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CARDIAC FUNCTION IN PATIENTS WITH CORONARY ARTERY DISEASE

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DOI: 10.36740/EmeMS202001101 **ORIGINAL ARTICLE**

CARDIAC FUNCTION IN PATIENTS WITH CORONARY ARTERY DISEASE PREPARED FOR CORONARY ANGIOGRAPHY

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Abstract

Introduction: Cardiovascular diseases are one of the major health issues in the world. One of the factors that adversely affects the cardiovascular system is the acceleration of heart rate.

The aim: Assessment of heart rate in patients with coronary heart disease depending on age and gender, as well as determination of patients ability to measure heart rate and to interpret the results.

Material and methods: The study included 100 patients, both genders (62% men), aged from 45 to 84 years (67.61 ± 9.22 years) with diagnosed coronary heart disease, directed to coronarography, hospitalized in the Department of Invasive Cardiology of the University Hospital in Białystok. The data has been gathered using own questionnaire (38 questions), NYHA and CCS scale.

Results: The majority of patients do not know how to measure their heart rate correctly. Subjects with higher education level and under 65 years of age more often declared the knowledge about the correct heart rate value. Only 7.9% of women and 11.3% of men performed heart rate measurements by themselves. Elderly patients less frequently performed heart rate measurements (p=0.017) than those under 65 years of age. As many as 84.2% of women and 75.8% of men believed that the value of the heart rate affects their health.

Conclusions: 1. Lack of patients' knowledge about the impact of heart rate on the cardiovascular status and lack of self-monitoring may lead to further disease development and deterioration of health. 2. Therapeutic education performed systematically on the subject of heart rate measurement, proper lifestyle and diet are important elements in improving the health of patients with coronary heart disease.

Key words

heart rate, measurement, patients' knowledge, cardiovascular diseases

INTRODUCTION

According to the World Health Organization (WHO), in 2002, 16.7 million people died worldwide due to cardiovascular diseases, including 4 million people in Europe, 55% of which were women and 43% were men. The most common cause of death resulting from cardiovascular disease was in 50% coronary heart disease [1]. One of the factors that adversely affects the cardiovascular system is the acceleration of heart rate. Many studies have shown that accelerated heart rhythm may lead to atherosclerotic changes, cardiomyopathy, arrhythmia and increases the risk of acute coronary syndromes. Numerous studies show that the accelerated heart rate increases the possibility of sudden death. On the other hand, decreasing the heart rate to about 60 beats/minute in subjects with ischemic heart disease favors a lower incidence of cardiovascular complications. In subjects with accelerated heart activity, in addition to pharmacotherapy, healthy lifestyle, proper diet, regular physical activity and elimination of emotional tensions and stress are essential. An important and often overlooked factor that may prevent cardiovascular disease is systematic measurement of heart rate [2].

The aim of the study was to assess the heart rate in patients with coronary heart disease depending on age and gender as well as on co-morbidities and applied treatment. The skills of measuring the heart rate by the patients and interpreting the obtained results have been determined.

MATERIAL AND METHODS

The study included 100 patients, both genders (62% men), aged from 45 to 84 years (67.61 ±9.22

years) with diagnosed coronary heart disease, hospitalized in the Department of Invasive Cardiology, University Hospital in Białystok. Data has been collected using own questionnaire containing 38 questions on the course of coronary heart disease, health status and lifestyle, evaluation of heart rate and patients' demand for health education about the disease. In addition, the severity of symptoms of heart failure (NYHA scale) and the scale of angina pectoris classification based on the severity of symptoms (CCS) have been used. The approval of the Bioethical Commission of the Medical University of Bialystok has been obtained for conducting the research. The collected data has been subjected to quantitative, percentage and statistical analysis using Spearman's rank correlation and Pearson's linear correlation in the PQStat v. 1.4.0 software. Statistical significance has been established as $p \leq 0.05$.

RESULTS

The largest group (79.0%) were patients over 61 years of age. The average age was 67.6 ±9.22 (median 69). The duration of the disease in more than half of patients (56%) was shorter than 5 years. In 23% of patients, coronary heart disease was diagnosed more than 10 years ago. The average duration of coronary heart disease in the study group was 8.4 ±10.2 years (median 5). The most common co-morbidities among the patients were: atherosclerosis (78%), hypertension (72%), previous myocardial infarction 58%, diabetes 17%, nephrolithes 6%, anemia 5%, hyperthyroidism 4%, history of stroke 16%. The most frequently performed procedure was coronary angiography (92%) (Table 1).

The medicines most commonly used by patients were anticoagulants (69%). More than half of the surveyed patients received beta blockers (55%). Approximately 40% of patients have been treated with statins and ACE inhibitors. The majority of subjects (92%) have been hospitalized 1 to 5 times. The average number of hospitalizations is 3.4 ±2.8 times (median 3). In the majority of patients surveyed (84%), the severity of NYHA symptoms has been assessed as I and II degree, and in 9% – III degree. 7% of patients revealed severe cardiac insufficiency (NYHA fourth stage). In 42% of patients, the stage of angina pectoris according to CCS has been evaluated as I degree, in 33% II degree, in 5% III degree, in 20% of patients IV degree of angina pectoris. It has been found that the type of heart failure does not depend on gender (p=0.742), place of residence (p=0.501) and education level (p=0.744). The degree of heart failure was significantly higher in elderly patients, i.e. after the age of 60 (p = 0.004). The data is presented in Table 2.

Table 1. Characteristics of examined group.

Characteristics of examined group		n	[%]
Gender	Women	38	38,0
	Men	62	62,0
Place of residence	City	65	65,0
	Countrywide	35	35,0
Education	Primary	29	29,0
	Secondary	52	52,0
	Academic	19	19,0
Financial source	Pension	63	63,0
	Professional work	20	20,0
	Disability pension	11	11,0
	Agriculture work	4	4,0
	Unemployed benefit	2	2,0
Co-morbidities	Artherosclerosis	78	78,0
	History of heart attack	58	58,0
	Hypertension	72	72,0
	Diabetes	17	17,0
	History of stroke	16	16,0
	Urolithiasis	6	6,0
	Anemia	5	5,0
	hyperthyroidism	4	4,0
	Cholelithiasis	3	3,0
Invasive cardiological treatment	Coronarography	92	92,0
	Percutaneous transluminal coronary angioplasty (PTCA)	32	32,0
	Coronary artery bypass graft (CABG)	8	8,0
	Eloectrostimulator implementation	3	3,0
	Bypass change	1	1,0
NYHA	I degree	42	42,0
	II degree	42	42,0
	III degree	9	9,0
	IV degree	7	7,0
CCS	I degree	42	42,0
	II degree	33	33,0
	III degree	5	5,0
	IV degree	20	20,0

In patients aged 45-60 years, the first class of CCS occurred in more than half of the patients (57.1%). Whereas class II advanced angina pectoris occurred in 36.8% women and 30.6% men. Class 21 angina pectoris was found in 21% of men surveyed. There is no statistically significant relationship between the severity of angina pectoris and gender (p=0.778), age (p=0.087) and patient residence (p=0.398) (Table 3).

The correct body mass based on the BMI index has been found in 16% of people. Obesity has

Table 2. Classification of severity of heart failure symptoms according to NYHA, considering gender, age, place of residence.

	Gender		Age (years)		Place of residence	
	Woman	Man	45-60	61-84	Countrywide	City
NYHA	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
I degree	17 (44,7)	25 (40,3)	15 (71,4)	27 (34,2)	15 (42,9)	26 (40,6)
II degree	15 (39,5)	27 (43,5)	4 (19,0)	38 (48,1)	12 (34,3)	30 (46,9)
III degree	3 (7,9)	6 (9,7)	2 (9,5)	7 (8,9)	3 (8,6)	6 (9,4)
IV degree	3 (7,9)	4 (6,5)	0	7 (8,9)	5 (14,3)	2 (3,1)
p	0,742		0,004		0,501	

Table 3. The stage of angina pectoris according to CCS, considering gender, age, place of residence.

	Gender		Age (years)		Place of residence	
	Woman	Man	45-60	61-84	Countrywide	City
CCS	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
I degree	16 (42,1)	26 (41,9)	12 (57,1)	30 (38,0)	18 (51,4)	23 (35,9)
II degree	14 (36,8)	19 (30,6)	6 (28,6)	27 (34,2)	8 (22,9)	25 (39,1)
III degree	1 (2,6)	4 (6,5)	1(4,8)	4 (5,1)	3 (8,6)	2 (3,1)
IV degree	7 (18,4)	13 (21,0)	2 (9,5)	18 (22,8)	6 (17,1)	14 (21,9)
p	0,778		0,087		0,398	

Table 4. BMI in regard to gender, age, place of residence.

		Gender		Age (years)		Place of residence	
BMI		Woman	Man	45-60	61-84	Countrywide	City
Correct	N	0	1	0	1	0	1
	[%]	0	1,6	0	1,3	0	1,6
Overweight	N	8	8	5	11	6	10
	[%]	21,1	12,9	23,8	13,9	17,1	15,6
I degree obesity	N	18	33	10	41	17	34
	[%]	47,4	53,2	47,6	51,9	48,6	53,1
II degree obesity	N	11	20	6	25	12	18
	[%]	28,9	32,3	28,6	31,6	34,3	28,1
Morbid obesity	N	1	0	0	1	0	1
	[%]	2,6	0	0	1,3	0	1,6
p		0,728		0,466		0,960	

Table 5. Hypertension measure in the right and left radial artery.

		Right radial artery		Left radial artery	
Hypertension measure		I measure	II measure	I measure	II measure
<60 (beats/minute)	N	28	20	16	11
	[%]	28,0	20,0	16,0	11,0
61-80 (beats/minute)	N	68	77	83	87
	[%]	68,0	77,0	83,0	87,0
>80 (beats/minute)	N	4	3	1	2
	[%]	4,0	3,0	1,0	2,0

been diagnosed in more than half of the patients (51%) and in 31% – its II degree. The mean BMI values in the examined group of patients were 28 ±4.3 kg/m² (median 28.1 kg/m², Max 41.6 kg/m², Min. 14.4 kg/m²). Among the examined men, 53.2% revealed I degree obesity and women – 47.4%. II degree obesity regarded similar percentage of women (28.9%) and men (32.3%). The lack of statistically significant differences between BMI and gender (p=0.728), age (p=0.466) and place of residence

Table 6. Heart rate in right artery in the first measure in regard to the history of cardiovascular disease surgical treatment.

Heart rate in right artery in the first measure		Coronarography		PTCA		CABG	
		YES	NO	YES	NO	YES	NO
<60 beats/minute	N	26	2	12	16	2	26
	[%]	28,0	28,6	37,5	3,5	25,0	28,3
61-80 beats/minute	N	64	4	17	51	6	62
	[%]	68,8	57,1	53,1	75,0	75,0	67,4
>80 beats/minute	N	3	1	3	1	0	4
	[%]	3,2	14,3	9,4	1,5	0	4,3
p		0,692		0,448		1,0	

Table 7. Heart rate in left artery in the first measure in regard to the history of cardiovascular disease surgical treatment.

Heart rate in left artery in the first measure		Coronarography		PTCA		CABG	
		YES	NO	YES	NO	YES	NO
<60 beats/minute	N	16	0	6	10	1	15
	[%]	17,2	0	18,8	14,7	12,5	16,3
61-80 beats/minute	N	76	7	25	58	7	76
	[%]	81,7	100,0	78,1	85,3	87,5	82,0
>80 beats/minute	N	1	0	1	0	0	1
	[%]	1,1	0	3,1	0	0	1,1
p		0,278		0,865		0,838	

Table 8. Self-measurement of heart rate in regard to gender, age and place of residence.

Self-measurement of heart rate		Gender		Age (years)		Place of residance	
		Woman	Man	45-60	61-84	Countryside	City
YES	N	3	7	5	5	3	7
	[%]	7,9	11,3	23,8	6,3	8,6	10,9
NO	N	35	55	16	74	32	57
	[%]	92,1	88,7	76,2	93,7	91,4	89,1
p		0,587		0,017		0,768	

Table 9. Self-measurement of blood pressure in regard to gender, age and place of residence.

Self-measurement of blood pressure		Gender		Age (years)		Place of residance	
		Woman	Man	45-60	61-84	Countryside	City
YES	N	31	46	19	58	21	55
	[%]	81,6	74,2	90,5	73,4	60,0	85,9
NO	N	7	16	2	21	14	9
	[%]	18,4	25,8	9,5	26,6	40,0	14,1
p		0,399		0,100		0,002	

Table 10. The awareness of normal heart rate in regard to gender, age and education level.

The awareness of normal heart rate		Gender		Age (years)		Education level		
		Woman	Man	45-60	61-84	primary	secondary	academic
YES	N	10	19	9	20	5	15	9
	[%]	2,0	30,6	42,9	25,3	17,2	28,8	47,4
NO	N	26	43	11	58	23	36	10
	[%]	6,0	69,4	52,4	73,4	79,3	69,2	52,6
p		0,992		0,040		0,033		

Table 11. The influence of heart rate on health condition in respondents opinion in regard to their gender, age, place of residence and education level.

Influence of heart rate		Gender		Age (years)		Place of residence		Education level		
		Woman	Man	45-60	61-84	city	countryside	primary	secondary	academic
YES	N	32	47	20	59	20	58	17	44	18
	[%]	84,2	75,8	95,2	74,7	57,1	90,6	58,6	84,6	94,7
NO	N	0	5	0	5	5	0	4	1	0
	[%]	0	8,1	0	6,3	14,3	0	13,8	1,9	0
p		0,402		0,044		0,0001		0,001		

(p=0.960) has been stated among the patients surveyed (Table 4).

Mean values of the heart rate measured on the right radial artery in the first measurement were 66 ±7.41 (median 66; Max. 88; Min. 54), while the mean values in the second measurement were 67 ±7.2 (median 67; Max. 92; Min. 50) (Table 5).

The mean values of the heart rate measured during the first measurement on the left artery were 67 ±5.9 (median 67; Max. 84; Min. 52), while the mean values in the second measurement were 68 ±6.31 (median 68; Max. 86; Min 50). Analyzing the value of the heart rate measured on the right radial artery, in the first measurement it has been observed that more than half of the surveyed patients (68%) was within the range of 61-80 beats per minute. Only 4% of patients revealed a heart rate above 80 beats per minute. The results are presented in Table 5. No statistically significant differences between the values of the heart rate on the right radial artery in the first measurement depending on the history of coronarography (p=0.692), PTCA (p=0.448) and CABG (p=1.0) have been observed. The data is presented in Table 6.

No statistically significant differences between the value of heart rate in left radial artery and the coronary angiography (p=0.278), PTCA (p=0.865) and CABG (p=0.838) have been stated. The results concerning the value of the heart rate measured on the left radial artery in the first measurement, taking into account gender, age and place of residence are presented in Table 7.

The self-measurement of blood pressure is performed by 77% of patients, while the measurement of heart rate by only 10% of subjects. Only 33% of the patients surveyed admitted they measure blood pressure every day, and 38% of patients measured blood pressure 2-3 times a week, 12% very rarely. Significant correlation between the independent measurement of the heart rate and the age of the patients has been observed. Elderly patients were less likely to perform an independent heart rate measurement (p=0.017). Patients admitted that the main reason for lack of heart rate control is lack of knowledge and skills in this area. Data on self-measurement of heart rate by patients, taking into account the gender, age and place of residence of respondents are presented in Table 8.

Subjects living in the city significantly more often measured blood pressure than those living in the countryside (p=0.002). Data regarding independent measurement of blood pressure by patients, including gender, age and place of residence of respondents are presented in Table 9.

Nearly 1/3 of the patients surveyed declared knowledge of the correct heart rate. The majority of subjects (79%) responded that the heart rate affects health. Only 5% of patients reported that their heart rate had no effect on their health, and 16% did not know whether their heart rate affects their health. The majority of surveyed women (84.2%) and men (75.8%) considered that the value of the heart rate affects their health. Only 8.1% of the men surveyed answered that the heart rate did not affect their health. A significant relationship has been found between age and education level, and the knowledge of normal heart rate value. Patients with higher education level and under 60 years of age declared significantly more often to have knowledge about the correct heart rate (p=0.035 and p=0.004, respectively) (Table 10).

Statistically significant differences have been found between knowledge on the impact of heart rate on a patient's health state and age (p=0.44), place of residence (p<0.001) and education level (p=0.001). Patients under the age of 60 were more concerned that the value of the heart rate affects their health than older patients. Subjects with higher education level and those living in the city had significantly greater awareness of the impact of heart rate on their health (Table 11).

All patients surveyed were interested in increasing the range of knowledge about coronary heart disease. The largest group of patients would like to obtain information on: principles of heart rate measurement (88%), methods of prevention of coronary pain (75%), diet (70%), proceedings at the time of coronary pain (70%), physical activity (52%), the way of taking medicines (50%), methods of dealing with stress (27%).

DISCUSSION

In recent years, more and more studies indicate that the accelerated heart rate is associated with developing atherosclerosis and other diseases of the cardiovascular system. Palatini et al. in studies conducted over the last 25 years, stated that resting heart rate has not yet been recognized as a prognostic factor and therapeutic target [3,4]. However, some epidemiological studies indicate that resting heart rate may be important in predicting the occurrence of cardiovascular diseases, including hypertension, myocardial infarction, coronary heart disease, circulatory failure and left ventricular dysfunction [5].

In 1945, Lewy et al. presented a relationship between the acceleration of heart rate and an increased risk of death caused by heart disease. During the study, it has been found that the risk of these diseases was the highest in the group of patients with HR>100 beats per minute [6].

In other studies conducted by Jouven et al. on a group of men aged 42-53 who were suspected of having heart disease, a relationship has been found between the incidence of deaths caused by myocardial infarction and an increase in resting heart rate [7]. Shaper et al. showed in their studies that patients with tachycardia are more susceptible to the development of heart arrhythmia, which is induced by myocardial ischemia. They also found that patients with coronary heart disease and heart rate above 90 beats per minute are more likely to have myocardial ischaemia than people whose heart rate was significantly lower [8].

In the GUSTO-1 study in patients with a history of myocardial infarction, accelerated cardiac function revealed to be a significant prognostic factor associated with 30-day mortality, similar to age, low systolic blood pressure, and anterior wall location of myocardial infarction [9] .

Kannel in his research presented the relationship between heart rate and mortality in relation to women and men. The results showed that a stronger relationship between total mortality and accelerated cardiac activity has been found in men, but it also had a significant impact on women [10].

In the Framingham Heart Study, CORDIS Study, it has been found that heart rate has the same effect on mortality rates as smoking or the presence of high systolic blood pressure [11]. In a study conducted by Hjalmarson et al., patients who had been hospitalized for a recent myocardial infarction with a heart rate ranging from 50-60 beats per minute were significantly less likely to die from other causes than infarct. Subjects with a heart rate out of this range were at higher risk of complications after a myocardial infarction [12]. The GISSI-2 and GISSI-3 trial showed that when patients were admitted to the hospital with increased heart rate, in-hospital mortality increased in 6-month follow-up in patients who had had a myocardial infarction and were treated with thrombolysis [13]. In the SPRINT-2 trials in patients with mild heart failure, in whom HR> 90 beats per minute, the risk of death during hospitalization was twice as high as in patients with HR <70 beats per minute [14].

Jouven et al. suggest that the accelerated heart rate not only affects myocardial ischemia, but may also cause severe arrhythmias and sudden cardiac death. In turn, Janse et al., in their work, add that in addition to myocardial ischemia caused by accelerated cardiac function, the phenomenon of re-entry, i.e. recurrent agitation and the appearance of increased oxidative stress may be important [10,15].

