

EMERGENCY MEDICAL SERVICE

RATOWNICTWO MEDYCZNE



**MEANS OF PROVIDING REMOTE PSYCHOLOGICAL ASSISTANCE
IN THE CONDITIONS OF QUARANTINE**

**INFLUENCE OF SELECTED SOCIO-DEMOGRAPHIC FACTORS ON THE
CARDIOPULMONARY RESUSCITATION EFFECTIVENESS**

THREE-STEP ANALYSIS OF SYMPTOMS OF CARBON MONOXIDE POISONING

PARTICIPATION OF POLISH PARAMEDICS IN MISSIONS ABROAD

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LIFE SATISFACTION OF PATIENTS AFTER ISCHEMIC STROKE

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Abstract

Aim: To evaluate the level of life satisfaction of patients after an ischemic stroke, as well as to determine the factors that may affect the life satisfaction.

Material and methods: The study included 100 subjects (42% women and 58% men) after an ischemic stroke recruited from the Department of Neurology of the Medical University of Białystok. The research material was collected on the basis of the author's questionnaire constructed on the basis of research, Satisfaction Life Scale SWLS, Barthel scale.

Results: The mean value of the SWLS scale was $23.15 (\pm 5.19)$, which is assessed as a high level of life satisfaction, and it was comparable among women and men (23.90 ± 5.69 and 22.60 ± 4.77 , respectively). The level of satisfaction of life after stroke, in relation to the situation before the disease, decreased in 41% of respondents, did not change in 27% of respondents, while in 8% of participants increased.

Conclusions: The level of life satisfaction of people after ischemic stroke was high despite complications and loss of independence experienced to varying degrees. The occurrence of complications is a decisive factor in the deterioration of the mobility of a person after ischemic stroke.

Key words

life satisfaction,
ischemic stroke,
disability

INTRODUCTION

Central nervous system diseases, including stroke, are the second cause of death in the world and the third in Poland. These diseases are also the most common cause of permanent disability in the population of people over 60 [1]. A small percentage (5-12%) of young people (under 45) affected by stroke indicates an increase in the incidence of stroke with age [2]. The clinical course of stroke is more severe in women, possible complications are more serious, and the prognosis is more unfavorable than in men. Comparing the damage caused by this unpredictable disease, greater neurological deficits, post-stroke depression, and disability are noted in the females. Women require help more often due to the complete inability to take care of themselves and function in everyday life [3].

A stroke not only a medical issue. It also regards social problems, according to the fact that many patients after surviving a stroke event are not able to return to their life independence and the situation before the onset of the disease [2]. Often, due to damage to particular brain parts, problems with move-

ment appear – gait disorders, movement incoherence and speech disorders which additionally deteriorates the functioning of the patient in society and often makes him dependent on third parties [1]. A patient's quality of life may decline rapidly. People affected by stroke are ashamed of their disability, which makes them unwilling to relationships, they are lonely, and often suffer from depressive disorders [4]. The new situation may force the patient to resign from his current job or give up hobbies and interests. Introducing new, healthy habits to everyday life and abandoning the existing ones (in order to prevent another stroke episode) may appear to be another source of stress for the patient. Thus, it can be concluded that a stroke complicates the entire life of such a person [5].

The feeling of life satisfaction is subjective and depends on the individual attitude. Everyone may feel completely different and create their own hierarchy of factors influencing the quality of life based on their feelings, experiences, values, life achievements and goals, as well as the level of health and well-being [6]. In case of a person suffering from stroke, level of life satisfaction may depend on the nature and

severity of the lesions and the degree of the patient's disability. The appearance of complications leads to concerns about the future. Problems with communication or with mobility are an obstacle in fulfilling the existing functions in society, which may largely affect the level of life satisfaction [7].

THE AIM

The aim of the study was to analyze the level of life satisfaction of patients after ischemic stroke and the factors that may determine it.

MATERIAL AND METHODS

DESIGN AND PARTICIPANTS

The research was conducted among 100 patients after ischemic stroke hospitalized at the Department of Neurology of the University Hospital in Białystok before being discharged home. The research material was collected on the basis of own questionnaire constructed for the needs of the research, standardized scales: the Satisfaction with Life Scale (SWLS) and the Barthel Scale. The study was conducted using the diagnostic survey method. The Life Satisfaction Scale (SWLS) was developed by Diener E. and is intended for individual and group testing of healthy and sick adults. The respondents may subjectively assess of the current living conditions [8]. The scale has five statements. The respondent assesses to what extent each of them relates to his/her current life. The result of the measurement is the general indicator of the feeling of satisfaction with life [9]. The International Barthel Scale is used to assess the patient's ability to self-care. It consists of ten consecutively assessed daily activities. Each of them is assigned an appropriate number of points. The patient's problems and the need for help in everyday life become apparent in the final score [10].

CHARACTERISTICS OF EXAMINED GROUP

The survey was conducted among 100 patients after ischemic stroke: 42% women and 58% men, 34-98 years old. The mean age of the respondents was 71 years (± 14.35). The age structure of the respondents was as follows: up to 60 years old 18%, 61-70 years old 26%, 71-80 years old 30%, > 80 years old 26%. The respondents most often functioned in formal relationships. This group constituted 60%, while the others were unmarried: widow / widower 34% and unmarried / single 6%. Among the respondents, 39% were rural residents, and 61% were citizens. 55% of all respondents assessed their housing conditions as very good, and 45% as good. None of the respondents described their housing conditions as bad. The spouses took care of 54% of the respondents, then children

– 34% of the respondents, and less often the spouses of the children – 3% of the respondents. In 9% of cases, no one from the family helped the respondent. The source of income of 61% of the respondents was retirement pension, 24% – employment, while 15% of the respondents were beneficiaries of disability pension. The structure of the respondents' education was as follows: primary 34%, secondary 22%, vocational 28%, higher 16%.

PROCEDURE AND ETHICAL CONSIDERATIONS

The research good clinical practice guidelines, and the followed procedures were in accordance with the Helsinki declaration. The research was approved by the Bioethics committee of the Medical University of Białystok (Resolution no. R-I-002/294/2019).

STATISTICAL ANALYSIS

The statistical analysis was performed with the use of STATISTICA version 7.0 software from StatSoft Polska. Differences between the compared groups were assessed on the basis of the significance test for qualitative (categorical) variables – chi-square statistics; Pearson's correlation coefficient $r(X, Y)$ was also used (based on chi-square values, a measure of the relationship between categorized variables, indicates the strength of the relationship). The results meeting the condition p below 0.05 were considered statistically significant.

RESULTS

Based on the collected data on height and weight, the BMI was calculated according to the formula: $BMI = (\text{body weight [kg]} / (\text{body height [m]})^2$. To assess the level of obesity, the obesity classification according to WHO for adults was used, according to which individual results indicate, respectively: normal weight (18.5-24.9), overweight without obesity (25.0-29.9), obesity I degree (30.0-34.9), obesity II degree (35.0-39.9), obesity degree III (above and equal to 40.0). In the study group, the BMI was normal in 47% of the respondents, while the problem of overweight and obesity concerned, respectively: 32% and 21% of the respondents. Considering alcohol abuse, respondents identified the frequency of this type of situation. The answer "never" was chosen by 70% of the respondents, "rarely" – 22%, "yes, it happens" – 8% of the respondents. During the last 6 months, 69% of respondents did not smoke. Of the remaining respondents, 17% admitted to occasional "smoking", while 14% smoked every day. The respondents assessed the level of stress in their life: 31% as "low", 41% as "average" and 28% as "high".

The respondents assessed the effectiveness of post-stroke rehabilitation as “high” – 32%, “average” – 16%, “low” – 8%. However, 44% of the respondents had no opinion on this matter. According to the respondents, they need help from third parties to a large and small extent – respectively: 35% and 32%. 33% of the group assessed themselves as functioning independently. The level of satisfaction of life after stroke in relation to the situation before the disease decreased in 41% of subjects, did not change in 27% of respondents, while in 8% of participants increased. Answer: I don’t know was chosen by 24% of the group.

Assessment on the Barthel scale – the mean value for the Barthel scale was $62.10 (\pm 34.58)$, which is assessed as “medium-severe”. This result concerned both women and men, with mean values, 62.50 ± 34.47 for women, and 61.81 ± 34.96 for men ($p = 0.922$). The lowest mobility was assessed in people over 80 years of age – $54.04 (\pm 30.73)$, however, it was not found that the results of the Barthel scale deteriorated along with the age of the patients ($p = 0.172$). It was also not shown that BMI significantly influenced the scale result ($p = 0.096$). The occurrence of complications is the decisive factor for the deterioration of the mobility of a person after ischemic stroke (Table 1).

The level of fitness of the respondents varied: light in 39% of the group, medium-heavy in 40% of the respondents, heavy in 21% of the respondents. The most severe problems were washing and bathing the whole body and climbing stairs. The respondents revealed the highest independence level in maintaining basic physiological abilities, such as controlling physiological needs, as well as moving from bed to chair and conversely, and walking with some help > 50 m.

The mean value of the SWLS scale was $23.15 (\pm 5.19)$, which is assessed as a high level of life satisfaction. The level of satisfaction with life was comparable among women and men (23.90 ± 5.69 and 22.60 ± 4.7 , respectively) and inhabitants of urban and rural areas (23.26 ± 4.80 and 22.97 ± 5.80 , respectively). Taking into account the age variable, the highest mean value was obtained for subjects between 61 and 70 years of age, while the lowest in the age group up to 60 years. The lowest level of satisfaction with life was obtained for the respondents with the status of unmarried / single men and subjects with an income of disability pension. It was observed that the level of satisfaction with life decreased insignificantly with the increase in the level of education. Subjects who were cared for by a spouse or a child were also characterized by a higher level of satisfac-

tion. The obtained differences were statistically insignificant. It was shown, however, that the housing conditions are of significant importance – a higher rating of housing conditions significantly correlated with a higher level of satisfaction with life (Table 2).

The mean SWLS score was higher in the group of subjects without complications, respectively. However, it was shown that the SWLS result depended on the assessment of the effectiveness of post-stroke rehabilitation. The highest average value was obtained in the group of subjects who replied: “I have no opinion”, which proves that they were not under rehabilitation, as they did not have any post-stroke deficits. It may be indirectly stated that the occurrence of complications significantly reduces the level of life satisfaction of a patient after a stroke, but this requires further research in a larger and more representative group of patients. The need to take medication was also irrelevant to the level of satisfaction. Also in terms of the level of independence and the level of mobility according to the Barthel scale, the obtained differences in the level of life satisfaction were not statistically significant (Table 3).

In the sten score, it was assessed that the level of life satisfaction of the respondents was usually high – 48%, then average – 40%, and in 12% of cases – low.

DISCUSSION

Ischemic stroke is a dangerous disease that adversely affects not only the physical health of the patient, but also his mental condition [11]. The satisfaction with the life of such person is usually reduced compared to the situation before the disease. This fact was confirmed by our results, according to which 41% of respondents had a lower level of satisfaction.

Stroke also makes that The person affected by stroke often loses control of their own body and needs at least some support. A 2013 study by Bro-la W. et al. showed that more than 36% of patients who completed hospitalization after a stroke required at least partial assistance in basic life activities [12], while the results of our analyzes showed that only 33% the group are independent. The own research indicated that the respondents’ activity varied and depended mainly on the occurrence of complications. Patients who did not develop complications showed the highest degree of independence. The lowest mobility was found in the oldest patients, i.e. after 80 years of age. The most difficult activity for almost half of the respondents turned out to be a full body bath. Charzyńska-Gula M. et al. obtained higher results in their studies, according to which as many as 86% of patients could not cope without help in main-

taining daily personal hygiene. She also found that movement in general was a problem for about 95% of the respondents, of which 40.5% remained permanently in bed [11], while in our research 43% of the respondents remained independent.

Our study has shown that stroke affects both men and women to a similar extent, with a slight indication of the majority of men. This problem mainly affected older people over 70. The level of satisfaction with the life of people of similar age was examined in 2010 by Świerżewska D., according to which the level of satisfaction oscillated around many factors, primarily living conditions, psychosocial development, and personal beliefs and feelings [13]. In own analyzes, the level of respondents' life satisfaction depended on the health condition, degree of independence and the presence of family / caregivers. In our study, the lowest level of satisfaction with life was experienced by unmarried and single men, as well as persons living on a disability pension. Patients who were cared for by their spouses or children felt more satisfied.

Own analyzes also showed that the more satisfied respondents are people with good financial situation and good or very good housing conditions. In studies on life satisfaction of students of the University of the Third Age conducted by Cebula M. et al., The results surprisingly showed that people with average and bad financial situation, divorced and separated persons showed a higher level of satisfaction [14].

Considering the complexity and insidiousness of a stroke, it should be assumed that satisfaction with a patient's life depends primarily on their health and

functionality [15]. In our own research, post-stroke complications made life difficult for as many as 74% of respondents. Almost half of these subjects suffered from speech disorders. Studies conducted in a similar research group, Bober M. et al. established that aphasia affected 15.5% of patients [16].

In our study, apart from communication difficulties, other complications were found. These Broła W. et al., based on the conducted research, add to the list of the most common complications depressive disorders, falls, dementia and cardiological complications [12], which may lead also to the higher need of counseling on cardiovascular disease risk factors [17].

However, as a result of the conducted analyzes, it was not proven that the level of life satisfaction significantly correlated with the occurrence of post-stroke complications. The effectiveness of rehabilitation turned out to be an important aspect. Most of the respondents, when asked about its effectiveness, answered "I do not know", which probably means that the respondents did not require any special exercises and improvement, due to the lack or only minor post-stroke complications. Research results from 2014 conducted by Iłżecka J. et al. confirm that post-stroke rehabilitation is an important element in the treatment process and the patient's return to independence. It is a specific prophylaxis of long-term immobilization that is dangerous to health and facilitates the adaptation of the patient to a new life situation [18]. Moreover, it is needed to consider the acceptance of illness as well, which has been shown to be correlated with disease duration, and order [19].

Table 1. Average score in Barthel scale for chosen variables.

Group		Mean	SD
TOTAL		62.10	34.58
Gender [NS, p=0.922]	women	62.50	34.47
	men	61.81	34.96
Age [NS, p=0.172]	under 60	64.17	36.99
	61-70	70.38	32.74
	71-80	60.67	37.66
	>80	54.04	30.73
BMI [NS, p=0.096]	norm	55.96	35.78
	overweight	65.16	33.71
	obesity	71.19	32.01
Complications occurrence [r(X,Y)=0.4872, p<0.001]	Yes	52.16	34.65
	No	90.38	10.29

Stressful situations beside being an indirect risk factor for stroke, it may also cause anxiety, mood disorders and depression and therefore the quality of life [5]. The respondents of own study turned out to be people exposed to stress – as many as 41% of people assessed its level as average. Błaszczyk B. et al., in their research on the lifestyle of patients before a stroke episode obtained a higher result – 60% of subjects was exposed to stress among the study group [20].

Only 14% of respondents admitted to every day smoking. Kalisz J. et al. describe this addiction as a

factor that almost triples the relative risk of stroke. According to the authors, 30-40% of patients who experienced stroke are heavy smokers [21]. It has been noted that despite the serious disease (coronary artery disease), from 6 to 18 months after hospitalization, over half off all smokers hospitalized are still smoking [22]. Therefore, we may hypothesize that more that the disease, the disability as a result of stroke affects the inability to continue the addiction, which significantly affects the satisfaction with the life of patients.

Table 2. Level of life satisfaction and sociodemographic situation.

Group		Mean	SD
TOTAL		23.15	5.19
Gender [NS, p=0.583]	women	23.90	5.69
	men	22.60	4.77
Age [NS, p=0.219]	under 60	20.44	5.69
	61-70	25.50	4.55
	71-80	21.67	3.38
	>80	24.38	5.95
Marital status [NS, p=0.077]	single	20.00	2.45
	married	23.15	5.38
	widow/er	23.71	5.10
Place of residence [NS, p=0.547]	city	23.26	4.80
	country	22.97	5.80
Living conditions [r(X,Y)=0.3576, p<0.001]	very good	24.95	4.52
	good	20.96	5.16
Education [NS, p=0.401]	primary	24.06	5.46
	vocational	23.55	5.74
	secondary	22.14	4.31
	higher	22.44	5.29
Professional activity [NS, p=0.406]	professionally active	23.95	5.97
	pension	23.19	4.99
	disability pension	21.80	4.84
Caregiver [NS, p=,106]	spouse	23.41	5.49
	child	23.62	4.93
	child – in – law	21.00	8.54
	not a family member	20.56	2.13

Table 3. Level of life satisfaction and the condition of examined patients.

Group		Mean	SD
TOTAL		23.15	5.19
Complications occurrence [NS, p=0.125]	Yes	22.57	5.27
	No	24.81	4.66
Need for rehabilitation [r(X,Y)=0.2071, p=0.037]	slight	21.75	5.09
	average	20.25	5.20
	high	22.81	4.94
	no opinion	24.70	4.97
Drugs administration [NS, p=0.648]	Yes	22.90	5.05
	No	23.76	5.56
Independence level [NS, p=0.961]	Yes, I need the help of third persons	24.14	5.81
	Yes, but in small extend, I need the Help of thirs persons	21.84	5.08
	Noi, I am ully independent	23.36	4.43
Level of movement abilities [NS, p=0.542]	slight	22.79	4.87
	average-severe	22.68	5.23
	severe	24.71	5.61

Own research shows the important role of a responsible lifestyle and mental resources in the prevention of stroke, which includes proper diet, physical activity, giving up addictions or treatment and control of comorbidities, which is confirmed by other reports [23-25]. Proper therapy, patient education and the introduction of simple and healthy habits into everyday life may turn out to be crucial in the prevention of strokes and improve prognosis, and of overall life satisfaction. It may also contribute to the reduction of medical personnel overstrain, especially nurses [26].

Our study showed that the level of life satisfaction of patients after ischemic stroke was high despite the complications and the loss of independence experienced to various degrees. The high score for the Satisfaction with Life Scale was reinforced by a high percentage of subjects with mild and moderate mobility impairments. The occurrence of complications is a decisive factor in the deterioration of the

mobility of a person after ischemic stroke. Due to the availability of post-stroke rehabilitation and high housing standards, the burden resulting from the losses after the disease does not reduce the overall satisfaction with life.

CONCLUSIONS

The level of life satisfaction of people after ischemic stroke was high despite complications and loss of independence experienced to varying degrees. The occurrence of complications is a decisive factor in the deterioration of the mobility of a person after ischemic stroke.

THE LIMITATION OF THE STUDY

The major limitation of our study is a small study population group, as well, as some limitations can also arise from habits and cultural biases of local population.

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MEANS OF PROVIDING REMOTE PSYCHOLOGICAL ASSISTANCE IN THE CONDITIONS OF QUARANTINE

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Abstract

Key words

Aim: To determine the approaches to form stress tolerance of the individual in quarantine conditions and justify the means of providing remote psychological assistance.

Material and methods: The research methods were chosen taking into account the set goal, and are also caused by the need for a comprehensive study of the means of providing psychological assistance to persons who are (were) in stressful conditions (analysis, prediction, comparative method, generalization method, etc.).

Results: The problem of overcoming stress involves the study of the patterns of formation and implementation of the processes of preventive and operational protection of the body and psyche from stressful influences; development and manifestation of various strategies (methods) and styles of behavior in these conditions; personal determination of the processes of counteraction; the role of functional resources in the formation of methods of countering stress. During remote psychological counseling of people in a crisis situation, it is useful to use directive interaction techniques. The use of valid psychotherapeutic methods provides for the preservation and restoration of the resource state of the consulted person.

Conclusions: Rehabilitation measures (the use of advisory methods; changing the strategies and behaviors of a person; using self-regulation techniques, etc.) are aimed at reducing the risks of developing stressful phenomena and their impact on a person during quarantine. The tools of professional psychological assistance should focus primarily on improving communicative openness, stress tolerance, social confidence, etc.

psychological help,
stress,
quarantine,
self-regulation techniques

INTRODUCTION

Today, it is no longer possible to name a single sphere of public life that would not be affected by the coronavirus pandemic. Directly or indirectly, the consequences of the spread of the COVID-19 virus around the world are felt by everyone – state authorities, large and small businesses, citizens of the absolute majority of countries. The psychological consequences of such a situation are, first of all, a certain loss of economic and social stability, anxiety, panic in society, as well as the risks of changes in people's psychological health. At the same time, civil society already occupies a prominent place in solving the problem of the COVID-19 pandemic through various social initiatives. Volunteer organizations focus their activities on such areas as various assistance to medical and other services; providing free legal advice on labor rights during the quarantine period; remote counseling of individuals on overcoming stress from quarantine restrictions.

Along with this, it is worth noting that each person has their own strengths and abilities that help them overcome life's difficulties. However, in crisis situations, some people are particularly vulnerable and therefore may need additional help. In particular, this

applies to people who belong to risk groups or need proper psychological support due to their individual characteristics.

Quarantine restrictions quite often have a significant impact on the state of psychological health of people [1]. Separation from loved ones, loss of freedom of movement, uncertainty in the state of health and boredom can lead to negative consequences: an increase in the number of suicidal manifestations, aggression, divorce, etc. The reasons for such personal manifestations may be fear of one's own health or fear of infecting others, which continues even after the end of quarantine restrictions. The stressful state can be aggravated by insufficient information (or its deliberate distortion) from health authorities (lack of clear instructions regarding the actions taken and confusion about the purpose of quarantine); the use of outdated approaches in public administration, etc.

Scientists also prove that the indicators of post-traumatic stress symptoms increase among young men who are in quarantine [2]. They are four times higher than among children who are not in quarantine [3]. This can be explained by the fact that as a result of the lack of sufficient life experience, it is much more difficult for them to adapt, including to

quarantine restrictions. Extraordinary circumstances of a radical change in the way of social existence, superimposed on the features of the transition age, lead to significant psychological traumatization of teenagers. The consequence of this is their neuroticism due to a violation of the compensatory defense mechanisms of the psyche.

In general, sharing the opinion of experts that during large outbreaks of infectious diseases, quarantine can be a necessary preventive measure [4], it should be noted that quarantine measures in a pandemic are often associated with a negative psychological effect. Features of the occurrence and course of stress symptoms in quarantine conditions determine the interest in this problem and determine the expediency of providing psychological assistance by specialists.

THE AIM

The aim is to determine the approaches to form stress tolerance of the individual in quarantine conditions and justify the means of providing remote psychological assistance.

