calculated;

t=1.96 is the confidence coefficient, corresponding to 95% confidence level;

Δ=0.05 is the limiting sampling error [17].

Within the limits of the calculated sample, quota groups were formed according to the following conjugate features: gender, age, urban/rural population, geographical region. In order to ensure the consistency of the distribution of these characteristics between the entire and sampled population, the quantitative composition of quota groups was presented in proportions corresponding to proportions in the entire population.

QUESTIONNAIRE

A questionnaire of 26 elements was developed by the authors for a structured interview based on the international experience of similar studies [7, 18, 19]. The initial block of the questionnaire assessed the previous training of CPR, including the type, frequency and duration of training, in the absence of training in the past - reasons, as well as readiness to go through training, factors determining the desire to learn. The task of the following questions was to assess the obstacles and readiness for resuscitation to a stranger or a relative (it is planned to present an analysis of the relevant data in a separate publication). Then the respondent was asked to rate the knowledge of CPR according to a five-point *Likert* scale (1 — "I know nothing" to 5 — "very good knowledge") and answer 2 open-ended questions regarding the position of the palms on the chest when conducting a closed heart massage. The final part of the questionnaire contained questions about the health status of the respondent, the presence of serious health problems in relatives, the experience of evidencing cardiac arrest, and recorded demographic data.

The questionnaire passed a preliminary test of clarity of understanding in a group of 10 volunteers, after which some amendments were made. Then, with the participation of 21 volunteers, the questionnaire was checked for the stability of the interview results over time (*test-retest reliability*) with an interval of 14 days between the primary and repeated surveys, which showed a high level of reliability (Cronbach's alpha=0.89; 95% confidence interval (95% CI): 0.64−0.96).

The survey was conducted in public places by 10 trained interviewers. All respondents were explained the purpose of the study, from each was given oral consent to participate.

STATISTICAL ANALYSIS

Descriptive statistics methods were used to present the data. To determine the relationship between qualitative variables, we used an analysis of contingency tables using nonparametric criteria — the Pearson χ^2 criterion — chi-square (*chi-square test*) and *Fisher's* exact test. The strength of correlation was determined by *Phi Coefficient* or *Cramér's V Coefficient*. Variables with a proven relationship (p <0.05) were included in mathematical models of binary logistic regression to assess the factors that determine the likelihood of prior CPR training and the desire to complete training. Collinear variables were excluded. The results of the regression analysis were expressed by the odds ratio (OR) and 95% CI. The statistical analysis was performed using *IBM SPSS Statistics* 23.0 software (*IBM Corporation, USA*). Differences were regarded as statistically significant with a *p* value <0.05.

RESULTS

As a result of the interview, 459 questionnaires were completed. The number of refusals or cases of incomplete interview turned out to be insignificant (*n*=25; 5%). Eight questionnaires contained incomplete or contradictory data and were excluded. The number of respondents with an identical combination of quota marks in some cases exceeded the size of the quota group. To maintain the representativeness of the sample, the corresponding excess of questionnaires (*n*=75) was excluded from the main analysis. The main analysis includes data from 384 respondents.

The distribution of demographic and socio-economic indicators is presented in Table 1. The majority of respondents were women — 55%, city residents — 59%, married people — 60%, employed or self-employed — 61%, people with at least secondary professional education — 82%. The presence of professional medical education was reported by 6% of respondents. The average total monthly income of the majority of respondents (54%) was less than 20,000 rubles.

They rated their own health as very good in 6% of cases, good in 40% of cases, satisfactory in 47% of cases, bad in 6% of cases, and very bad in 1%. The presence of serious health problems among relatives was confirmed by 34% of respondents (*n*=130).

Approximately 21% of respondents (*n*=81) witnessed cardiac arrest in the past. Of these, 26% (*n*=21) reported that resuscitation had not been performed, 51% (*n*=41) — that they performed the resuscitation, but they did not

participate in it, and 23% (*n*=19) took part in resuscitation. In 23 cases, witnesses of a cardiac arrest (28%) confirmed that a victim was a relative, and 5 of them (22%) participated in the resuscitation.