The association of the probability of myocardial ischemia caused by accelerated heart action was also confirmed in other studies [10, 15]. Similar observations about the occurrence of death were demonstrated by Diaz et al. by examining a group of men and women diagnosed with coronary heart disease [16].

Levine, in his work stated that reducing the heart rate from 70 beats per minute to 60 beats has an effect on life extension from 80 to 93.3 years [17].

In turn, Kaplan et al. showed a relationship between the stage of atherosclerosis development and the occurring differences in heart rate. In Sutton-Tyrell et al. studies, the relationship between accelerated heart rate and atherosclerotic lesions that appeared in the carotid arteries of older people participating in the SHEP study has been presented [18, 19]. Perski et al. showed that the accelerated heart rate increased the development of atherosclerosis three times in people who had a history of myocardial infarction. In subjects with low heart rate, where HR was <63 beats per minute, the changes in the vessels were much less significant [20]. In turn, Beere et al. in their studies conducted in macaques showed that performing a sinus-atrial node ablation, and thus a decrease in the heart rate leads to a reduction in the formation of atherosclerotic lesions in the arteries [21].

Own research shows that in the group of subjects included in the study, in which heart rate measurements have been performed, the main co-morbidities were atherosclerosis (78%) and arterial hypertension (72%). Traub et al. suggested that the accelerated heart rate may lead to vascular endothelial dysfunction, which increases its permeability and enables penetration of fats into the vessel walls. An increase in sympathetic nervous system tension leads to an increase in blood pressure and metabolic disorders [22].

Many studies also indicate that stress may be a factor that affects the normal heart rhythm. According to Salmon long-term stressful situations, a fast pace of life may contribute to the occurrence of cardiovascular disease. Also short-term mental stress may contribute to induction of arrhythmia and transient myocardial ischaemia [23]. In a study conducted by Bilińska et al., it has been observed that the cause of myocardial ischemia and arrhythmia in patients with stable coronary heart disease may be stress. They confirmed their outcomes by conducting a mental stress provocation test in patients [24].

Snall et al., in their research showed that during stressful situations, an increase in adrenaline and noradrenaline occurs, which increases the strength of the contraction of the heart muscle and cause an acceleration of heart rate [25]. Tylka describes stress as a factor that accelerates the onset of myocardial infarction, contributes to the development of hypertension, may cause myocardial ischemia and causes arrhythmias and leads to sudden cardiac death [11].

The study showed very low awareness of patients about the importance of heart rate, regardless patient's declarations on the subject. Patients do not control heart rate due to lack of knowledge and skills in this area.

CONCLUSIONS

1. Lack of patients' knowledge about the impact of heart rate on the cardiovascular system and lack of heart rate self-management skills may lead to further disease development and worsening of health.
2. Therapeutic education conducted systematically on the subject of heart rate measurement, proper lifestyle and diet are important elements in improving the health of patients with coronary heart disease.

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DOI: 10.36740/EmeMS202001102 **ORIGINAL ARTICLE**

ASSESSMENT OF THE KNOWLEDGE OF POLICE OFFICERS OF THE POLICE PREVENTION DEPARTMENT IN THE FIELD OF FIRST AID

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Abstract

Introduction: This text attempts to assess the level of knowledge in the field of first aid on the example of officers of the Police Prevention Department in Lublin.

The aim: The main motive for conducting own research was the specificity of the service, which is based on direct contact of the policeman with people who need help. The same requirement becomes a policeman's possession of theoretical and practical knowledge, as it will often be the reason for the success of rescue operations.

Material and methods: The study was conducted at the turn of October and November 2019, which was attended by 104 officers of the Police Prevention Department in Lublin. Among the research techniques, I used my own survey created for the purpose of verifying the topic of the work, consisting of the metric and ten closed questions with four answer variants checking knowledge in the field of first aid. The intended effect was to put each officer as a first aid person in order to check the current knowledge of the respondents in this respect.

Results: The results obtained indicate that police officers of the Police Prevention Department in Lublin have knowledge of first aid at a sufficient level (44.6% of correct answers), however, it is unstructured and requires supplementation. Particularly noteworthy are the lack of knowledge in the area of: the use of adrenaline in anaphylactic shock, the supply of acetylsalicylic acid in case of suspected myocardial infarction, the management of open chest pneumothorax and the diagnosis of stroke.

Conclusions: There are thematic spaces for first aid that should be updated by respondents. The first aid curriculum should be harmonized and the knowledge provided should be based on current guidelines. In addition, when providing first aid, policemen should consider the aspect of their own security.

Key words

first aid,
emergency medical services,
police officer,
Police Prevention Department,
security,
psychological support

INTRODUCTION

Aspects related to first aid and broadly understood issues related to rescue constitute an almost inseparable part of the tasks that police officers carry out during their daily service. The definition of first aid is set out in the Act of 8 September 2006 on the State Emergency Medical Services [1], according to which first aid will be defined as a set of actions taken to rescue a person in a state of sudden health emergency performed by a person at the scene of an accident, including also with the use of medical devices and equipment for medical devices within the meaning of the Act of 20 May 2010 on medical devices and medicinal products [2] dispensed without a doctor's prescription, authorized on the territory of the Republic of Poland.

The specificity of the service, which is based on direct contact with people in need of help, requires a police officer to have theoretical and practical knowledge, since this will affect the lives of others and the success of the rescue operations. It is therefore necessary to constantly train skills and systematically update knowledge on issues related to first aid.

In addition, service in the Police Prevention Department also has an impact on the scope and conditions in which first aid is provided. This is also supported by a wide range of services performed by officers of the Police Prevention Departments. On the one hand, it will be patrol service, on the other, operation in a compact unit.

Providing first aid to victims by a policeman is on the one hand the fulfillment of the oath and the conduct in accordance with the ethos of the policeman's work, on the other hand an obligation that results from a number of legal acts. The policeman acquires knowledge in the field of first aid at an early stage of basic training at one of the Police Schools in Poland, where he performs 42 didactic hours. In addition,

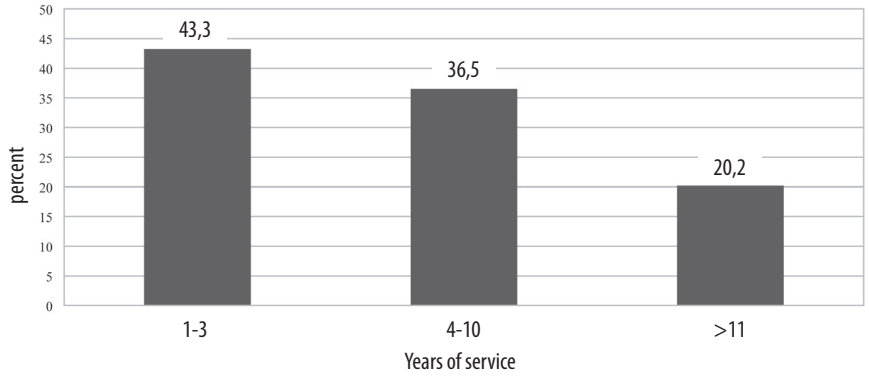

Fig. 1. Service experience.
Source: Own study

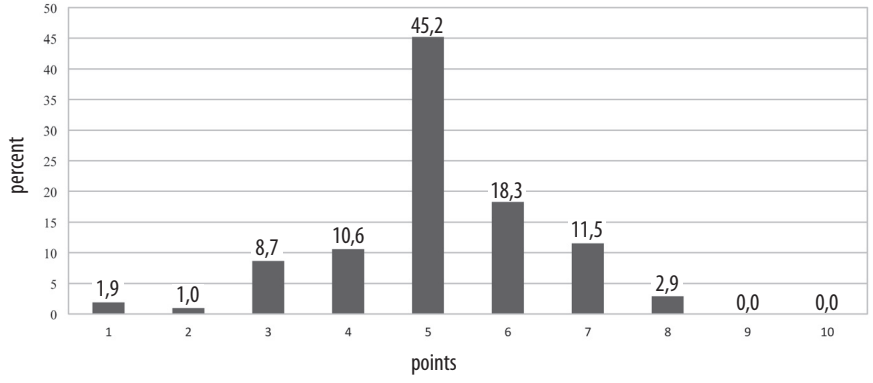

Fig. 2. Subjective assessment of own knowledge of first aid.
Source: Own study

officers of the Police Prevention Department acquire knowledge and improve skills in first aid during specialist courses and as part of local professional development. Policemen also have the opportunity to participate in a qualified first aid course, giving the professional title of a lifeguard, which allows systematizing the knowledge acquired so far in order to effectively cooperate with the services cooperating with the State Emergency Medical Service.

THE AIM

In this text, the main attention has been focused on assessing the level of knowledge in the field of first aid on the example of officers of the Police Prevention Department in Lublin. At the same time, an attempt was made to determine to what extent police officers provide first aid and what problems they encounter during their daily service.

MATERIAL AND METHODS

The survey was conducted at the turn of October and November 2019, which was attended by 104 officers of the Police Prevention Department in Lublin. The seniority of police officers ranged from one to 23 years of service. The most numerous group were policemen from 1 to 3 years of service – 43.3%, the service duration of respondents from 4 to 10 years was 36.5%, while officers with over 11 years of service accounted for 20.2% of all respondents (Fig. 1) .

In this work, among the research techniques, I used my own survey created for the purpose of verifying the subject of the thesis, consisting of the metric and ten closed questions with four answer options, one-choice testing of knowledge in the field of first aid, constructed on the basis of the guidelines of the European Resuscitation Council from 2015 [3]. The intended effect was to put every officer in the role of a first aid person in order to check the current knowledge of the respondents in this regard.

Before answering the first aid question, officers were asked to provide answers regarding the use of acquired knowledge and skills in daily service. The questions also related to issues related to the practical approach to the injured person, scope of first aid, maintaining safety during performed activities and obtained psychological support after situations under severe stress.

The next stage of the work was an attempt by the subjects to make a subjective assessment of the level of first aid knowledge (Fig. 2). The presented results show that 45.2% of officers rated their knowledge skills at 5 points. This accounted for almost half of the respondents, interestingly no person stated their knowledge at the level of 9 and 10 points, while the

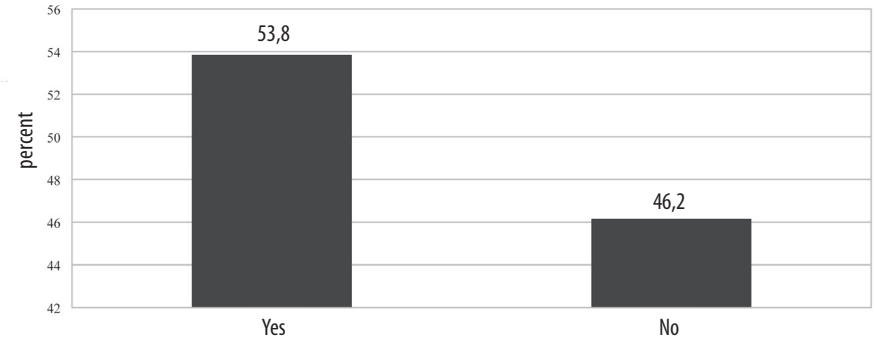

Fig. 3. Do you give first aid during your service?
Source: Own study

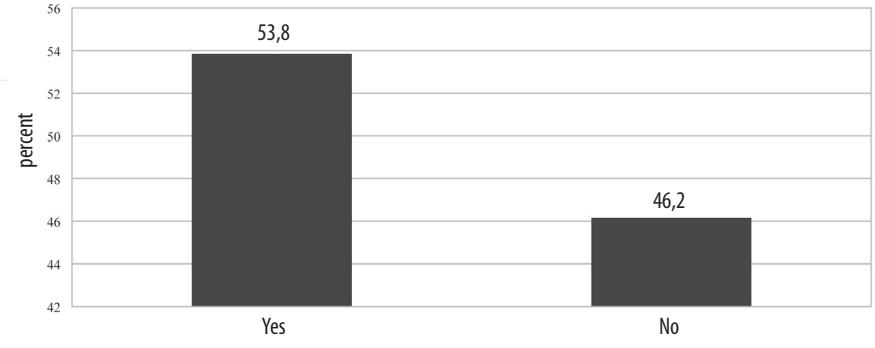

Fig. 4. Have you ever omitted your own safety during your activities?
Source: Own study

second result among the respondents, i.e. 18.3%, was six-point self-assessment. The average self-assessment presented by all respondents about first aid was 51.1%.

The aspect related to the provision of first aid by officers of the Police Prevention Department in Lublin during the service concerned the next part of the text (Fig. 3). 56 respondents admitted to the situation in which first aid was given, which constituted 53.8% of all respondents. The scope of activities that were undertaken while providing assistance, the police listed, among others:

- cardiopulmonary resuscitation;
- providing first aid to a drowned person;
- placing the injured person in a safe position;
- stabilization of the broken lower limb;
- applying pressure dressing for massive bleeding;
- providing assistance to the victim in hypothermia.

Similarly, the results were presented in which 53.8% of respondents admitted to the situation in which they felt fear for their own lives, giving the reason for skipping safety during performed activities (Fig. 4).

Going one step further, the officers were asked whether they received psychological support after a rescue operation or intervention in high stress. All respondents, i.e. 104 policemen, replied that they had never received help in any form after traumatic situations. The research results obtained in this area make us reflect on the specificity of the daily service of police officers.

RESULTS

The first question concerned the aspects of providing first aid in the case of people suffering from asthma, who were subject to intervention, and in whom the general state of health deteriorated, including the problem with breathing (Fig. 5). The majority of respondents, i.e. 64.4%, answered the question correctly, choosing a procedure in which they helped the victim take a bronchodilator [3]. A group of 24% of policemen chose the answer in which they gave nothing as a first aid method, because they did not know how to do it, and for safety they called the Medical Rescue Team.

The next question concerned the principles of providing first aid in the event of chest pain suspected of myocardial infarction (Fig. 6). In this case, the correct answer, i.e. for victims with chest pain, should be given orally 150-300 mg of aspirin to chew [3], provided only by 23.1% of respondents. Most officers, as much as 56.7% chose the answer in which they did not give any medicine, because in first aid you can not do it. 14.4% of respondents considered

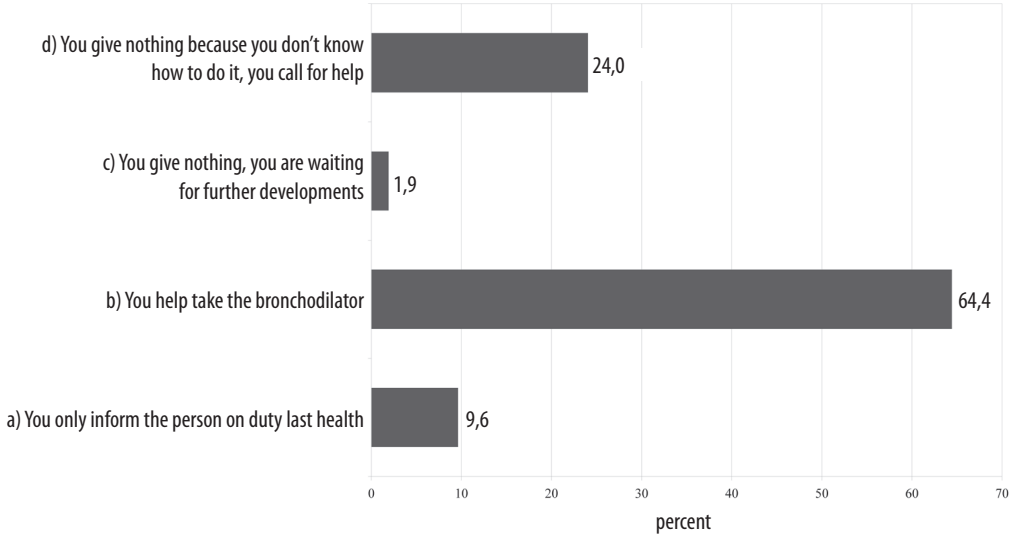

Fig. 5. The right course of action for a person suffering from asthma who you are intervening with, whose overall health has deteriorated and breathing problems are likely to occur.
Source: Own study

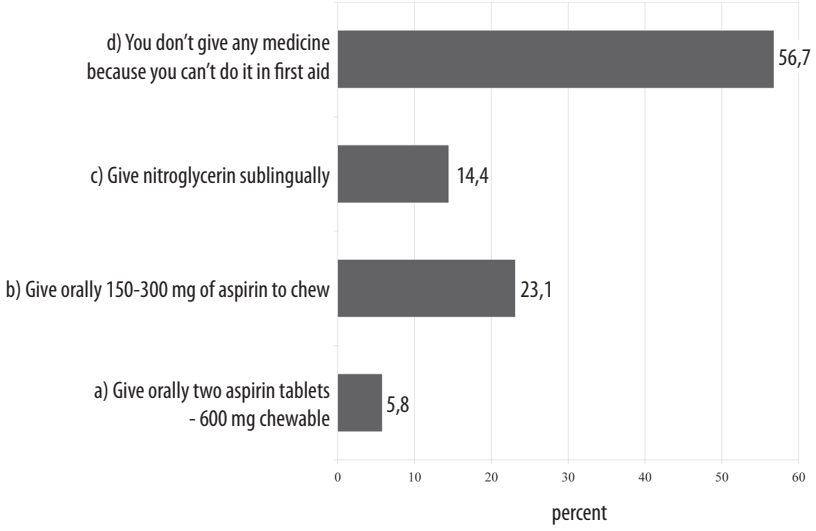

Fig. 6. In pre-hospital conditions, victims of chest pain suspected of having a myocardial infarction should be.
Source: Own study

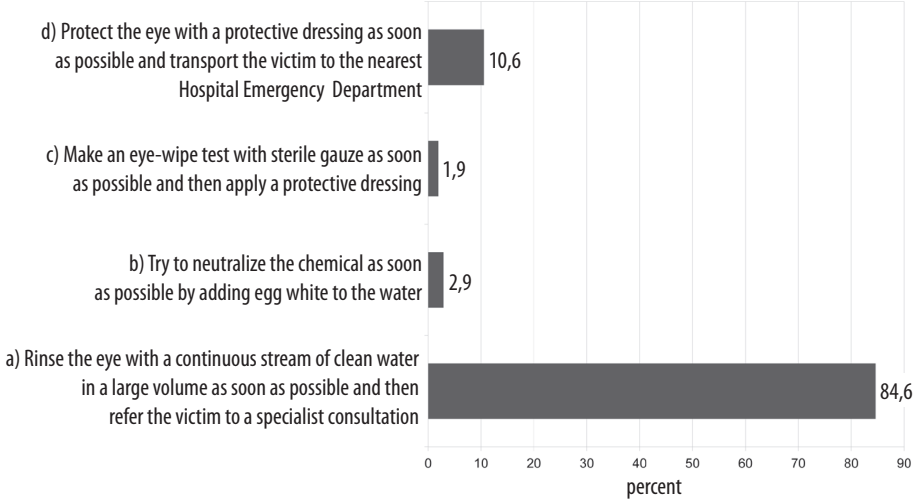

Fig. 7. In the event of eye injury caused by a chemical, it should be.
Source: Own study.