MATERIAL AND METHODS

The research methods were chosen taking into account the goal set, and are also caused by the need for a comprehensive study of the means of providing psychological assistance to people who are (were) in stressful conditions:

- 1) the method of analysis allowed us to learn the regularities of the formation and implementation of the processes of preventive and operational protection of the body and psyche from stressful influences;

- 2) prediction method – to prognose stable patterns and relationships of a person with the conditions of a constantly changing social environment;

- 3) comparative method provided a correlation of factors that form the mechanisms of mental regulation of overcoming stress and characterize the essence of this process;

- 4) the method of generalization was used to study the provisions of psychological and socio-psychological literature.

Finding out the etymology of stress symptoms using these methods allowed us to identify self-regulation techniques that are most relevant when a person is undergoing emotional conflict states provoked by the spread of COVID-19 and appropriate quarantine measures.

The study was carried out in accordance with the requirements of the regulations on academic integrity at the National Academy of Internal Affairs, which was developed on the basis of Ukrainian and inter-

national experience in ethical rulemaking. This document was approved by the Academic Council of the National Academy of Internal Affairs (protocol No. 5 of 27.03.2018) which was put into effect by Order of the rector of the Academy (Order No. 422 of 30.03.2018).

RESULTS

For a person's life, his or her mental and physical health, happiness, the ability to overcome stress is important. Overcoming is the changing mental and behavioral efforts that a person uses to respond to stress demands. An effective response to stress that leads to adaptation is the use of a strategy of interaction with the stressor, which significantly reduces the experience of stress. It is impossible to think that you can completely avoid stress. Also, stress itself isn't necessarily something bad. A certain amount or level of stress in our lives is natural. Stress is often a natural consequence of living in the real world. Only the use of ineffective ways to deal with stress can be exhausting, bring unhappiness.

There are several theoretical approaches to the problem of overcoming stress, which are based on various schemes of interrelation of personality traits, situation and process of overcoming: personality-oriented, problem-oriented and cognitive approaches [5-7].

So, in particular, the personality-oriented approach assumes an unconditional environmental constant, that is, the constancy of the situation; success of overcoming stress is determined by personal characteristics. This allows us to consider the phenomenon of overcoming stress in the context of a pandemic and quarantine as a personality trait, and therefore allows to determine the styles of overcoming stressful phenomena based on the individual psychological characteristics of a person. It is worth noting that a person's personal characteristics can be perceived as potential "provocateurs" of the development of distress, they can become such only in a certain situation, when interacting or imposing stressors, in the absence of social and psychological support.

Along with this, a characteristic feature of the problem-oriented approach to overcoming stress in quarantine conditions is the emphasis on the dependence of the strategies used to overcome problems on the requirements of the environment. Overcoming stress is usually aimed at finding ways to change the relationship between the subject and environmental conditions, or at reducing their emotional experiences and distress. It is assumed that different types of stressors correspond to different types of decisions and processes of overcoming. One of the criteria that

allow us to classify stressful situations during quarantine restrictions is whether the situation becomes harmful or it has potential positive consequences, that is, it serves as an incentive for choosing a particular form of behavior.

As for the cognitive approach, in our opinion, its application is associated with certain evaluation processes that should take into account such positions. First of all, a person's ability to cope with a problem mainly depends on their attitude to the situation. Most often, an attitude is understood in the form of a conscious assessment of a situation as successful, containing a threat, harm, loss, or incentive. A difficult or dangerous situation (real or imagined) creates an attempt to solve or mitigate the problem (problem-oriented coping), while a situation containing harm or loss is likely to trigger a solution that reduces or mitigates negative emotions from the stressor. In addition, under quarantine conditions, people can resort to various strategies for overcoming stress, changing them under the influence of the requirements of this problem. Despite the peculiarities of individual perception of the quarantine problem, people often assess environmental conditions in this way, which gives reason to believe that any assessments of survival strategies should be associated with a specific problem caused by the epidemiological situation. The individual's actions to overcome stress should be aimed at identifying and controlling the basic emotion that occurs during the influence of the stressful factor on the individual. Emotion control can favorably determine the effectiveness of solutions in relation to the problem, that is, it is one of the best ways to manage emotions and behavior in a particular stressful situation.

Therefore, the problem of overcoming stress involves the study of the patterns of formation and implementation of the processes of preventive and operational protection of the body and psyche from stressful influences; development and manifestation of various strategies (methods) and styles of behavior in these conditions; personal determination of the processes of counteraction; the role of functional resources in formation of methods of counteracting stress. Overcoming comes into effect not only in cases where the complexity of the task exceeds the capabilities of the usual reactions, makes regulatory adaptation insufficient, requires new resources, but also when it is necessary to change behavior in critical situations, with chronic exposure to stressors and quarantine measures.

During a long-term stressful situation caused by quarantine restrictions, it is important for peo-

ple to master the skills of self-stabilization of the psychological state. Each specialist psychologist has his own proven effective techniques for helping in a critical state, which can be modified to a specific situation, but what stabilizes the state in one case may not be useful in another. Moreover, what helped before may not help or even have a negative impact after a while. In addition, you should take into account the peculiarities of providing psychological assistance online, which differs from traditional therapy.

Advisory methods still have priority over corrective ones, since correction is prolonged in time and sometimes there is a need to use techniques that involve tactile techniques [8]. Hence, it is worth noting that the main advantages of online counseling are the possibility of receiving psychological help in circumstances where it is not possible to hold a meeting.

Promoting responsibility development should start with working on resources. This can be helped by the "resource map", which outlines the appropriate criteria for studying the resources of a particular person: support in the family; support for loved ones; outside support; real material resource; ideal plans; realistic plans and a positive view of oneself [9]. Taking into account such criteria, the resource map will provide an opportunity to analyze the available material, psychological, social and spiritual resources and help a person see the situation not only from the point of view of traumatic experience, but also from the point of view of responsibility for their life and prospects for adaptation and their own development in new living conditions.

Among the means of preventing and overcoming stress in quarantine conditions, motivational interviewing is becoming relevant. Motivational interviewing can be used in various situations of interaction with a person in a crisis situation, since this approach allows you to activate the internal motivation of the individual to change. The stages of motivational interviewing provide for: determining the level of motivation of a person to change in general and to continue interaction with a specialist, in particular; psychotherapeutic work is aimed at promoting a person's decision to change his or her own behavior (which involves working with internal and external actions); psychological support of the client ensures his or her readiness for changes.

At the same time, it is advisable to note that during remote psychological counseling of people in a critical situation, it is useful to use directive interaction techniques that take into account the following practical recommendations:

1. Clearly formulate a suggestion or instruction for action.
2. Use paradoxical instructions (paradoxical intentions). Paradoxical intentions are useful when working with people who refuse or are unable to follow specific suggestions and instructions. A person is asked to perform at least three incorrect actions (for example, if they complain of poor sleep, they are asked to try to stay awake, etc.).
3. Apply role-based interaction measures. A person or group members are asked to practice applying the behavior or response model defined during the consultative interaction in a "laboratory setting" before implementing it. For example: "Let's recreate this situation again, in roles, only you apply the form of behavior that we agreed on or defined."
4. Using dereflexion. For example: "Identify a negative experience, thought; Now find something positive in this experience and focus on it; and now let's try to find the value that the positive and negative factors of this experience have together."
5. Analyze possible consequences of the solutions found. At this stage, all proposed solutions are analyzed and the short-and long-term consequences of their implementation are determined.
6. Rating of solutions found. Make a comprehensive analysis of the pros and cons of solutions and their consequences, and make a rating of the received options for solving the problem.
7. Summarize and transfer your experience to your daily life. At this stage, the best solution to the problem is identified, a plan for its implementation is developed, the motivation for implementation and, accordingly, the implementation plan is determined. Effective at this stage is the use of summation and directive skills, as well as the skills of conducting a consultative interview.

At that time, it is necessary to distinguish techniques for regulating the mental state that can provide a favorable result of countering stressful phenomena [8, 10, 11]. First of all, "Emotion freedom techniques" deserves attention. An important requirement of its use is to reduce unpleasant strong feelings, not only anxiety and disquietness, but also anger, feelings of loneliness, resentment, envy, uncertainty, etc. Psychotherapeutic work in this case is aimed at finding an anxious thought or thought about a negative feeling (frustration, fear) generated, among other things, by quarantine restrictions; determining its intensity (in points from 1 to 10); finding out the place of the body where it is "localized", that is, which parts of the body "respond" to it; drawing up a verbal formula that needs to be re-

peated during this exercise. This formula consists of two parts. In the first – our disturbing thought, in the other – a constant element consisting of the words "accept" and "love". These words trigger the activity of certain areas of the brain that trigger a more adaptive than anxiety process of reorientation to a resource, a sense of control, and the ability to cope with pressing problems under stress.

So, it can be stated that the use of these psychotherapeutic methods provides for the preservation and restoration of the resource state of the consulted person.

DISCUSSION

Given the rate of spread of coronavirus infection, quarantine measures may include travel restrictions, curfews, workplace risk control, postponing or canceling events, closing certain facilities, and so on. These restrictions often provoke the current state of "isolation" and "closeness" of the individual in an atmosphere of fear and uncertainty, etc. Considering the problem of restoring psychological health of individuals in quarantine conditions and the expediency of forming individual stress tolerance, we have expanded the boundaries of understanding the features of providing remote psychological assistance (conducting psychodiagnostics and psychological counseling), in crisis situations, found in scientific sources [4, 12].

The occurrence and experience of stress depends not so much on objective as on subjective factors, on the characteristics of the person: his or her assessment of the situation, comparing the strength and characteristics with what is required, etc. [13,-15]. Any surprise that disrupts the usual course of life can cause stress or become a stress factor. At the same time, neither the content of the situation itself, generated, in particular, by quarantine measures, nor the degree of its objective threat, matter. It is the subjective attitude to it that is important. During quarantine measures, the risks of individual psychological changes of the individual increase: emotional instability, anxiety, timidity, and so on. The recovery effect can be improved due to the possibilities of psychological assistance (including remote), especially when working with risk groups or individuals who need proper psychological support due to their individual characteristics.

CONCLUSIONS

Based on our analysis, recommendations for providing psychological assistance to people under quarantine measures were given and justified. The problem of overcoming stress involves studying the

patterns of formation and implementation of mental processes from stressful influences; the development and manifestation of various strategies (methods) and styles of behavior in these conditions. Crisis situations with high emotional saturation, the complexity of interpersonal communication can significantly affect the course of a person's life, identification of which requires significant organizational efforts from a specialist psychologist both at the stage of establishing favorable relationships and direct psychological assistance.

Rehabilitation measures (the use of advisory methods; changing the strategies and behavior mod-

els of a person; using self-regulation techniques, etc.) are aimed at reducing the risks of developing stressful phenomena and their impact on a person during quarantine under the conditions of epidemiological stress. The tools of professional psychological assistance should primarily help to improve communicative openness, stress tolerance, social confidence.

Prospects for further research include study of the influence of psychological means on the level of recovery of working capacity of employees of various categories after the expiration of quarantine restrictions (resumption of planned events, opening of certain institutions and establishments, etc.).

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The topic and content of the scientific article is consistent with the provisions of the priority areas of research of the National Academy of Internal Affairs for 2020-2023 within the research work "Psychological, pedagogical and sociological support of law enforcement officers" (State registration number 0113U008196).

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THE CLINICAL CHARACTERISTICS OF PATIENTS ADMITTED TO THE EMERGENCY DEPARTMENT BECAUSE OF IMPLANTABLE CARDIOVERTER DEFIBRILLATOR SHOCK

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Abstract

Aim: To present the clinical spectrum of the Emergency Department (ED) patients with presumed electrical shocks. **Material and methods:** The electronic recordings of the patients admitted to the ED of University Hospital in Wrocław between April 2020 and June 2021 were searched for the words: discharge, electrical storm, syncope, convulsions. The received patients recordings were checked and all patients with electrical shocks from implantable cardioverter defibrillators (ICDs) both real and presumed were included into the study. Patients were divided into three groups: patients hospitalized due to adequate ICD discharges, patients hospitalized for other reason who had adequate interventions in the ICD memory and patients with incorrectly diagnosed ICD interventions.

Results: The study group consisted of 26 patients. There was 18 men aged 65.9 ± 10.9 and 8 women aged 68.1 ± 12.4 ($p=0.66$). A total of 20 patients had electrical shocks confirmed by ICD memory checking and 6 patients had no ICD shocks.

Conclusions: ED visits due to discharges of ICDs are rare. The medical history of ICD discharge could be misleading, because some patients interpret different symptoms or acoustic signals of the ICDs as a discharge. The ICD patients with syncope, unconsciousness, history of seizures should have their ICD checked for the possible discharges.

Key words

ICD shock,
inadequate ICD shock,
ICD patients
in Emergency Department

INTRODUCTION

Implantable cardioverter defibrillators (ICD) are used to prevent sudden cardiac death for high risk patients [1]. Defibrillator discharges are one of the most frequent reasons for Emergency Department (ED) attendance of the ICDs recipients [2]. The other common reasons are acute coronary syndromes, heart failure decompensation, infections related with procedure of generator and leads insertion [2]. Three specific for ICDs recipients clinical scenarios are: cardiac arrest in an ICD recipient, ICD shocks in non-arrested patient, the presence of arrhythmia, ischemia, syncope in an ICD recipients with no ICD shocks.

The occurrence of the low energy therapy is often found during the planned visit in outpatient clinic monitoring cardiac implantable electronic devices. However, the occurrence of high energy therapy is usually painful and leads the patient to seek the medical attention immediately. Moreover, the patients with implanted ICD are aware of the possibility of the occurrence of a therapeutic electrical shock and could interpret different symptoms as the electrical shocks. Therefore, it should be kept in mind that the

history of electrical shock is not always an equivalent of a real electrical shock.

Finally, some patients admitted to the ED, because of loss of consciousness, convulsion may have unnoticed electrical shock from their ICD.

The examination of a patient with ICD in the ED requires an analysis of the history about electric shock, chest pain, syncope, palpitations [3]. The details of the ICD history that should be taken: manufacture, year of implantation, history of electrical shocks, history of ventricular tachycardias. Physical examination including obtains vital signs, checking for signs of heart failure, assessment of the jugular veins distension, chest auscultation for the new cardiac murmurs or rubs. Clinical investigation include 12 lead ECG, serum creatinine, sodium, potassium, magnesium, full blood count, troponin and natriuretic peptide concentration [3].

The patients with ICDs and the history of electrical shocks, loss of consciousness, cardiac arrest should have their ICD interrogated as soon as possible and device memory should be checked for arrhythmias and delivered therapies. The patients with many repeated inadequate shocks should have their ICD temporarily inactivated by placing a magnet upon it.

THE AIM

The aim of the study was to present the clinical spectrum of the ED patients with presumed electrical shocks.

MATERIAL AND METHODS

The electronic recordings of the patients admitted to the ED of University Hospital in Wrocław between April 2020 and June 2021 were searched for the words: discharge, electrical storm, syncope, convulsions. The received patients recordings were checked and all patients with electrical shocks from ICDs both real and presumed were included into the study.

The patients were divided into two groups. Group 1 consisting of subgroup 1a with electrical shock(s) reported at admission which were confirmed during the device interrogation, and subgroup 1b with no history of electrical shocks but the presence of them in the device memory. Group 2 had the history of electrical shocks. However, they were not confirmed during device memory checking.

The group 1 was also divided into the subgroup of patients with adequate shock(s) and inadequate shock(s).

The following data were gathered from electrical recordings: age, gender the cause of ICD implantation, the presence and adequacy of the electrical discharge, laboratory findings: haemoglobin concentration, leucocyte number, mean corpuscular volume of the erythrocytes, platelets number, C-reactive protein, sodium, potassium, creatinine and troponin concentration.

The number of the electrical shocks 24 hours before admission were noted.

Electrical storm was recognized when at least three adequate ICDs interventions were confirmed during the 24 hour period before admission.

It was also noted how the patient was brought to hospital, whether survived or no to the discharge from the ED, and whether was admitted to another ward or was discharged home.

STATISTICAL ANALYSIS

Continuous variables were presented as means and their standard deviations or medians and interquartile ranges (IQR) and compared with Student T test or Mann Whitney U test respectively.

The discrete variables were presented as number and percentages and compared with chi2 test.

P less than 0.05 was regarded as significant.

RESULTS

STUDY GROUP

The study group consisted of 26 patients. The total number of patients treated in the ED during the

studied 15 month period was about 45 000. Less than 1 in 1000 patients was admitted, because of apparent ICD shock.

One patient was foreigner and had no documentation regarding his ICD or the circumstances of ICD implantation.

There was 18 men aged 65.9 ± 10.9 and 8 women aged 68.1 ± 12.4 ($p=0.66$).

THE OCCURRENCE OF ELECTRICAL SHOCKS

A total of 20 patients had electrical shocks confirmed by ICD memory checking and 6 patients had no ICD shocks.

In the group 2 the shocks were reported by patients in 4 cases, by Emergency Medical Service team in one case, and by family member in one case.

The clinical characteristics of the patients was presented in the table 1.

One shock was noted in 6 cases (23.1%), two shocks in 6 cases (23.1), two patients had 3 shocks (7.7%), one patient had 4 shocks (3.8%), 3 patients had 6 shocks (11.5%), and two patients had 12 shocks (7.7%).

Subgroup 1b patients constituted about 10% of all patients with ICD discharge (Group 1).

The laboratory findings at admission were presented in the Table 2.

In the Table 3 the patients characteristics with adequate and inadequate shocks were presented.

DISCUSSION

The first finding of the study is that patients with ICD electrical shocks are not frequent cases in the ED and constituted less than 0.1% of the treated patients.

The second finding is the median number of the shocks was 2 and 30% of patients had only one shock. Among patients with one shock, there was a man with loss of consciousness and jerking movements, what is the indication for the arrival to the ED even if there was only one shock. If the patient receives more than one shock they should be admitted to the ED immediately [3]. Therefore, it is not surprising that the most common way of admittance is being brought by Emergency Medical Services.

The occurrence of electrical shocks in the general population of the ICD patients is higher, but many patients do not go to the hospital especially when a single ICD discharge occurs and they have no additional severe symptoms like dyspnoea, chest pain, syncope, fever.

The third finding is that low, but substantial number of ICD patients with prehospital ICD discharge are admitted without aware of discharge. The patients

may not remember the shock especially when they lost of consciousness before the shock or were asleep. The epilepsy like activity may result from brain anoxia due to arrhythmia related low perfusion. The patients with syncope should have their ICD interrogated [4].

The fourth finding is that about 30% of patients with presumed ICD discharge had in fact no shocks. The shocks may be felt in a different way and the interpretation of the different body signals in ICD recipients usually involve ICD shock's occurrence [3]. Furthermore, two patients interpreted the acoustic signals of their ICD announcing battery depletion as ICD shocks. This finding indicate the necessity of education. Patients should be taught meaning of different acoustic signals of their ICDs. Furthermore, the shocks are sometimes reported by family members or even Emergency Medical Services staff members, who are aware of the ICD presence. It could be presumed that unusual body movements may be interpreted as ICD shocks. Further studies are needed to better understand this phenomenon and to prevent it.

Finally, it was found that none of patients died at the ED. This finding is concordant with the reports that short lasting mortality in patients admitted with ICD shocks is less than 1% (5).

The occurrence of ICD shocks is a factor of poor prognosis. The poor prognosis is usually related to the underlying cardiovascular disease but not to the electrical instability of the patient [5].

CONCLUSIONS

1. ED visits due to discharges of ICDs are rare.
2. The medical history of ICD discharge could be misleading, because some patients interpret as discharge different symptoms or acoustic signals of the ICDs.
3. The ICD patients with syncope, unconsciousness, history of seizures should have their ICD checked for the possible discharges.

LIMITATIONS OF THE STUDY

The main limitation of the study is that not all ICD patients had their ICD checked, what may have

Table 1. The clinical characteristics of the studied patients.

Parameters	Group 1		Group 2
	Subgroup 1a Discharge (+) Report of discharge (+)	Subgroup 1b Discharge (+) Report of discharge (-)	Discharge (-) Report of discharge (+)
Number of the patients	18	2	6
Number of electrical shocks, median (IQR)	2 (1-6)	1 (1-1)	0
Age, years	65.0±10.2	72.5±13.4	69.5±14.2
Male gender, n(%)	10 (56)	2 (100)	6 (100)
Primary prevention, n(%)	12 (67)	1 (50)	3 (50)
Secondary prevention, n(%)	6 (32)	1 (50)	3 (60)
Adequate discharge, n(%)	14 (78)	2 (100)	NA
No adequate discharge, n(%)	4 (22)	0 (0)	NA
Ischaemic cardiomyopathy, n (%)	10 (55.6)	2 (100)	5 (83.3)
Dilated cardiomyopathy, n (%)	4 (22.2)	0 (0)	1 (16.7)
Hypertrophic cardiomyopathy, n (%)	2 (11.1)	0 (0)	0 (0)
Electrical disorders, n (%)	1 (5.6)	0 (0)	0 (0)
Atrial fibrillation (chronic or paroxysmal), n (%)	9 (50)	1 (50)	4 (66.7)
Diabetes, n (%)	4 (22.2)	0 (0)	0 (0)
ED mortality	0 (0)	0 (0)	0 (0)
Brought to the ED by EMS	15 (83.3)	1 (50)	6 (100)
Hospitalisation in the other hospital ward	12 (66.7)	2 (100)	3 (50)

an effect on underdiagnoses of electrical shocks in studied population. The second limitation is a small study group. This may be the reason why during the studied period there was no ICD patients after cardiopulmonary resuscitation provided by Emergency Medical Services team. In previous periods a case of a history of electrical shock in pacemaker recipi-

ents who in fact had no possibility to have electrical shocks was reported. Finally, the study period was during epidemic COVID-19 era, what may lower the number of patients admitted to the ED, because of the fear of nosocomial infections. The patients with positive COVID-19 swab test in the ambulances were not brought to the University Hospital.

Table 2. The laboratory findings at admission.

Parameters	Group 1 Discharge (+)	Group 2 Discharge (-)	p
Haemoglobin, g/dL	12.9±2.3	13.3±3.7	0.81
MCV, fL	89.0±12.0	91.6±7.4	0.61
Leucocyte number, 103/uL	8.1±1.6	9.5±2.7	0.13
Platelets number, 103/uL	243±62	183±69	0.048
Sodium, mEq/L	138±3	140±3	0.25
Potassium, mEq/L	4.2±1.5	4.6±0.3	0.57
Magnesium, mEq/L	1.9 (1.8-2.2)	3.8 (1.8-5.8)	0.058
eGFR, mL/min/1.73m ²	64.4±24.3	70.8±23.5	0.58
C-reactive protein, mg/L	2.2 (1.1-7.7)	22.4 (1.4-55.6)	0.005
Troponin, ng/mL	26.1 (15.9-100.2)	21.8 (2.3-55.6)	0.41

Table 3. The demographics, electrolyte and troponin levels in patient with adequate and inadequate shocks.