PRIOR TRAINING FOR CPR

According to a survey, 204 out of 384 respondents (53%) reported that in the past they had studied CPR, how to perform a closed heart massage and (or) artificial respiration. Most of the respondents had organized training as a part of a school, secondary professional or higher education (28%, *n*=95), at the place of work or service (27%, *n*=91), in driving courses (21%, *n*=72), less frequently when receiving medical education (6%, *n*=20). A part of the respondents studied independently using literature (books, magazines, articles, etc., 7%, *n*=23), video (5%, *n*=17), online courses (1%, *n*=5). Other sources of information (5%, *n*=17) included the Internet (*n*=5), in rare cases — information stands, yacht management courses, diving, swimming, fire-applied sports sections.

Of those trained, 14% (*n*=28) learnt CPR less than 6 months before the survey, 10% (*n*=21) were trained 6–12 months ago, 18% (*n*=36) were trained 1–5 years ago, 54% (*n*=110) were trained more than 5 years ago, and another 4% (*n*=9) could not recall the time of training. According to the survey results, it was found that 44% (*n*=89) of the respondents completed one CPR course of study, 22% (*n*=46) completed 2 courses, 20% (*n*=41) — 3-5 courses, 11% (*n*=22) — more than 5 courses, while the other survey participants (3%) reported on other forms of training besides courses.

The analysis of contingency tables revealed that the presence of previous CPR training is related to gender, age, marital status, level of education, occupation, medical education and monthly income with no relation to the place of residence (urban/rural) (Table 1). In the logistic regression model, the male gender (OR: 1.7; 95% CI: 1.1–2.6), higher education (OR: 2.4; 95% CI: 1.5–3.8), wage employment/freelance(OR: 2.7; 95% CI: 1.6–4.4) and students (OR: 6.9; 95% CI: 2.5–19.2) acted as independent predictors of prior learning CPR.

Table 1

Social and demographic data of respondents and its correlation with previous training and willingness to learn CPR

Parameters	Total, *n* (%)	Studied CPR, *n* (%)	*p*	Phi/Cramer's V	Ready to learn, *n* (%)	*p*	Phi/Cramer's V
Gender			0.030	0.111		0.004	-0.147
Male	174 (45.3)	103 (59.2)			77 (44.3)		
Female	210 (54.7)	101 (48.1)			124 (59.0)		
Age, years			0.003	0.225		0.016	0.201
18-24	32 (8.3)	22 (68.8)			22 (68.8)		
25-29	34 (8.9)	19 (55.9)			18 (52.9)		
30-39	78 (20.3)	38 (48.7)			45 (57.7)		
40-49	61 (15.9)	39 (63.9)			38 (62.3)		
50-59	67 (17.4)	40 (59.7)			35 (52.2)		
60-69	61 (15.9)	31 (50.8)			23 (37.7)		
≥ 70	51 (13.3)	15 (29.4)			20 (39.2)		
Residence			0.152	-0.073		0.581	-0.028
City	228 (59.4)	128 (56.1)			122 (53.5)		
Non-urban area	156 (40.6)	76 (48.7)			79 (50.6)		
Marital status			0.008	0.189		0.010	0.186
Not married	81 (21.1)	53 (65.4)			39 (48.1)		
Married	229 (59.6)	121 (52.8)			129 (56.3)		
Divorced	34 (8.9)	17 (50.0)			21 (61.8)		
Widowed	39 (10.2)	12 (30.8)			11 (28.2)		
No answer	1 (0.3)	1 (100.0)			1 (100.0)		
Education			0.001	0.228		0.044	0.151
Elementary	1 (0.3)	0 (0.0)			0 (0.0)		
Compulsory	12 (3.1)	3 (25.0)			5 (41.7)		
Complete	55 (14.3)	25 (45.5)			31 (56.4)		
Intermediate professional	157 (40.9)	72 (45.9)			84 (53.5)		
Higher	153 (39.8)	99 (64.7)			81 (52.9)		
Academic rank	6 (1.6)	5 (83.3)			0 (0.0)		
Occupation			<0.001	0.286		0.004	0.219
Wage employment	173 (45.1)	110 (63.6)			98 (56.6)		
Freelancer	60 (15.6)	32 (53.3)			32 (53.3)		