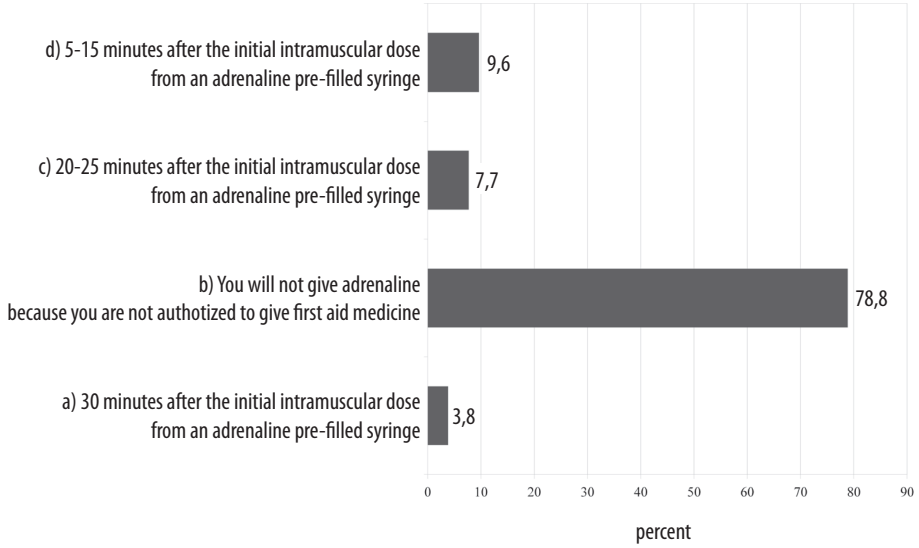

Fig. 8. In pre-hospital settings, a second intramuscular dose of adrenaline should be given to people whose symptoms of anaphylaxis persist.
Source: Own study

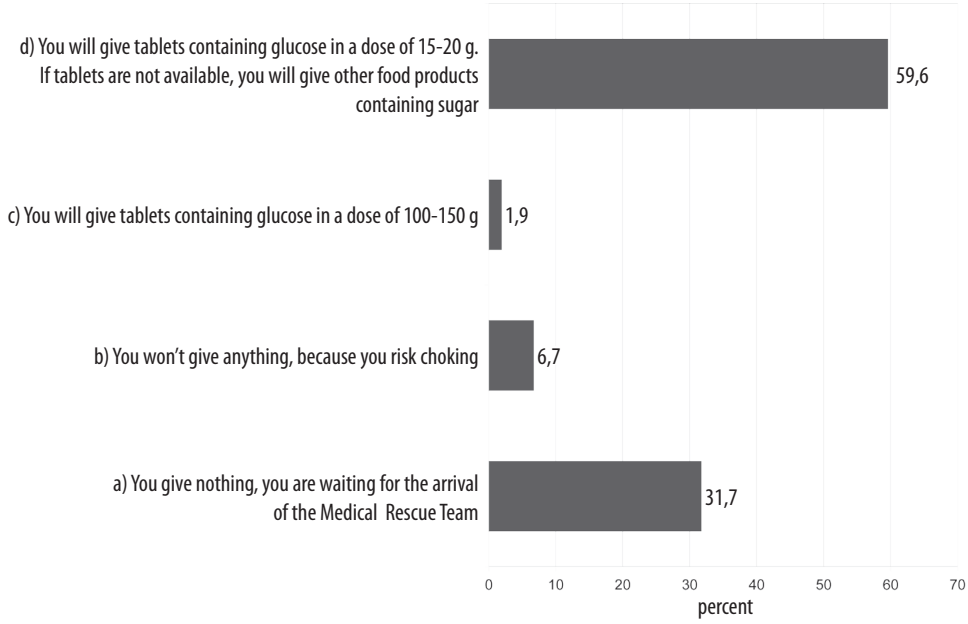

Fig. 9. Conscious patients with symptomatic hypoglycemia should.
Source: Own study

it appropriate to administer sublingual nitroglycerin, and 5.8% of policemen gave a response in which they would give two aspirin tablets orally.

In the event of an eye injury caused by a chemical substance, most of the respondents, as much as 84.6%, answered correctly choosing the answer that recommends to rinse the eye with a continuous stream of clean water in a large volume, and then refer the victim to a specialist consultation [3]. Only 10.6% of officers considered proper eye protection with a protective dressing as soon as possible and transporting the injured person to the nearest Hospital Emergency Department (Fig. 7).

Another question was related to the management of anaphylactic shock in the pre-hospital setting and adequate supply of a second dose of adrenaline (Fig. 8). The answer according to which it is considered appropriate to give a second dose of adrenaline to people whose symptoms of anaphylaxis do not subside after 5–15 minutes after the

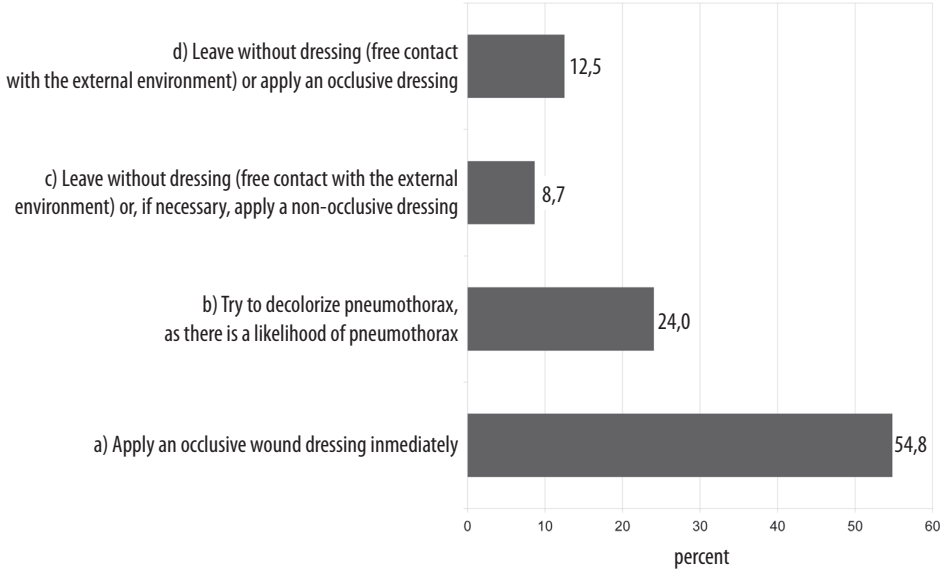

Fig. 10. The injured in a car accident with an open chest wound should be.
Source: Own study.

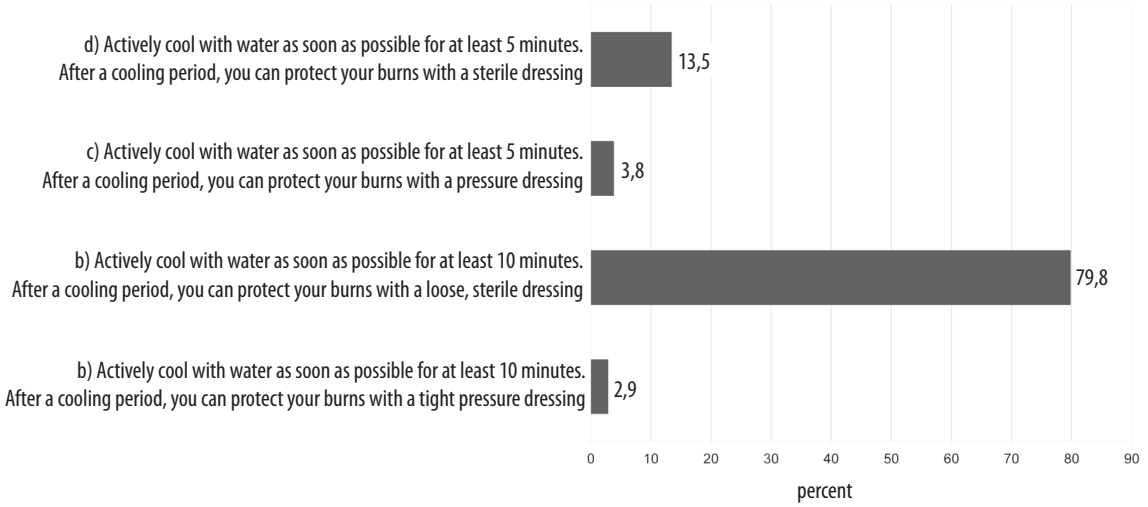

Fig. 11. An injured person with thermal burns in the area of the upper limbs belongs.
Source: Own study.

initial intramuscular dose [3] was given by 9.6% of all respondents. The vast majority of respondents, as much as 78.8%, stated that they would not give adrenaline because they do not have the right to administer first aid. Adrenaline 20−25 minutes after the initial dose of adrenaline was chosen by 7.7% of respondents. The above question perfectly illustrates not only the purely technical issues of proper adrenaline supply, but also the legal aspects related to it. On the one hand, they will be the guidelines of the European Resuscitation Council from 2015, which literally indicate that in pre-hospital conditions a second dose of adrenaline intramuscularly should be given to people whose symptoms of anaphylaxis do not subside after 5–15 minutes after the initial intramuscular dose from an adrenaline prefilled syringe. A second dose of adrenaline intramuscularly may also be necessary if symptoms recur [3]. On the other hand, Polish law has a slightly different position on this issue, as it only allows the administration of OTC drugs in first aid, while adrenaline in pre-filled syringes is registered in

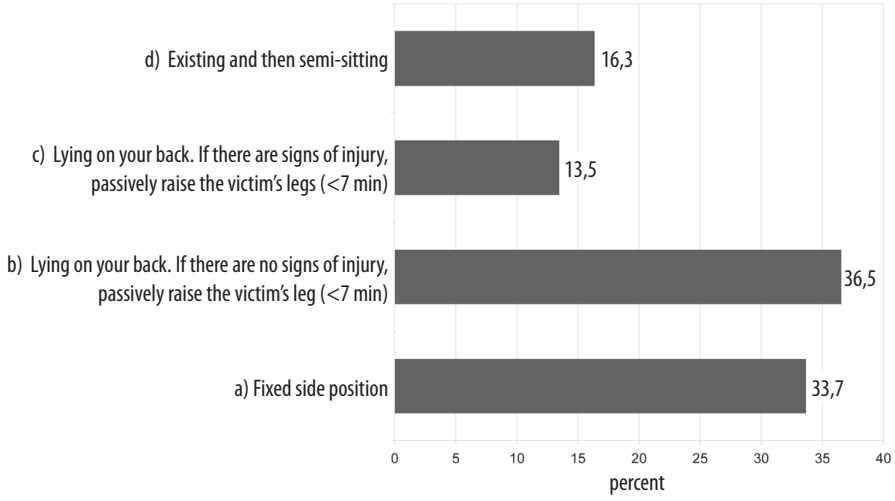

Fig. 12. You will put the injured person with shock symptoms in the position.
Source: Own study.

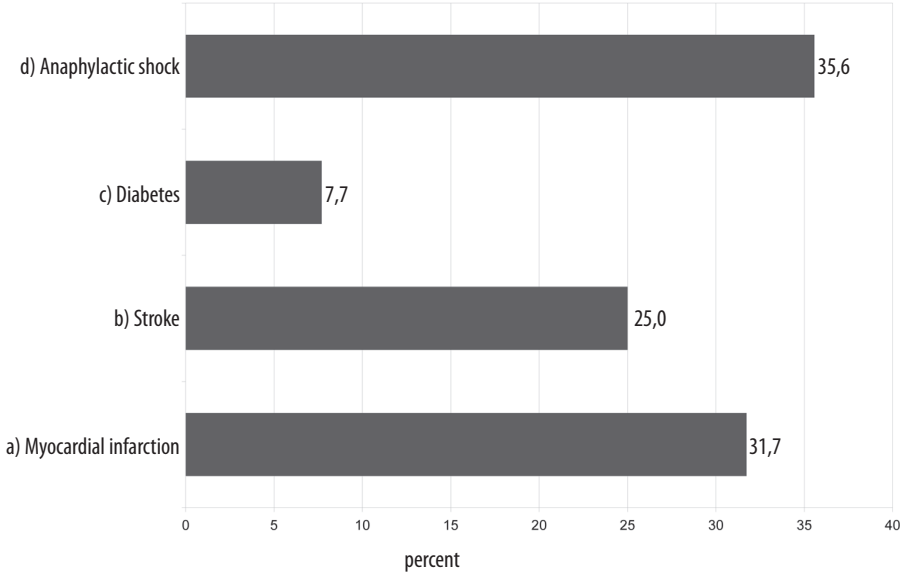

Fig. 13. The FAST diagram refers to the diagnosis.
Source: Own study.

Poland as a prescription drug. Therefore, there are interpretational differences, which on the one hand forbid administering the drug to a person in a state of immediate threat to life, which is undoubtedly anaphylactic shock, on the other, European standards recommend and even require such a possibility. Considering the above aspects, it is necessary to consider whether the life-threatening condition in which appropriate behavior can save human life will be a state of emergency. Undoubtedly, the issue of broadly understood drug supply should enter the canons of any first aid training, while experience shows that it is ignored.

According to the majority of respondents, the proper management of a conscious patient with symptomatic hypoglycemia (Fig. 9) is the administration of a glucose-containing tablet at a dose of 15-20 g or administration of other food products containing sugar [3] − 59.6% of all responses. Almost half the score, i.e. 31.7%, achieved a response in which officers did not say anything, waiting for the arrival of the Medical Rescue Team. Only 6.7% of

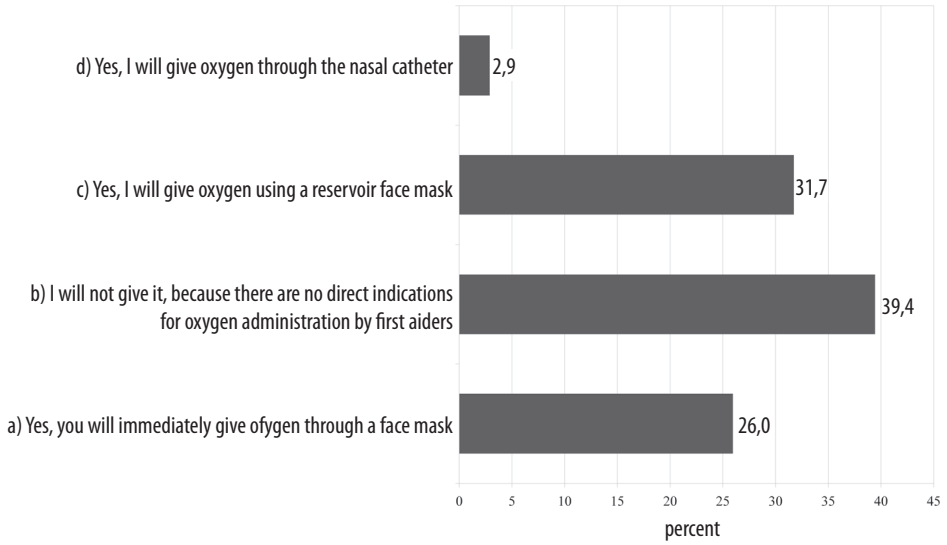

Fig. 14. Do you give oxygen to the injured party in an accident that reports breathlessness as per the guidelines? *Source: Own study.*

respondents answered that they are forbidden to give anything orally, as this may result in choking.

The question regarding the procedure in the case of an open chest wound caused a lot of problems for the subjects, and this is confirmed by the answers given (Fig. 10). The officers were put in a situation where they had to help the injured in a car accident with an open chest wound. Appropriate treatment in this case should be to leave the wound without a dressing that will have free contact with the external environment or use a non-occlusive dressing [3]. Only 8.7% of all respondents gave the correct answer. The largest number of officers, 54.8%, gave an answer in which they would apply occlusive wound dressings. Interestingly, 24% of first aid policemen would attempt to relieve probable pneumothorax far beyond what was included in first aid.

Another case that the police had to deal with was related to thermal burns, located within the upper limbs (Fig. 11). In this case, most of the respondents, almost 80%, gave the correct answer by actively cooling the burns with water for at least 10 minutes, while after the cooling period the burns were secured with a loose, sterile dressing [3]. The remaining part of officers, i.e. slightly more than 20%, incorrectly provided first aid in thermal trauma.

The question regarding the way of arranging the victim with shock symptoms (Fig. 12) did not give a definite answer among the respondents, as 33.7% of policemen would use a fixed lateral position, while slightly more, because 36.5% gave the correct answer by choosing a lying position with a passive back leg lift, provided that the injured party is not traumatic [3]. Disturbing is the fact that the position lying on the back with passive elevation of the injured injured leg was chosen by 13.5% of the respondents, while 16.3% of the officers chose the standing position and then the semi-sitting position.

The results of the study on the diagnosis of stroke according to the FAST scheme were interesting (Fig. 13). First aid providers should be trained to use the FAST (Face, Arm, Speech, Tool – face, arm, speech) scheme, which allows early recognition of stroke symptoms [3]. The above problem caused a lot of interpretation problems to the respondents, because the largest group of respondents, i.e. 35.6%, replied that this pattern concerns the diagnosis of anaphylactic shock. However, only 25% of officers gave the correct answer. A significant percentage, because almost 40% of respondents, answered that the FAST scheme concerns the diagnosis of myocardial infarction or diabetes. The obtained results may induce reflection on conducting trainings taking into account issues related to the above subject.

The last case before which the respondents had to face was a car accident in which the injured person was conscious with preserved airway patency but reporting shortness of breath and breathing problems (Fig. 14). The question concerned the legitimacy of oxygen supply by first aiders. 39.4% of policemen coped with the above problem, claiming that there are no direct indications for administering oxygen in first aid [3]. Surprisingly, the other answers also had their supporters, as 31.7% of respondents would give oxygen using a facial mask with reservoir, while almost 30% of respondents would give oxygen a facial mask or nasal catheter.

TEST SCORE

Performing a collective analysis of the results, I used the knowledge level assessment system, which took into account the correct answers of all policemen. For each correct answer the officer received 1 point, while the maximum number of points to get was 10.

- 81-100% – correct answers – very good level
- 61-80% – correct answers – good level
- 41-60% – correct answers – sufficient level
- 21-40% – correct answers – low level
- up to 20% – correct answers – insufficient level

The result of 44.6% indicates that police officers of the Police Prevention Department in Lublin have knowledge of first aid at a sufficient level, but it is unstructured and requires supplementation.

DISCUSSION

Policemen serving in the Police Prevention Department are often a pedestrian link in the survival chain, providing first aid to victims in conditions resulting from the specificity of tasks and the environment. For this reason, they are required to have an appropriate level of both theoretical and practical knowledge and to constantly train skills in this field.

When analyzing the research results, it can be seen that it is necessary to constantly update knowledge and systematically organize first aid classes. Noteworthy are the results in which the respondents were asked to provide answers on how to help a person with chest pain that could suggest a heart attack, in which only 23.1% of policemen gave the correct answer and in the case of a second dose of adrenaline, where only 9.6% of respondents answered correctly. Evidently, the police are not convinced that they need to have appropriate skills, e.g. in the use of an adrenaline pre-filled syringe and choosing the right place for its supply. In a huge percentage, officers are not aware of the need to perform procedures within the canons of first aid. On the one hand, the question of oxygen supply caused difficulties, where over 60% of respondents supplied oxygen to the injured, e.g. through a face mask or nasal catheter, while on the other 24% of respondents in the field of first aid see pneumothorax relief. The more problematic aspect is the skillful recognition of stroke symptoms according to the FAST scheme, which 75% of respondents were confused with anaphylactic shock, heart attack and diabetes. There is also a tendency to avoid taking any actions as part of first aid by the respondents, arguing with a lack of authorization or only calling for help from the Medical Rescue Team. This can be clearly seen in the case of a person suffering from asthma, in whom 24% of respondents did not help the injured party due to lack of knowledge only by calling for help. Another example is the management of hypoglycemia where 31.7% of all officers did not take any action waiting for the arrival of emergency services. It can be assumed, however, that the above problem is dictated by the lack of knowledge of currently applicable first aid guidelines. In addition, mention should be made of the possibility of using first-aid medicines without a prescription. This is a significant problem because so far many instructors in first aid courses teach not to give any medicine.