Parameters	Appropriate shocks N=20	Inappropriate shocks N=4	p
Age, years	65.1±9.9	68.3±13.6	0.27
Male gender n(%)	11 (69)	1 (25)	0.13
Shock number, n (IQR)	3 (1-6)	2 (2-2)	<0.001
Sodium, mEq/L	138.5 (137.5-139.0)	140.5 (140-142)	0.030
Potassium, mEq/L	4.2 (3.6-4.3)	4.0 (3.8-4.1)	0.53
Troponin, ng/mL	48.1 (21.4-125.0)	10.2 (3.4-18.7)	0.021

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CONFLICT OF INTEREST

The Author declares no conflict of interest.

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METABOLIC COMPONENT OF ACUTE LEFT VENTRICULAR FAILURE TREATMENT IN PATIENTS WHO UNDERWENT ON-PUMP CORONARY ARTERY BYPASS GRAFTING

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Abstract

Aim: To study the effectiveness of the use of a combination of L-carnitine and arginine to improve the results of treatment of cardiac surgery patients with acute left ventricular failure who underwent CABG with cardiopulmonary bypass (CPB).

Material and methods: 500 patients were operated. All of them underwent CABG with CPB. Sixty patients who required inotropic support in the postoperative period were selected. The patients were divided into two groups of 30 people each. Inotropic support with dobutamine and metabolic support with a combination of levocarnitine and arginine were used to stabilize hemodynamics in the basic group. Stabilization was performed with dobutamine alone in the control group.

Results: The venous saturation during the period of hemodynamic stabilization was higher in basic group. In the basic group, the recovery time of hemodynamics and the total dose of the inotropic drug were shorter/lower than in the control one.

Conclusions: The groups of patients were homogeneous and the process of hemodynamic stabilization was achieved in both groups. The combination of Levocarnitine and Arginine has a pronounced antihypoxic effect on the myocardium. Using this combination can reduce the hemodynamic recovery time by 1.3 times and reduce the total dose of the inotropic drug by 1.33 times.

Key words

CABG,
acute left ventricular failure,
L-carnitine,
arginine

INTRODUCTION

Coronary artery bypass grafting (CABG) is the most common open heart surgery [1]. In the USA alone, more than 200,000 such operations are performed annually [2]. This is due to the high prevalence of coronary atherosclerosis and related consequences. Currently, preference is given to operations with cardiopulmonary bypass (CPB). The on-pump/off-pump ratio is 80/20 [3]. Cardiopulmonary bypass surgery has a number of advantages, first of all, these are the best long-term results. The analysis shows that off-pump CABG can increase the frequency of repeat revascularization by 38% compared to on-pump CABG [4]. This is due to the fact that the surgeon during the coronary anastomosis is in more comfortable conditions in comparison with the off-pump. He or she has no time limits for the procedure, the anastomosis area is always brought to the ideal visualization area, which has a positive effect on the quality of the anastomosis itself [5].

Despite the colossal development of equipment, surgical techniques, and anesthetic techniques, complications continue to arise in the perioperative period. Up to 14% of patients need urgent medical help at the emergency department within 30 days of discharge

with postoperative complications. Among them there are sternum infections, pneumonia, thromboembolic events, shunt failure, atrial fibrillation, pulmonary hypertension, pericardial effusion, stroke, kidney damage, abdominal ischemic syndrome and hemodynamic instability [2]. However, the most considerable complication after CABG with CPB is the development of acute left ventricular failure (ALVF) [6].

For the drug treatment of ALVN after operations with CPB, adrenergic agonists (sympathomimetics, catecholamines, inotropes) are used. These drugs include dopamine, dobutamine, epinephrine, norepinephrine. When studying the energy resources of the affected myocardium, it was found that dobutamine has the least effect on the energy expenditure of the cardiomyocyte. This drug, at the moment, is the first-line drug in the treatment of ALVF after surgery with CBP.

Dobutamine is a synthetic catecholamine with a strong affinity for both β_1 and β_2 receptors, to which it binds in a 3: 1 ratio. With a cardiac stimulating effect on β_1 receptors, dobutamine is a potent inotropic with weaker chronotropic activity. Binding to vascular smooth muscle results in combined α_1 -adrenergic agonism and antagonism, as well as β_2 -stimulation,

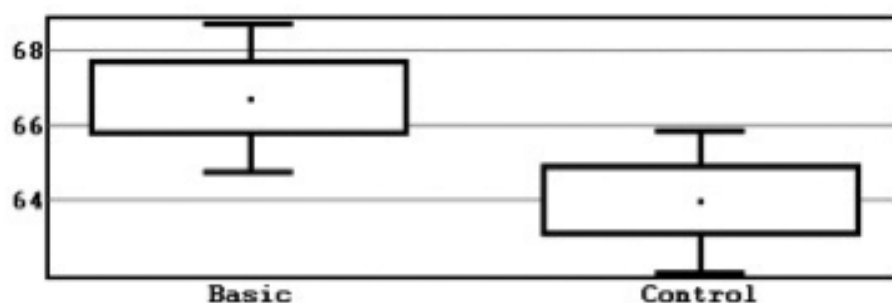


Fig. 1. Venous saturation [%]. Confidence interval “SvO₂” during hemodynamic stabilization.

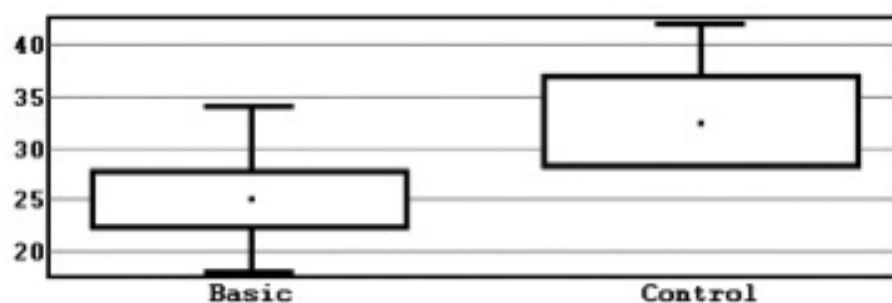


Fig. 2. Recovery time [h]. Confidence interval of hemodynamic recovery time.

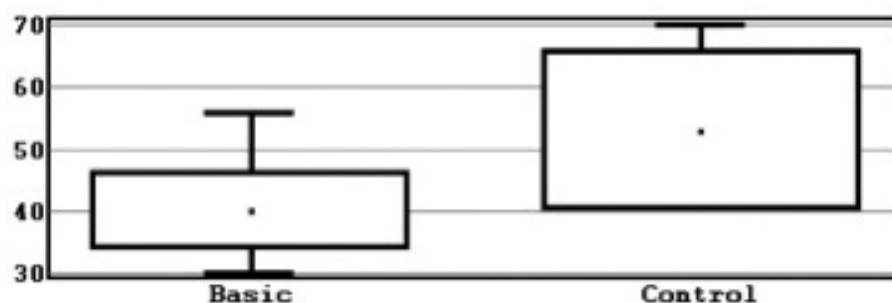


Fig. 3. The total dose of the inotropic drug, µg/kg. Confidence interval for the total dose of the inotropic drug.

so that the net vascular effect is often expressed in moderate vasodilation, especially at lower doses (≤ 5 µg/kg/min).

Doses up to 15 µg/kg/min increase cardiac contractility without significantly affecting peripheral resistance, probably due to the balancing effects of α_1 -mediated vasoconstriction and β_2 -mediated vasodilation [7]. Side effects include tachycardia, increased ventricular rate in patients with atrial fibrillation, and ventricular arrhythmias.

However, in addition to inotropes, metabolic drugs also have a positive effect on the myocardium. They include such drugs as levocarnitine and arginine.

L-carnitine plays an important role in the β -oxidation of fatty acids (FA), that is, in the production of energy in the mitochondria. In this case, L-carnitine acts as a specific co-factor that controls the rate of oxidation of long-chain FAs and facilitates their transfer across the inner mitochondrial membrane. In addition, L-carnitine is involved in the removal of excess FAs from mitochondria, and then from the cytoplasm, thus preventing the development of the cytotoxic effect. Under conditions of ischemia, acyl coenzyme A accumulates in mitochondria, the balance of which with free coenzyme A is maintained due to the work of the so-called carnitine shuttle, which transports acyl residues of

Table 1. Central hemodynamic indices in the basic and control groups before and after surgery, during the stabilization period.

Parameters	Before operation	After operation	Stabilization
Basic Group			
MAP [mm Hg]	113.33 [101,67:120]**	81,16 [78,67:83,33]*	86,93 ±8,38**
HR [beats/min]	75.97 ±8.71*	79.5 [76:81]*	80 [76:96]*
SI [ml/m ²]	20.94 ±5.2*	24.18 ±5.7*	24.48 ±6.3*
CI [l/(min*m ²)]	3.086 ±0.7775*	1.972 ±0.5666*	2.069 ±0.5767*
SVR [din*cm-5]	4.056 ±1.545*	2.194 ±0.6318*	2.293 ±0.5171*
Control Group			
MAP [mm Hg]	101,67 [91,67:110]**	79,16 [74,67:83,67]*	82,19 ±8,99**
HR [beats/min]	77.83 ±8.37*	82 [78:88]*	80 [74:84]*
SI [ml /m ²]	21.96 ±5.5*	25.01 ±8.1*	26.75 ±7.0*
CI [L/(min*m ²)]	3.238 ±0.7849*	2.083 ±0.6813*	2.087 ±0.4753*
SVR [din*cm-5]	3.491 ±0.9673*	2.228 ±0.8616*	2.269 ±0.6991*

* – $p > 0.05$, ** – $p < 0.05$

FA. Removing excess acetyl groups from mitochondria, L-carnitine promotes the formation of malonyl-coenzyme A, which inhibits the work of the carnitine shuttle and thereby reduces the rate of β -oxidation of fatty acids under ischemic conditions. It has been shown that the level of L-carnitine in the myocardium decreases in coronary artery disease, acute myocardial infarction and heart failure of various origins.

Arginine belongs to the class of conditionally essential amino acids, it is an active and versatile cellular regulator of numerous vital functions of the body and has significant protective effects: antihypoxic, membrane stabilizing, cytoprotective, antioxidant, and detoxifying. Arginine is involved in the regulation of intermediate metabolism and energy supply processes and plays a role in maintaining hormonal balance in the body. It is known that arginine increases the blood levels of insulin, glucagon, growth hormone and prolactin, takes part in the synthesis of proline, agmatine polyamine, and is involved in the processes of fibrinogenolysis and spermatogenesis. Arginine is a substrate for the formation of NO synthase, an enzyme that cata-

lyzes the synthesis of nitric oxide in endothelial cells. The drug activates guanylate cyclase and increases the level of cyclic guanine monophosphate (cGMP) in the vascular endothelium, reduces the activation and adhesion of leukocytes and platelets, inhibits the synthesis of adhesion molecules VCAM-1 and MCP-1, suppresses the synthesis of endothelin-1, which is a powerful and stimulatory vasoconstrictor smooth myocytes of the vascular wall. Arginine also inhibits the synthesis of asymmetric dimethylarginine, a powerful endogenous stimulator of oxidative stress [8].

The combination of L-carnitine and arginine allows you to combine the positive effects of both substances to achieve a stabilizing effect on the myocardium that underwent CPB surgery.

THE AIM

To study the effectiveness of the use of a combination of L-carnitine and arginine to improve the results of treatment of cardiac surgery patients with acute left ventricular failure who underwent coronary artery bypass grafting with cardiopulmonary bypass.

Table 2. Indicators of oxygen transport in the basic and control groups before and after surgery, during the stabilization period.

Parameters	Before operation	After operation	Stabilization
Basic Group			
SvO ₂ [%]	74.38 ±9.09*	71.9 ±6.65*	66.71 ±5.26**
PvO ₂ [mm Hg]	42.16 ±5.68*	41.95 ±5.12*	38.04 ±3.38*
DO ₂ [ml/(min*m ²)]	528 ±152.7*	499.8 ±135.9*	546.9 ±118.1*
VO ₂ [ml/(min*m ²)]	130.8 ±56.33*	134.8 ±59.51*	164.4 ±49.15*
Control Group			
SvO ₂ [%]	74.23 ±6.32*	72.71 ±7.67*	63.98 ±5.26**
PvO ₂ [mm Hg]	43.91 ±7.47*	44.49 ±8.01*	36.44 ±3.31*
DO ₂ [ml/(min*m ²)]	541 ±148.8*	471.7 ±143.4*	523.4 ±126.9*
VO ₂ [ml/(min*m ²)]	132.9 ±45.98*	122.7 ±49.18*	176.5 ±48.39*

* – $p > 0.05$, ** – $p < 0.05$

MATERIAL AND METHODS

500 patients were operated on at the State Institution of Science “Research and Practical Center of Preventive and Clinical Medicine” State Administrative Department, Kyiv. All of them underwent coronary artery bypass grafting with cardiopulmonary bypass. Sixty patients who required inotropic support in the postoperative period were selected. The patients were divided into two groups of 30 people each.

The basic group included 22 men and 8 women aged 37 to 78 years, the average number of bypasses was 3.17 ± 0.65 . Inotropic support with dobutamine and metabolic support with a combination of levocarnitine and arginine were used to stabilize hemodynamics.

The control group also included 22 men and 8 women aged 37 to 81 years, the average number of bypasses was 3.3 ± 0.54 . Stabilization was performed with dobutamine alone.

There were no statistically significant differences in the groups (by gender, age, number of bypasses applied), $p > 0.05$.

A number of studies were carried out in order to verify the homogeneity of both groups. The indices of central hemodynamics and oxygen transport in both groups were compared at different time intervals: before surgery, after surgery, during the period of stabilization.

The calculations were carried out using the Med-Stat program.

RESULTS AND DISCUSSION

With the development of acute left ventricular failure, the question on the basis of what criteria should inotropic support be prescribed arises.

The vast majority of cases of ALVF occur intra-operatively, when the sternum/intercostal space is still spread apart. An operating team with sufficient experience can ad oculus assess changes in the contractility of the heart and raise the question of the appointment of inotropic support, taking the presence of hypotension into account (mean arterial pressure below 60 mm Hg) and/or bradycardia (own rhythm with a heart rate below 60 beats/min), venous hyper-

tension (central venous pressure above 15 mm Hg). However, the final answer to this question can be given by performing transesophageal echocardiography (decrease in global contractility, the appearance of new zones of a-, hypokinesis [9]), measurement of lactate level, determination of venous saturation and / or arterio-venous saturation difference, partial pressure of oxygen in the venous blood, calculation of the anion gap.

Lactate is the main byproduct of anaerobic glycolysis. Lactic acid can build up if it is produced faster than the liver can utilize it. When its content in the blood rises significantly, lactic acidosis occurs [10]. The normal lactate level is 0.5-3.5 mmol/L. There are moderate fluctuations: 3.5-4.5 mmol/L, significant – 4.5-8.0 mmol/L and critical – > 8.0 mmol/L. The indication for the appointment of inotropic support is an increase in lactate levels above 4.5 mmol/L.

Venous saturation (SvO_2) is normally in the range of 65-70%. A decrease in this indicator indicates a slowdown in blood flow and a greater extraction of oxygen by tissues [11]. A decrease in SvO_2 below 60-65%, as a rule, indicates a decrease in the pumping function of the heart and requires the appointment of inotropic support. However, there are cases when it is impossible to rely on the SvO_2 rate in its pure form. If the patient has a violation of alveolar-capillary transport due to chronic obstructive pulmonary disease (COPD), the consequences of viral pneumonia, or congenital heart disease with mixing of the circulation; in this case, it is not the venous saturation that should be taken into account, but the arterio-venous saturation difference index. Normally, it is 30%. A decrease below 25 is an indication for the appointment of inotropic support.

The normal venous oxygen partial pressure (PvO_2) is 40 mm Hg and higher [12]. The mechanism of PvO_2 formation is identical to SvO_2 . Decrease in value below 35 mm Hg is the indicator for the use of catecholamines.

Anion gap (AG) is the difference between the Na^+ concentration and the sum of the Cl^- i HCO_3^- concentrations. Under physiological conditions, it is equal to 8-12 meq/L. The AG value underlies the separation of acidosis. In hyperchloremic acidosis, the AG value is approximately 12 meq/L. This pathological condition develops due to the loss of alkalis. With normochloremic acidosis, $AG > 12$ meq/L. Reasons: the presence in the plasma of anions that are not routinely determined – lactate, acetoacetic, alcohol metabolites. In cardiac surgery, this condition is most often associated with an increase in lactate levels [13]. It is the increase in AG above 12 meq/L that is an

indication for the appointment of inotropic support.

Inotropic support was prescribed to patients in both groups taking into account the above factors.

Dobutamine dosing was carried out (in accordance with the manufacturer's instructions) in the range from 2 $\mu\text{g/kg/min}$ to 15 $\mu\text{g/kg/min}$, under the control of hemodynamics and blood gas parameters; levocarnitine and arginine – the drug Tivorel (also in accordance with the instructions) was dosed 2000/4200 mg for 24 hours of treatment.

To assess central hemodynamics, the following indicators were assessed: mean arterial pressure (MAP), heart rate (HR), stroke index (SI), cardiac index (CI), systemic vascular resistance (SVR). To assess oxygen transport, venous oxygen saturation (SvO_2), venous blood partial pressure (PvO_2), oxygen delivery (DO_2), oxygen consumption (VO_2) were used. To assess the rate of stabilization, the time of hemodynamic recovery (hours) and the total dose of the inotropic drug ($\mu\text{g/kg}$) were used.

To assess the differences in indicators for a single parameter in a certain time period (before, after surgery, stabilization period), we compared the “mean” (“median”, for a distribution other than normal) of the two samples, “Basic Group” and “Control Group” (Student's test, Wilcoxon's W-test for a distribution other than normal), i.e. the cardiac index (CI) before surgery in the main group was compared with the CI before surgery in the control group, etc. Each indicator of central hemodynamics (Table 1) and oxygen transport (Table 2) was subjected to this procedure in comparison with the basic and control groups in each of the time intervals.

The calculation showed that no statistically significant differences were found ($p > 0.05$) in any sample, except for mean arterial pressure (MAP) before surgery and during the stabilization period in terms of central hemodynamics, as well as “ SvO_2 ” in the period of stabilization of hemodynamics in terms of oxygen transport.

A statistically significant difference in mean arterial pressure was found during the period of hemodynamic stabilization ($p < 0.05$). Thus, the mean blood pressure in the basic group was 86.93 ± 8.38 mm Hg versus 82.19 ± 8.99 mm Hg in the control group. However, it did not matter because the corresponding indicator before surgery was also higher in the basic group – 113.33 [101.67:120] mm Hg against 101.67 [91.67:110] mm Hg in the control one.

With regard to venous saturation during the period of hemodynamic stabilization, a statistically significant difference was also revealed ($p < 0.05$). SvO_2 in the basic group was $66.71 \pm 5.26\%$, and in the con-

trol group – $63.98 \pm 5.26\%$ (Fig. 1). The figure shows the interval estimation of venous saturation in basic and control groups during the period of hemodynamic stabilization. The mean (point), the mean bias (rectangle) and 95% confidence interval (distribution whisker) are presented.

In the basic group, the recovery time of hemodynamics was 25 [17:38] hours, and in the control group – 32.5 [28:48] hours (Fig. 2). The figure shows the interval estimation of hemodynamic recovery time from the end of the operation to stabilization. The median (point), the median bias (rectangle) and 95% confidence interval (distribution whisker) are presented.

To verify the statistical differences, a number of calculations were performed. Based on the calculation of the Shapiro-Wilk test, the distribution of the sample was found to be different from the normal one. The central trends were compared for two independent samples; the calculation was performed using the Wilcoxon W-test; $W = 693.5$; central tendencies differ at the level of significance $p = 0.001$. Multiple comparisons were calculated for 2 samples – Kruskal-Wallis rank univariate analysis; $H = 10.7$, the number of degrees of freedom $k = 1$; a difference at the level of significance $p = 0.001$ was revealed. Dunn's criterion was calculated; $Q = 3.28$; the difference was statistically significant at the $p < 0.01$ level. The data processing methods confirmed a statistically significant difference in the hemodynamic recovery time in the basic and control groups ($p < 0.05$).

In the basic group, the total dose of the inotropic drug was 40 [22:65] $\mu\text{g/kg}$, and in the control group – 53 [42:72] $\mu\text{g/kg}$ (Fig. 3). The figure shows the interval estimation of total dose of the inotropic drug from the end of surgery to stabilization. The median (point), median bias (rectangle) and 95% confidence interval (distribution whisker) are presented.

To verify the statistical differences, a number of calculations were also carried out. The Shapiro-Wilk test also showed a non-normal distribution of the sample. Comparison of central tendencies for two independent samples was held, Wilcoxon's W-test; $W = 748.0$; central tendencies differ at the $p = 0.013$ significance level. Multiple comparisons for 2 samples, Kruskal-Wallis rank univariate analysis; $H = 6.1$, the number of degrees of freedom $k = 1$. The difference was revealed at the level of significance $p = 0.013$. Dunn's criterion; $Q = 2.47$; the difference was statistically significant at the level of significance $p < 0.05$. Data processing methods also confirmed a statistically significant difference in the total dose of the inotropic drug in the basic and control groups ($p < 0.05$).

CONCLUSIONS

Based on the fact that there are no statistical differences in most indicators of central hemodynamics and oxygen transport, it can be concluded that the groups of patients were homogeneous and the process of hemodynamic stabilization was achieved in both groups.

Considering a statistically significant increase in the venous saturation index in patients of the basic group during the period of hemodynamic stabilization, the combination of Levocarnitine and Arginine has a pronounced antihypoxic effect on the myocardium that underwent surgery with cardiopulmonary bypass.

The introduction of a combination of Levocarnitine and Arginine into the treatment for acute left ventricular failure in patients undergoing coronary artery bypass grafting with cardiopulmonary bypass can reduce the hemodynamic recovery time by 1.3 times ($p < 0.05$) and reduce the total dose of the inotropic drug (dobutamine) by 1.33 times ($p < 0.05$).

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

OBSERVANCE OF ETHICAL NORMS

In conducting the study, the authors adhered to the principles of the Declaration of Helsinki, the Council of Europe Convention on Human Rights and Biomedicine (1997), the relevant provisions of the WHO, the International Council of Medical Research Societies, the International Code of Medical Ethics (1983) and the laws of Ukraine. Each patient included in the study signed an informed consent for medical intervention. The study protocol was approved by the local ethics commission.