Student	24 (6.3)	18 (75.0)			17 (70.8)		
Retired	104 (27.1)	36 (34.6)			38 (36.5)		
Unemployed	20 (5.2)	8 (40.0)			14 (70.0)		
Military	2 (0.5)	0 (0.0)			1 (50.0)		
Other	1 (0.3)	0 (0.0)			1 (100.0)		
Medical education			<0.001	-0.232		0.831	-0.011
Yes	22 (5.7)	22 (100.0)			12 (54.5)		
No	362 (94.3)	182 (50.3)			189 (52.2)		
Average monthly income			0.003	0.219		0.609	0.108
<10,000 руб.	86 (22.4)	40 (46.5)			48 (55.8)		
≥10,000 - <20,000 roubles	122 (31.8)	53 (43.4)			67 (54.9)		
≥20,000 - <30,000 roubles	76 (19.8)	51 (67.1)			42 (55.3)		
≥30,000 - <40,000 roubles	37 (9.6)	20 (54.1)			15 (40.5)		
≥40,000 - <60,000 roubles	9 (2.3)	8 (88.9)			5 (55.6)		
≥60,000 руб.	5 (1.3)	4 (80.0)			2 (40.0)		
No answer	49 (12.8)	28 (57.1)			22 (44.9)		

It was established that 47% (180 of 384) of the respondents had never been trained in resuscitation. The distribution of reasons why respondents did not undergo training is shown in Fig. 1. The category "other" (5%) included the following arbitrary formulations of the respondents: "there were no offers", "there was no chance", "there was no opportunity", "there was no system of training", "fear", "I don't want to learn" .
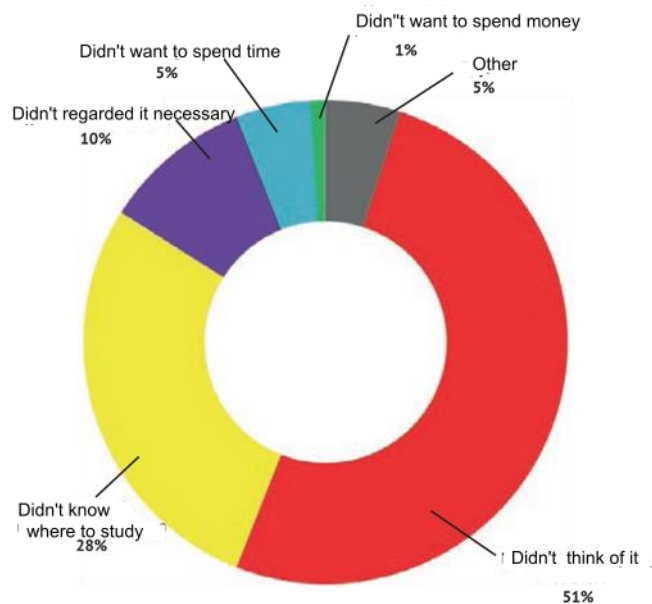

Fig. 1. The percentage distribution of answers to the question "Why did you not learn resuscitation?"

KNOWLEDGE OF CPR

When evaluating their own knowledge of CPR, 17.7% (68 out of 384) of the respondents indicated "I know nothing", 45.6% (175) rated their knowledge as "weak", 29.7% (114) as "medium", 5.5% (21) as "good", and 1.6% (6) as "very good".

The location of the palms on the chest for performing compressions (the lower half of the sternum along the midline) was correctly identified by 46% (175 of 384) of the respondents, whereas the frequency of compressions within the recommended range (100-120 min) [20] was named by 4% (14 out of 384) of respondents. Of the respondents with medical education, 68% and 14%, respectively, replied correctly to these questions.

When analyzing the contingency tables, a link was established between the presence of previous CPR training, a higher self-esteem of knowledge on resuscitation ($p<0.001$; Cramer's test=0.496) and correct answers to questions about the position of the palms for compressions ($p<0.001$; Phi=0.241) and the frequency of chest compressions ($p=0.002$; Phi=0.155) which was statistically significant in all cases. At the same time, the assessment of one's own and correct answers did not depend neither on the number of courses completed, nor on the duration of the last training ($p>0.05$).

WILLINGNESS TO LEARN CPR AND FACTORS MOTIVATING TO LEARN

In 52% (201 of 384) cases the respondents replied to the question: "Would you like to undergo resuscitation training?» in the affirmative 31% (118) — negative, 17% (65) — difficult to answer.