On this basis, it can be concluded that aspects related to activities that may be undertaken under first aid should be discussed in detail and presented as part of the professional development of policemen, taking into account skills training. Also noteworthy are the issues related to providing psychological support to police officers after traumatic situations. The results of the research clearly show that on one hand the policeman keeps the vow of vows, according to which he serves the citizens even at risk of life, on the other, in a situation where, bypassing his own safety, risking his own life in the event of an accident, he can remain alone. The presented results of own research indicate that police officers of the Police Prevention Department in Lublin have knowledge in the field of first aid at a sufficient level, but it is not systematized and requires supplementation.

CONCLUSIONS

1. The respondents showed a sufficient level of knowledge about first aid (44.6% of correct answers), the same level the officers achieved in a subjective study determining their knowledge in this area − 51.1%.
2. There are thematic areas in the field of first aid that require the respondents to supplement their knowledge (management of anaphylactic shock − 90.6% incorrect answers, protection of open chest pneumothorax − 76% incorrect answers, management of suspected myocardial infarction − 76.9% incorrect answers, ability to recognize stroke symptoms − 75% incorrect answers).
3. The officers of the Police Prevention Department during daily service encounter situations in which they provide first aid, often ignoring the safety aspects. In addition, they do not receive psychological support after interventions under severe stress.

4. One should strive to standardize the scope of training in first aid, both at the local and central level, and the transferred knowledge should be based on current guidelines.
5. The first aid training should cover topics related to the use of medicines obtained without a prescription, as this is a significant problem because of the fact that instructors skip the above issue.

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DOI: 10.36740/EmeMS202001103 **ORIGINAL ARTICLE**

PSYCHOTROPIC MEDICATION USE FOR CHRONIC PAIN IN OLDER ADULTS

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Abstract

The aim: To evaluate antidepressant drug, hypnotics and benzodiazepine use in older persons suffering from chronic pain treated in a pain clinic.
Material and methods: The study was conducted from January 2014 till April 2018 among patients under the care of two Warsaw pain clinics. The project enrolled 482 persons aged 65 and older. The patients' age, sex, time of observation, type of pain and kind of medications administered were analyzed. Their emotional state was assessed by means of the Hospital Anxiety and Depression Scale – Modified Version (HADS-M) and the intensity of pain with the Numerical Rating Scale (NSR).
Results: The studied group visited the pain clinic mainly because of osteoarticular pain (50%) and neuropathic pain (37%). Psychoactive drugs were given to 218 (45.23%) of patients, of whom 185 (38.38%) took antidepressants. Every second patient with neuropathic pain was on antidepressant. Antidepressant medications were used for patients aged 65-74 more often than for those above 75 years of age. Patients who had been under the care of the clinic for more than five years were prescribed antidepressants more often than those whose treatment had been shorter than three months.
Conclusions: The study showed that the use antidepressants had an impact on pain intensity, but no significant effect on depression.

Key words

chronic pain, antidepressants, elderly, pain clinics

INTRODUCTION

The occurrence of chronic pain, defined as experienced at least for three months, is growing with age. Chronic pain occurs more often in older years, but it is not included in the clinical picture of physiological aging. However, the aging process of particular systems and organs contributes to creating the background for chronic pain. As regards the nervous system, a decrease in nerve fibre density along with growing age, a fall in number of myelinated sensory nerve fibers, degeneration and demyelination foci, neurotransmitter concentration decrease (catecholamine, gamma-aminobutyric acid – GABA), and as a result nerve conduction slowing are observed. Also, the activity of antinociceptic endogenic systems (opioid, noradrenal, serotonin, cholinergic, GABAergic) is reduced and endorphin secretion is abated. More frequent occurrence of chronic pain in the elderly is caused in particular by the aging of the motor system and skin. Involutional changes in the skin and the subcutaneous tissue boost the stimuli transduction. As regards the motor system, degenerative changes in tenocytes and myocytes, sarcopenia, osteopenia, and balance disorders coincide with subsequent overburdening of various groups of muscles and tendons [1, 2].

The pain is most often receptor-generated or nociceptive and it is triggered by direct irritation of pain receptors in the way it happens in injuries, sprains, fractures and contusions. Headaches, visceral pain and abdominal pain are also examples of nociceptive pain. A special type of pain is nociceptive pain caused by tissue injury and resulting inflammation [3]. The pain in rheumatic diseases, such as degenerative joint disease (osteoarthritis), rheumatoid arthritis and systemic connective tissue diseases, are examples of inflammatory nociceptive pain. Osteoarthritis is the main cause of chronic pain and disability in elderly people [4].

Neuropathic pain is not receptor-generated. It comes from a damaged nervous system at the peripheral, cerebrospinal or central level. Various injuries and diseases of the nervous system can be the cause of neuropathic pain. While pain endures, some structural transformations occur not only around the damaged fibres, but also in the neighbouring

undamaged nerve fibrer, as well as changes in neurotransmitter release and multiple system conduction disorders, which leads to pain persistence. Diabetic and ischemic polineuropathy, postherpetic neuralgia, trigeminal neuralgia or carpal tunnel syndrome are typical examples of neuropathic pain. Invertebral disk disorders and injuries are important causes of neuropathic pain in the elderly [5].

Older adults often experience the co-occurrence of various pain mechanisms, and thus various types of pain. Long-lasting pain may have severe consequences. As far as brain is concerned, the slowing of cerebral blood flow as well as the loss of neurons in the thalamus and basal ganglia have been observed. Chronic pain is a risk factor for attention and memory disorders, sleep disorders such as difficulty in falling asleep or keeping continuity of sleeping. It also poses the risk of painkiller addiction. The area of the damaged nerve suffers neuropathic and angiokinetic disorders, leading to sensory loss of touch with accompanying hypersensitivity to other stimuli, loss of deep reflexes, muscle atrophy, paresis and limited joint mobility [4]. The senile population is particularly liable to the consequences of chronic pain such as motor and functional impairment, anxiety and depression disorders, increased risk of falls, dependence on caretakers, overuse of analgesic drugs and seeking medical advice more often [6, 7]. A complex strategy of treating chronic pain is a challenge for healthcare systems [8, 9].

Chronic pain therapy in elderly patients should adhere to standard treatments of pain as well as to standard geriatric procedures. It should be adjusted to the specificity of patients' medical history and take into account any adjuvant drugs acting as analgesics [10-12]. Considering the risk of polypharmacy in older adults, the treatment of chronic pain is a significant geriatric problem in everyday clinical practice.

The aim of the study was to evaluate antidepressant medications, hypnotics and benzodiazepine us in elderly persons suffering from chronic pain who were treated in a pain clinic.

MATERIAL AND METHODS

PARTICIPANTS

The research was conducted on patients under the care of two out-patient pain clinics in the city of Warsaw, Poland: The Pain, Anesthesiology and Intensive Care Department of the Medical University of Warsaw, located at 4 Lindleya Street, and the Pain Clinic, located at 231 Czerniakowska Street, from January 2014 to April 2018. The inclusion criteria for participation in the study were: age 65 or older, ascertainment of pain on the basis of the patient's medical history, and attending a pain clinic in the city of Warsaw. The exclusion criteria were the lack of the patient's informed consent and the lack of ascertained problem with pain or clinical symptoms. The study was conducted in accordance with the Helsinki Declaration and approval no. AKBE/24/15 obtained from the Bioethics Committee of the Medical University of Warsaw. It was approved by the managers of the clinics involved. The patients taking part in the project were informed about the voluntary nature of their participation, their anonymity, and the fact that the results of the study would be used exclusively for scientific purposes and in publications.

ASSESSMENT

The research was conducted on the basis of the analysis of the medical histories of the patients attending the pain clinic, including such data as age, sex, time of observation, type of pain and type of medications used. The method of diagnostic survey with the use of the questionnare technique was applied. Pain intensity was evaluated by means of the the NSR – Numerical Rating Scale. Their emotional state as regards anxiety, depression and aggression was assessed with the help of the Hospital Anxiety and Depression Scale – Modified Version (HADS-M) [13].

STATISTICAL ANALYSIS

The data collected from the survey questionnaires were entered into the database of the Microsoft Excel MS Office 2010 for Windows 10. The results were statistically analyzed using the STATISTICA version 12.5 (StatSoft, Krakow, Poland) software. The following tests were employed in order to evaluate the results: the Mann-Whitney test to compare medians in the groups, and the chi-squared method for comparing the number of patients in groups. The study assumed statistical significance at the level of $p<0.05$.

RESULTS

The study enrolled 482 people aged 65 or more, of whom 318 were female and 164 male.

THE PATIENTS AGE

The patients age ranged from 65 to 92, the average age being 75. The age bracket 65-74 (youngest old) included 238 participants and the group over 75 years (oldest old) numbered 244. The patients under study comprised 47.25% of all 1020 patients who were under the care of the pain clinics.

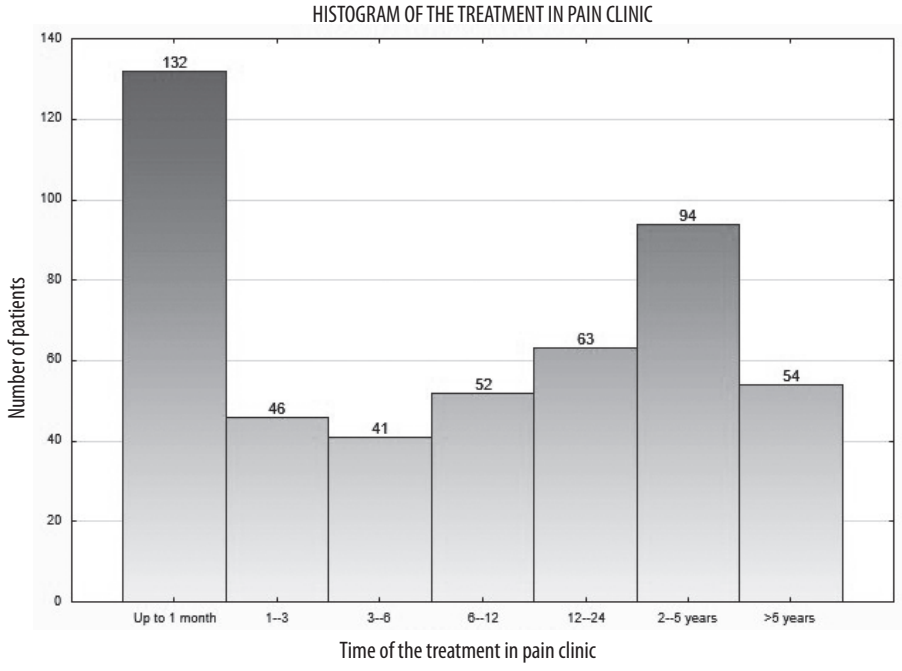

Fig. 1. The time of treatment in the pain clinic.

THE TIME OF OBSERVATION

The time of observation of particular patients differed: 132 of them had been treated for less than a month and 114 visited the clinic for the first time. A group of 149 people had been treated for a period from one month to one year. The number of those treated for less than one year totalled 281. Sixty three patients had been treated for one or two years, 94 from two to five years and 54 for more than five years. (Fig. 1)

THE TYPE OF PAIN

The patients suffered from the following types of pain: 241 people (50%) were treated for osteoarticular pain, 177 (nearly 37%) for neuropathic pain, 27 for headaches, 30 for cancer pain, and 7 for other types of pain. Table 1 shows the distribution of types of pain in the observed patients in relation to their sex and age group. Osteoarticular pain was observed more often in the group of 75 years and older as compared to those of 65-74 years old (132 *vs.* 109 persons) and more often in women, more than half of whom reported this type of pain. In the age group of over 75, they even exceded 70%. Neuropathic pain was diagnosed in comparable numbers of younger and older patients under study (90 *vs.* 87 persons), though it occurred more often in women, both younger and older.

Thirty patients reported two types of pain. Of the 22 suffering from osteoarticular pain, in 19 cases the other type was neuropathic pain and in three cases a headache. The remaining eight patients suffered from neuropathic pain; in five of them it was accompanied by a headache and in three by cancer pain.

PAIN INTENSITY

The average pain intensity on the NRS scale was 4.4. In the age group 65-74 the NRS median was 5, and in the group of 75 years or more it was 4, the difference not being stastically significant (p=0.117).

Table 1. Distribution of types of pain in the observed patients.

Type of pain	All patients studied			Age groups					
				65-74 years			75 and more years		
	Total	Women	Men	Total	Women	Men	Total	Women	Men
N	482	318	164	238	151	87	244	167	77
Osteoarticular	241	170	71	109	74	35	32	96	36
Neuropathic	177	114	63	90	56	34	87	58	29
Headache	27	15	12	14	8	6	13	7	6
Cancer pain	30	15	15	20	11	9	10	4	6
Other	7	4	3	5	2	3	2	2	0

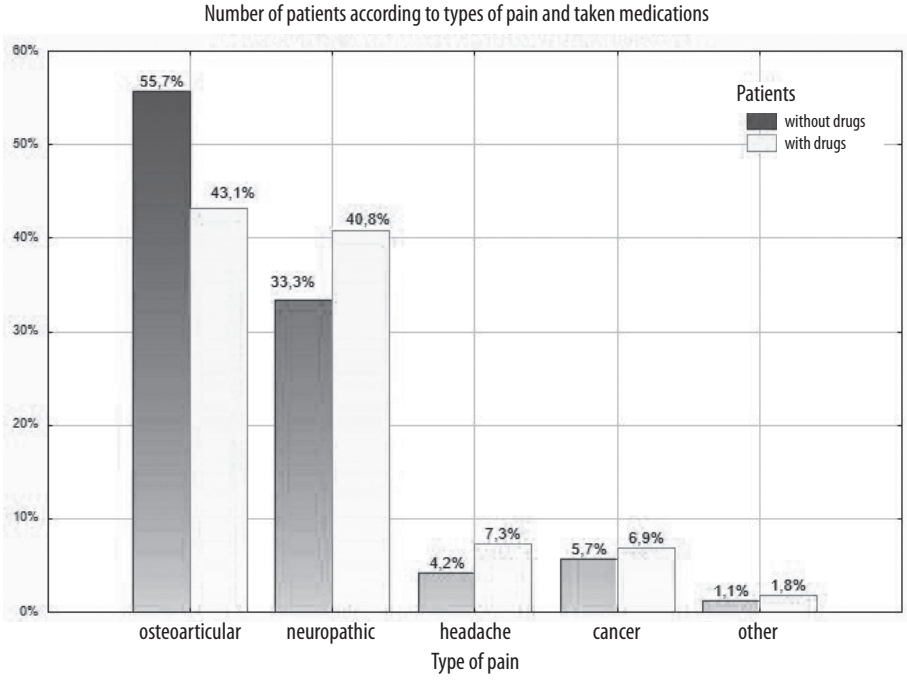

Fig. 2. The rate of patients using drugs in relation to types of pain.

MEDICATIONS TAKEN

Of the examined population of 482 patients, 218 (45.23%) were administered adjuvant psychotropic drugs (antidepressants, benzodiazepines and hypnotics). The mean age of the patients treated with the analyzed drugs was 72, and that of the patients not taking them 76.5 years (p=0,000). No substantial differences in the number of men and women in the groups with and without these medications were found (71/147 *vs.* 93/171, p=0.53). Among the patients receiving psychotropic drugs, 185 took antidepressants, 12 – drugs from the benzodiazepine group (BDA), and 33 – hypnotic drugs. Some of the patients took more than one medication. One patient with neuropathic pain took three drugs: antidepressant, BDA and sleeping pills. Eleven patients took two medications: 10 of them an antidepressant and in eight cases a sleeping pill, while in two cases BDA as the second one. One patient took BDA and a hypnotic drug.

Of the 218 patients taking the drugs under analysis, 94 (43.12%) had osteoarticular pain, 89 (40.83%) neuropathic pain, 16 (7.34%) headaches, 15 (6.88%) endured cancer pain, and 4 (1.83%) complained of other types of pain. Figure 2 shows the percentages of patients taking drugs as compared with those not taking any, in relation to types of pain.

Table 2 presents the profile of the figures representing the use of particular groups of medications depending on the type of pain. In the group of 185 taking antidepressants, the majority were patients with neuropathic pain, numbering 81 (45.75%). The second largest group were 73 patients with osteoarticular pain (30.29%). It was found that the use of antidepressant drugs differed essentially depending on the type of pain (p=0.006).

In the age group 65-74 antidepressants were taken by 46.64% patients and among the patients aged over 75 by 30.33%, this difference being statistically significant (chi-squared method p=0,000).

Table 2. The use of particular groups of drugs in the examined patients, depending on the type of pain (the explanation and percentages are given in the text).

Treatment		Type of pain					N	p
		Osteoarticular	Neuropathic	Headache	Cancer	Other		
No adjuvants		147	88	11	15	3	264	0,076
With adjuvants	Antidepressants	73	81	14	13	4	185	0,006
	Benzodiazepines (BDA)	6	4	2	0	0	12	0,451
	Hypnotics	21	8	2	2	0	33	0,416

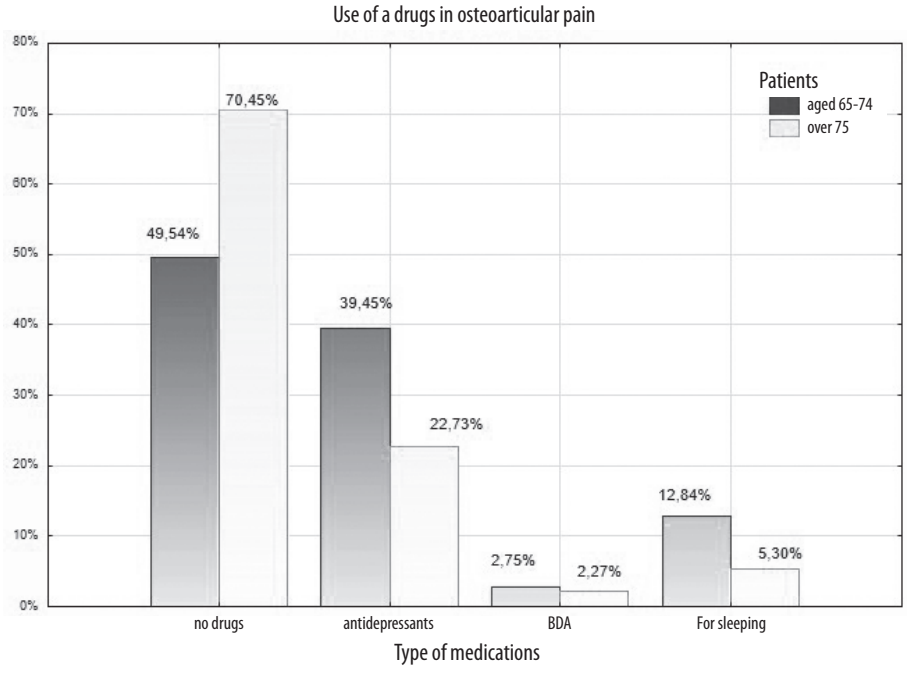

Fig. 3. Use of drugs by the patients with osteoarticular pain.