FOUNDING

The study was performed as part of research work "Optimization of specialized and highly specialized medical care of surgical profile on the principles of *Fast track surgery* for certain diseases of the thyroid and thyroid glands, internal and reproductive organs, abdominal wall, in particular using atomic force microscopy and using the method of prelamination for processing".

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INFLUENCE OF SELECTED SOCIO-DEMOGRAPHIC FACTORS ON THE CARDIOPULMONARY RESUSCITATION EFFECTIVENESS PERFORMED BY THE POLICE OFFICERS DURING THE SERVICE

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Abstract

Aim: To assess the influence of selected socio-demographic factors on the CPR effectiveness performed by the police officers during the service.

Material and methods: An observational, pilot study was conducted on a group of 90 police officers working in Rzeszów powiat. Each officer performed a 2-minute CPR on a dedicated Resusci Anne QCPR training phantom. The obtained parameters for chest compressions and ventilation were recorded using a dedicated SimPad SkillReporter tablet. Statistical analysis was performed using the Statistica 13.1 software.

Results: The analysis of the obtained results concerning the influence of sociodemographic variables on the quality of CPR showed that both age, sex and work seniority significantly differentiated the selected parameters of chest compressions. Being an older man predisposed to deeper chest compressions. Women performed chest relaxation more effectively. Younger policemen provided chest compressions at a frequency recommended by the European Resuscitation Council (ERC) guidelines. The above variables did not differentiate the groups in terms of ventilation.

Conclusions: The age, sex and work seniority of the surveyed policemen significantly influenced the performance of chest compressions with no differences in ventilation parameters.

Key words

resuscitation,
sudden cardiac arrest,
police officer,
socio-demographic factors,
ventilation,
chest compression

INTRODUCTION

The development of civilization is associated with an increased number of accident victims and the frequency of cardiovascular diseases. In 2017, 32,760 traffic road accidents were recorded in Poland in which 39,466 people were injured, and head and neck injuries were the main cause of death [1, 2]. About 400,000 people experience sudden cardiac arrest (SCA) yearly in Europe, 350,000 of which occur outside hospital [3]. The life-saving procedure in SCA is to initiate cardiopulmonary resuscitation (CPR) immediately by bystanders and, if possible, to defibrillate early. For effective CPR, it should be started within 4 minutes of cardiac arrest [3].

The State Medical Emergency System cooperates with other units, including the police. These units are responsible for i.e. providing support in the field of qualified first aid [4]. The ability of police officers on duty to properly conduct CPR is extremely important, because due to their profes-

sion, they are often the first to appear at the scene of an SCA event. The officers are required to provide qualified first aid not only by ethical principles, but also by applicable legal regulations [5]. These are mainly: Art. 1 of the Act of April 6, 1990 on the protection of human life and health, art. 36 of the Act of May 24, 2013 and the Regulation of the Council of Ministers of July 26, 2005 on the procedure to be followed when exercising certain powers of police officers [6-8]. As a result of the source analysis of the main medical databases related to the ability to provide first aid by police officers, a deficit of research related to the presented subject matter was identified.

THE AIM

The aim of the study was to assess the influence of selected socio-demographic factors on the CPR effectiveness performed by the police officers during the service.

MATERIAL AND METHODS

The study received a positive opinion of the Bioethics Committee at the University of Rzeszów. It was carried out in the period from September 2016 to December 2017, after obtaining the consent of the municipal police chief and police officers in Rzeszów. The study was conducted at the headquarters of the Police Station in Rzeszów. 300 police officers were qualified for the preliminary examination. For a reliable comparison of the studied variables, 90 people (45 women and 45 men) were finally drawn. For statistical analysis, the officers were divided into two age groups: 26-36-years-old and 37-56-years-old. The division was also made according to the work seniority: 1-9 years and 10-28 years. This division was made on the basis of the median length of service. There were 49 people in the shorter internship category, while 41 in the longer internship group. The inclusion criteria for the study were as follows: voluntary consent to participate in the study, health condition enabling the study to be carried out with the use of selected research tools, and employment in the police. The exclusion criteria included: lack of informed consent and health condition that did not allow the task to be performed. Detailed characteristics of the studied group is presented in Table 1.

Table 1. Characteristics of the study group.

	Study group		
	Women (n=45)	Men (n=45)	Total (N=90)
Age [yrs]	35.8 ± 5.53	38.13 ± 5.59	36.97 ± 6.08
Work seniority [yrs]	7.4 ± 4.93	11.06 ± 5.39	9.23 ± 5.93

ORGANIZATION AND COURSE OF THE STUDY

Directly before the study, a pilot study was carried out on a group of 20 people. Due to the lack of structural defects of the research tools, the result of the sample was included in the study. Each qualified police officer was asked to fill in the form of socio-demographic data (sex, age, work seniority). The obtained data was recorded in the scientific and research questionnaire developed by the author. After a brief introduction to the course of the study, a task was presented – to perform a 2-minute CPR on the QCPR Little Anne phantom (Laerdal Resusci Anne®, 50 kg, Laerdal, Norway) according to skills possessed. The adult phantom made it possible to perform: airway opening, ventilation and recording of chest compression parameters. Each police

officer performed both compressions and mouth-to-mouth ventilation of the chest. The guidelines of the European Resuscitation Council (ERC) were used: tidal volume 500-600 ml, pressure depth 5-6 cm, chest compressions to rescue breaths ratio (30:2), rescue breath time (1 s) [3]. (Polish Resuscitation Council). Thanks to the Wireless SkillReporter Software Resusci Anne (Laerdal Norway 2015), it was possible to record the following parameters in real time: compression rate and depth, correct hand positioning, chest relaxation, frequency and length of the intervals between chest compressions and rescue breaths and ventilation volume. Based on the above parameters, the overall level of resuscitation was calculated. The criteria were: <49% – low, 50-74% – moderate and > 75% – high level of the tasks performed.

STATISTICAL ANALYSIS

The data obtained during the study were analyzed using tests assessing the differences between the study groups. Due to the lack of normality of the distribution of variables (assessed with the Shapiro-Wilk test), non-parametric analyzes were used: the Mann-Whitney U test and the Spearman's rank correlation coefficient. The level of statistical significance in the study was adopted at $p < 0.05$. The calculations were performed with the Statistica 13.1 software (StatSoft Inc.).

RESULTS

The impact of selected sociodemographic parameters (age, sex, work seniority) on the level of CPR was analyzed.

Greater compressions depth and percentage effectiveness of chest compressions deep enough were found in the senior police officers than in the younger police officers group. However, it did not reach a high level in both groups – moderate in the older group and low/moderate in the younger policemen group (Table 2).

Comparing the obtained results with regard to sex, it was found that women deform the chest better, while men compress it deeper, with more compressions sufficiently deep (Table 3).

Based on the analysis of the influence of seniority on the parameters of chest compressions, a higher mean depth was found among officers with longer work experience. Police officers with a shorter experience compressed the chest with a frequency similar to the ERC recommendation (Table 4). There was no statistical significance for ventilation parameters.

Table 2. Analysis of the correlation of the age variable on the parameters of chest compression and ventilation.

	Age		
	26-36 yrs (n=45)	37-56 yrs (n=45)	p value
Depth [mm]	46.57±10.74	54.02±8.29	<0.05
Compression [%]	40.8±39.49	72.58±36.01	<0.05
Compression result [%]	52.00±23.63	68.4±26.81	<0.05
Relaxation [%]	62.33±39.22	64.36±35.79	>0.05
Frequency [%]	42.64±39.19	32.25±38.11	>0.05
Ventilation [%]	51.8±35.7	51.96±32.42	>0.05
Tidal volume [ml]	537.16±401.44	544.56±339.47	>0.05

Mann Whitney U test

Depth – average pressure depth measured in millimetres;

Compressions – deep enough in[%];

Compression Score – percentage of successful compressions;

Relaxation – complete chest relaxation in[%];

Frequency – the appropriate frequency of compressions in[%];

Ventilation – ventilation efficiency in[%];

Tidal volume – average tidal volume in millilitres.

Table 3. Analysis of the correlation of the sex variable on the parameters of chest compression and ventilation.

	Sex		
	Women (n=45)	Men (n=45)	p value
Depth [mm]	45.51±9.9	54.98±8.33	<0.05
Compression [%]	39.98±39.32	73.4±35.43	<0.05
Compression result [%]	58.31±32.65	65.6±28.04	>0.05
Relaxation [%]	80.8±29.34	47.24±36.57	<0.05
Frequency [%]	44.91±39.98	30.01±36.61	>0.05
Ventilation [%]	20.22±30.27	22.24±25.5	>0.05
Tidal volume [ml]	495.73±401.08	585.98±333.75	>0.05

Mann Whitney U test

Depth – average pressure depth measured in millimetres;

Compressions – deep enough in[%];

Compression Score – percentage of successful compressions; Relaxation – complete chest relaxation in[%]; Frequency – the appropriate frequency of compressions in[%]; Ventilation – ventilation efficiency in[%]; Tidal volume – average tidal volume in

millilitres.

Table 4. Analysis of the correlation of the work seniority variable on the parameters of chest compression and ventilation.

	Work seniority		p value
	1-9 yrs (n=49)	10-28 yrs (n=41)	
Depth [mm]	47.61±9.92	53.39±9.88	>0.05
Compression [%]	45.06±40.36	70.59±37.3	<0.05
Compression result [%]	59.12±30.87	65.34±30.04	>0.05
Relaxation [%]	68.55±30.87	57.12±39.23	>0.05
Frequency [%]	41.02±39.75	33.39±37.72	<0.05
Ventilation [%]	22.29±29.62	19.98±25.88	>0.05
Tidal volume [ml]	570.51±391.44	505.41±487	>0.05

Mann Whitney U test

Depth – average pressure depth measured in millimetres;

Compressions – deep enough in[%];

Compression Score – percentage of successful compressions;

Relaxation – complete chest relaxation in[%];

Frequency – the appropriate frequency of compressions in[%];

Ventilation – ventilation efficiency in[%];

Tidal volume – average tidal volume in millilitres.

DISCUSSION

The study assessed the effectiveness of CPR among police officers and the impact of selected demographic variables on the quality of the procedure.

The selection of the sample for the study is justified due to the nature of the duties performed by police officers and the fact that officers frequently conduct CPR until the arrival of medical services [9-11]. Immediate initiation of CPR in the event of SCA by witnesses of the event increases the chance of the victim's survival, which was confirmed in the study conducted by Sanna T et al. on 1,583 people assessing the influence of early defibrillation on the quality of CPR.

Similar conclusions stem from the study by Stiell IG et al, which assessed the effectiveness of immediate rescue actions by witnesses of the incident, fire service and police officers on a group of 5,335 victims [12, 13]. Both theoretical knowledge and practical skills are required to provide first aid. In the study on a group of 390 Spanish police officers, knowledge about CPR was assessed. Lack of training in conducting CPR was found in 19.7% of the respondents,

while only 49.7% of police officers declared their readiness to provide first aid. This allowed the authors to draw a conclusion about the necessity to conduct regular training [14].

In order to precisely assess the level of CPR performed, the Resusci Anne QCPR phantom was used, which enabled the recording of selected parameters: the depth and frequency of compressions, the degree of chest relaxation and ventilation parameters.

The study group performed a 2-minute CPR, while the mean achieved result, including compression and ventilation parameters, was 56.73% (moderate level). On the basis of the available literature, the presence of studies analyzing the knowledge of police officers in the field of pre-medical first aid was found, with a simultaneous shortage of works checking practical skills. In the study by Płaczek A, on a group of 120 police officers assessing the level of CPR, it was found that more than half of the respondents obtained a result above 50%, while in the work of Krammel M et al., a group of 255 police officers showed a high level of CPR in both performing only chest compressions and ventilation, as well as in the group that additionally uses an AED defibrillator [15, 16].

When assessing the impact of selected socio-demographic parameters on the level of CPR performance in our study, we found a correlation between work seniority: sufficiently deep compressions (47.61 ± 9.92 vs. 53.39 ± 9.88) and the appropriate frequency (41.02 ± 39.75 vs. 33.39 ± 37.72). When analyzing the depth of compressions, it was found that officers with 10-28 years of work seniority obtained much higher results, while police officers with less than 10 years of experience compressed the chest with a frequency consistent with the ERC recommendations.

The analysis of the influence of sex on CPR showed a statistically significant difference between the mean compression depth, which was 45.51 mm for women and 54.98 mm for men. There was also a relationship between sex and the level of CPR performed. Males serving in the police had a higher score of compressions deep enough than females (73.40% vs. 39.98%). Women significantly more often performed compressions with full chest relaxation (80.8% vs. 47.24%). In a study conducted by scientists from the Sabzevar University of Medical Sciences in Iran on a group of 194 medical workers, a relationship between sex and the quality of chest compressions was also demonstrated. 20% of the tested men had a high level of chest compressions, while for women the result was 0.03%. The results of chest compressions obtained by women are similar to the results obtained by nurses in a study conducted

at the University of Rzeszów. Both the study and the control group consisted of women and the parameters obtained before the training were as follows: mean pressure depth – 51 and 47.58 mm, and full chest relaxation – 83.92 and 92.54% [17, 18].

In our study, the age of the officers significantly differentiated the group in terms of the quality of task performance. Police officers in the older age group (37-56 years) achieved a higher mean depth of chest compressions (46.57 ± 10.74 vs. 54.02 ± 8.29) and the number of sufficiently deep compressions (40.8 ± 39.49 vs. 72.58 ± 36.01). The above-mentioned relationship was not demonstrated in a study conducted at the Iranian University, where each age group performed chest compressions at a similar level [13].

Due to the small amount of studies determining the level of knowledge and skills of police officers in the field of first aid, it is necessary to further expand their knowledge in this field. Police officers are often the first to arrive at the scene and are required to start CPR. The presented work may constitute an introduction to conducting further research and be the basis for the implementation of adequate training among officers. The research conducted so far on the impact of training on the ability to conduct CPR has confirmed the improvement in the effectiveness of AED defibrillator use as well as an increase in self-confidence and motivation from 12 and 73% to 99 and 94% [19]. In addition, it should be emphasized that appropriate training and its frequency may negligibly affect the quality of resuscitation procedures and translate into an increase in the chances of cardiac arrest survival [20].

CONCLUSIONS

Sex, age and seniority significantly differentiate the quality of selected compression parameters, with the simultaneous lack of influence of selected socio-demographic parameters on the level of ventilation. Women significantly more often performed full relaxation of the chest, while men compressed it deeper. Officers in the older age group performed significantly more deep enough compressions. Police officers with longer service seniority achieved a higher average depth of compressions, while the younger ones had a better frequency.

LIMITATIONS OF THE STUDY

The study had several limitations. We assessed only the practical skills of the participants and their impact on the effectiveness of CPR in accordance with the BLS algorithm of the 2015 European Resuscitation Council guidelines. Due to the small group of surveyed police officers, the study does not fully reflect the level of skills of police officers, but it may be considered in further research. In addition, the phantom used does not reflect the exact reality, but is an important and proven tool for training and improving the knowledge and skills of CPR. Due to the clearly stated goal, the study did not compare other variables, which made it possible to accurately compare the influence of sex, age and seniority on selected parameters. Moreover, not all of the surveyed police officers were employees of the traffic department, which could have resulted in less experience in providing first aid, despite the completed training in this field.

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CONFLICT OF INTEREST

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THE ASSESSMENT OF THE POLISH LIFEGUARDS' KNOWLEDGE OF THE PRINCIPLES OF CARDIOPULMONARY RESUSCITATION IN VICTIMS OF DROWNING DEPENDING ON WORK EXPERIENCE, TYPE OF WORKPLACE AND EXPERIENCE IN RESUSCITATION

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Abstract

Aim: The main aim of the study was to assess the lifeguards' knowledge of qualified first aid depending on: work experience, type of workplace, experience in providing CPR (cardiopulmonary resuscitation).

Material and methods: The study included 433 lifeguards. Males 60.05% (n=260). The mean age was 24.7 ± 7.5 . Management of a person after an episode of drowning, CPR, AED (automatic external defibrillation), oxygen therapy, methods of opening the airway were assessed using a questionnaire. Statistical analysis was carried out using PQStat set ver. 1.8.0.338. The correct answers in the group was compared by one-way analysis of variance and post-hoc test by Tukey and estimating the Fisher's linear method. Test probability at $p < 0.05$ was considered as significant.

Results: The mean of the results in the group was $74.65\% \pm 17.22$. The correct answers in the study group differs significantly depending on work experience. The results in the group with the longest work experience are significantly higher than in the other groups. The correct answers in the surveyed group also differs significantly depending on the type of workplace. The results obtained in the group of sea lifeguards are significantly higher than in the other groups. The comparison of the groups indicates a significant trend proportional to the size of the waterbody. The correct answers differed significantly depending on the experience in providing CPR.

Conclusions: Work experience, type of workplace and experience in providing resuscitation have an impact on the lifeguards' knowledge of selected elements of qualified first aid. Attention should be paid to the education of the group with the shortest work experience.

Key words

first aid,
lifeguard,
cardiopulmonary resuscitation
(CPR),
rescue,
drowning

INTRODUCTION

Drowning is one of the leading causes of accidental death worldwide [1]. Prevention of drowning is essential to reduce both mortality and morbidity. However, if the prevention fails, the availability and quality of pre-hospital and inpatient care will determine the prognosis [1]. In victims of drowning, it is crucial to maintain the continuity of the links of the drowning survival chain and the cardiac arrest survival chain [2]. From this perspective, in Poland, according to the Act on the State Emergency Medical Service, first responders, i.e. usually Emergency Medical Services (EMS) are the pre-hospital pillar of the system. The Act also regulates the principles of operation of units supporting the EMS system, including water rescue services [3]. Adapted to work under specific circumstances, their purpose is to sup-

port EMS units, especially under difficult environmental conditions [4]. Water areas are a challenge for EMS teams. They usually do not have the appropriate substantive and technical preparation and equipment necessary to performed water rescue activities. In order to ensure the continuity of rescue operations and patient care, it is necessary to establish close cooperation between the State EMS system and water rescue services. These services employ qualified staff, appropriately trained to operate in water areas and support the EMS teams. Each active lifeguard is also required to complete a qualified first aid course preparing to provide first aid in emergencies. The course consists of 41 hours of practical classes and 25 hours of theoretical classes [5]. Recertification should take place at least every three years. The course and frequency of training have an undeniable impact on the

quality of life-saving activities [6]. However, the large diversity of the group of lifeguards in terms of work experience, type of workplace and the importance of the issue prompted us to conduct a research analysis to assess the lifeguards' knowledge of selected elements of qualified first aid. Potential conclusions on the relationship between the structure of the group and the mastery of the most important aspects of the qualified first aid may improve safety in water areas in Poland.

THE AIM

The main aim of the study was to assess the lifeguards' knowledge of selected elements of qualified first aid.

Detailed purposes of the study were focused on the assessment of the lifeguards' knowledge of selected elements of qualified first aid depending on:

- work experience
- type of workplace
- experience in providing cardiopulmonary resuscitation (CPR)

MATERIAL AND METHODS

The research was conducted between 1 December 2018 and 31 March 2019. The study group contained active lifeguards and water rescue instructors working in swimming pools, inland and sea.

An original questionnaire, consisting of a total of twenty questions was developed to assess the knowledge of selected elements of the qualified first aid. The responses to twelve of the questions (multiple-choice questions with one correct answer) allowed for the assessment of knowledge about: management of an unconscious person after an episode of drowning, CPR, automatic external defibrillation (AED), active and passive oxygen therapy, non-instrumental and instrumental methods of opening the airway.

The last question was focused on the identification of factors having a potential positive impact on the competences of the respondents in the studied aspect. Here, the subjects could choose several answers.

The inclusion criteria for the study were as follows:

- valid qualifications to work as a lifeguard or water rescue instructor
- a valid certificate of the qualified first aid course

STATISTICAL ANALYSIS

Statistical analysis of the data was carried out using PQStat set ver. 1.8.0.338. Quantitative variables are presented using basic descriptive statistics: the arithmetic mean (\bar{x}), standard deviation (SD), median (Me)

and interquartile range [IQR] or percentages (%). The level of correct answers (%) in the surveyed group depending on work experience, workplace and previous experience in CPR was compared by one-way analysis of variance and post-hoc test by Tukey and estimating the Fisher's linear method. Test probability at $p < 0.05$ was considered as significant and test probability at $p < 0.01$ was considered as highly significant.

RESULTS

The study included 433 lifeguards. Males accounted for 60.05% of the respondents ($n=260$). The mean age was 24.7 ± 7.5 (Me = 22, [IQR 20-26]). The characteristics of the study group depending on work experience, type of workplace (waterbody) and experience in providing CPR are presented in Table 1.

Table 1. Characteristics of the study group depending on work experience, type of workplace (waterbody) and previous experience in CPR.

Work experience (years)	<1	1 – 5	>5
n (%)	92 (21.3)	215 (49.6)	126 (29.1)
Type of workplace (waterbody)	Swimming pool	Inland waterbodies	Sea
n (%)	251 (58)	78 (18)	104 (24)
Previous experience in CPR	None	Once	Twice or more
n (%)	256 (59.1)	68 (15.7)	109 (25.2)

The mean of the results obtained in the study group was $74.65\% \pm 17.22$ (Me = 75, [IQR 66.7-91.7]). The frequency of correct answers to as many as four out of twelve questions was lower than this value. The percentage distribution of correct answers to individual questions is presented in Table 2.

The percentage of correct answers in the surveyed group differs significantly ($p < 0.01$) depending on work experience. The results obtained in the group with the longest work experience are significantly higher than in the other two groups. Data analysis and comparison of the three groups indicate a highly significant trend proportional to work experience (Table 3).

The level of correct answers in the surveyed group also differs significantly ($p=0.0131$) depending on the type of workplace. The results obtained in the group of sea lifeguards are significantly higher than in the group of lifeguards working in inland waterbodies and swimming pools (Table 4). The compari-

son of the three groups indicates a highly significant ($p=0.0021$) trend proportional to the size of the waterbody in which the respondents worked.

Table 2. The frequency of correct answers on a survey questions in the study group.

	Question content:	Correct answers frequency n (%)
1.	What is the proper rate of chest compressions during CPR?	392 (90.5)
2.	What is the proper depth of chest compressions during adult CPR?	362 (83.6)
3.	Under what circumstances CPR should be stopped?	414 (95.6)
4.	Under what circumstances, defibrillation with the use of AED should not be done?	179 (41.3)
5.	How will you start providing first aid to an unconscious victim who has been pulled out of the water?	280 (64.6)
6.	What oxygen flow should be set on the oxygen pressure regulator during CPR?	264 (60.9)
7.	What oxygen concentration should be provided to the patient during CPR?	251 (57.9)
8.	What oxygen concentration can be achieved if self-inflating bag is connected to oxygen source with a flow of 15 l/min but no reservoir bag is used?	208 (48.0)
9.	How the correct size of the oropharyngeal tube should be measured?	407 (93.9)
10.	What is the correct way of opening the airway in an adult victim with a suspected cervical spine injury?	385 (88.91)
11.	How can you provide a high quality chest compressions during CPR?	321 (74.1)
12.	If there is a gastric contents in the upper airway of a drowning victim, what should be done prior to 5 initial ventilations?	416 (96.0)

Table 3. Comparison of correct answers percentage in study group depending on work experience.