According to the analysis of contingency tables, the desire to undergo CPR training does not depend on the availability of prior training, number of courses completed, length of the last course of study, level of self-assessment of CPR knowledge, correct replies to the questions for knowledge assessment, medical education, some experience of evidencing the heart attack, assessments of one's own health, place of residence (urban/rural) or monthly income ($p>0.05$), but related to gender, age, marital status, level of education, occupation (Table 1) and the presence of serious health problems in relatives ($p=0.032$; Phi=0.110, statistically significant).

As a result of the construction of a logistic regression model, it was established that the female gender (OR: 2.3, 95% CI: 1.5–3.6), age under 60 (OR: 1.9; 95% CI: 1.2– 3.2) and marital status, except for widowhood (OR: 3.0; 95% CI: 1.3–6.8), were statistically significant predictors of willingness to learn CPR.

The distribution of the main motivating factors indicated by the respondents intheir replies to the question: "What can induce you to undergo resuscitation training?" is presented in Fig. 2. The motivating factors ("other") randomly indicated by the respondents included: "the desire to improve the professional level", "the desire to help a person", "interest", "life experience", "terrorist attacks", "war", "need for work".
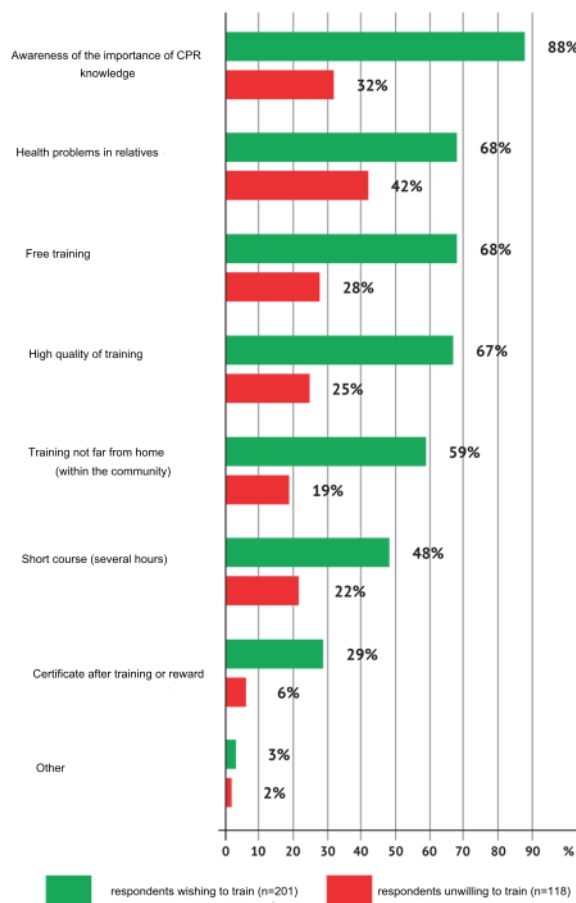

Fig. 2. Factors motivating to learn CPR in respondents who expressed a willingness or unwillingness to learn

DISCUSSION

According to the survey results, a little more than half of the adult population of the Crimean Peninsula have ever been trained in how to conduct resuscitation (Fig. 3). Moreover, approximately 44% of respondents who attended CPR courses did not study more than once, and less than a quarter of respondents underwent CPR training within one year before the survey.
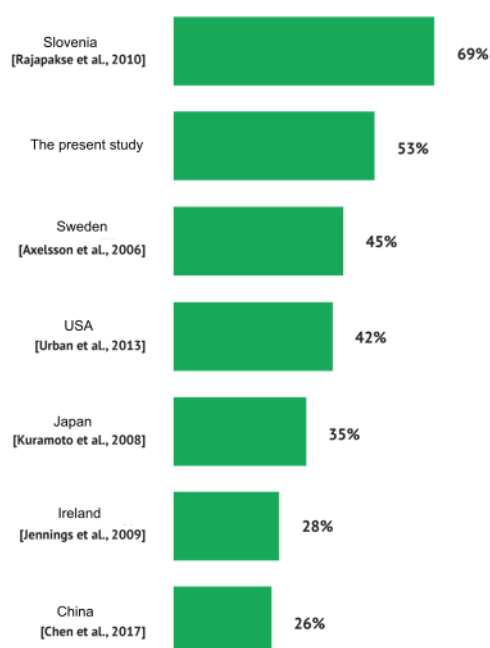
Fig. 3. The prevalence of CPR training in the Crimean population in comparison with literature data

Women, people over 60, unemployed and retired, widowers and people with a monthly income of less than 20,000 rub. are mostly not trained in resuscitation. Most of the unmarried, persons with higher education, workers and students learnt CPR. The prevalence of resuscitation training among the urban and rural population is not significantly different.