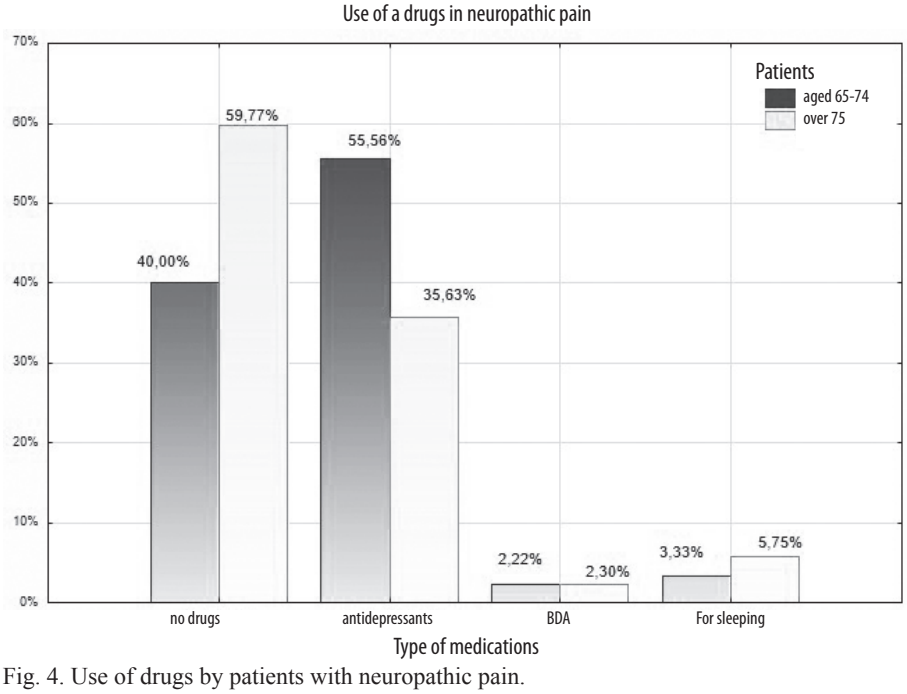

Fig. 4. Use of drugs by patients with neuropathic pain.

Table 3. Use of drugs depending on the time of treatment (the explanation and percentages are given in the text).

Treatment		Time of treatment							p
		up to 1 month	1-3 months	3-6 months	6-12 months	12-24 months	2-5 years	over 5 years	
No adjuvants		108	25	19	25	29	38	20	0.000
With adjuvants	Antidepressants	14	20	21	22	28	49	31	0.000
	Benzodiazepines (BDA)	5	0	1	1	2	3	0	0,696
	Hypnotics	6	1	1	6	5	11	3	0.149

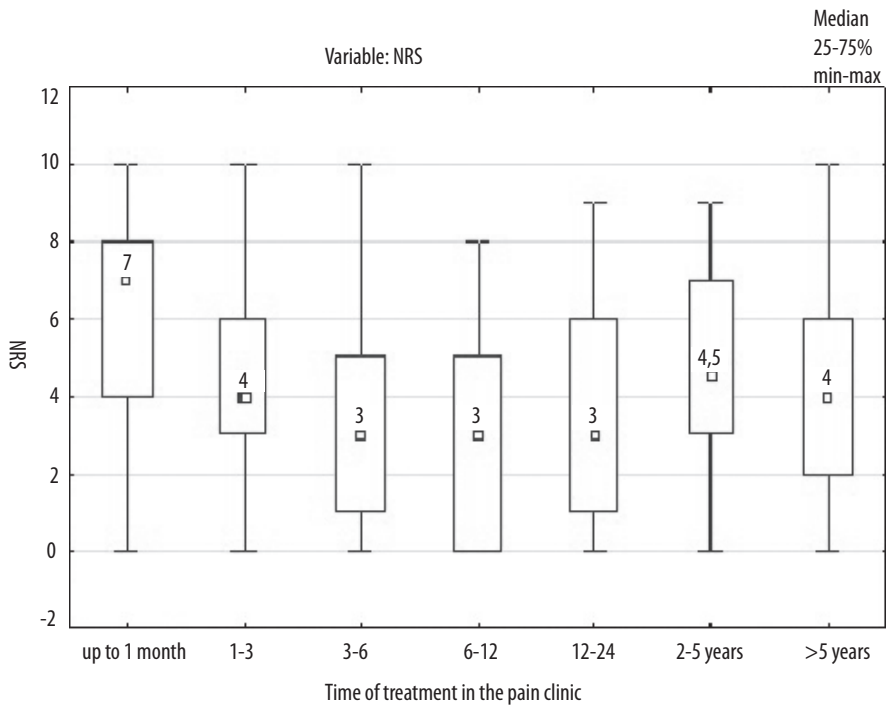

Fig. 5. Pain intensity on the NRS scale in relation to the time of treatment.

No important differences in using andidepressants in relation with sex were found.

Figures 3 and 4 present the use of the medications under study in osteoarticular and neuropathic pain in the groups of younger and older geriatric patients. Atidepressant drugs were used more frequently by 65-74 years old patients, especially by those suffering from neuropathic pain, but also by those with osteoarticular pain (55.56% *vs*. 35.63%, p=0.007; 39.45% *vs*. 22.73%, p=0.004 chi-squared method, respectively).

THE USE OF MEDICATIONS AT PARTICULAR STAGES OF TREATMENT

The use of antidepressants was increased from the 3rd month of the observation and stayed on more or less the same level (Table 3).

Nearly 60% (57.41%) of the patients observed for more than five years received antidepressant medications. The number of patients without adjuvants kept decreasing among those who attended the clinic for a longer period of time (54.35% of patients with no drugs who had been treated up to three months *vs*. 37.04% patients with no drugs treated over five years). Of the twelve patients who took BDA, five had attended the clinic for less than a month. No patient treated for over five years took BDA.

THE USE OF MEDICATIONS AND THE NRS

The reduction of pain intensity from 7 points on the NRS scale to mild pain of 1-3 points and the lower range of moderate pain was achieved (Fig. 5).

THE USE OF MEDICATIONS AND DEPRESSION SCORE

The use of antidepressants had no real effect on the score for depression. The median of the score for depression in the group receiving antidepressant medications was 7.0 as compared to 6.0 in the group not given these drugs (p=0.784).

DISCUSSION

Pain disorders are very common among older adults. The studies by Synak et al. had already shown that pain disorders were the most frequent complains reported by the seniors (69.2%), followed by cardiovascular symptoms (58.6%). With diseases it is the other way round. Cardiovascular diseases occupy the first place and they afflict 75% of geriatric patients, while motor system diseases come second, afflicting 68% [14].

The results of the cross sectional countrywide PolSenior study carried out on a representative sample of 4979 people aged over 65 and 715 aged 55 to 59 indicate that chronic pain affects 41.6% of people aged over 65. It has been shown that in older adults chronic pain was more often reported by women and people in the age bracket of 80-84; they usually suffered from sacral and lower limb pain, and reported multiple pain locations [15]. In our study, the number of patients over 65 years old constituted 47.25% of all patients treated in the pain clinics.

Chronic pain is one of multiple medical problems of older individuals. Multimorbidity, polypharmacy and atypical course of disease are common

characteristics of geriatric patients [16]. Elderly people in particular tend to face various health, medical, job, family and private problems or losses which make them susceptible to negative mood states [17]. The PolSenior study revealed depression symptoms, assessed by means of the Geriatric Depression Scale (GSD), in 29.7% of the elderly people under observation. More than half of them (51.8%) reported chronic pain. On the other hand, one-third of the group enduring chronic pain had depressive symptoms [18]. Similarly, in the studies of Brasilian at al., depression was observed in 35.2% of the elderly patients with chronic pain [19].

The meaning and conditioning of emotional disturbances such as anxiety, depression and aggression among the patients treated in the pain clinic was pointed out by Kosson at al. [20]. The symptoms of depression, assessed with the HADS-M scale, existed in 17.85%, and borderline depressive symptoms in 25.17% of all patients in the pain clinic. Their paper has shown that the level of anxiety and aggression is determined by age and depression, related to gender and occurs more frequently in women.

The standards of treating chronic pain in elderly people stress the role of coadjuvants, including antidepressants [21]. The use of andidepressant medications in chronic pain is justified not only by cooccurrence of chronic pain and lowered mood, but most of all by pathophysiological mechanisms common for both depression and chronic pain, especially neuropathic and psychological pain [22].

In the present study, four of the ten elderly people were treated for neuropathic pain. Every second patient with neuropathic pain was on antidepressant drugs. These drugs were more often used for patients aged from 65 to 74 years old as compared to those over 75. Antidepressants were given more often to the patients who had been under the care of the clinic for over 5 years than to those who had visited it for less than three months. The studied group showed the decrease of pain intensity with longer time of observation, although the use of atidepressant drugs had no important effect on the score for depression. The analgesic effect of antidepressants occurs independently from their effect upon depression [23, 24].

No increased use of hypnotics and BDA by the patients under the study was noticed during the observation. No patient took benzodiazepine in the group observed for over five years. This group of drugs have significant side effects, which contribute to falls and impair cognitive functions. Reduction of their use in favor of administering antidepressant medications allows to prevent such adverse reactions.

The studies of patients treated for lumbar-sacral pain and those undergoing knee arthroplasty also show the advantages of antidepressant medication use [25, 26].

Back pain study was carried out in the United States on a representative sample of 5103 adults aged from 20 to 69 years, 700 of whom reported chronic pain in this area. 36.9% of the group suffering from chronic pain took at least one prescribed anelgesic medication within the preceding 30 days; 18.8% of them used opioids, 9.7% non-steroid anti-inflammatory drugs, 8.5% myorelaxant drugs and 6.9% gabapentin or pregabalin. Antidepressant and sleeping drugs were used by 17.8% and 4.7% respectively [27].

The French study based on the data from electronic medical records registered 63,557 cases of chronic pain including 9,852 cases neuropathic chronic pain. The estimated incidence of chronic pain and chronic neuropathic pain occurring in adults ranged from 27.2% (95% confidence interval: 26.1-28.4) to 32.7% (26.0-43.3) and from 5.55% (2.89-19.0) to 7.30% (6.40-8.41), respectively. Most of the patients were female and the median of age was 67 (55-80) and 63 (51-76) respectively for the cases of chronic and neuropathic pain. Drugs used most frequently by chronic pain patients included paracetamol (62.1%), mild opioids (39.7%) and non-steroid anti-inflammatory drugs (32.7%), while in patients with neuropathic pain anticonvulsive drugs (45.3%), as well as tricyclic antidepressants (18.1%) prevailed; noradrenaline serotonine reuptake inhibitors (13,3%) were also used more often [28−30].

The PolSenior study demonstrated that the population of elderly people enduring chronic pain used antidepressants more often (4.87%) than people free from pain (3.17%). It was also found that the average number of drugs taken by chronic pain sufferers was 5.7 as compared to 4.7 taken by those free from pain. This confirms the risk of polypharmacy in this group of patients [15].

CONCLUSIONS

Older adults with chronic pain referred to an outpatient pain clinic create a challenge for pain specialists. Antidepressive agents use should be considered an important element of adequate chronic pain treatment, irrespectively of their potential adverse effects (not included in the present study). Such approach facilitates pain control, limits the use of hypnotics and benzodiazepines and may improve patient's quality of life and functional status.

Moreover, it increases safety of therapy with opioid analgesic drugs in carefully chosen cases.

Chronic pain treatment in older adults must consider complex and multidimensional needs of these patients, as described by a French philosopher Michael de Montaigne: "Chronic pain does not consider solely the sick part of the body, but encompasses the whole human being".

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

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COMPARISON OF EMOTIONAL WELLBEING IN PATIENTS AFTER COLORECTAL SURGERY UNDER SPINAL AND GENERAL ANAESTHESIA

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Abstract

Introduction: The contemporary anaesthesiology allows to perform the same procedure choosing from among a variety of different anaesthetic methods. The world standards suggest the analgesia of an operated site only. It is long since the general anaesthesia has been given up in the case of small surgeries. Most frequently, medical doctors adjust anaesthesia only to a particular disease entity, to a patient's health condition or even to operator's abilities. Medical doctors are often deprived of empathy and are not interested in patients' stressful feelings as to the unpleasant situation they landed up in.

The aim: The study was aimed at evaluating patients' mental comfort and general feeling after proctologic procedures carried out under the subarachnoid or general anaesthesia.

Material and Methods: 30 randomly selected patients treated with surgical methods due to perianal diseases were included in the study. In order to be included in the study the patients had to have no history of operative treatment, thereby being vulnerable to this sort of stress. The patients were divided into two equally numerous groups, A and B. Group A was subjected to the general intravenous anaesthesia while group B was treated with the subarachnoid anaesthesia. The study was conducted using a specially designed anonymous questionnaire filled in within the first 24 hours after the surgery. The questionnaire was composed of 11 questions, the only correct responses being "Yes" or "No".

Results: Obtained scores indicate only to the presence of differences between both groups as for the answers to questions on the feeling of being stressed during the operative procedures, and on the fact whether the patient could hear medical staff's conversations during the surgery or not. Responses acquired are in line with expectations – the patients anaesthetised with the general method could not hear any "chats", and the nervousness definitely dominated in the group B. The question regarding feeling pain during or immediately after the operation was much more commonly answered with complaints by patients belonging to group A.

Conclusions:

1. The operative treatment of anus-related diseases is associated with a strong stress response.
2. Proctologic procedures under a general anaesthesia provide patients with a greater comfort and keep them with the feeling of intimacy.
3. Proctologic procedures under a conduction anaesthesia may be the source of patients' discontent.
4. It is necessary to implement a strong sedation prior to the aforementioned procedures.

Key words

general anaesthesia,
subarachnoid anaesthesia,
proctologic diseases,
stress,
empathy,
postoperative pain

INTRODUCTION

Contemporary anaesthesiology has a lot to offer. The same procedure can be performed under different types of anaesthesia. In patients with ASA score 1 or 2 the possibilities are unlimited. Central nerve blocks are popular because of the high quality and relative safety of this analgesic technique. Although this type of anaesthesia is almost always associated with hypotension and bradycardia due to the block of the preganglionic fibres in the sympathetic division, it is regarded as the first choice in obstetrics and trauma surgery. Unilateral spinal anaesthesia is also possible on a limited area, which minimizes the risk of cardiovascular side effects [1, 2].

In some cases, international standards somehow force the use of only local anaesthesia in the surgical site. In everyday practice, nerve blocks (at the plexus or trunk) are performed using small amounts of local anaesthetics [3].

However, there are surgical procedures in which for other reasons we should not go back to the old times and the experiments described in 1898 by

August Bier and his assistant, August Hildebrand. Guided by clinical aspects, doctors adjust anaesthesia only to the type of disease and the patient's state of health. They often do not even try to empathize with the treated patient.

Hospitalization puts the patient's physical privacy to the test. The discomfort associated with colorectal disease intensifies when the patient is moved onto the operating table. Nudity, combined with suffering, increases fear and stays in the memory as a negative experience. In such situations, premedication does not work as doctors would wish or expect.

The aim of this study was to assess emotional wellbeing in patients after colorectal surgeries performed under spinal and general anaesthesia.

MATERIAL AND METHODS

Thirty patients admitted to a general surgery department for the surgical treatment of colorectal disease were enrolled in the study. Eligible patients had no history of surgical treatment, and hence low ability to cope with the stress associated with it. These patients may have been hospitalized many times before, but they had never been to the operating room. The study was approved by the Bioethics Committee for Research at the Medical University of Łódź (decision no. RNN/130/14/KB of 11.02.2014). ASA 1 or 2 patients, non-pregnant, signed informed consent and were premedicated with 7.5 mg of oral midazolam 60 min before the surgery. Two equal groups of patients were created: group A (intravenous general anaesthesia) and group B (spinal anaesthesia).

On arrival at the operating room a standard procedure was implemented: basic vital parameters of the patient were monitored, the vein of the forearm was cannulated, and 1000 ml of crystalloids was infused. In Group A, anaesthesia was induced before positioning the patient for surgery. These patients received 0.05 mg/kg bw midanium, intravenous infusion of propofol 2 mg/kg bw, and sufentanil in 10 microgram fractional doses adjusted to pain impulses. Patients in group B received spinal anaesthesia at the L3-L4 level with a height-adjusted dose of Marcaine Spinal 0.5% Heavy (2.5-4 ml).

The study was conducted using a specially prepared anonymous questionnaire completed by the patient on the first day after surgery. The questionnaire consisted of 11 questions to be answered 'yes' or 'no'.

Patients were asked the following questions:

1. Did you talk to the anaesthetist before the procedure?
2. Did you have a choice of anaesthetic technique?
3. Did you feel any pain during or right after the procedure?
4. Did you know how the surgery would be done?
5. Do you remember being taken to the operating room?
6. Were you stressed during the procedure?
7. Do you remember the question that the anaesthetist asked you before the procedure?
8. Do you remember what the doctors talked about during the surgery?
9. Would you choose the same anaesthetic technique again?
10. Would you decide to have the same procedure again?
11. Do you feel that your physical privacy was compromised?

RESULTS

The study group comprised 30 subjects aged 20-64 years, 18 men (60%) and 12 women (40%). Only 8 of them had a history of hospitalization. For each of these patients it was the first general or local anaesthesia in their life. The following procedures were performed in patients: haemorrhoidal excision (n=18), perianal abscess drain (n=5), pilonidal cystectomy (n=3), anal fissure repair (n=4):

a. Severe stress during the procedure was experienced by 11 out of 15 patients who had spinal anaesthesia and 2 out of 15 patients who had general anaesthesia.
b. 7 patients from group B could remember the conversation between surgeons.
c. Only 3 out of 15 patients who had spinal anaesthesia would decide to have the same procedure again.

Patients gave the following answers to questions:

GROUP A GROUP B

1. Did you talk to the anaesthetist before the procedure?
   YES 14, NO 1; YES 13, NO 2
2. Did you have a choice of anaesthetic technique?
   YES 12, NO 3; YES 14, NO 1
3. Did you feel any pain during or right after the procedure?
   YES 14, NO 1; YES 0, NO 15
4. Did you know how the surgery would be done?
   YES 10, NO 5; YES 8, NO 7
5. Do you remember being taken to the operating room?
   YES 14, NO 1; YES 12, NO 3
6. Were you stressed during the procedure?
   YES 2, NO 13; YES 11, NO 4

7. Do you remember the question that the anaesthetist asked before the procedure?
   YES 4, NO 11; YES 5, NO 10
8. Do you remember what the doctors talked about during the surgery?
   YES 0, NO 15; YES 7, NO 8
9. Would you choose the same anaesthetic technique again?
   YES 13, NO 2; YES 9, NO 6
10. Would you decide to have the same procedure again?
    YES 6, NO 9; YES 3, NO 12
11. Do you feel that your physical privacy was compromised?
    YES 5, NO 10; YES 9, NO 6

Questions for patients were considered as qualitative (nominal) variables. The chi-square test of independence was used to compare the groups, or Fisher's test if data did not meet the requirements of the chi-square test. The zero hypothesis in both tests stated that there are no differences between the answers given by the two groups (the answers are independent of the group). The alternative hypothesis assumed differences between groups. Statistical analysis was performed in the Statistica 10 software package. The level of significance was adopted at $p<0.05$.

Answers to questions (number of 'yes' answers and their percentage) per group and for all patients, and p values are presented in Table 1.

The analysis indicated that the only differences between the two groups concerned answers to questions 3, 6 and 8. Question 6 concerned stress during the procedure, and question 8 concerned whether the patient heard conversations between medical staff during the procedure. The obtained answers are consistent with expectations – patients under general anaesthesia did not hear conversations, and those given spinal anaesthesia were clearly more stressed. Patients from group A much more frequently answered 'yes' to Question 3 about feeling pain during the procedure or right after it.