Work experience (years)	<1	1-5	>5
x (%)	73.7	71.8	80.0
Me	75	75	83.3
SD	18.5	17.4	14.6
IQR	58.3-91.6	58.3-83.3	66.6-91.6
p value	<0.0001		
Fisher's Least Significant Difference	p value	0.0034	

The frequency of correct answers in the surveyed group also differed significantly ($p < 0.01$) depending on the experience in providing CPR. The results of the subjects who participated in CPR two

or more times are highly significantly higher than in the group of lifeguards who provided CPR only once and those who did not perform real life CPR. The comparison of the three groups shows a highly significant ($p < 0.01$) trend indicating that with the increasing experience in real life CPR, the level of lifeguard's knowledge on performing the procedure increases (Table 5).

Table 4. Comparison of correct answers percentage in study group depending on, type of workplace (waterbody).

Type of workplace (waterbody)	Swimming pool	Inland waterbodies	Sea
x (%)	72.7	75.8	78.4
Me	75	79.1	75
SD	17.7	17.8	14.6
IQR	58.3-83.3	66.6-91.6	66.6-91.6
p value	0.0131		
Fisher's Least Significant Difference	p value	0.0021	

Table 5. Comparison of correct answers percentage in study group depending on previous experience in CPR.

Previous experience in CPR	None	Once	Twice or more
x (%)	71.3	75.7	81.7
Me	75	75	83.3
SD	16.7	17.2	16.3
IQR	58.3-83.3	66.6-91.6	75-91.6
p value	<0.0001		
Fisher's Least Significant Difference	p value	<0.0001	

When asked what, in their opinion, could contribute to better preparation for cardiopulmonary resuscitation (CPR) most lifeguards indicated:

- increasing the number of hours of practical classes in the form of scenarios (62%),
- increasing the frequency of training (53%),
- increasing the quality of qualified first aid training in terms of educators and training equipment (32%),
- dedicating the program of qualified first aid courses mainly to the issue of emergencies (24.2%).

DISCUSSION

Drowning remains a serious public health problem, killing 362,000 people annually [7]. For this reason, our analysis focuses on the selected areas of qualified first aid, i.e. the management of an unconscious victim of drowning, providing CPR, automatic external defibrillation, passive and active oxygen therapy, as well as instrumental and non-instrumental methods of opening the airway. All water facilities and areas accessible to the public should be supervised by the appropriate water rescue services, while the quality of life-saving activities in the event of drowning and cardiac arrest depends primarily on training of lifeguards [4, 8-10]. Studies on the knowledge and skills of lifeguards published in the literature focus mainly on the effectiveness of education and training methods [10-14]. In Poland, the process of training is identical for all lifeguards, regardless of their work experience, type of workplace and experience in emergencies [5]. Perhaps, a more thorough knowledge of this professional group is a key to a better adaptation of the training to individual needs of the group, and thus higher effectiveness of qualified first aid and consequently greater safety of victims.

Among the 433 subjects, the majority were lifeguards with 1-5 year work experience (49.6%), employed in swimming pools (58%) with no experience in providing real life CPR (59.1%). The mean of the results obtained in the study group was $74.65\% \pm 17.22$ and was significantly higher than in the study conducted by Kiszek et al. (51%) who assessed the lifeguards' knowledge of basic life support (BLS) procedures [11]. Our assessment additionally covered the rescue activities of qualified first aid extended to include non-instrumental opening of the airway in a suspected cervical spine injury, instrumental opening of the airway and oxygen ventilation. As for the specific objectives, highly statistically significant trends were found for work experience, type of workplace and experience in providing CPR. The highest mean of correct answers in the entire questionnaire was obtained by lifeguards with the longest work experience, working in sea waterbodies and those who had provided CPR at least twice. Our study results and the lack of scientific reports in this regard should prompt a deeper analysis of the issue. Especially with regard to the type of waterbody, because currently in Poland the target place of lifeguards' work does not determine the process of training or oblige paramedics to acquire additional qualifications [4, 5, 8]. Longer work experience is connected with the need to undergo regular recertification of the quali-

fied first aid course, and thus ensures greater contact with the subject of providing first aid in emergencies [5]. In accordance with the Polish law, lifeguards are obliged to undergo first aid training every three years [3, 5]. This also applies to paramedics who have just acquired the right to work as a lifeguard, which means that for the next three years they are not required to undergo, even a short, retraining in CPR or providing first aid to victims of drowning. Therefore, especially with regard to this group, modification of the education on qualified first aid should be considered. The education should also be adapted to the conclusions of scientific research [6, 11, 15, 16]. The study group also showed a highly significant upward trend in the respondents' knowledge, proportional to the experience in providing CPR. While this issue also requires further research, some authors suggest that experience in providing CPR can be thought-provoking, positively influence the ability to cope with emotional responses, improve the perception of one's own achievements, and motivate to further development of CPR skills. Importantly, the experience may also increase self-confidence in providing CPR [17]. According to the research conducted among medical personnel, this effect may be enhanced by introducing post-resuscitation debriefing [18-21]. Because compared to medical personnel, the frequency of resuscitation among lifeguards is relatively low, including high fidelity simulation (HFS) in their training is worth reconsidering. The advantages of this method may be especially useful in the group of lifeguards inexperienced in resuscitation [6, 22, 23]. Here, it is also worth referring to the results of our study, in which the lifeguards themselves most often (62%) indicated an increase in the number of hours of practical classes in the form of scenarios as a solution to improve the preparation for resuscitation.

The effective education of resuscitation and the management of victims of drowning is a challenge for scientists, educators and clinicians [6, 24]. The latest guidelines of the European Resuscitation Council indicate the potential of training more focused on the specificity of participants. Therefore, introducing modifications in the education of lifeguards on the principles of providing first aid in emergencies should be preceded by a better understanding of the characteristics of this professional group, its needs, possibilities, as well as problems and limitations.

CONCLUSIONS

Work experience, type of workplace (type of waterbody) and experience in providing resuscitation have an impact on the level of lifeguards' knowledge

of selected elements of qualified first aid. Particular attention should be paid to the education of the group with the shortest work experience, those working in swimming pools and with no experience in providing resuscitation. Also an oxygen therapy and AED use should be important element during the education programme.

LIMITATIONS OF THE STUDY

The study was conducted in a relatively small group of subjects. Only some elements of knowledge were subject to the assessment. In future research, it would be advisable to conduct an analysis and evaluation of practical skills during a simulated scenario in a larger group of lifeguards.

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POTENTIAL CONFLICT OF INTEREST

F.J. is the medical consultant for Octopus VR, Lodz, Poland, in the project “Development work in the field of VR ACT application enabling the implementation of medical simulations in ALS/PALS training scenarios” which is co-financed by the European Union under the European Regional Development Fund, Action I.2. investments of enterprises in research and innovation. F.J. is medical consultant in “ECO CPR” project, financed by the program “Innovation Incubator 4.0” as part of the non-competitive project entitled “Support for the management of scientific research and commercialization of the results of R&D works in scientific units and enterprises” under the Intelligent Development Operational Program 2014-2020 (Measure 4.4). K.S., K.F., D.K., K.G., D.T. have no potential conflict of interest.



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INCREASED DEMAND FOR SERVICES PROVIDED IN HOSPITAL EMERGENCY DEPARTMENTS

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Abstract

Increase in demand for health services in HED (Hospital Emergency Department) and their increasing this greater overcrowding is known from the English language as overcrowding. The concept of overcrowding is also inherently related to the notion of frequent use of assistance in the SOR. However, no uniform criterion for defining this concept has been developed so far. The aim of this study is to present the causes of the phenomenon of overcrowding and the related issues of patients' functioning in the health care system. The main reasons for this phenomenon are the demographic aspect, i.e. the extension of the average age of many societies, but also the tendency of patients to omit medical assistance at the primary health care level and go directly to the HED as facilities with greater diagnostic and therapeutic possibilities. The consequences of the overcrowding phenomenon are, above all, an increase in the costs of HED functioning, longer waiting times for health services provided in the HED and excessive workload of the staff employed there. Currently, overcrowding has been recognized as a global public health problem.

Key words

overcrowding,
frequent users,
Hospital Emergency Department

INTRODUCTION

The growing demand for health services provided in HEDs (to people who are not in a state of emergency health is a problem that the health care systems of many countries have been struggling with for years. In recent years, only in the United States, Canada, Australia and Great Britain, an increase in the demand for services in HEDs was observed on average annually by 3-6.5% [1]. The most significant increase, by 6.5%, was recorded in Great Britain, which translated into costs for the state budget of 60 million British pounds, ie 85 million US dollars [2]. In 2009-2010, the cost of admissions to HEDs in British hospitals amounted to as much as GBP 11 billion. For comparison, in the same period, the total cost of all hospitalizations amounted to PLN 20.5 billion [3].

Increase in demand for health services in HED and their increasing this greater overcrowding is known from the English language as overcrowding. This problem has been observed since the 1980s. Currently, it has been recognized as a global problem of public health [4]. The consequences of the overcrowding phenomenon are, above all, an increase in

the costs of HED functioning, longer waiting times for health services provided in the HED and excessive workload of the staff employed there.

THE AIM

The aim of this study is to present the causes of the overcrowding phenomenon and the related issues of patients' functioning in the health care system.

MATERIAL AND METHODS

The study was conducted by analyzing the most recent available foreign literature on the subject matter, in particular studies from Anglo-Saxon countries.

REVIEW

Researchers are unable to unequivocally define the causes of this phenomenon. Some of them indicate the demographic aspect as the main reason, i.e. the extension of the average age of many societies. The elderly, suffering from numerous chronic diseases, are frequent patients in ED. They belong to a group of patients known as "high risk high cost pa-

tients” in HEDs (high risk high cost patients – HRHC patients).

Patient tendency is indicated as another possible cause to bypass medical assistance at the primary health care level and go directly to HED as to facilities with greater diagnostic possibilities and therapeutic [5]. Importantly, it should be noted that most patients are convinced that the same service provided in the HED is of a higher quality than in the specialist or primary health care [6].

Other reasons for the excessive burden on the HED are, as indicated by the researchers, the lack of access to other medical facilities and the lack of knowledge among patients, on the one hand, about the possibilities of obtaining help in facilities other than HED, and on the other hand, about the proper and objective assessment of one’s own health and the appropriate choice of aid [7, 8].

Interestingly, the researchers also indicate climatic conditions among the factors influencing the increase in the load on the SRD. Toloo et al. Estimate that due to global warming in 2030 the number of patients in HED may double, and in 2060 it may increase even 21 times [9].

An attempt to systematically find the cause of the overcrowding phenomenon is the meta-analysis by Coster et al., Who reviewed the literature on the reasons why people in a situation of deterioration of their health are more likely to turn to HEDs for help than to specialist health care. The analyzed publications come from the period 1995-2016 [10].

The most common reason that appeared in 26 out of 38 analyzed studies and was assessed as the main reason for the increase in the need for advice in the HED was omitting the doctor’s institution in primary care and seeking help directly in the HED. The factors influencing such a choice of patients, which resulted from the analyzed publications, include, first of all, the long waiting time for an appointment with a primary care physician, as well as the patients’ conviction that they do not have sufficient competence of a primary health care physician to solve their health problem, and general dissatisfaction with their primary care physician [11, 12]. The authors of the analysis also estimated that 7 out of 30 HED patients did not know where they could benefit from night health care services [13].

Another important reason for the excessive burden on HEDs resulting from the above-mentioned analysis of the literature was the patient’s anxiety about his health, his internal conviction about the need to obtain help immediately and greater trust in the units of the emergency medical system [14].

On the other hand, in 15 out of 38 analyzed studies, patients indicated convenient access to these departments, defined as availability 24 hours a day, 7 days a week and no obligation to make an appointment in advance as the key factor in choosing HED as a form of assistance [15].

Another important reason for using the HED, present in 13 out of 38 analyzed studies, was the patient’s conviction of the need to go to HED due to the diagnostic possibilities available there, in particular radiological diagnostics. This factor was also confirmed in another study, which showed that up to 80% of patients assessed their health as too serious for diagnosis and treatment to be performed only by a primary care physician [16].

Subsequently, in 11 out of 38 publications included in the discussed analysis, it was found that a strong motivator for patients to benefit from HED assistance was the advice given to them by their relatives, which encouraged them to go to these wards for help.

This analysis also includes data from countries where the so-called co-payment of patients in financing treatment costs under health insurance, referred to as co-payment. Coster et al. Showed that in 3 studies from the USA and in 1 from Australia, costs incurred directly by the patient were a significant factor influencing the choice of a service provider in the event of a sudden deterioration of health [17].

DISCUSSION

The concept of overcrowding is also closely related to the notion of frequent use of assistance in the SOR. However, no uniform criterion for defining this concept has been developed so far. In the literature on the subject, one can find significantly divergent criteria, ranging from 3 to 20 interventions in a given year or 3 visits in a given month [18].

In the area of this concept, two other terms can also be found, i.e. people who frequently use the help of the SOR, i.e. who visit 4 or more visits a year, and people who use such help very often (hyperusers), i.e. who visit 10-20 visits. annually [19]. Numerous researchers have attempted to distinguish the features that characterize these groups of patients. Many of them unanimously suggest that this group can be briefly described as the aforementioned high-risk and high-cost patients (HRHC patients). These are usually patients suffering from several chronic diseases of low socioeconomic status at the same time and using health services to a greater extent than other patients [20]. Salazar et al. Indicate that among patients from the frequent users group the annual mortality is high and amounts to as much as 18.6% [21]. On the other

hand, other researchers identified the most common causes of death among this influenza patients, which are cancer, ischemic heart disease, drug and drug poisoning, and suicide [22].

As previously mentioned, people in older age groups are significantly more frequent patients (OR = 2.4; 95% CI = 2.3 to 2.6) [23]. In addition, the researchers also selected other demographic factors that are significantly associated with the frequent use of ED assistance. These are: single parenting, single or divorced status, secondary education or less, and an annual income below 10 thousand US dollars [24]. However, in the case of clinical factors influencing the frequent use of ED assistance, the authors indicate: chronic disease (OR = 3.1; 95% CI = 1.8 to 5.3), neoplastic disease (OR = 4.2; 95% CI = 1.3 to 13.4), gastrointestinal disease (OR = 6.3; 95% CI = 2.0 to 20.2), cardiovascular disease (OR = 8.4; 95% CI = 2.5 to 28.1) and respiratory disease (OR = 4.2; 95% CI = 1.0 to 17.0) [25]. Among the factors increasing the risk of frequent visits to the HED, Swiss researchers selected being incapacitated (OR = 15.8; 95% CI = 1.7), living close to, i.e. less than 10 km from the HED (OR = 4.6; 95% CI = 2.8 to 7.6), being uninsured (OR = 2.5; 95% CI = 1.1 to 5.8), unemployed or receiving social benefits (OR = 2.1; 95% CI = 1.3 to 3.4). A significant risk factor was also the number of previous hospitalizations in a psychiatric ward (OR = 4.6; 95% CI = 1.5 to 14.1) and the use of health services in 5 or more hospital wards in the last 12 months (OR = 4.5; 95% CI = 2.5 to 8.1). In the cited study, the risk of frequent visits to the HED was defined as 4 or more interventions in the HED per year and it increased significantly if 2 out of 4 analyzed social factors were present (OR = 5.4; 95% CI = 2.9 to 9.9) or 2 out of 4 analyzed medical factors (OR = 7.9; 95% CI = 4.6 to 13.4), and in the case of a combination of factors from both groups. In contrast, patients from the frequent users group had a 10 times higher probability of having 3 out of all 8 assessed risk factors (95% CI = 5.1 to 19.6) [26].

Not only the problem of overloading the HED, but also the entire medical rescue system by groups of patients who often use emergency medical services, is subject to numerous studies. Based on material from Baltimore County, the authors selected 1,969 patients who had 6 or more interventions in the last 23 months. They were African-American men aged 45 years or older, significantly more often than other patients with chronic somatic diseases such as diabetes (39.9 vs. 14.6%), asthma (40.9 vs. 13.4%) or HIV infection (9.1 vs. 2.4%). Importantly, as indicated by the researchers, over 23% of the interventions were

related to the abuse of psychoactive substances or exacerbation of mental illness [27]. In contrast, in another study based on data from central Pennsylvania and including patients with Medicaid, Medicare, or commercial insurance, researchers found that frequent users there were younger (18-39 years old), had multiple comorbidities, had Medicaid coverage, and had more frequent visits in primary care and hospitalizations [28].

In another study, the authors showed that significantly more often than patients transported by other means of transport, patients transported to the HED by the EMS were seriously injured or in a state of sudden deterioration of health, had a longer and more costly stay in the ward, and were less likely to leave the ward against the medical recommendations. They were also older, were more likely to pay for benefits themselves, or were Medicare or Medicaid beneficiaries or uninsured, and less privately insured [29].

Despite many studies on determining the profile of patients who frequently use services in HED, researchers who have been dealing with the subject for years emphasize the inability to clearly distinguish the characteristics of this group of patients [30].

However, one of the common features among frequent users in the studies cited above is the presence of chronic diseases, often several at the same time. Billings et al. In their study based on the analysis of the number of fees for service

In the Medicaid program in New York City, they challenged the notion that ED costs are generated largely by people who do not require assistance in such facilities. In the analyzed sample of patients, the vast majority of the frequent users group admitted to the HED 3 to 5 times a year were chronically ill whose needs were not identified and provided on time by primary care [31].

The results of the above study indicate the problem of primary health care failure in providing assistance to people burdened with serious illnesses in the course of which there are frequent exacerbations requiring emergency assistance. Importantly, other authors even directly conclude that due to the inefficiency of outpatient care, both primary care and specialist care, HEDs are the primary place for providing medical assistance to chronically ill patients [32, 33]. On the other hand, SOR are established to help people in a state of sudden health emergency.

CONCLUSIONS

In fact, also in Poland, HEDs do not only go to patients in a state of emergency health. Often these are people who should be admitted by NOCh or oth-

er units of the health care system. As in other countries, a large number of patients in Polish HEDs results from the relatively easy accessibility of these departments, the convenience of the patients themselves and the shortest way to obtain specialist advice [34].

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THREE-STEP ANALYSIS OF SYMPTOMS OF CARBON MONOXIDE POISONING IN PRE-HOSPITAL MEDICAL RESPONSE TEAMS

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Abstract

Diagnosing chronic carbon monoxide poisoning can be a challenge for medical response teams. It is characterised by unclear symptoms, which develop in a manner similar to many chronic cardiological or neurological diseases, and has consequences that can occur up to several months later. As a result, the character of such poisoning is often underestimated in daily practice. Multiple interventions and working under pressure does not always allow for a detailed analysis of many factors. It is therefore vital to develop solutions that allow for quick assessment of whether a patient has been exposed to carbon monoxide poisoning. Three-step analysis of the symptoms of poisoning is an ideal example. This consists of a consultation on exposure to carbon monoxide poisoning, the presence of symptoms suggesting hypoxia due to poisoning, and determining the carboxyhaemoglobin index using equipment carried by the medical response team. Emergency procedures based on these three elements result in rapid identification of people suffering from carbon monoxide poisoning who require oxygen therapy, and the transportation of such people to specialised units for hyperbaric oxygen therapy. This system of analysis can also be used as part of a standard examination for assessing the exposure of a patient to carbon monoxide, both in hospital emergency departments and in medical response teams.

Key words

carbon monoxide poisoning,
reference standards,
hypoxia

INTRODUCTION

Carbon monoxide (CO) is a gas that the human senses are unable to identify. It is a colourless, odourless gas that does not cause any irritation and is tasteless. It has a molecular weight similar to air, with which it mixes freely in any proportions [1]. The basic toxic mechanism that affects the human body consists of building stable connections with metalloproteins, in particular haemoglobin. It is 200-300 times more effective in building such connections and thus displaces oxygen, occupying the so-called haemoglobin haem sites and creating carboxyhaemoglobin (COHb). The formation of this compound results in respiratory impairment and leads to tissue hypoxia [2, 3]. Around 10-15% of the carbon dioxide binds to plasma proteins. The 40-fold increase in myoglobin oxygen affinity causes the formation of non-reactive carboxymyoglobin (COMb), responsible for limiting oxygen consumption in the muscles, leading amongst others to serious cardiac dysfunction. Heart problems occur in 30% of patients with medium and severe poisoning, including arrhythmia, left ventricular systolic disorders and myocardial infarction [4, 5, 8]. It must be remembered that in addition to severe neurological symptoms such as loss of consciousness

or seizures, 40% of patients suffering from carbon monoxide poisoning also display chronic symptoms. Over a period of between 3 and 240 days there may be neurological after-effects including cognitive and memory impairment, depression, stupor, Parkinson's disease, personality disorders and other psychotic symptoms [6 7].

THE AIM

The aim of this article is to present a proposal for a three-step analysis of the symptoms of carbon monoxide poisoning in the pre-hospital setting.

REVIEW AND DISCUSSION

DIAGNOSIS OF CARBON MONOXIDE POISONING IN PRE-HOSPITAL CONDITIONS

Currently, in spite of a great many studies aiming to improve the treatment of people with carbon monoxide poisoning, the only effective antidote is oxygen therapy in hyperbaric conditions. Alternative pharmacological treatment aimed at protecting the patient from the later effects of carbon monoxide are today only at the experimental phase [8]. The use of hyperbaric oxygen therapy considerably shortens the half-life of carboxyhaemoglobin. When breathing atmos-

pheric air, this period lasts from 230 to 330 minutes. The application of passive oxygen therapy using 100% oxygen reduces this time to 30-90 minutes. The use of hyperbaric oxygen therapy at a pressure of 3 atmospheres reduces the half-life of carbon monoxide haemoglobin and restores correct supply of oxygen to the tissue in about 20 minutes [9-11]. Of key importance in treatment is the level of haemoglobin CO saturation, as well as the time period between exposure and the start of hyperbaric therapy. It is considered that for carbon monoxide poisoning, the period between the exposure and the commencement of hyperbaric therapy should not exceed six hours [10]. Unfortunately in practice, the effectiveness of hyperbaric therapy is negatively affected by a time delay between diagnosis at the site of an incident or in a hospital emergency department and transport to a medical facility equipped with a hyperbaric chamber. As a result this extends the actual period over which the therapy must be applied. There are also instances where an apparent improvement in a patient's clinical condition results in specialist treatment not being applied, which may result in later complications. An effective solution to this problem is three-step analysis of exposure to carbon monoxide poisoning, which allows for the implementation of procedures to shorten the time required for transport of the patient to a facility where they can receive the best care as quickly as possible.