The training was mostly organized (82% of respondents) and took place during driving courses, when receiving education or at the place of work, which indicated limited opportunities for acquiring the necessary knowledge and skills for non-working people. At the same time, self-study programs (for example, online courses), which are considered by the European Resuscitation Council as a possible alternative to full-time study [21], have been used in isolated cases.

A significant proportion of the respondents (47%) have never completed CPR training, mainly due to the fact that they did not think about the need to undergo such courses or did not know where to study. This indicates a lack of awareness among the population about the problem of OHCA and the importance of providing first aid to victims with a cardiac arrest, as well as the low availability of CPR training for the population. According to foreign studies, the lack of training is also mainly due to the fact that people did not know where to take CPR courses, or did not suspect that such training existed [7, 22, 23].

Assessment of knowledge showed that respondents who had previously received resuscitation training more often reply to questions correctly and evaluate their own knowledge of CPR higher. However, the level of knowledge in the studied population as a whole was low, and people with medical education in most cases answered incorrectly along with the rest of the respondents. In our study, the percentage of correct answers concerning the position of the hands and the frequency of chest compressions was 46% and 4%, respectively. It was similar in the United States (34% and 6%, respectively) [19] and Slovenia (38% and 1%) [24].

Approximately half of the respondents expressed a desire to undergo resuscitation training, regardless of the experience of previous training and the level of knowledge on CPR. Less willingness to learn CPR is a characteristic of the male gender, people over 60, widowers and retirees. Both for those who wanted and for those who did not want to learn, the main factors motivating to learn were the understanding of the importance of learning, possible health problems with relatives and free tuition.

A search for domestic publications on the topic of research found one job with assessing public opinion on first aid issues [25]. According to the results of an anonymous poll of passersby, the majority of respondents (78%) assessed their first aid knowledge as fragmentary or reported inability to provide first aid, which is generally consistent with the results of our study. At the same time, readiness for training was significantly lower: 70% of respondents said that they were not ready to learn the rules of first aid [25].

The high relevance of the OHCA problem in the studied region is evidenced by the results of a recent epidemiological study based on the analysis of emergency call cards for cases of cardiac arrest in Simferopol for 3 months [11]. The analysis showed a high incidence of OHCA (674 cases per 100 thousand population per year) with a low prevalence of cases of resuscitation by witnesses of OHCA (2.3%) [11]. The lack of involvement of the population in the process of providing first aid for OHCA was further confirmed by the results of this survey: although more than 20% of respondents witnessed a cardiac arrest, less than a quarter of them participated in CPR.

The study had a number of limitations. The survey was conducted on the territory of the Crimean Peninsula, and

the results cannot be extrapolated to the general population of the Russian Federation. The study did not take into account the ethnicity of the participants. It is possible that those who gave their consent to participate in the survey had more interest and were more motivated to learn CPR than those who refused to be interviewed.

FINDINGS

1. The results of the study indicate insufficient and uneven coverage of the population of Crimea with cardiopulmonary resuscitation (CPR) training, limited learning opportunities, low motivation to learn and poor knowledge of CPR issues.

2. There is a need for the development and implementation of mass education programs for CPR skills, including alternative training methods, such as online courses. The content of training programs must comply with the current international guidelines for CPR.

3. Activities aimed at raising awareness of the problem of out-of- hospital circulatory arrest (OHCA) and the importance of CPR, as well as increasing the availability of training should ensure the involvement of the least trained and motivated population groups, which can contribute to an increase in the frequency of resuscitation by witnesses of OHCA and lower mortality.

4. The obtained results testify the urgency of the problem of teaching the population the skills of CPR. The described method may be used to perform similar research in other regions of Russia or at the federal level.

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