There were no significant differences between answers given to other questions, despite quite marked differences (≥20%) in answers to Q9 to Q11.

DISCUSSION

Transformations in the Polish economy have also changed the approach to patients. Principles of the free market have been rapidly adopted by the healthcare system and have forced healthcare service providers to see their patients as clients. To survive in a competitive market, medical professionals have to constantly improve the quality of services offered. And the quality of the provided healthcare services is measured by patient satisfaction.

Medical professionals who work with seriously ill people strongly focus on the outcome of their work during the diagnostic and therapeutic process. How the outcome is achieved is less important, because success is what counts. However, understanding the opinions and expectations of patients is a very important aspect of high-quality medical services [4].

Pursuant to Article 20 of the act on patient rights and the patient rights ombudsman, "The patient has the right to privacy and respect for personal dignity during the provision of health care services"[5]. The necessity of exposing private parts of the body and staying in a forced position for a long time is inherent for most surgical procedures. However, patients who undergo long procedures involving numerous medical staff, and who can hear conversations between surgeons and their comments, feel greater discomfort and exposure of physical privacy. When doing their

Table 1. Answers to questions provided by patients.

Question	Group A	Group B	Total	p-value
Question 1	14 (93%)	13 (87%)	27 (90%)	1.000
Question 2	12 (80%)	14 (93%)	26 (87%)	0.598
Question 3	14 (93%)	0 (0%)	14 (47%)	0.000
Question 4	10 (67%)	8 (53%)	18 (60%)	0.456
Question 5	14 (93%)	12 (80%)	26 (87%)	0.598
Question 6	2 (13%)	11 (73%)	13 (43%)	0.001
Question 7	4 (27%)	5 (33%)	9 (30%)	1.000
Question 8	0 (0%)	7 (47%)	7 (23%)	0.006
Question 9	13 (87%)	9 (60%)	22 (73%)	0.215
Question 10	6 (40%)	3 (20%)	9 (30%)	0.427
Question 11	5 (33%)	9 (60%)	14 (47%)	0.272

Source: author's own analysis.

duties, medical professionals are unable to avoid conversations in the operating room, and cannot hide bad emotions if something does not go to plan, or something unexpected happens to the patient.

The humanism of medical profession is reflected in the ability to understand the unique experiences of other people and to respond effectively to them. It is empathy that should guide choices made by medical professionals as to the technique and course of anaesthesia. By empathizing with other people, a specific relationship is built between the doctor and patient that improves the quality of health care services provided.

In 1946, the newly constituted World Health Organization (WHO) defined health as 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity' [6]. A holistic approach to the problem requires anaesthetists to take care of the patient's mental wellbeing. Leaving patients conscious during surgical treatment for embarrassing health problems and those involving private body parts, and not administering general anaesthesia, combined anaesthesia or local anaesthesia with sedation (Ramsey score R2-3), we open wide their subconsciousness, in which every unpleasant experience will be stored. Experiences, conclusions and assessments stored in the subconsciousness make us automatically react to reality later. Our conscious mind works out some justifications for decisions and conclusions made subconsciously. Subconsciousness determines and precedes conscious thinking. It is difficult to predict which negative emotions will be remembered by the patient. The absence of pain during anaesthesia is not the only thing anaesthetists want to achieve. A professional anaesthesiological service requires more than that. Reportedly, humans rely on subconsciousness more than they suspect. Within one second we receive 100 billion bits of information, but only 100 bits are consciously registered [7]. The rest of the information is also saved and influences our behaviour. In an experiment Chun Slong Soon et al. (2008) examined people pressing a button with either the left or right hand. The impulses from a subject's brain were analyzed by a computer. The experiment demonstrated that it was possible to predict which hand would press the button a few seconds before it actually happened [8]. Our intellect justifies the decisions that we make subconsciously. Wakefulness, consciousness and subconsciousness are connected by a loop of numerous feedback relationships. The prefrontal cortex constantly communicates with the subcortical centres in the brain.

Continuous stimulation of the reticular formation in the midbrain and in the brain stem by impulses coming from exteroreceptors and proprioceptors regulates wakefulness and consciousness. Central nerve block reduces this stimulation, thereby leading to sedation [9,10]. As it turns out, it does not protect against the reception of negative stimuli from the environment, but only reduces the need for medication. Only deep sedation combined with sleep and retrograde amnesia ensures emotional wellbeing during a surgical procedure. Numerous reports have emphasized the importance of conscious sedation as a state in which by using one or many drugs we induce depression in the CNS while maintaining verbal contact with the patient [11,12].

A successfully performed surgery is not a reason for patient satisfaction if he or she has unpleasant flashbacks after a procedure done without deep sedation. Such patients often no longer make their judgements based on rational calculation. Negative experience, information learned from conversations and sounds, and observations made by the patients stay for a long time in their subconsciousness and determine their judgements, future behaviour, and choices related to types of treatment and anaesthesia.

CONCLUSION

1. Surgical treatment of colorectal diseases is very stressful for patients.
2. Colorectal surgeries under general anaesthesia provide greater comfort and physical privacy to patients.
3. Colorectal surgeries under spinal anaesthesia may be a cause of patient dissatisfaction.
4. Patients require deep sedation before colorectal surgeries.

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DISSOLVING PAIN IN OPEN FOCUS™ ATTENTION

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Abstract

The aim: In this article, I present dissolving pain mind exercises created by myself on the basis of the Open Focus™ theory. I explain the Open Focus™ theory and I relate it to some aspects of current theories describing neurophysiological processing of pain within the brain.

Event-related potentials induced by a painful stimulus are associated with modulations of ongoing oscillations. They appear as event-related synchronisation or desynchronisation (ERS/ERD) in different frequency bands. It has been suggested that these ERD/ERS activities reflect various aspects of pain perception, including the representation, encoding, integration and behavioural responses to pain. ERD/ERS pattern may also facilitate focal cortical activation (focal ERD) and simultaneous deactivation or inhibition of surrounding cortical areas, which are outside the focus of attention (surrounded by ERS).

The Open Focus™ theory recognises four styles of attention. Switching between attention styles during simple mind exercises strengthens the alpha band rhythm synchronisation (alpha ERS). It can inhibit information processing in the brain structures affected by pain.

This mechanism represents a 'top-down' control inhibitory process and is exploited in the pain dissolving exercises.

Key words

alpha rhythm, attention, chronic pain, open focus, attentional flexibility

INTRODUCTION

The dissolving pain in Open Focus™ exercises described in this article last 10–20 minutes which makes them easy to perform in my everyday GP setting [1]. They require a participant to listen to a set of simple instructions while sitting in a comfortable position with closed eyes. The participant is fully aware during the exercises and can stop them at any moment. They always trigger a nice, relaxed state and a feeling of slight drowsiness which fades down within 1−2 minutes. They do not involve hypnosis or subliminal messages. They do not have contraindications and they cannot trigger unpleasant side effects.

I have been practising these exercises with my patients during my regular GP clinics for the last 8 years. I have suggested them mainly to patients who had already tried various types of anaesthesia and still suffered from chronic pain. They were usually very keen to try a new and non pharmaceutical approach.

The effects of the exercises varied depending on the patient and the character of pain. Pain was often reduced after the first try, and in some cases, it dissolved completely. I witnessed many sudden recoveries straight after performing the exercise. Most of the patients achieved significant pain reduction after 4-5 days of regular exercising. I also witnessed the improvement in mobility which often at first went unnoticed by the patient. My consulting room is located at the end of a long corridor and, without their awareness, I saw people who had come in with limb/back problems, leaving either walking better or moving their arms more easily.

To check if my presence played any role, I uploaded some exercises to the internet. They have been tried by people from all over the world with often good effects. I have also received positive reviews from people performing the exercise from the script.

I must admit that in some cases they do not work. It usually (but not exclusively) happens to elderly patients who may have difficulty understanding the concept of diffusing their attention.

It also could be that the benefits of performing the exercises fade down after a few hours. I always suggest to these patients to repeat the exercise regularly for a few days to achieve long term improvement. However, some of them show disappointment after a recurrence of the pain and do not continue with exercising. I think, this can be explained by the very limited time I have for communicating the idea of this approach.

To avoid confusion, I always make sure that the reason of the pain has been established before I suggest this approach. Sensing the pain can be important in any investigation process and these exercises once successful can make the situation less clear.

THE OPEN FOCUS AND THE FOUR ATTENTION STYLES THEORY

The Open Focus™ is the name of an attention training program created by Dr. Lester Fehmi, neuroscientist and psychologist from Princeton, New Jersey, US. Dr. Fehmi has been running a neuro-feedback clinic

for attention disorders for almost 40 years. He created a series of mind exercises which help to cultivate the whole brain waves synchronisation in alpha frequency. This training is supported by a neuro-feedback EEG machine designed by Dr Fehmi's which is calibrated to detect this specific brain waves pattern. On the basis of his findings, Dr. Fehmi has developed The Four Attention Styles Theory [2]. His theory describes four different styles in which we can pay attention and relates these styles to electrical processing in the brain.

- The most common understanding of attention is when we say that we "pay attention" or we "concentrate on something". For example, a reader of this article must focus on the lines of text in order to understand it. It limits the reader's conscious awareness to a narrow stream of stimuli which are being voluntary narrowly selected from a wide array of stimuli constantly available to him/her. According to Dr. Fehmi's theory, this type of attending can be described as the narrow attention style also known as selective attention.
- The opposite to the narrow style is the diffused attention style when one is simultaneously aware of all available stimuli (visual, auditory, tactile, olfactory, etc) and/or three dimensional space which is continuously present around us.

The other two styles of attention include.

- The objective attention style – when one feels separated from an attended object (the object can be everything one can focus on; like a physical object, a sound, a taste, a thought, a feeling, sensation from the body, etc). For example, it can be triggered when one is confronted with danger or during an argument.
- The immersed attention style – when we feel connected, for example, while reading a good book, or during an involving activity like playing an instrument (Fig. 1) [3].

According to Dr. Fehmi, stress, anxiety, pain and life's challenges make our attention narrow and objective. It is natural to narrow our attention (to focus) on pain or a problem in order to deal with it efficiently, but most people overuse this style in everyday life. Often, habitual focusing creates an impression that the reality consists of separated objects making our attention objective. This is because one can concentrate on only one thing or sensation at a time leaving the rest outside of the focus. It can make us feel distant, alienated and lonely.

Doctor Fehmi says we can support ourselves in relating to what's difficult by diffusing (broadening, opening focus of) our attention. Diffusing allows us to see the big picture and connect (immerse) with its elements. It helps to realign with the world and to create healthy relationships. According to Dr. Fehmi, simultaneous diffusing and immersing our attention makes the brain activity more synchronous in alpha frequency.

Doctor Fehmi suggests everyone should be flexible in paying attention and practice ability to attend in Open Focus™.

Attentional flexibility means that one can alternate between different attention styles.

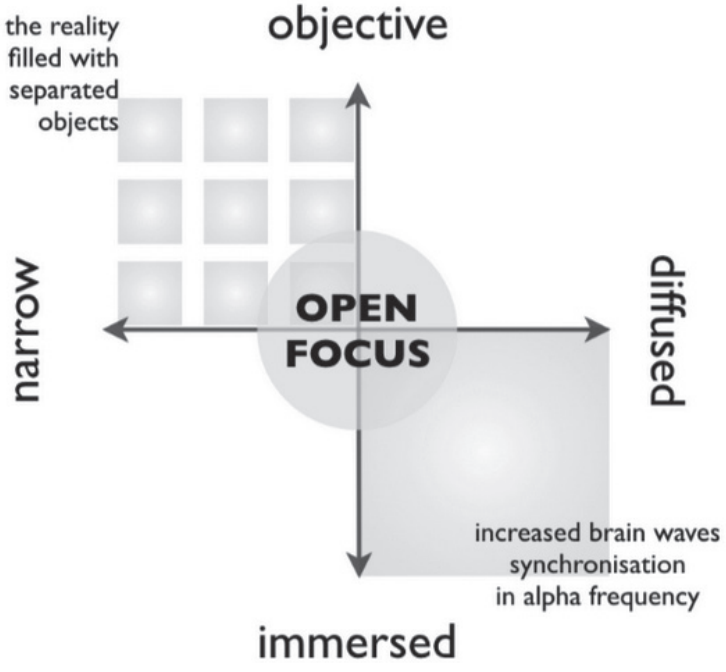

Fig. 1. The four attention styles graph.

Open Focus™ attention means that one can balance all attention styles at the same time. For example, a reader of this text can stay focused on the lines of text while diffusing attention by becoming aware of the space at the same time. Please, try an example below.

Can you become aware of space between lines of this text and between these words? Do it now, please. Keep reading and become aware of space which is between you and a screen you are reading from now? Do not stop reading and become aware of space around the screen at the same time. There is also space on both sides of you. Become aware of it and feel your shoulders gently dropping now. Become aware of space behind you. There is a lot of space around us all the time but we tend to ignore it. Stay aware of space on both sides of you and become aware of space below and above you. Feel muscles around your eyes gently relaxing. Stay aware of space and keep reading.

Doctor Fehmi says, that the way in which we pay attention is directly linked to our well-being. He links habitual attending in **the narrow/objective** style with the sympathetic system overstimulation and attending in **the diffused/immersed** style with the para-symphatetic system activation [4]. He claims that once we learn to balance our attention, we can positively influence the mind and body. It means that attention flexibility can be regarded as an integral part of a healthy lifestyle together with a healthy diet and physical activity.

Open Focus™ training starts from simultaneous awareness of many objects. Then one can progress to awareness of space between objects (it might be space between physical objects, silence between sounds or breaks between thoughts, etc). Finally one practices awareness of space between and inside objects which according to Dr Fehmi helps us attending in the diffused and immersed attention style and generates the whole brain synchrony in alpha frequency.

ELEMENTS OF THE BRAIN'S RESPONSE TO PAIN

Event-related potentials induced by a painful stimulus are associated with modulations of ongoing oscillations. They appear as event-related synchronisation or desynchronisation (ERS/ERD) in different frequency bands. It has been suggested that these ERD/ERS activities reflect various aspects of pain perception, including the representation, encoding, integration and behavioural responses to pain [5−8].

ERD/ERS pattern may also facilitate focal cortical activation (focal ERD) and simultaneous deactivation or inhibition of surrounding cortical areas, which are outside the focus of attention (surrounded by ERS) [9−13].

It has been suggested that mechanism helps to fully concentrate on pain and deal with it efficiently while not being distracted by other stimuli [14].

It seems plausible to expect that increasing alpha synchronisation (alpha ERS) in the brain network involved in pain processing will result in diminishing the pain experience. Not surprisingly it had been already researched with promising results [29−31].

The functional inhibition role of alpha band synchronisation has been already well documented [15−18]. It also has been shown that strong pre-stimulus alpha power in task-relevant regions negatively affects subsequent stimulus processing [19−23]. Degree of alpha lateralisation has been linked to ability to ignore task irrelevant hemifield and sustain attention [24−27]. The functional inhibition role of alpha band synchronisation is likely responsible for an attentional failure in a famous inattentive blindness experiment [28].

The inhibition role of alpha band synchronisation is utilised by the dissolving pain in Open Focus™ exercises. The enhancement of alpha band is created by switching attention styles from narrow/objective to more diffused and more immersed [32].

This represents a 'top-down' control inhibitory process.

THE FOUR ATTENTION STYLES THEORY AND A PROCESS OF DISSOLVING THE PAIN

According to the four styles attention theory, **pain triggers the narrow objective** attention style (upper, left quadrant of the graph).

The pain triggered style of attention is **narrow** because the pain constantly redirects the attention towards itself – *'I cannot stop feeling this pain'*.

It is also objective because the pain creates an impression that the painful part of the body is separated from self (I, ego) – *'I have this pain and I want to get rid of it'*.

According to Dr Fehmi, **in order to dissolve the pain**, the attention should be shifted from the narrow/objective style to **more diffused** *(become aware of the wide array of sensations including the pain)* and **more immersed** *(connect with the pain)*. This shift of attention generates strong, synchronous waves in alpha frequency in the brain network processing the pain [32].

Diffusing attention makes the pain less disturbing as it becomes only one of many processed stimuli (although it is still experienced). The simplest way to diffuse attention is to become aware of sensations coming from both hands at the same time and/or the

empty space around and inside the pain. It must be pointed out that including the pain into broad attention (diffusing) is distinct from redirecting attention from the pain (distracting) [33].

Immersing with the pain helps not to experience it as a separated from self (I, ego). The easiest way to immerse with the pain is to become aware of the centre of the pain and to let go. The difficult part of 'letting go' is that one does not have to do anything in order to achieve it. Immersing happens on its own and one can only let it happen. Once it is done by sufficient time one can merge (unify) with the pain. This process might be facilitated by a cross-frequency synchronisation between gamma band waves representing the pain stimulus and low frequency activity in deep brain structures [34].

During the dissolving pain in Open Focus™ exercises, the participant is initially asked:

1. To become aware of sensations coming from both hands, lips and the tongue at the same time in order to diffuse an attention between those three areas. They have been chosen specifically due to their biggest representation in the brain sensory area.
2. Once it happens the participant is asked to become aware of space in the room.
3. Then the participant is asked to feel space together with hands, lips and the tongue. This enhances alpha band synchronisation in the whole brain.
4. Then the participant is asked to add to that experience a sensation of pain which introduces synchronous alpha brain waves to brain networks processing the pain experience.

OPEN FOCUS™, MINDFULNESS AND MEDITATION TECHNIQUES AS TYPES OF ATTENTION TRAINING AFFECTING PAIN EXPERIENCE

Open Focus™ attention training can be regarded as one of many approaches to attention training, together with Mindfulness and many traditional meditation techniques.

Mindfulness has been defined by its creator as paying attention on purpose, in the present moment and without judgment. There are dozens of research looking at Mindfulness effects on the brain in pain [35−38]. Interestingly, some of them describe a similar mechanism to the one presented in this paper [39].

Equally many ancient meditation techniques can be regarded as an attention training [40−42]. There is also research available showing that experienced meditators change their appraisal of pain [43−45].

THE ADVANTAGE OF THE OPEN FOCUS™ ATTENTION TRAINING

I believe, the advantage of the Open Focus™ method over other attention modulation approaches is that it has identified four attention styles, which for most people, makes it easy to learn. It also does not require the assistance of a health professional (after initial introduction). It can be presented during a 10-20 minute appointment or can be learned from a script or recording.

The recognition of attention styles and the brain physiology related to them enables:

- a very fast induction (immersing through diffusing),
- simplicity (simple and direct instructions, easy to practice shortly after introduction to the method, no need to engage with a health professional),
- possibility of adjusting the exercise to the particular patient by calibrating a personal attention preference,
- no need for readjusting personal believes and behaviours (can be used as a stand alone technique),
- easy switch to other popular applications of the Open Focus™ method (dissolving unwanted emotions, fast falling asleep),
- based on short lasting exercises without compromising efficiency (important in GP setting),
- no need for time consuming introduction to the method (important in GP setting).

It is worth mentioning that the same principle (augmenting the perception by changing an attention style and increasing alpha power in the brain structures processing a stimulus) can be used to inhibit perception of many internal or external stimuli like itch, hunger, anxiety, fear, cold, etc.

I have been experimenting with this approach for the last 9 years with many interesting results. Changing attention style helps in many everyday situations like walking into a swimming pool with cold water, after sitting for a prolonged time with legs crossed and slowly getting up experiencing pins and needles in my legs, small burnings, injuries and eating very spicy food.