For effective treatment of patients who have suffered carbon monoxide poisoning, the diagnosis of poisoning must be based on three factors. Analysis of the circumstances indicating potential exposure to the effects of CO, the appearance of symptoms of poisoning, and confirmation of this by measuring the level of carbon monoxide in the body (Fig. 1)

ANALYSIS OF FACTORS REGARDING EXPOSURE TO THE EFFECTS OF CARBON MONOXIDE

Carbon monoxide is a naturally-occurring gas but is produced mainly as a result of human action. Its principal source is the process of the incorrect

burning of coal, wood and other organic substances with an insufficient supply of oxygen. In the course of correct burning, exhaust gases from coal contain only 1% of carbon monoxide. In conditions where the burning is incorrect, the level of CO can be as high as 30% [12]. Today, apart from exposure linked to industry (coal mines, steelworks and gas plants), carbon monoxide can also be present in other places such as car workshops and garages due to vehicle engine exhaust gases, which contain around 11% of the gas. In people's home environment, the most common sources of CO are devices for heating and water heaters. Currently, around 3 million low efficiency coal-fired boilers and stoves are in use which do not guarantee correct conditions for the burning of fuel. In 11% of homes, the main source of heating is a fireplace or a wood burning stove [13]. At the same time, it is estimated that over half of the 6 million households that use the mains gas supply have continuous flow gas water heaters. If such devices are used incorrectly there can be an insufficient supply of air and incomplete burning of the gas, as a result of which toxic concentrations of carbon monoxide can develop. An example of this type of reduction in air flow is the installation of seals on windows and the blocking of ventilation grilles [14]. This type of behaviour is typical in the heating season, when the vast majority of poisonings occur. The autumn/winter period sees hospitalizations at levels 4-7 times greater than in the summer months, with the highest number in December and January [15, 16]. Another cause of carbon monoxide poisoning unconnected with heating devices are unfavourable meteorological conditions. In very high winds, there can be an inverse balance of air pressure between the interior of the home and around the chimney stack, which can result in a backflow of exhaust fumes into the house [14]. Another group of people who may be exposed to carbon monoxide are those who have been in a smoke-filled environment as the result of a fire. In this case, there may be other dangers apart from

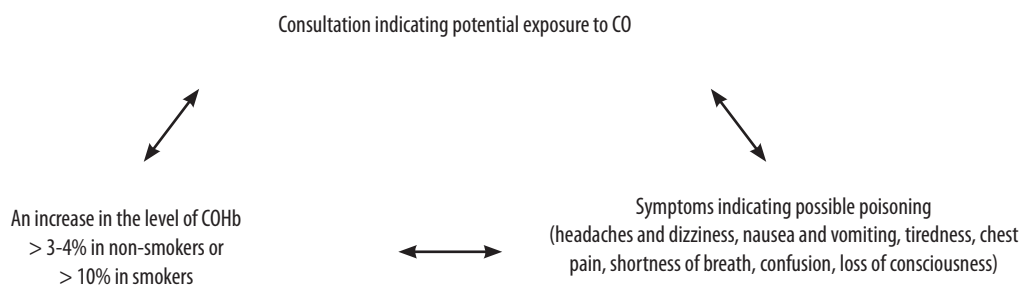


Fig 1. Three-step diagnosis of carbon monoxide poisoning.

Own elaboration based on: *Practice Recommendations in the Diagnosis, Management, and Prevention of Carbon Monoxide Poisoning* [2]

exposure to carbon monoxide, including exposure to other gases and burn injuries caused by the high temperature. In theory, taking into consideration the occurrence of potential sources of exposure and the seasonality of poisonings, when a medical operator receives a report of an incident and suspects poisoning, they should determine the type substance, the period of exposure, the number of people affected and the number of people who could have been subject to exposure. In practice, medical response teams are often sent on an intervention without full information that may suggest a danger of exposure to CO.

ANALYSIS OF SYMPTOMS INDICATING POSSIBLE CARBON MONOXIDE POISONING

In the daily practice of medical response teams, a common cause of interventions are 'feeling bad', 'headaches' or 'dizziness'. If a full consultation is not conducted, it is not only the patient's life that is in danger, but also the lives of the paramedics who will be in an environment with high levels of CO. Today, detectors are frequently used to determine levels of carbon monoxide in the air, or to test the concentrations of gas inside premises. Sensors that can detect the presence of CO use three principal methods: chemo-optical technology using, for example, Gell cells, devices using metal semiconductors and electrochemical detectors [17]. Unfortunately, not all intervention teams have such detectors or use them as standard practice for signalling the presence of excessive concentrations of carbon monoxide. In such situations, paramedics may encounter difficulties in making a correct diagnosis due to unusual symptoms of CO poisoning. Such symptoms may suggest flu-related conditions (headaches and joint pain, nausea), cardiological issues (disturbed heartbeat, indications of myocardial ischemia), or neurological conditions (headaches and dizziness, behavioural disorders, loss of consciousness) [18]. Carbon monoxide has a toxic effect on the human body even in very low concentrations. The occurrence and worsening of symptoms is a result of the concentrations of CO and the period of time for which the patient was in the toxic environment. Light headaches occur in people who have been exposed to a concentration of 100-200 ppm for 2 to 3 hours. At concentrations of 400 ppm, severe headaches occur after 60 minutes. A concentration of the gas at the level of 800 ppm causes dizziness, vomiting and seizures after only 45 minutes, leading to loss of consciousness and a coma after two hours. Concentrations above 1600 ppm cause severe headaches, vomiting and seizures after only 20 minutes of exposure, leading to death after 2 hours. Higher

concentrations cause disturbing symptoms after only a few minutes and lead to death after a period of between 3 and 30 minutes (Table 1) [19, 20].

Table 1. Carbon monoxide poisoning symptoms according to volumetric concentrations in the air

Concentration of CO in the air	Symptoms of poisoning
400 ppm	severe headache after exposure for 1 hour
800 ppm	dizziness, vomiting and seizures after exposure for 45 minutes, coma after 2 hours
1 600 ppm	severe headache, vomiting and seizures after exposure for 20 minutes
3 200 ppm	intense headache and vomiting after exposure for 5-10 minutes
6 400 ppm	headache and vomiting after 1-2 minutes
12 800 ppm	loss of consciousness after 2-3 breaths

The detectors mentioned earlier that can confirm the presence of carbon monoxide and in some cases determine the concentrations in parts per million (ppm), should be used as standard practice by medical response teams, especially in the autumn/winter period. However, it must be remembered that if a medical operator suspects carbon monoxide poisoning on the basis of a telephone consultation, they should, according to recommendations, tell the person reporting the incident to open the doors and windows to ventilate the room and lower the concentration of CO. In such situations, detectors often do not indicate the presence of carbon monoxide if the premises have been ventilated. It must therefore be assessed whether the patient's symptoms are the result of earlier concentrations of carbon monoxide. A final assessment of earlier levels can be carried out later by the fire service.

Lack of a detailed analysis of symptoms that could result either from the effects of carbon monoxide or an indicator of other diseases, e.g. flu-like illnesses or heart disease, as well as lack of detailed consultation with patients reporting recurring headaches and chronic fatigue, and often combined with an elevated level of Hb and an increased number of erythrocytes may result in no diagnosis of chronic poisoning being made. This may occur when the person exposed to harmful concentrations of carbon monoxide reports recurring worrying symptoms, but these diminish in

intensity after several hours away from the place of exposure due to ventilation in conditions where there is no exposure. According to data from the Centers for Disease Control and Prevention, over 40,000 visits every year to hospital emergency departments in the USA are related to carbon monoxide toxicity. At the same time, according to data from the agency, the actual figure is probably higher, and at least 11,000 cases remain undiagnosed every year [17, 21, 22]. It must therefore be estimated that around 25% of patients suffer from undiagnosed chronic carbon monoxide poisoning.

ASSESSING COHB LEVELS IN PRE-HOSPITAL CONDITIONS

In physiological conditions, the level of carboxyhaemoglobin in the human body is around 3-4%, with this level rising to 10% among smokers [2, 21, 23]. Worrying symptoms of poisoning increase proportionally to an increase in COHb in the body. At a level of between 10% and 30% there are increasing symptoms from light to severe, including headaches, loss of balance, feelings of tiredness, loss of breath and heart palpitations. A level of COHb in the range 30-50% is considered to be severe poisoning and is characterised by severe headaches and loss of balance, nausea and vomiting, hypotension followed by heart problems, tachycardia and tachypnoea and loss of awareness. A further increase in concentrations leads to weakness and muscle impairment, making it impossible for the victim to escape from the danger and making their survival dependent on assistance from outside [12]. However, the symptoms cannot be taken as any basis for determining the actual degree of poisoning the patient is suffering from, as their clinical condition is often dependent not only on the concentrations of CO and the period of exposure, but also on the victim's individual sensitivity.

The basic method for measuring the concentration of carboxyhaemoglobin in the blood is a laboratory test, however this is impossible at the site of an incident. Currently, in pre-hospital conditions, there are two non-invasive methods for evaluating the level of carboxyhaemoglobin. One of the non-invasive test methods is to determine the level of gas in exhaled air. When the breath is held, carbon dioxide diffuses in the lungs through the walls of the alveoli, and the level of carboxyhaemoglobin in the blood in the pulmonary capillaries obtains a balanced level of COHb with that present in the air bubbles [23]. During the test, the patient holds their breath for around 15-20 seconds, which allows the carbon dioxide to achieve the same level in the pulmonary capillaries as in the air bubbles. The patient then breathes out into the

test device, which uses an electrochemical method to take the measurement and then displays the result of the carbon monoxide level in ppm and in percentage of COHb in the exhaled air [23].

The next method consists of analysing various light wavelengths typical for individual types of haemoglobin using a special advanced pulse oximetry sensor. Standard pulse oximeters conduct the measurement using two wavelengths, 660 and 990 nm, but are unable to correctly measure the level of carboxyhaemoglobin [2]. Masimo Rainbow sensors, which are available as a dedicated module for a range of defibrillators, take measurements using eight different light wavelengths typical for individual types of haemoglobin. The data is sent to a detector, which calculates the levels of oxyhaemoglobin (HbO₂), methaemoglobin (MetHb) and carboxyhaemoglobin (COHb) [24, 25]. Incorrect parameter levels for which the norms are exceeded are displayed on the screen [26].

Devices which enable non-invasive assessment of the level of carboxyhaemoglobin in the patient's body do not provide conclusive data on the degree of poisoning, but in correlation with information on the visible symptoms and the circumstances of the possible exposure, enable a decision to be made on the implementation of the best path of treatment for patients exposed to the toxic effects of carbon monoxide.

TREATMENT OF CARBON MONOXIDE POISONING

The first step is to use detectors to examine the place where the incident occurred for the possible presence of carbon monoxide. If CO is confirmed in the air, the patient, other residents and the medical response team must be isolated or must evacuate the location. Initial assessment of the patient's vital signs should be extended to include a non-invasive test of the level of COHb in the body. At the same time, it must be remembered to also test those present in the same premises, even if they do not initially report any symptoms. After initial assessment confirms suspected CO poisoning, in a patient with preserved vital functions, oxygen therapy must be begun immediately using the highest concentration of oxygen available, taking into consideration the necessity of using instrumental opening of the airway and assisted ventilation. In recent years, there have been reports of beneficial effects being seen in the treatment of carbon monoxide poisoning victims using positive pressure ventilation (CPAP) via a face mask without the need for intubation [27-29]. Symptoms that accompany poisoning, such as loss of awareness resulting from increasing swelling of the brain and sei-

zures, should be treated according to locally applicable standards. Every patient must also be assessed for possible cardiac disorders.

In the literature there is no consensus that allows for uniform guidelines to be developed on indicators for applying hyperbaric oxygen therapy, however, it would appear to be appropriate to limit the period of time in which carbon monoxide can have a harmful effect on the body. Analysis of the three aspects of exposure to the effects of carbon monoxide shows that immediate treatment in a specialist facility must be undertaken for all pregnant women due to exceptional carbon monoxide affinity to foetal blood haemoglobin. Even if the level of COHb in a pregnant woman is not above 25% and there are no accompanying neurological or cardiac disorders that persist despite treatment with normobaric oxygen therapy, there is still a real danger of foetal death. The next group that require immediate hyperbaric oxygen therapy are patients with a confirmed level of COHb higher than 25%, in conjunction with reported loss of consciousness and pathological neurological symptoms, along with features of myocardial ischemia and heart arrhythmia [2, 10].

CONCLUSIONS

According to data on the website of the Polish National Health Service, in the years 2009-2015, 24357 people were hospitalised due to carbon monoxide poisoning. Among patients with medium and severe poisoning, only 40.4% were treated using hyperbaric oxygen therapy. At the same time, it is worth drawing attention to the results of research conducted in one of the facilities treating carbon monoxide poisoning patients in the USA. Of the 1711 patients treated at the facility, 1606 arrived with an earlier laboratory test result confirming the level of carboxyhaemoglobin in the blood. The need to apply hyperbaric oxygen therapy was determined in 105 patients based on a non-invasive test. In the results presented by the author, the average time after which hyperbaric treatment was commenced was around one hour shorter than when carbon monoxide poisoning had to be confirmed via a laboratory blood test [30].

Equipping medical response teams with tools allowing them to make an early assessment of the presence and level of carbon monoxide at the site of an incident and to non-invasively determine the level of poisoning would make it possible to develop a procedural algorithm. Taking decisions at the pre-hospital stage would shorten the time required for transporting a patient to a specialist facility and

would increase the number of patients treated with hyperbaric oxygen therapy, thus avoiding later complications caused by carbon monoxide poisoning.

The presented algorithm can be used to confirm carbon monoxide poisoning and to make a decision about the necessity of direct transfer of the patient to a center where oxygen hyperbaria can be used (Fig. 2).

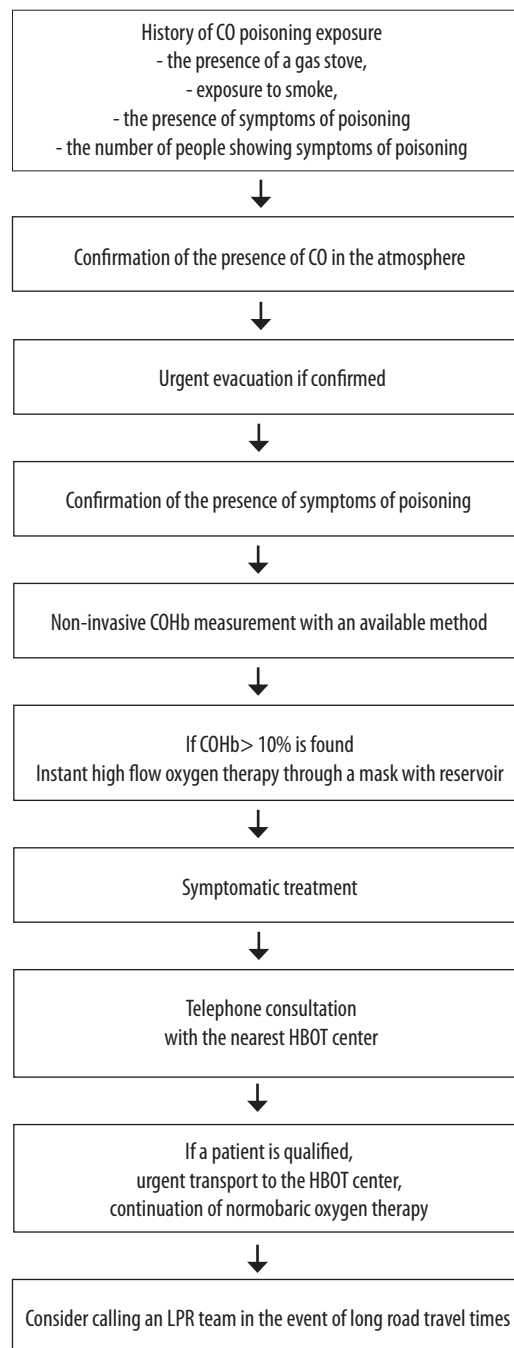


Fig. 2. Algorithm of emergency medical teams in a patient with suspected CO poisoning.

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CONFLICT OF INTEREST

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PARTICIPATION OF POLISH PARAMEDICS IN MISSIONS ABROAD – SELECTED ISSUES

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Abstract

Aim: Assessment of the preparedness of paramedics for mission trips. Evaluation of the mission as a place for professional development of paramedics. Assessment of the usefulness of the experience gained by paramedics on missions in working conditions in Poland. Analysing the attendance of paramedics on missions. Learning about personal opinions and experiences of selected participants of missions.

Material and Methods: The study was conducted between 01.2020 and 08.2020. The research group consisted of 20 paramedics of different ages. Data were collected using an electronic survey consisting of 22 questions and extended telephone interviews consisting of 33 questions. Statistical data obtained from the Redemptoris Missio Foundation were used to analyse attendance.

Results: The majority of survey participants rated their preparation for their first mission at a score of 3 ($f=0.45$) or 4 ($f=0.35$) on a 5-point scale. The most frequently used skill was foreign language, with 9 ($f=0.45$) respondents using it all the time and 9 ($f=0.45$) using it frequently. The paramedics experienced the greatest development in the area of non-medical skills ($f=0.6$) and in foreign language use ($f=0.5$). Most of the respondents rated the usefulness of the experience gained as 5 ($f=0.35$) or 4 ($f=0.25$) on a 5-point scale. Analysis of the obtained statistical data showed very low attendance of paramedics on missions compared to other medical professions. The interviews provided an in-depth look into the feelings and opinions of selected paramedics regarding missions, which were mostly consistent or similar.

Conclusions: The paramedics believe that they are sufficiently prepared to go on missions. Thanks to missions: they gain new experience, consolidate their knowledge and skills, exchange experience with medical personnel from all over the world. However, missions do not allow one to fully utilize their expertise in emergency medicine. Experience gained abroad is proved to be useful for paramedics in working conditions of Polish health care system. Attendance of paramedics on missions is very low, but there are a lot of potential areas where their knowledge and skills could be used.

Key words

emergency medical services,
paramedics,
medical mission,
volunteerism

INTRODUCTION

The development of civilization has contributed to the occurrence of threats, including, among others, increasing social stratification in individual countries and increasing environmental degradation. Western civilizations are responsible for some of them, especially in the so-called “third world countries”. Indirectly – through the negative influence of colonialism on countries in Africa, South America and Asia, as well as directly – through the increased exploitation of natural resources, which can lead to disasters and slavery among the local population [1, 2].

In response to the effects of these actions and a sense of collective responsibility for others, humanitarian organizations began to emerge, which brought together volunteers to provide assistance for those who needed it the most. Although the first such organization established by Henrei Dunant in 1863 is the Red Cross [3], it is only in the 1980s that a signifi-

cant growth in the number of charity organizations worldwide is observed [4].

In Poland, the first humanitarian organization with an international range – Polish Humanitarian Action – was established in 1992 [5]. In 1999, it was joined by the Polish Medical Mission [6] and in 2006 by the Polish Centre for International Aid [7].

The inspiration for writing this paper was and continues to be the problem of staff shortages

in health care facilities, including paramedics in developing countries and the ever increasing, but still small number of volunteers who are willing to take part in various types of missions.

AIM

Assesment of the preparedness of paramedics for mission trips. Evaluation of the mission as a place for professional development of paramedics. Assesment of the usefulness of the experience gained by para-

medics on missions in working conditions in Poland. Analysing the attendance of paramedics on missions. Learning about personal opinions and experiences of selected participants of missions.

MATERIAL AND METHODS

The study involved 20 Polish paramedics, including 15 men and 5 women, aged 25-50 years, who participated at least once in a mission at least once in their lives.

An online questionnaire of our own authorship was used to conduct the study. This tool consisted of 22 open-ended and closed-ended questions regarding, among other things: types and locations of missions, motivation of paramedics, requirements and preparation before going on missions, usage of their knowledge and skills, and future plans related to missions. In the questions concerning the evaluation of their preparation and usefulness of the gained experience, the respondents were asked assessment

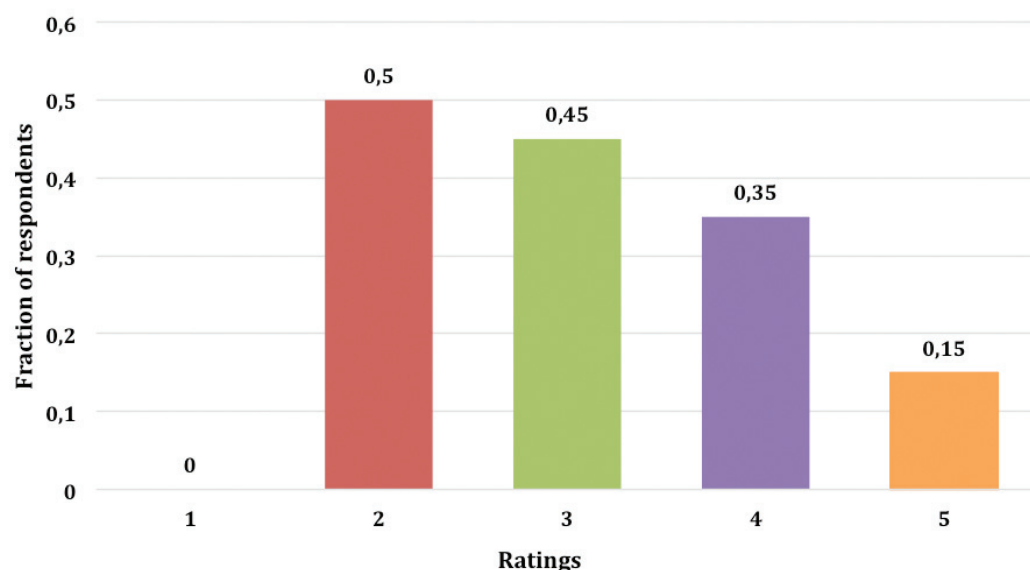


Fig. 1. Respondents' assessment of their preparation to go on their first mission.

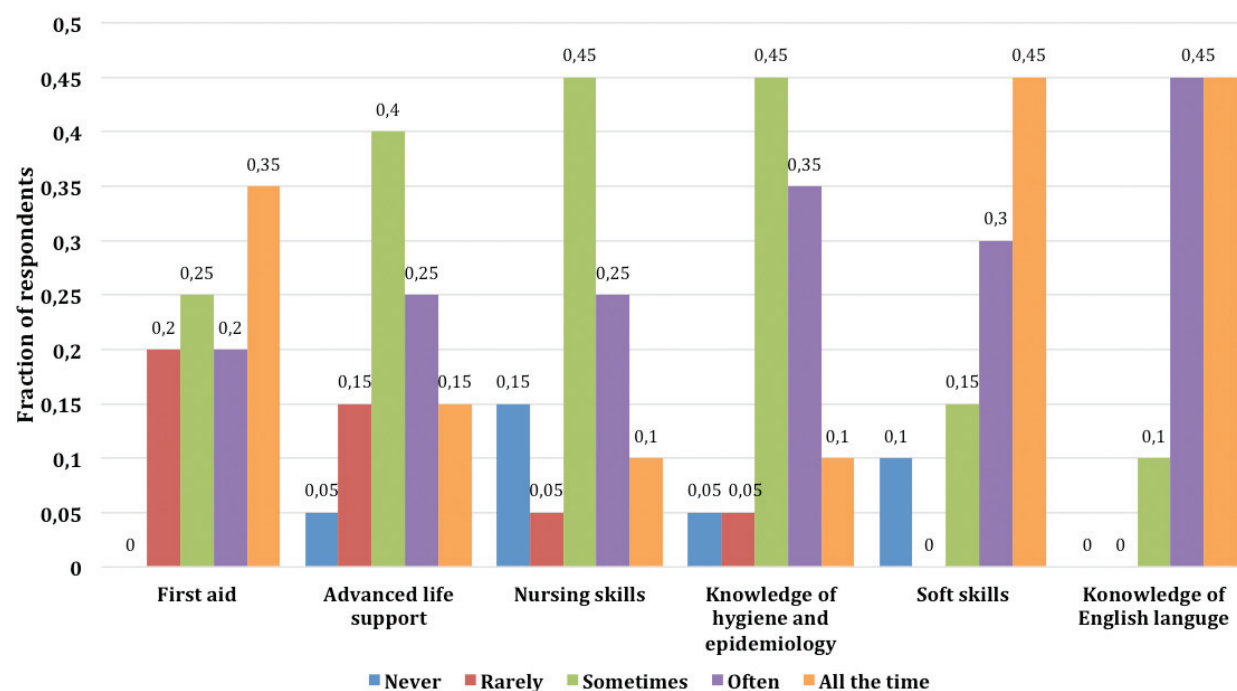


Fig. 2. Use of knowledge and skills during a mission trip.

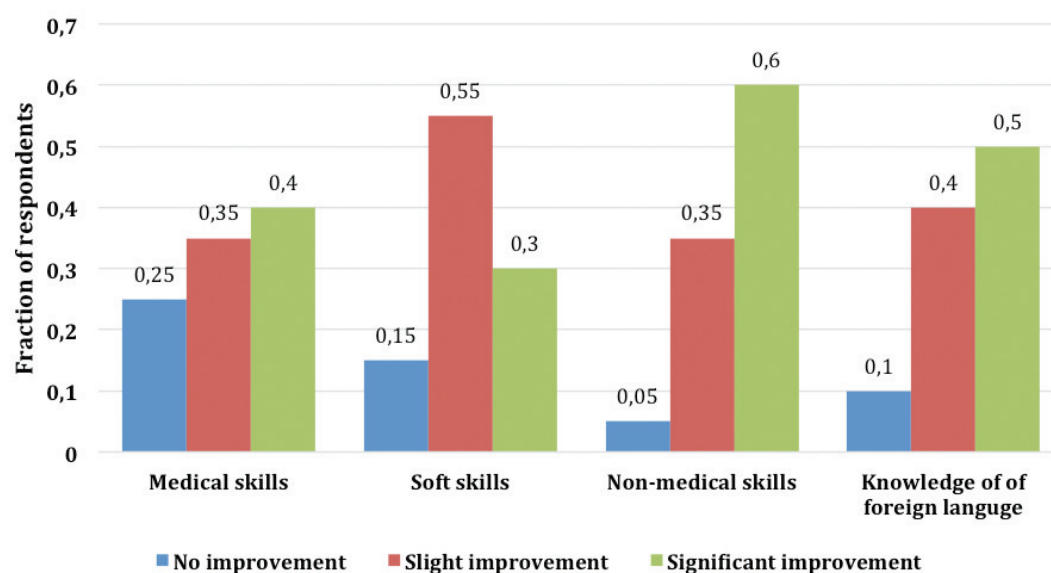


Fig. 3. Skill development during a mission trip.

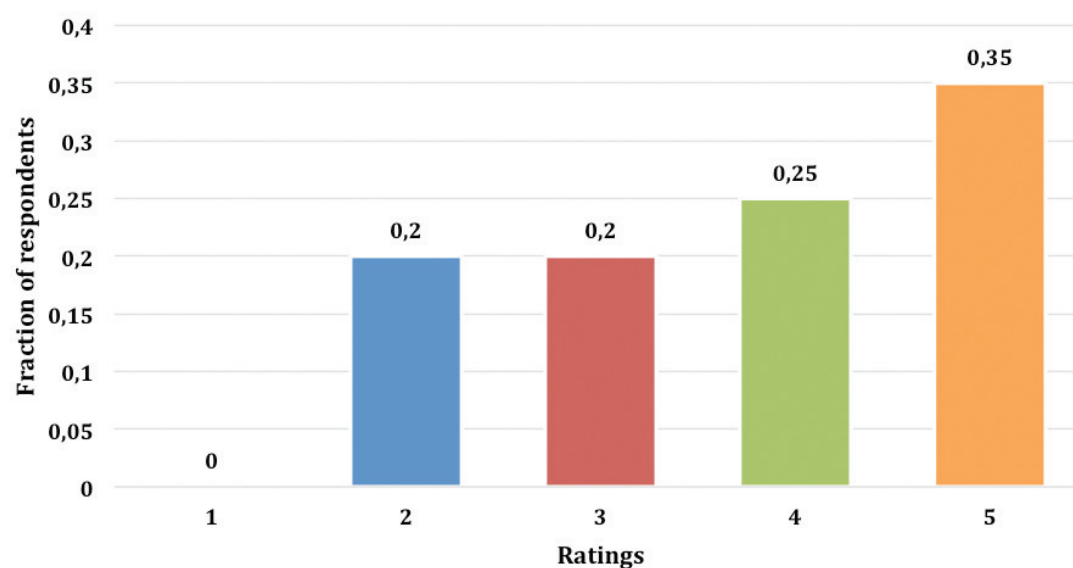


Fig. 4. Usefulness of experience gained on missions in the work of a paramedic in Poland.

of given aspect qualitatively on a scale from 1 to 5, where 1 meant the worst assessment and 5 the best.

The small number of study participants, due to the conditions of participation in the survey, prevented the collection of a representative sample group. For this reason, descriptive statistical analysis was applied to all partial values, and results are presented on a fractional scale (f). The fraction value was calculated in relation to the total number of responses given by the respondents to the question asked.

An extended interview was conducted with three medics who met the inclusion criteria.

The inclusion criteria were: higher education (minimum bachelor's degree) in emergency medicine, participation in at least two missions, the extraordinary nature of the mission, and its impact on personal and professional life.

The research tool for the extended interview was a script containing 33 questions about: basic information concerning the missions in which they participated; their motivation; preparation for the trip; the course of the missions, including the conditions on them; the medical personnel with whom they cooperated; observations about the trip itself and the

Table 1. Statistics from the Redemptoris Missio Foundation on medical representatives going on foreign missions through them.

YEAR	Medical Staff							Total
	Doctors	Dentists	Students	Nurses	Midwives	Paramedics	Others	
1991			6					6
1992								0
1993		1	6				1	8
1994								0
1995								0
1996	2		2					4
1997	4	2	3					9
1998	1			1				2
1999	5	1	4	1				11
2000			4					4
2001	3	1	4	2				10
2002	11		10				4	25
2003	2	2	6	1			1	12
2004			5					5
2005	2		4					6
2006	3		5					8
2007	2		2					4
2008	2		2				1	5
2009	1		2		1			4
2010	1		1	2				4
2011	3	1	5	1				10
2012	2	3	2	1				8
2013	3	2	2	1	2			10
2014	4	3		1	1	1		10
2015	7	2	4		2			15
2016	5	5	1			1		12
2017	5	7	1		1		3	17
2018	13	1	1	1	3	1	2	22
2019	12	8	2		1		8	31
	93	39	84	12	11	3	20	262

impact of the mission on their private and professional lives.

Transcripts were prepared from the recorded telephone interviews and analyzed for three guiding themes: life before and after going on missions; knowledge, skills, and experience gained on missions, safety, and experiences during missions.

In order to examine the frequency of paramedic trips, data obtained by the Polish Redemptoris Mission Foundation, which prepares and mediates medical personnel for medical, humanitarian, training and development missions, were analysed.

RESULTS

Most respondents (12) participated in a medical mission, 7 in a peacekeeping mission, 6 in a training mission, 3 in a development mission, and 2 in a humanitarian mission. 12 participated in a mission more than once. The paramedics participated in missions in: Asia (11 respondents), Africa (9 respondents), Europe (8 respondents), Australia and Oceania (2 respondents), South America (1 respondent).

The most popular organizations that mediated trips to missions were: Polish Centre for International Aid, Polish Military Contingents, Polish Medical Mission.

The majority of study participants – 9 ($f=0.45$), rated their preparation for their first mission as 3, 7 ($f=0.35$) as 4, and 3 ($f=0.15$) as 5 on a 5-point scale. Only one ($f=0.05$) study participant rated their preparation at 2, no one gave a rating of 1 (Fig. 1).

The skills most frequently used during the mission were: English language skills – 9 ($f=0.45$) responses “all the time”, 9 ($f=0.45$) “often”, 2 ($f=0.1$) “sometimes”) and soft skills (9 ($f=0.45$) responses “all the time”, 6 ($f=0.3$) “often”, 3 ($f=0.15$) “sometimes”, 2 ($f=0.1$) “never”. The respondents used also: knowledge about hygiene and epidemiology – 2 ($f=0.1$) “all the time”, 7 ($f=0.35$) “often”, 9 ($f=0.45$) “sometimes”, 1 ($f=0.05$) “rarely”, 1 ($f=0.05$) “never”, nursing skills – 2 ($f=0.1$) “all the time”, 5 ($f=0.25$) “often”, 9 ($f=0.45$) “sometimes”, 1 ($f=0.05$) “rarely”, 3 ($f=0.15$) “never”. First aid was used least often – 7 ($f=0.35$) “all the time”, 4 ($f=0.2$) “often”, 5 ($f=0.25$) “sometimes”, 4 ($f=0.2$) “rarely”, and advanced life support – 3 ($f=0.15$) “all the time”, 5 ($f=0.25$) “often”, 8 ($f=0.4$) “sometimes”, 3 ($f=0.15$) “rarely”, 10 ($f=0.5$) “never” (Fig. 2).

During the missions paramedics developed the most: foreign language skills – 10 ($f=0.5$) developed them significantly, 8 ($f=0.4$) developed them to a small extent, 2 ($f=0.1$) did not develop them at all, non-medical skills – 12 ($f=0.6$) developed them significantly, 7 ($f=0.35$) to a small extent, 1 ($f=0.05$) did not develop them at all. Medical skills were least developed – 5 ($f=0.25$) did not develop them at all, and 7 ($f=0.35$) to a small extent, soft skills – 3 ($f=0.15$) did not develop them at all, 11 ($f=0.55$) to a small extent (Fig. 3).

The largest group of respondents – 7 ($f=0.35$) rated the usefulness of experience gained on missions as 5 on a 5-point scale, 5 ($f=0.25$) as 4, 4 ($f=0.2$) as 3 and 4 ($f=0.2$) as 2 (Fig. 4).

Analysing the data obtained from the Redemptorist Mission Foundation, one can notice a systematic increase in the number of participants from all medical professions since the beginning of the statistics (Table 1). Over the years, several yearbooks can be noted in which the attendance of volunteers was significantly higher than neighbouring years, including: 1999, 2002, 2015, 2018 and 2019. This is mainly due to natural and humanitarian disasters occurring in the world in the years mentioned above and new medical projects coordinated by the Redemptorist Mission Foundation starting.

Also evident in Table 1 is the difference between the attendance of physicians, dentists and students, and the other medical professions, including paramedics, which account for one of the least numerous representations of medical professions. Extended interviews

were conducted with three paramedics. The first had 8 years of experience in the profession and had participated in 4 medical missions: in Ukraine (2 times), in Nepal, and in Lebanon. The second interviewee had 3 years of experience as a paramedic and 14 years of experience as a soldier and had participated in missions in Afghanistan, and also in Kosovo. The most recent paramedic had 20 years of professional experience and participated in nine foreign missions, including Georgia and Afghanistan, among others.

LIFE BEFORE AND AFTER THE MISSION

All interviewees indicated that they went on their first mission with established knowledge and experience. All three rated the trips positively and acknowledged that it had a positive impact on their personal and professional lives. For one of them, participation in missions influenced the decision to emigrate and also to start working as a paramedic in another country. Two medics emphasized that thanks to missions they appreciated access to running water or electricity, which are standard in Poland. All of them declared their willingness to go on another mission within 1-3 years. Expected destinations are: Iraq, Lebanon, Georgia.

KNOWLEDGE, SKILLS, AND EXPERIENCE GAINED ON MISSIONS

Participants in the interviews graduated with a bachelor's degree in emergency medicine and unanimously agreed that during missions they used the knowledge and skills gained on them. Each added, however, that medical experience gained in medical rescue teams in Poland or military experience from previous service proved more useful on the trips. Only one of the interviewees went on his first mission spontaneously and without much preparation, but this was due to the tense political situation in Ukraine. Two interview participants went through a detailed preparation process prior to their tours, during which they took part in a number of courses and trainings. Nevertheless, all rated their preparation for their first mission as good. All three acknowledged that they had developed their skills and gained new knowledge and experience through them. They also appreciated the opportunity to work with paramedics from other countries, which allowed them to exchange interesting experiences.

Two of them mentioned that non-medical skills such as foreign language skills, horseback riding and ability to move in the mountains were very useful.

During the interviews, a valuable remark was also made that one should not decide to go on such a trip immediately after graduation, but first gain relevant experience in Poland.

SAFETY AND SURVIVAL DURING THE MISSION

Opinions on mission safety were very divided. One of the medics, who participated in the stabilization mission in Afghanistan, despite the fact that he felt relatively safe during the mission, was constantly accompanied by a sense of threat to his life. The other participant on the mission in Afghanistan, despite the military nature of the mission, constantly felt safe and protected. A paramedic who went alone on a mission to Ukraine felt threatened only on the first trip, which was due to lack of prior preparation. One of the participants pointed out the very hard working conditions in Afghanistan and the poor medical facilities which he encountered there. The other however, dealt with better medical equipment than the one he worked on in Poland. Extreme feelings among the participants were caused by the different nature of the mission, different year of departure and different region. The two paramedics got to know the local communities, their traditions and culture. They also had opportunity to taste traditional cuisine, so these trips were memorable.

DISCUSSION

Our own research has shown that participation in a mission abroad in most cases positively affects the professional life of paramedics. The trips enriched the career of participants with new experiences, provided motivation for continuous improvement in their profession and allowed the exchange of knowledge and skills with medical personnel from around the world. In case of one of the respondents ($f=0.05$), participation in the mission even contributed to changing the country of residence and taking a job there. 18 ($f=0.9$) respondents expressed willingness to take part in another mission, and 15 ($f=0.75$) would encourage their friends to do so.

Opinions were divided concerning the use of skills, knowledge, and development in terms of emergency medicine on missions. Missions were not considered an appropriate place to acquire skills and knowledge in emergency medicine, but only to consolidate the one already possessed and to test one's skills in different conditions. Only 8 ($f=0.4$) of the respondents admitted that they used their knowledge and skills in advanced emergency medicine often or all the time during the mission. However, the trips were a good place to: use soft skills, develop non-medical skills, act without a plan and without preparation, make decisions under pressure, as well as use a foreign language – mainly English.

Experience gained on missions was considered useful in the paramedic profession by 12 ($f=0.6$) re-

spondents, and 6 ($f=0.3$) respondents indicated that the trip was an interesting career diversification, although missions rarely allowed to use specialized skills and knowledge in emergency medicine.

The attendance of paramedics on medical missions was very low and is not getting any better. It is questionable whether the reason for this is the usefulness of these professions in missions, since the presence of all medical professions, illustrated in Table 1, is needed for the proper functioning of the health care system. As one of the reasons for this state of affairs can be considered the small number of projects directed to the deficit professions, when many others focus exclusively on three groups – doctors, medical students and dentists. Selected projects offered by the Redemptorist Mission Foundation include: “Cardiologist in Africa”, “Dentist in Africa”, summer internships and medical volunteering for students. Another reason for this is the versatility of doctors and the possibility of using their skills in many situations – not only to provide assistance in health care facilities, but also to train staff in many specialist areas of medicine.

During the course of this study, despite attempts to reach many organizations, foundations, and community groups across the country, we were only able to obtain responses from 20 paramedics who had participated in mission trips.

The literature on the subject is scarce and the conclusions from the observations made are original and in agreement with the information available in the literature.

Jarosz [8] described medical volunteering in the Redemptorist Mission Foundation, analysed the attendance of various medical professions and presented the forms of preparing volunteers for missions. The following people went through the Foundation: physicians (93), students of the Karol Marcinkowski Poznań University of Medical Sciences (78), dentists (39), nurses (12), midwives (11), audiologists (4), paramedics (3), public health specialists (2), physiotherapists (1), other volunteers (13). Doctors played a dominant role in the above list, with the highest number of them leaving. Very low attendance of paramedics was also noticeable. The reason for this may be: the lack of projects aimed exclusively at paramedics, the focus of education mainly on non-hospital activities related to emergencies, as well as the relatively short presence of this profession in Poland. Jarosz [8] also notes a very important element of going on a mission, which is the preparation of volunteers before departure. It is necessary to develop and implement interdisciplinary training activities including the transfer of knowledge and skills in: prevention, diag-

nosis, treatment of tropical diseases, as well as international public health, cultural and social differences occurring in the area of mission centres operations, rules of conducting responsible aid activities in the area of the Global South, rules of maintaining safety, working conditions in mission hospitals and clinics.

This overlaps with the development of interdisciplinary training activities, which include the transfer of knowledge and skills in prevention, diagnosis, treatment of tropical diseases, as well as international public health, cultural and social differences occurring in the area of operation of missionary centres, principles of responsible assistance activities in the Global South, principles of safety and working conditions in missionary hospitals and clinics. This coincides with the responses of the participants in this study regarding the requirements they have to meet before leaving and the preparations for the trip.

Palion and Wieczorek [9] interviewed an experienced paramedic, a participant of many foreign missions. The main motivation of the paramedic to leave were new experiences and an attempt to find himself in the surrounding world. An important role was also played by the need for new experiences, testing themselves in unusual conditions, and constantly posing new challenges, which was also evident in the following study, this was also evident in this research. On the basis of the experiences gained, the interview participant listed the predispositions necessary to take part in medical missions, which included: openness, creativity, readiness to find oneself in new – unusual situations, and the ability to function well in a group in uncomfortable circumstances and under constant stress.

A study by Suchowiak et al [10] suggests that there is an opportunity to create a dedicated project for health professions less present in missions. The study also mentioned annual vaccination campaigns and the lack of appropriate personnel to facilitate them. This creates an area in which paramedics, for example, could become involved. Suchowiak et al [10] also described various nursing procedures that paramedics can perform, including physical examination on admission and administration of painkillers, which creates another opportunity for paramedics to be involved in these types of missions.

Lipska [11] describes the medical mission in refugee camps organized in Albania. In their everyday work, Polish physicians encountered various diseases. The most common were infections of the upper respiratory tract and gastrointestinal tract, as well as dermatological ailments. Exacerbations of chronic diseases related to discontinuation of permanently prescribed treatment were also a serious problem,

most likely due to lack of permanent access to health care, due to refugee status. An extensive vaccination campaign was conducted among the refugees during the first weeks of work. Surgeons at the makeshift infirmary treated injuries, gunshot wounds, and frostbite resulting from the several-day journeys through the mountains. There were often parasitic diseases, especially head lice. During the refugees' stay in the camps, the ill health of the patients was most often connected with various infections, and during the summer heat, a large group were dehydrated patients – especially the elderly and children, as well as those with sunburn. A constant pediatric problem was malnutrition or inadequate nutrition of infants and young children with symptoms related to deficiencies of appropriate vitamins and other micronutrients. There were also newborn babies among the patients, as well as women with advanced pregnancy. The above-mentioned activities could certainly be performed by paramedics, who have extensive experience in the above-mentioned activities. Paramedics could certainly be used, who have extensive experience in hospital emergency departments in Poland and who currently successfully support surgeons in wound care in the hospital conditions, as well as currently participate in the vaccination process against Sars-CoV-2. In the practice of medical rescue teams, paramedics also have to deal with the aforementioned illnesses on a daily basis, such as dehydration, defrost, burns. It is also not uncommon to deliver a baby in a non-hospital setting.

In his work, Pawłowski [12] described the impact of medical aid delivery on population evangelism at a mission place. One of the conclusions resulting from the work of the study was the need to increase the proportion and number of qualified medical personnel composed of representatives of the local population trained to provide medical services. The author pointed out the transition from a mission model in which personnel were dedicated solely to provide medical assistance for a specific period of time (medical missions), to those in which the emphasis is on training local personnel and making the local population independent of humanitarian aid (development and training missions). The paper [12] also addressed the significant problem of shortages of appropriate equipment to assist in local health and shortages of supplies – mainly medicines and bandaging materials. It is therefore required that specialized equipment and supplies be sent on future missions in addition to qualified personnel. Pawłowski [12] has classified external assistance in four dimensions: current communication with mission personnel and support for their work in difficult conditions, ap-

appropriate preparation of personnel by organizing training in tropical medicine, assistance in case of illness and periodic health examinations, supplementation of personnel, among others by sending medical students to missions, who are treated as additional help and can gain valuable knowledge and skills, supplying missing medical equipment and necessary materials and medicines. It is very likely that in this way students not only from the medical faculty, but also from the emergency medical service or nursing can be involved.

In this work, the issues raised are not fully exhausted. However, according to the authors, it is a very interesting observation on the participation of paramedics in missions so far dominated by doctors, nurses and medical students.

The development of civilization, on the one hand, has contributed to the extension and improvement of the quality of human life, on the other – new problems have arisen, including primarily the demographic crisis

on the African continent, the expansion of extremist groups in less stable regions of the world and the migration crisis in Europe. A detailed knowledge of the topic would be of great importance in the attempt to cope with the problems and use for this purpose, so far neglected, professional group of paramedics.