I (and some of my friends and patients) have already experimented with unpleasant smells, itch, anxiety, fear, hunger, etc. In all these situations there is a significant shift of perception. It sometimes requires training, but it is achievable by many.

By regular practice, I have significantly improved my attention span, I have learned how to control my physical pain and to reduce stress. I can fall asleep every time when I want, I communicate better with my patients and I can be creative on demand.

These exercises are safe, easy to learn, effective (immediately or after a short training), based on neuro-feedback research and free. I believe, they could be added to an already existing list of pain remedies which can be recommended by health professionals to their patients.

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CONFLICT OF INTEREST

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CLINICAL FEATURES OF SKIN LESIONS OCCURING IN THE COURSE OF EMERGENCIES IN CHILDREN

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Abstract

A pediatric patient is a challenge for any healthcare provider, regardless of the profession or the level of competency. The main reason is a lack of experience and a specific method of diagnosis and treatment. One of the key elements of health assessment is skin examination. It can provide a wealth of valuable information necessary to make the right decisions. **The aim** of the study was to present various forms of skin lesions occurring in meningococcal sepsis, selected infectious diseases and urticaria. The information contained in the article may help to systematize the knowledge and maybe helpful in the diagnosis and the proper treatment.

Key words

differential diagnosis, pediatric emergency medicine, skin manifestations, acute disease

INTRODUCTION

In 7.82% of cases, interventions undertaken by Emergency Medical Service (EMS) Teams affect people under 20 years of age, whereas in 0.35% of cases – children under one year of age [1]. The professional experience of employees of the EMS system in providing healthcare to pediatric patients is small. The lack of experience is a factor that affects the safety of the proceedings. Respiratory system diseases (30.41%), gastrointestinal system diseases (21.20%), fever (17.51%), injuries (5.99%), and loss of consciousness (5.07%) are the leading causes for admission of children to the emergency department (ED) [2].

A skin examination can bring much information and be helpful in further proceedings. The variety of lesions and the reasons for their occurrence requires extensive knowledge from decision-makers. In many cases, only timely and proper diagnosis can reduce the risk of permanent damage to health or death in life-threatening cases.

The study aims to recall the essential elements of skin lesion assessment and to discuss disease entities in which their correct identification is the key to diagnosis.

MENINGOCOCCAL SEPSIS

Neisseria meningitidis is a Gram-negative diplococcus, for which a man is the only reservoir. This pathogen commonly colonizes the nasopharynx mucosa. The invasive meningococcal disease (IMD) is the most common and, at the same time, the most serious form of infection. It is caused by the invasion of bacteria into physiologically sterile spaces, such as the central nervous system (CNS) or blood. IMD can occur as sepsis or purulent meningitis. Sepsis is a life-threatening multi-organ dysfunction caused by disturbed regulation of the body's response to infection. A generalized inflammatory reaction, often caused by bacterial infections, is its pillar. It is a state of an immediate threat to life. The unusually rapid development of meningococcal sepsis symptoms is the basis for calling it fulminant. Such a course of the disease means that despite the rapid and correct treatment, sepsis is characterized by high mortality – up to 25%, and in untreated patients reaches 100%. At the time of diagnosis, most patients already have symptoms of multi-organ dysfunction. It has been shown that 74% of children with IMD will require assisted ventilation, and 55% – vasoactive drug infusion [3].

In 2017, 224 IMD cases were reported in Poland, of which 156 were sepsis. The mean age of patients was five years [4, 5]. The most common primary site for bacterial entry is the respiratory system. It is estimated that in 40% of cases, IMD occurs as a meningococcal respiratory infection. The initial phase of infection is difficult to recognize because it resembles respiratory or digestive tract infections. After 4-6 hours, there may

be a short-term improvement in health. Jackowska and Wagiel distinguish a group of prodromal symptoms, which include poor general condition, lethargy, fever, nausea / vomiting (a refusal to eat), irritability, symptoms of upper respiratory tract infection, abdominal pain and diarrhea. However, such ailments as joint or limb pain, cold hands or capillary recurrence for more than 2 seconds, and pale, blue or marbled skin are considered so-called "red flags" for sepsis. Along with the development of the disease, the patient's body temperature may rise or fall (>38.3°C or <36°C), as well as chills, weakness, tachycardia, tachypnoe, and disturbances in consciousness may appear. Acute symptoms include acute circulatory failure and hemorrhagic ecchymotic rash [6]. The criteria for sepsis diagnosis are based on the sequential organ failure assessment score (SOFA) developed by the European Society of Intensive Care Medicine. The parameters that, according to this scale, affect the patient's prognosis are oxygenation index, platelet count, serum bilirubin and creatinine, mean arterial pressure, and assessment of consciousness.

Skin lesions in the course of meningococcal sepsis are very characteristic and referred to as *purpura fulminans* (Fig. 1). In over 60% of cases they are caused by the discussed pathogen [7]. *Purpura fulminans* is a symptom of disseminated intravascular coagulation (DIC). Lesions take the form of ecchymoses greater than 2 mm in diameter, located below the outflow area to the superior vena cava. They do not disappear under pressure (so-called glass symptom), because they are caused by blood clots in small blood vessels. Thrombosis leads to ischemia, swelling and death of endothelial cells and then to blood extravasation. Initially, one or more small ecchymoses are observed, which then expand and merge with each other to form hemorrhagic blisters and necrosis. Petechiae are initially located on the feet, so it is essential to completely undress the patient for examination. This fact is explained by the increased ischemia of these parts of the body in shock and collateral failure.

In the case of IMD, meningeal symptoms may occur, of which the raised and pulsating fontanelle is the equivalent in the newborns and infants. Immediate antibiotic therapy and maintenance of respiratory and cardiovascular function is the basis of treatment. The antibiotic − 3rd generation cephalosporin, e.g., 50 mg/kg ceftriaxone intravenously or cefotaxime at a dose of 50 mg/kg intravenously – should be administered no later than one hour after the assessment of the health state. In case of shock symptoms, fluid therapy with a crystalloid solution in the volume

Fig. 1. Meningococcal sepsis.

Fig. 2. Chickenpox.

of 20 mL/kg should be started and be given in 5-10 minutes. In the event of hypotension persisting after a repeated bolus three times, an infusion of catecholamines (dopamine at a dose of 10-20 μg/kg/min) should be initiated. At the same time, one should remember to correct hypoglycemia, metabolic acidosis, electrolyte, and coagulation disorders [6].

VARICELLA AND ZOSTER

Both chickenpox and shingles are caused by the same virus − *Varicella zoster virus*, VZV from the *Herpesviridae* family. To prodromal symptoms, occurring 1-2 days before the appearance of skin lesions, one can include fever, malaise, headache, and stomachache. In the period from January 1 to August 31, 2018, 111,116 cases were reported to the National Institute of Hygiene, which gives an incidence of 289.20 per 100,000 inhabitants [4]. Skin lesions in chickenpox appear according to the scheme: macula-papule-follicle-pustule-scab. This evolution lasts 1−7 days. The patient should be considered contagious until the last lesion dries. New changes appear in a period of 3-5 days, and the multiformity of changes and their presence at various stages of evolution is characteristic − the so-called "starry sky" symptom. The lesions are located on the face, torso, and are accompanied by itching. It is worth mentioning that they can also be located on the mucous membranes in the mouth and urogenital area. The erythema that forms the basis of the lesion is irregular, which gives the appearance of "dew drop on the rose petal". Typical lesions for chickenpox are shown in Figure 2. Fever associated with uncomplicated chickenpox rarely exceeds 38.6°C. In almost half of the patients, the number of lesions is 50−250, and the mean age of onset is 3.9 years. Bacterial superinfection of skin lesions, cerebellar ataxia, and encephalitis are the most common complications of chickenpox [8, 9].

Herpes zoster (HZ) occurs in people who have had chickenpox before. HZ is rarely seen in children with a well-functioning immune system. The symptoms of HZ relate to one, two or three dermatomes especially at the level of C2-L2 and do not exceed the midline of the body. The clinical picture of HZ are fluid-filled vesicles occurring on the erythematous medium. Patients report unpleasant sensations such as pain, itching and burning in the area. There is hyperalgesia and tenderness; in addition, lymphadenopathy, headache, and fever may occur. Lesions occur gradually over 7 days, and over a period of 14–21 days they are covered with scab [8−10].

Reactivation factors include sunburn, stress, fever, trauma, radiation therapy, immunosuppression, cancer and HIV infection [8]. Independent risk factors also include female sex, Caucasian race, pre-existing HZ in the family, and autoimmune diseases [11]. In half of patients, complications such as: bacterial superinfection, meningitis, shingles of the eye or ear, including Ramsey-Hunt syndrome are observed [12]. In children ≤12 years of age with a properly functioning immune system and in the mild course of the disease, symptomatic treatment (antipyretic, antipruritic, analgesic) is recommended. Acyclovir may be used in patients at risk or in severe disease. It should be mentioned that for both chickenpox and herpes zoster, compliance with basic hygiene is crucial, while lubrication of lesions is not recommended, e.g. liquid powders, as this increases the risk of secondary bacterial superinfection [13].

HERPETIC STOMATITIS

This disease is considered to be the most common form taken by primary HSV-1 infection. It can also be asymptomatic. Most often, children aged 3−5 years get sick. HSV-1 infection usually occurs in childhood. In 90% of cases, the child acquires the virus vertically [14]. The disease is usually mild. If one has a full-blown form, one may need to be admitted to the hospital for intravenous hydration. The disease begins with a sudden onset of fever up to 40°C, accompanied by lymphadenopathy. In the mouth, redness and swelling of the gums can be observed, and the mucous membranes are covered with pin-sized vesicles surrounded by a red border. Over time, the vesicles macerate, collapse and merge, forming a gray film. Then the lesion changes into ulceration and erosion, which may result in an increased bleeding tendency. The described changes are painful, hence the unwillingness to swallow saliva, which can give a picture of drooling as well as anorexia. Sometimes vesicles are observed on the skin of the face and hands. If the lesions on the mucous membranes become superinfected, one can smell an unpleasant odor from the mouth. The overall disease causes general malaise. The period of occurrence of acute changes lasts 5-7 days. After about 2-3 weeks, the lesions heal and leave no traces. Problems with food and fluid intake last about 7-9 days. In children under six years of age, the inclusion of acyclovir in the first three days of the disease reduces the duration of symptoms and infectivity [15]. In randomized controlled trials, the use of lidocaine gel was not shown to increase oral fluid intake. Although such symptomatic treatment may reduce pain, it should not be abused [16].

MEASLES

Measles is an acute infectious disease caused by the *Paramyxoviridae* virus. According to data from

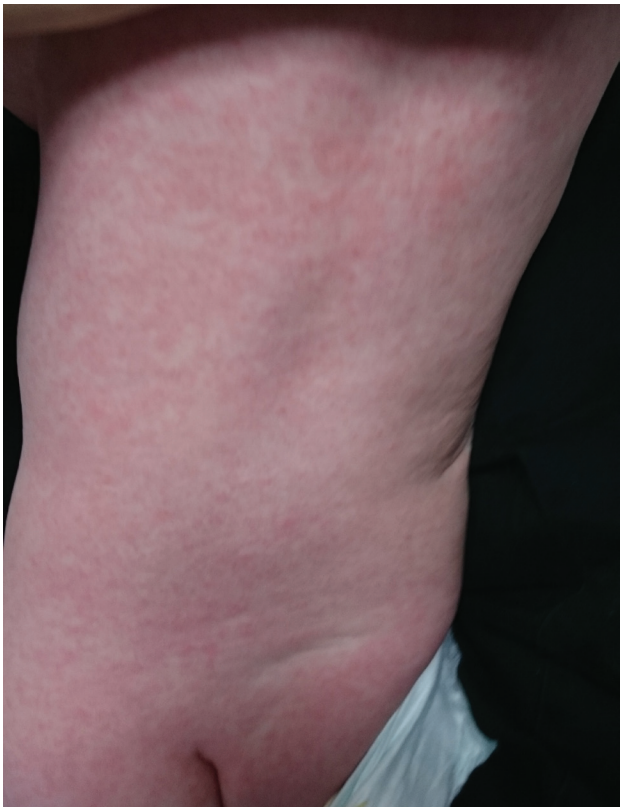

Fig. 3. Measles.

Fig. 4. HFMD.

the World Health Organization, in 2012, over 27,000 cases of measles were recorded in Europe, while in the following year – over 31,000. Most cases were observed in Georgia (25%), Turkey (23%), and Ukraine (10%). In Poland, the incidence was 1.9 and 2.2 cases per million inhabitants in 2012 and 2013, respectively. It is worth noting that 66% of patients are children, mostly between 1 and 4 years old. More than 75% of cases occur in persons who have not had a protective vaccination. About 4% of those infected are health care workers [17, 18]. The effect of increased activity of the so-called anti-vaccination movements is the fact that outbreaks have been registered in 14 European countries since 2017. [19]. Measles occurs only in humans, and the transmission of the virus is via a droplet route and through direct contact with a sick person. The incubation period is 10−14 days. The patient is contagious four days before and four days after the onset of the rash.

Prodromal symptoms include high fever, cough, runny nose, and conjunctivitis. After 3−4 days, a typical rash appears with an associated high fever (39−40°C). The general condition usually improves on the third day, and the patient recovers after 7−10 days. Half of the patients develop typical measles symptoms such as Koplik spots, photophobia, and conjunctivitis [20]. Koplik spots are a pathognomonic symptom of this disease. It has the form of small, white spots with a red border located on the oral mucosa, usually at the level of the second molars. They appear 1-2 days before the onset of rash and persist 1-2 days after it occurs. Hence, they can be overlooked if the study is performed in a full-blown period. A typical rash is macular-papular in nature and initially locates behind the ears and on the forehead (Fig. 3). Then within the next 24-48 hours, it spreads to the face, neck and the next day to the chest and limbs [21]. Due to the particular image, these changes are called "leopard skin". The rash begins to fade and disappears after 3−7 days, in the same order in which it appeared. The rash leaves brown discoloration and delicate exfoliation.

Complications of measles occur in approximately 5−17% of patients. Children under five years of age are most at risk. The most common are otitis media, laryngotracheitis, and pneumonia [18].

The relatively low number of measles cases is the result of immunization of society and the so-called population immunity. In 2000−2010, the number of deaths decreased by 74% [22]. According to WHO recommendations, vaccination must be complete – that is, it consists of two doses [23]. In the works cited above, it was noted that the occurrence of measles cases was strongly correlated with the migration movement. Syrian, Bosnian, Romanian and Ukrainian nationalities are mentioned among

the populations that were the reservoir of infection. Cases of outbreaks in smaller Roma communities are also described in the literature [24].

Treatment of measles is only symptomatic. Antipyretic drugs, room darkening for photophobia, hydration and nutrition are recommended. Good effects of intramuscular administration of vitamin A and intravenous ribavirin infusion have been reported in some patients, but this is not considered a standard practice [25].

HAND, FOOT AND MOUTH DISEASE (HFMD)

HFMD is a common childhood viral disease. The most common pathogens that cause HFMD are the *Picornaviridae* family viruses, especially Enterovirus71, Coxsackie A6 and A16 [26]. This disease occurs mainly in children under five years of age, but may also affect older children and occasionally adults. The mean age of patients with HFMD is 2.4 years. Atypical changes are more common in children under 2 years of age. Enterovirus infections usually occur between May and July (77%) and then between October and December [27]. There is no published official data on the HFMD epidemiology in Poland, because the disease is not subject to obligatory reporting to sanitary services.

The main symptoms include fever and rash, which may be accompanied by papules or vesicles. It is located on hands, feet, lips, around large joints, and on the buttocks (Fig. 4). In children, the changes are not itchy, while in adults, they can cause great discomfort. The disease is self-limiting. Lesions usually disappear 7-10 days after the onset of symptoms [28]. It is estimated that in 6% of cases, the infection is asymptomatic. Complications can appear in 21%. The most common are those from the central nervous system: aseptic meningitis, acute flaccid myelitis, and encephalitis. Upper respiratory tract infection, gastroenteritis, myocarditis, and neurogenic pulmonary edema have also been observed [29,30]. There is no specific antiviral treatment. In the uncomplicated form of HFMD, antipyretic therapy should be initiated, and adequate hydration is recommended. Despite the large economic costs resulting from HFMD, currently, no preventive vaccinations are available [31].

URTICARIA

Many parents seek medical help when their child develops urticaria. Often this is because caregivers associate sudden skin changes with an anaphylactic reaction, hence many of them use the help of hospital emergency departments or EMS teams. In fact, skin lesions occur in 94% of cases of anaphylaxis; however, urticaria alone should not be treated as anaphylaxis [32].

Urticaria is a skin disease that can occur in many clinical forms and with varying severity. It is caused by mast cell degranulation, which may be evoked by many exo- and endogenous allergic, infectious, and inflammatory factors. According to the duration of symptoms, urticaria is divided into acute (lasting < 6 weeks) and chronic (lasting > 6 weeks). The incidence of both forms in the pediatric population ranges from 2.1% – 6.7%. It concerns almost 2% of patients admitted to the emergency room and is most often observed in November, which, however, has not yet been clearly explained [33].

This set of clinical symptoms is characterized by the sudden onset of blisters, angioedema, or both. The emerging swelling of the skin has different sizes, usually surrounded by an erythematous border. It may be accompanied by itching, sometimes burning or pain. Swelling usually lasts longer than blisters. [55]

Volonakisi et al. showed that 78.4% of children 1-14 years old suffering from chronic urticaria had only blisters, 15% had blisters with edema, and 6.2% – only edema [34]. Skin changes observed all over the body occurred in 46% of children, whereas lesions limited to limbs were observed in 14.5% of cases, torso – 10% and face – 4.3% of cases. On the other hand, urticaria was located simultaneously on the limbs and the trunk in 24.5% of patients [35]. Angioedema may also affect mucous membranes, which in the case of the respiratory tract, may result in impaired patency. In addition, respiratory (41.4%), digestive (10.5%), urogenital (0.7%) and rarely neurological (0.4%) symptoms may appear. Systemic symptoms such as fever occur in 29.3% of cases and skin lesions without accompanying symptoms – in 45.1% of cases. Exposure to inhaled allergens and an unrecognized cause results in a longer duration of symptoms, while medications and contact allergies are shorter [35].

The causes of urticaria most frequently mentioned by various authors include: infections (32% – 69%), drugs (5.4% – 11.6%), allergies (2.7% – 23.5%), and the presence of parasites (8.69%). In more than half (53.7%) of cases, the cause of acute urticaria remains undiagnosed.

The most characteristic of urticaria is an infection of the respiratory tract, mainly of the nasopharynx, tonsils, and bronchi. As a rule, these are viral infections. According to a study in Thailand, the prevalence of various infections as a cause of acute urticaria decreases with age (56.5% in newborns, 51.2% in pre-school children, 42.1% in school children, and 17.1% in adolescents) [36].

Of the drugs that cause urticaria, the most common are non-steroidal anti-inflammatory drugs (NSAIDs) (32.4%: ibuprofen, diclofenac, acetylsalicylic acid), antibiotics (25.2%: mainly penicillin V and G), vaccinations (7.9%), paracetamol (3.6), herbal preparations (8.6%), antiepileptic drugs (3.6%), anti-diarrheal drugs (5%) and antiemetic drugs (2.2%) [37]. Nevertheless, the most common allergens causing urticaria are food and inhalation allergens as well as insect stings, and contact allergens [35].