CONCLUSIONS

The paramedics believe that they are sufficiently prepared to go on missions. Thanks to missions: they gain new experience, consolidate their knowledge and skills, exchange experience with medical personnel from all over the world. However, missions do not allow one to fully utilize their expertise in emergency medicine. Experience gained abroad proves useful for paramedics in working conditions of Polish health care system. Attendance of paramedics on missions is very low, but there are a lot of potential areas where their knowledge and skills could be used.

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CONFLICT OF INTEREST

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EMERGENCY AND IMMEDIATE MEDICINE IN UKRAINE: ORGANIZATIONAL, LEGAL, CLINICAL ASPECTS

February 25, 2022, Poltava State Medical University, Poltava, Ukraine

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STATE OF EMERGENCY MEDICAL CARE FOR THE POPULATION OF UKRAINE

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Introduction: The first contact with the health care system, for many people, is when they call the emergency medical service, which provides timely detection of emergencies, resuscitation and further referral of critically ill patients for specialized care, and in many cases, the final treatment of existing conditions of health disorders. If there are problems with access to medical care, people often seek it only in case of acute illness or injury. An effective emergency medical care system is able to provide prompt care to patients with emergencies even before a clinical diagnosis is established, ensuring continuity of medical care and a safe patient route.

The aim: To investigate the state of emergency medical care in Ukraine.

Materials and methods: Statistical reporting form №22 (annual) "Ambulance station report". The method of descriptive analysis were used.

Results: On the territory of Ukraine, every citizen and any other person has the right to free, affordable, timely and high-quality emergency medical care provided in accordance with current legislation of Ukraine. Emergency medical teams are divided into general medical teams, about 963.7, paramedical teams – 1835.4, and specialized teams: cardio-resuscitation – 12.0, psychiatric – 34.8, neurological – 3.8, and others. The number of staff positions of emergency physicians is 1.69 per 10 thousand population (in 2019 – 1.78 per 10 thousand; in 2018 – 1.83 per 10 thousand population), in turn, the staffing is 59.17% of needs (2019 – 58.81%; 2018 – 61.17%); the number of paramedics and nurses is 4.79 per 10 thousand population (2019 – 4.62 per 10 thousand population; 2018 – 4.56 per 10 thousand population), the staffing is 81.74% (2019 – 81.52%; 2018 – 83.87%). According to the State Institution "Center for Medical Statistics of the Ministry of Health of Ukraine" in 2020 in Ukraine as a whole registered 172.3 calls to the ambulance per 1,000 population (in 2019 – 192 per 1,000 population; in 2018 – 178.87 per 1,000 population). Despite the reduction in the total number of ambulance calls, the percentage of unjustified ambulance calls is growing in 2020 by 14.9% of all appeals (in 2019 – 10.5%; in 2018 – 8.5%).

In 2020, in the structure of calls of emergency medical teams, diseases that occurred suddenly accounted for 71.4% (in 2019 – 71.9%; in 2018 – 73.2%), accidents, injuries and poisonings – 9.1% (in 2019 – 9.3%; in 2018 – 9.1%), for outpatient deliveries – 0.5% (in 2019 – 0.5%; in 2018 – 0.5%), for transportation of patients to hospitals and trauma centers – 4.1% (in 2019 – 3.7%; in 2018 – 4%). The share of ambulances in road accidents is 7.6% of all calls (in 2019 – 6.1%; in 2018 – 5.3%). The number of victims of road accidents in Ukraine in 2020 was 50,365 (in 2019 – 47,123; in 2018 – 45,781.0), among them the number of fatalities was 10.6% (in 2019 – 15.4%).

Conclusions: In order to reduce the number of injuries, infectious diseases and non-communicable diseases, the main focus of work is still on primary prevention, but strengthening the emergency medical care system can also make a significant contribution to reducing mortality and long-term disability.

Key words: emergency medical care, prevention

РАПТОВА СЕРЦЕВА СМЕРТЬ У ДІТЕЙ ТА ПІДЛІТКІВ

SUDDEN HEART DEATH IN CHILDREN AND TEENAGERS

Білоїваненко О. І.¹, Ляхова Н. О.², Голованова І. А.², Харченко С. В.²Biloivanenko O. I.¹, Liakhova N. O.², Holovanova I. A.², Kharchenko S. V.²¹ЗОЛОТОНІСЬКЕ УПРАВЛІННЯ ГОЛОВНОГО УПРАВЛІННЯ ДЕРЖПРОДПОЖИВСЛУЖБИ В ЧЕРКАСЬКІЙ ОБЛАСТІ²ПОЛТАВСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ¹ ZOLOTONOSHA DEPARTMENT OF THE MAIN DEPARTMENT OF THE STATE FOOD AND CONSUMER SERVICE IN CHERKASY REGION² POLTAVA STATE MEDICAL UNIVERSITY

Вступ: Останніми роками як в засобах масової інформації, так і в наукових виданнях спостерігається збільшення кількості інформації про погіршення стану здоров'я дітей шкільного віку. За даними науковців за останні 10 років захворюваність серед дітей зросла на 26,8%, високий рівень фізичного здоров'я виявлено лише у 0,32% юнаків та дівчат. Загальна захворюваність учнів закладів загальної середньої освіти України становить 64 – 71%, різноманітні відхилення у стані фізичного і психічного здоров'я мають до 90% здобувачів освіти.

Мета: Вивчення факторів, які призводять до раптової серцевої смерті дітей на уроках фізичної культури.

Матеріали і методи: Аналіз літературних джерел. Методи: бібліосемантичний, аналітичний, контент-аналіз.

Результати: Дитячий організм найуразливіший до дії пошкоджуючих факторів. Це обумовлює формування клінічно виражених розладів у дітей, виникають різні проблеми, захворювання та патології. Так, упродовж останніх років спостерігається негативна тенденція щодо зростання серцево-судинної патології у школярів. Це пов'язано з інформаційними переваженнями, гіподинамією, поширенням шкідливих звичок, стресогенними ситуаціями, модернізацією, звичкою до споживання «швидкої їжі». У віковій групі 12-14 показники захворювання на серцево-судинні захворювання зростають в декілька разів. Особливу увагу та занепокоєння викликають випадки раптової серцевої смерті дітей на уроках фізичного виховання у закладах загальної середньої освіти. Низка смертельних випадків під час занять фізичною культурою і спортом викликає стурбованість не тільки серед спеціалістів у сфері медицини та фізичного виховання, а й у суспільстві загалом. Причинами раптової серцевої смерті спеціалісти вважають нерозпізнані вроджені хвороби серця; гостре перенапруження здорового серця; недооцінена набута патологія серцево-судинної системи; рефлекторна зупинка серця; серцеві ускладнення. Одним з факторів, що може призвести до раптової серцевої смерті начебто здорової дитини, на думку кардіологів, є недостатня діагностика. Здоровій дитині ЕКГ знімається лежачи, в покої, а при напруженні та фізичному навантаженні можуть проявлятися порушення серцевого ритму, що приводять до фатальних наслідків. Ще однією проблемою є те, уроки фізичної культури в закладах загальної середньої освіти призначені виконувати оздоровчу функцію – зменшувати явища гіподинамії й гіпокінезії, поліпшувати адаптаційні можливості організму, сприяти його фізичному розвитку, проте навантаження на цих уроках розраховані на здорову дитину. Саме тому рівень та інтенсивність фізичних навантажень повинні бути індивідуальними для кожної дитини і відповідати не тільки її загальній фізичній підготовленості, але й враховувати захворювання, проведені профілактичні щеплення, самопочуття в день уроку тощо. Сьогодні перед викладачами фізичного виховання, дитячими тренерами з різних видів спорту стоїть проблема контролю за станом серцево-судинної системи організму учнів, що покладає на них велику відповідальність.

Висновки: Таким чином, проблема раптової кардіальної смерті дітей та підходи до її вирішення суттєво залежать від виявлення та усунення факторів ризику виникнення функціональних та морфологічних порушень з боку серцево-судинної системи у дітей. Гостро стоїть питання щодо організації профілактичних скринінгових обстежень, які передбачають застосування навантажувальних тестів з використанням ЕКГ та ехокардіографічної візуалізацією серця. Особливого значення набуває необхідність забезпечення закладів освіти, охорони здоров'я, місць проведення тренувань та змагань необхідним обладнанням для надання невідкладної допомоги, а також навчання навичкам серцево-легеневої реанімації не тільки медичного, а й іншого персоналу. Також необхідно налагодження правильного збалансованого харчування в закладах освіти та організація санітарної просвіти для роз'яснення батькам необхідності дотримання принципів здорового принципу життя для їх дітей.

Ключові слова: раптова серцева смерть, діти і підлітки.

Key words: sudden cardiac death, children and adolescents.

HOW TO ORGANIZE MEDICAL CARE FOR BURN DISEASE

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Introduction: The topic we have chosen is quite relevant, because the burn injury is very specific and usually unpredictable, because the whole body is involved in the pathological process.

The aim: To study the changes in the body in burn disease and the principles of medical care for the injured patient.

Materials and methods: In the study, we used the experimental method, modeling and forecasting.

Results: Burn disease is the body's response to severe burn injury, which irritates, damages and kills many skin receptors with the subsequent replacement of all internal organs and systems and disruption of all types of metabolism. During the burn disease there are the following periods: burn shock; acute burn toxemia; septicotoxemia (lasts until complete recovery of lost skin and elimination of infectious complications); recovery. During the study on rats with experimental burn disease revealed changes in the activity of enzymes in various organs: pancreas, kidneys, liver, salivary glands and in parallel changes in the activity of enzymes in the blood. This causes metabolic disorders, lipid peroxidation processes in the body and can lead to negative consequences. Therefore, to prevent this reaction and changes in the body, it is advisable to properly organize medical care for the injured patient in the initial stages. Pre-hospital care for burns is highly effective, but requires skilled action to prevent injury: reduction of the traumatic effect of exogenous hyperthermic factors in order to limit the damage to deeper tissues; providing emergency resuscitation. Hospital therapy in the initial stages should be associated with minimizing burn shock and prevention of organ failure, and subsequent stages of treatment should be aimed at correcting external defects to prevent such negative phenomena as massive scars, muscle contractures.

Conclusions: Taking into account the results obtained during the study, the negative impact of the damaging factor caused by burns is determined not only on the site of damage, but also on the body as a whole, causing pathological changes in the functioning of most body systems at the molecular level. This indicates that the injured patient should be properly cared for in the early stages; pre-hospital care for burns is highly effective, but requires skilled action to prevent injury.

Key words: burns, medical care, internal organs

ТЕЛЕМЕДИЦИНА – ДИСТАНЦІЙНЕ НАДАННЯ ЛІКАРСЬКИХ ТА КОНСУЛЬТАЦІЙНИХ ПОСЛУГ

TELEMEDICINE – REMOTE PROVISION OF MEDICAL AND CONSULTING SERVICES

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ПОЛТАВСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ

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Вступ: У поняття, що розглядається, входить дуже широке коло завдань і рішень. У загальному вигляді вони поділяються на дві великі категорії: “лікар-пацієнт” та “лікар-лікар”.

Мета: Вивчити використання телемедицини як дистанційного надання лікарських та консультаційних послуг.

Матеріали і методи: Проаналізовані законодавчі та галузеві нормативні матеріали.

Результати: Незважаючи на поширену думку про те, що телемедицина — напрям молодий і поки що мало використовується на практиці, свою історію він почав задовго до появи комп'ютера за часів телеграфів. Власне консультації фахівців по телефону також можна умовно віднести до цієї сфери. У той же час перший сеанс відеоконференцз'язку в якості інструменту для телемедицини був проведений в 1965 році. Це була трансляція операції із заміни аортального клапана на штучне серце, яку асистував видатний кардіохірург Майкл ДеБейкі. Тому розвиток телемедицини особливо важливий в кардіології, оскільки небезпека серцево-судинних захворювань часто полягає в гострому несподіваному початку й атиповій клінічній картині, що не дозволяє самим пацієнтам, а часто і дільничним лікарям поліклініки швидко й правильно оцінити ситуацію, що у свою чергу може призвести до смерті пацієнта. Широкого розвитку набула система дистанційної цілодобової невідкладної консультативної кардіологічної допомоги з можливістю безпосереднього передавання ЕКГ по телефонних лініях. Це дозволяє в 3–9 разів скоротити час із моменту появи перших симптомів захворювання до надання кваліфікованої медичної допомоги в повному обсязі, що в багатьох випадках допомагає зберегти життя й здоров'я пацієнтів. У разі пандемії вірусних інфекцій, коли кількість заражених людей, безліч територій поширення зростають з неконтрольованою швидкістю, вирішальну роль грає швидке реагування медичних працівників. Якщо єдиним виходом є жорстка самоізоляція, телемедицина залишається єдиним доступним інструментом охорони здоров'я.

Висновки: Впровадження телемедицини надає переваги, в першу чергу, для пацієнтів, які потребують в підвищенні ефективності та якості лікування, в прискоренні передачі інформації про результати обстежень між різними спеціалізованими клініками без транспортування хворого (особливо у критичних випадках), в проведенні дистанційних (телемедичних) консультацій вузькими спеціалістами у територіально віддалених медичних установах, в проведенні лікарських консилиумів (телеконференцій) з фахівцями лікувальних закладів незалежно від місця їх розташування, в уникненні помилок через нерозбірливий почерк лікарів, в зменшенні термінів обстеження пацієнтів.

Ключові слова: телемедицина, дистанційна допомога, консультативна допомога, ефективність та якість лікування, лікар-пацієнт.

Key words: telemedicine, remote care, counseling, efficiency and quality of treatment, doctor-patient.

FEATURES OF EMERGENCY CARE FOR VENOUS THROMBOEMBOLISM AT THE PRIMARY LEVEL

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Introduction: The prevalence of deep vein thrombosis (DVT) reaches 160 cases per 100,000 population. The incidence of DVT in surgical patients reaches 80% and is the cause of 3-15% of deaths from pulmonary embolism (PE) without treatment. In this case, the incidence of PE reaches one case per thousand of the population and is the cause of death of 3-15% of patients in the hospital.

The aim: To improve the results of diagnosis and medical care in patients with venous thromboembolism at the primary level of medical service.

Materials and methods: Materials were clinical data of patients, international clinical protocols, observation methods and analytical.

Results: Diagnosis of DVT is still a challenge, especially at the primary level. The diagnosis is based not only on the anamnesis, data obtained during the examination and determination of the risk of DVT on the Wells score. The results of determining the D-dimer blood test and Doppler Ultrasound of the veins are decisive. If there is a clinical picture of PE, an ECG, consultation with a cardiologist, echocardiography and angiopulmonography are also indicated. If there is evidence of DVT or PE, a consultation with a vascular surgeon is necessary. A patient with DVT may not be hospitalized if his condition is stable, there are no complications of DVT, low risk of bleeding and medical care provided. In all the patients, anticoagulant and compression therapy should be started immediately. Patients with ascending thrombophlebitis, severe DVT, its complications should be hospitalized in urgent surgery. When there is PE with impaired vital functions intensive care needs. In the presence of low-risk PE, the patient may be hospitalized in the therapeutic department with subsequent outpatient treatment.

Conclusions: High-quality care for patients with venous thromboembolism at the primary level should be aimed not only at a full examination of the patient, but also to the using of modern tactics and treatment of such patients.

Key words: deep vein thrombosis, pulmonary embolism, primary care, tactics

ANALYSIS OF EMERGENCY MEDICAL CARE FOR OUT-OF-HOSPITAL CHILDBIRTH IN CHERNIVTSI REGION IN RECENT YEARS*Krasnova O. I.¹, Pluzhnikova T. V.¹, Belousova N. O.²*¹ POLTAVA STATE MEDICAL UNIVERSITY, POLTAVA, UKRAINE² BUKOVYNIAN STATE MEDICAL UNIVERSITY, CHERNIVTSI, UKRAINE

Introduction: Outpatient births are births that take place outside the walls of a specialized medical institution (maternity hospital). Outpatient births occur at home, in the cabin of an ambulance, in outpatient clinics, in transport and elsewhere. Most often such births occur in premature pregnancy. In full-term pregnancy, outpatient births occur in women who have given birth many times. Outpatient delivery is usually rapid or premature. Timely arrival of the emergency medical team to the patient significantly reduces the risk of complications and mortality, including in outpatient deliveries.

The aim: To analyze the work of the municipal enterprise "Chernivtsi Regional Center for Emergency Care and Disaster Medicine" for 2018–2020.

Materials and methods: The data of the reporting of the Chernivtsi regional center for the last years served as materials, the statistical method, the system analysis and the system approach were used in work.

Results: The rate of calls for emergency care for outpatients and pathology of pregnancy in 2020 decreased by almost 2.4 times compared to 2018. The number of trips by emergency medical teams to rural areas has slightly increased. The rate of timely arrival of teams to the patient has significantly decreased. In rural areas, the arrival rate of emergency medical teams to the patient indicates 65% of emergency trips in 10 minutes and 52% of emergency trips in 20 minutes. One of the problematic issues is the workload of the emergency medical service of Chernivtsi region with unusual non-core challenges. The main areas of work of the "Chernivtsi Regional Center for Emergency Care and Disaster Medicine" are: improving the material and technical base of the enterprise, saving budget and own funds, efficient use of material and human resources, locating the subscriber by phone, initial sorting of calls by urgency, control of repeated calls.

Conclusions: In the districts it is necessary to further staff the teams of emergency medical care units with full-time medical staff in order to ensure round-the-clock work. Improve the interaction of the operational dispatch service of emergency medical care centers with primary health care centers and clinics of Chernivtsi in case of emergency. View clinical patient referral routes.

Key words: emergency medical care, out-of-hospital childbirth, analysis

КОМПЛЕКСНИЙ ПІДХІД ДО ПРОВЕДЕННЯ УРГЕНТНОЇ САНАЦІЇ В КЛІНІЦІ ДИТЯЧОЇ ХІРУРГІЧНОЇ СТОМАТОЛОГІЇ

COMPREHENSIVE APPROACH TO EMERGENCY SANITATION IN THE CLINIC OF CHILDREN'S SURGICAL DENTISTRY

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Вступ: Вибір методик і фармакологічних препаратів для проведення місцевого знеболення на даний час досить виважений. Однак за умов ургентної хірургічної санації, чи при наданні іншої невідкладної допомоги, маніпуляції супроводжуються больовими відчуттями, які можуть бути обумовлені різними патологічними механізмами, що потребує диференційованого підходу до індивідуалізації тактики лікування в кожному конкретному випадку. При цьому доводиться враховувати ступінь залучення нооцептивних больових рецепторів, що в значній мірі обумовлює інтенсивність і особливості больового синдрому. Але при роботі з дітьми лікарі стикаються з проблемами, що стосуються вибору перш за все, методики і визначення анестетика, який доцільніше використовувати в тому чи іншому випадку. Найчастіше це класичні традиційні методи – інфільтраційна, провідникова, регіональна, а на даний час все більшого поширення набувають парадонтальні та пульпарні анестезії. Однак передбачити поведінку пацієнтів неможливо, навіть при використанні психологічного впливу в доопераційному періоді. Неконтрольована реакція організму при емоціональному стресі під час проведення стоматологічного втручання може призводити до певних ускладнень, які мінливі у часі.

Мета: Покращити умови для підвищення ефективності надання ургентної стоматологічної хірургічної допомоги дітям за поліклінічних умов.

Матеріали та методи: Дослідження стосується 128 пацієнтів, у яких проводили оцінку їх загальносоматичного стану та психоемоціонального статусу за стоматологічною клінічною шкалою, яка виражалася в балах. Додатково визначали частоту пульсу. Ця процедура виконувалася перед початком лікування і після його завершення. Для подальшої роботи із загальної кількості обстежених дітей після тестування для поглибленого вивчення отриманих результатів було залучено 36 осіб віком від 7 до 12 років. Відповідно до оцінювання за шкалою вони мали психоемоціональний показник від 0 до 1 бала. Враховуючи вікові особливості поведінкових реакцій та їх емоціональних проявів, обстеження проводилися відразу по завершенню всіх маніпуляцій і через 1 годину з метою встановлення ефективності психотерапевтичних заходів, спрямованих на корекцію страху.

Результати: Всім дітям надавалася спеціалізована допомога у вигляді ургентної хірургічної санації порожнини рота і мова йшла про загострення хронічних форм періодонтитів тимчасових зубів. Слід зауважити, що у всіх дітей перед початком лікування психоемоційний стан був однаковим і становив від 0 до 1 бала, а частота пульсу коливалася від 92 до 110 уд./хв. Із усіх існуючих раціональних методик профілактики негативного відношення дітей при спілкуванні з лікарем-хірургом-стоматологом нами була обрана найбільш проста – психотерапевтичне відволікання, яке включало елементи переконання, рольових ігор, розваг та абстрагування. Ми звернули увагу на те, що чим уважніше дитина сприймає інформацію, тим вона краще піддається впливу і переймається конкретним сприйняттям ситуативної реальності. Проведення рольових ігор, які відволікають від негативних думок, дозволяє сформувати хоч і тимчасовий, але специфічний стереотип поведінки дитини, що значно полегшує роботу лікаря. Перевага цього виду корекції психоемоційного стану полягає в тому, що вона не потребує додаткових витрат, спеціального обладнання, а лише вимагає компетенції медперсоналу. Результати дослідження дозволили встановити, що за таких умов сугестивної підготовки після проведення анестезії і вилучення причинного зуба у дітей прискорювався пульс до 120-133 уд./хв., і у всіх така реакція була однотипною. Слід зауважити, що навіть через 1 годину у 47% пацієнтів він залишався на тих же величинах, а у 53% нормалізувався. Що стосується бальної оцінки психоемоційного статусу, то слід відмітити, що вона зростала до 2 балів відразу після оперативного втручання у всіх випадках і у 33% випадків зберігалось навіть через час по завершенню всіх маніпуляцій.

Висновки: Таким чином, застосування раціональної психотерапії у дітей на хірургічному стоматологічному прийомі за амбулаторних умов при ургентній санації порожнини рота, дозволяє зменшити негативний вплив на їх психоемоціональний статус та створити сприятливі умови для роботи дитячого лікаря-хірурга-стоматолога. Питання, пов'язані з підвищенням ефективності стоматологічного забезпечення, слід розглядати як комплекс заходів, які дозволяють знизити вираженість ступеня їх лабільності з врахуванням можливостей індивідуального, диференційованого підходу до вирішення цього непростого питання.

Ключові слова: ургентна хірургічна санація порожнини рота, діти, комплексний підхід

Key words: urgent surgical sanitation of the oral cavity, children, a comprehensive approach