CONCLUSIONS

A pediatric patient is a challenge for all healthcare professionals, requiring a different approach than for adults. It should be emphasized that many times in the pre- and post-graduate education process insufficient time is devoted to these issues, which results in a lack of knowledge and experience in dealing with the most common health problems in children. The difficulty also lies in the variety of symptoms and differences in the image of the disease in the child and adult patient. In the presented work, only the most important disease units are discussed, which can be found on duty in emergency care, hospital emergency department or EMS team. The authors hope that the information contained in the above work will help to systematize knowledge and will be helpful in the diagnosis and proper treatment of a child with skin lesions.

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DOI: 10.36740/EmeMS202001107 **REVIEW ARTICLE**

EMERGENCY SEVERITY INDEX – TRIAGE SYSTEM DESCRIPTION AND LITERATURE REVIEW

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Abstract

The number of patients admitted to the emergency departments increases worldwide. ED overcrowding has negative effects on patient safety because of increased time to exam and appropriate treatment. The implementation of valid and trustworthy triage system is one of the methods of overcoming overcrowding by providing right resources to the right patient in the right time. Emergency Severity Index (ESI) is one of the most valid and reliable triage systems. There are various studies that analyze the ESI and compare it to other triage systems. The aim of this study is to present the ESI triage system to the Polish reader and to review English literature regarding this topic.

Key words

triage,
ESI,
Emergency Severity Index,
Emergency Department

INTRODUCTION

The number of patients admitted to the emergency departments (ED) rises worldwide [1]. There are many reasons for this phenomenon, such as insufficiency of prehospital care, increasing demand for health services, decreasing numbers of hospital beds and health care personnel [2–4]. Similar observations can be made in the Polish EDs [5].

The ED overcrowding is linked with various negative effects for patients, for example prolonged length of stay (LOS), increased mortality, delays in antibiotic administration, delayed start of resuscitation, inadequate pain control [6]. It is also linked with increasing aggression towards ED staff [7]. Implementation of the valid and reliable triage system is one of the means to provide high quality and safe patient care within overcrowded EDs [8].

The reason to use triage is to provide help to as many patients as possible in the scarce resource setting [9]. In the overcrowded EDs staff time and bed availability are the most insufficient resources [8]. The aim of the triage in the ED is to quickly detect patients that can't wait to be seen and to specify the admission order of the others [9]. The triage systems are not designed to safely discharge patients from the ED and shouldn't be used for this purpose. It is the earliest stage of patient management during ED visit [8].

There are many triage systems described in the literature with proven effectiveness. The most popular systems worldwide are Australasian Triage Scale (ATS)[10], Manchester Triage System (MTS)[11], South African Triage Scale (SATS)[12], Canadian Triage and Acuity Scale (CTAS)[13] and Emergency Severity Index (ESI)[14]. The latter two were recommended by American College of Emergency Physicians and Emergency Nursing Association joint commission to implement in the EDs within USA [8].

The subject of the ED triage is scarcely described in Polish literature. The aim of this study is to present the basics of the ESI triage system to the Polish reader and to review the English literature regarding this topic.

THE EMERGENCY SEVERITY INDEX – SYSTEM DESCRIPTION

The ESI triage system was created in the late 1990s by the team of physicians and nurses led by Wuertz and Eitel. The system was repeatedly modified on the basis of provided studies. The 4th version of the system is the most current [14]. The implementation manual and the training materials are available on the project website. ESI is the most popular triage system in the USA [15], earning recognition in other countries [16–19]. The following description is based on the implementation manual [14].

The system is based on simple algorithm with four decision points. The affirmative answer in each point ends the triage process and grants the appropriate acuity level (Fig. 1).

In the decision point A the triage nurse has to identify patients with life-threatening conditions. The triage nurse should evaluate the ABCDE exam and the necessity to perform life-saving interventions, for example airway protection, mechanical ventilation, emergency cardioversion or electrostymulation, fluid resuscitation, tension pneumothorax decompression. These are ESI 1 patients that require immediate physician support.

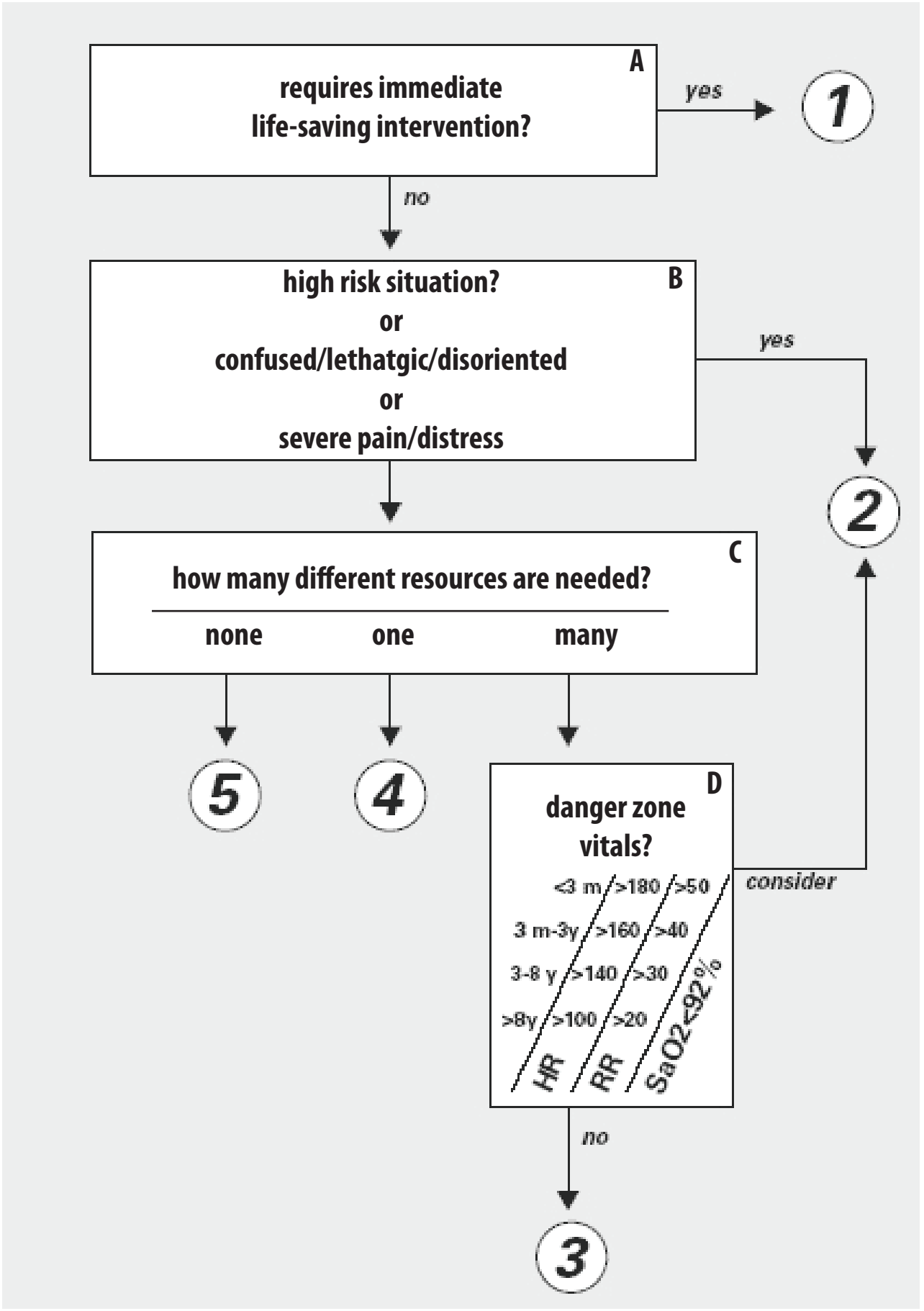

Fig. 1. The ESI algorithm. Used with Authors' permission.

In the decision point B the triage nurse determines the group of patients that can't wait to be seen by giving positive answer to one of questions:

1. Can the patient complaints or mechanism of injury suggest the serious illness (dangerous situation)?
2. Is the patient suffering physically (reporting NRS 7/10 pain with additional symptoms such as diaphoresis, forced body posture, abnormal vital signs) or mentally?
3. Can new consciousness deficits be observed?
4. The patients that fulfill the above criteria are granted the ESI level 2. They have to be seen by the physician in 10 to 15 minutes.

The decision point C determines the priority of the patients that can wait to be seen based on the number of the ED resources required to make the disposition decision (admission, referral or discharge). The ED resources, as by ESI system, are laboratory tests, imaging, ECG, iv and im drug administration, nebulization, consultations and various procedures (such as wound suture, Foley catheter insertion, procedural sedation and some procedures (for example physical exam, tetanus immunization, splinting). The patients that don't require any resources have ESI category 5 and those requiring one resource have ESI category 4.

As for patients requiring two or more resources, they should have vital signs (heart rate, respiratory rate, O_2 saturation) evaluated in the decision point D before granting ESI level 3. If their vital signs are in the danger zone, the triage nurse should consider the patient uptriage to ESI category 2.

There is no defined time to physician examination for the ESI level 3-5 patients. They should be seen as soon as possible, but after those with more urgent category.

The resource count is unique to the ESI system [9]. It allows the patient streaming to the appropriate ED zones (for example fast track area for low-resource ESI 4 and 5 patients), making it possible to conserve beds and resources of the main ED areas for the patients in the life-threatening situations or requiring broader diagnostic and treatment [20]. Patient streaming can shorten the ED LOS of those in the ESI 4 and 5 groups [21, 22]. This approach makes it possible to give the right resources to the right patients in the right time [8].

The authors stress in the implementation manual that the ESI should be used by experienced triage nurses, optimally after additional triage course [14]. In 2016 Martin showed no correlation between triage nurse experience and validity or reliability of the provided triage [23]. There is clear connection between triage quality and systematic training described by Ghanbarzehi [24], Rahmati [25], Cone [26], Brosisky [27] and Shelton [20].

The vital signs evaluation is required in the decision point D of the algorithm. However, the triage nurse should take the vital signs on every step of the triage if it can change the acuity level. The authors recommend to take the vital signs during triage of every patient. Nejad analyzed in 2014 the vital signs that are responsible for the uptriage from ESI level 3 to 2. The majority of uptriage decisions was based on respiratory rate and heart rate deviations. O_2 saturation alone was the reason of uptriage in 2,2% of cases [28]. Garbez in 2011 identified patient age, vital sign abnormalities and the need for time-sensitive procedure as main reasons of uptriage [29]. In 2016 Gunaydin modified the decision point D by including 7 parameters instead of 3. As a result, the correlation between triage category and need for hospitalization decreased [30].

STUDIES REGARDING ESI IN THE ADULT PATIENT POPULATION

Validity and reliability are the main two parameters used for the evaluation of triage systems. Validity describes the capacity to differentiate the acuity of the admitted patients [31]. Currently there is no "golden standard" for acuity evaluation, therefore substitute criteria are used for validity testing. Examples of those criteria are standardized patient cases, the need for life-saving intervention, ED LOS, the need for hospitalization [32]. Invalid triage decision is known as mistriage – overtriage (overestimation of patient acuity) or undertriage (underestimation of patient acuity) [33].

Reliability of the triage system describes triage decision agreement between different providers (inter-rater reliability) or by the same provider in different time (intra-rater reliability) [32]. It is usually measured as kappa statistic varying from 1,0 (total agreement) to 0 (total disagreement) [8]. Different kappa (weighted or unweighted) is used in different studies, which impedes direct comparison of the results [32].

In the meta-analysis of 19 studies published between 2000 and 2013 Mirhaghi described the ESI reliability as good (pooled coeficient 0,79) – very good in the adult population (0,815) and good in pediatric population (0,769). The mistriage was observed mainly in ESI 3-5 categories. The tendency to uptriage the patients to ESI 2 was also noticed [34].

Esmailan showed in 2014 very good reliability (K 0,94) of ESI triage provided simultaneously by nurses and physicians [35].

Mirhaghi described in 2015 the rise of the ESI triage reliability from sufficient (K 0,33) to moderate (K 0,54) over one year of using the system. He pointed out that although ESI implementation in the developing country (Iran) improved the triage process, it was still underpowered in comparison to developed countries. The author marked cultural differences and less formalized decision making as main reasons of lower reliability [17].

In 2015 Jordi described 59,6% validity with good reliability (K 0,78) of the ESI in the analysis of the standardized cases solved by triage nurses. Multicenter study, based on case-solving by triage nurses, performed by Mistry in 2018 showed similar results: low validity (59,2%) and good reliability (0,73) [36].

Grossmann described in 2011 very good reliability (K 0,98) and high validity (described as correlation between the triage category and ED LOS, resource utilization, need for hospitalization and mortality) of the ESI after implementation in Germany [16].

Bergs conducted in 2014 evaluation of the ESI implementation in the Belgian hospital based on standardized clinical cases solving. The validity was 77,5% and reliability was very good for both weighted and unweighted kappa. The authors stressed high number of undertriage in ESI 2 scenarios (37,8%) [18].

In 2018 Hinson estimated mistriage risk of 20% by analysis of ED discharge papers. Advanced age, abnormal vital signs (bradycardia, tachycardia, hipotension, hypoxia) and some complaints (chest pain, neurologic disorders, dyspnea) were linked with higher risk of undertriage, while overtriage was connected with upper respiratory tract infection, laryngological complaints, hipotension, hypertension and allergies [37].

Van der Wulp analyzed in 2010 the patient population qualified to ESI 5 category. The majority of patients were young women. 83,9% was discharged home. The ESI 5 patients referred to outpatient clinic or admitted to hospital (what was considered undertriage) were mostly older people and those primarily referred to ED [38].

In the retrospective study conducted by Dalawari in 2015 the proper triage category was given in 53,8% of patients, 22,9% were undertriaged and 23,4% were overtriaged. The authors observed decrease in the triage validity in the months following the training. The periodic training and quality control programme were described as crucial for proper triage validity [39].

Silva compared in 2017 estimated and used resources in the ESI 3-5 patients, showing 64,7% agreement. The result was lower than observed in previously published studies. The resource utilization was overestimated in the majority of cases [40].

In 2016 Alexander evaluated the triage nurse prediction of patient disposition. The hospitalization need was correctly predicted in 71,5% and discharge in 88% of cases. Discharge of category 4 and 5 patients was correctly predicted in 99% of cases [41].

Bauman proved in 2007 the validity of the ESI in patients over 65 years old. The triage category was associated with ED LOS, resource utilization, the need for hospitalization and 1-year survival [42]. In the study conducted by Platts-Mills in 2010 less than half (42,3%) elderly patients requiring life-saving intervention were identified using ESI. Undertriage was associated with deviation from the ESI algorithm [43]. Grossmann showed in 2012 that undertriage risk was higher in the elderly population following problems with identification of the high risk situation and inappropriate interpretation of the vital signs. The association of the ESI category with resource utilization, ED LOS, patient disposition and mortality was present. The study concluded that ESI is valid and reliable triage system in the elderly population [44]. In other study Grossmann evaluated the undertriage risk in the elderly patients to be over 20%. The risk was associated with the patient age. Holding to the ESI algorithm was vital for the proper triage [45].

COMPARISON OF ESI WITH OTHER TRIAGE SYSTEMS

In 2009 Storm-Versloot compared reliability of ESI and MTS based on standardized case studies. MTS had better reliabilty than ESI (Kw 0,82 vs 0,73). The deviation of given and true acuity categories was no more than one category [46]. Van der Wulp showed in 2009 similar capabilities of ESI and MTS in predicting the need for hospitalization and patient mortality [47]. Storm-Versloot compared in 2011 triage based on ESI, MTS and informal 3-tier system. Undertriage was evaluated as 11%, 14% and 8% for those systems. Resource utilization, ED LOS and need for hospitalization were similar in compared systems, as was validity [48].

The study conducted by Alpert in 2011 showed good reliability of ATS and moderate of ESI. The participants recognized ESI to be easier to use [49].

Wuerz showed in 2001 better reliability and validity of ESI in comparison to 3-tier triage system [50]. The study conducted by Travers in 2002 showed similar results [51]. Participants of both studies recognized ESI to be easier to use and more helpful in decision making than the 3-tier system. Maleki showed in 2015 better efficiency of ESI than formerly used

3-tier system. It was noticed that after ESI implementation the times from triage to physician evaluation and from physician evaluation to further orders was longer, while the time until lab test results was shorter [52]. Lim compared ESI with 3-tier triage system in 2018 showing similar reliability (K 0,75 vs 0,81). ESI had higher validity with less mistriage [53].

Swailes showed in 2009 that time from triage to painkiller administration in patients with abdominal pain was similar when using ESI and informal triage system. It was noticed that ESI 2 patients got painkillers quicker than ESI 3 patients [54]. Yuksen showed in 2017 higher validity of ESI compared to informal 4-tier triage [55]. Ying-Fong compared in 2018 ESI with Patient Acuity Category Scale (PACS) triage system used in Singapore. Reliability of both systems was similar when solving standardized clinical cases (K 0,87 vs 0,88) and evaluating patients (K 0,59 vs 0,49). The correlation of acuity level and the need for hospitalization and resource utilization was moderate in both systems. Patient streaming by predicted resource utilization was possible when using ESI [56].

In the systematic review regarding the efficiency of ESI, MTS, CTAS, ATS and SATS, Hinson did not find one of the triage systems to be superior over others. Identified problems, such as low sensitivity for detecting patients with myocardial infarction, severe sepsis or pulmonary embolism, requiring life-saving intervention, at risk of death during hospitalization and elderly patients with life-threatening conditions, concerned all analyzed triage systems [9].

CONCLUSIONS

With growing numbers of patients admitted to the ED, the implementation of the ED triage system with proven validity and reliability is required. Emergency Severity Index is such system. Its validity and reliability was proven in various studies for both general and elderly population. The studies comparing ESI with other triage systems show similar triage quality regardless of the system used. There is the need for uniform methodology for conducting studies regarding triage systems in order to improve ability to compare different systems. Many studies stressed the need for constant triage quality analysis and recurring triage nurse trainings to improve triage efficiency. The authors of this study state that uniform triage system implemented nationwide with central validation and certified training would be beneficial for triage quality.

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DOI: 10.36740/EmeMS202001108 **REVIEW ARTICLE**

THE HOSPITAL EMERGENCY DEPARTMENT IN POLAND - THE HISTORY AND THE EVOLUTION

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Abstract

The hospital emergency department (ED) is a place where diagnostics and initial treatment of a seriously injured person should take place. The introduction of the "Integrated Medical Rescue for 1999-2003" program resulted in the establishment of hospital ED. The first wards were opened in 1999 as a result of the transformation of functioning emergency rooms. The project assumed the formation of about 278 ED in Poland. In 2003 in Poland, there were 38 ED and 98 emergency rooms.

Key words

hospital emergency department, Poland, history, legal acts, investments

INTRODUCTION

The hospital emergency department (ED) is a place where diagnostics and initial treatment of a seriously injured person should take place. There, the patient has the first contact with a specialist, so the doctor must be equipped with devices that allow the patient to be admitted in a life-threatening condition from the emergency medical service (EMS) team. Also, in the ward, performed rescue activities are assessed, and one determines further patient management [1]. Emergency rooms perform a similar function. These are sets of rooms in which a patient is admitted to the hospital without a referral, emergency procedures are performed, and emergency outpatient assistance is provided [2].

HISTORY OF THE "SYSTEM UNITS"

The first unit in Poland dealing with saving human life in emergencies was established in 1891 in Cracow. The EMS was modeled on the Viennese

Fig 1. A horse ambulance of the Cracow Volunteer Rescue Association [4].

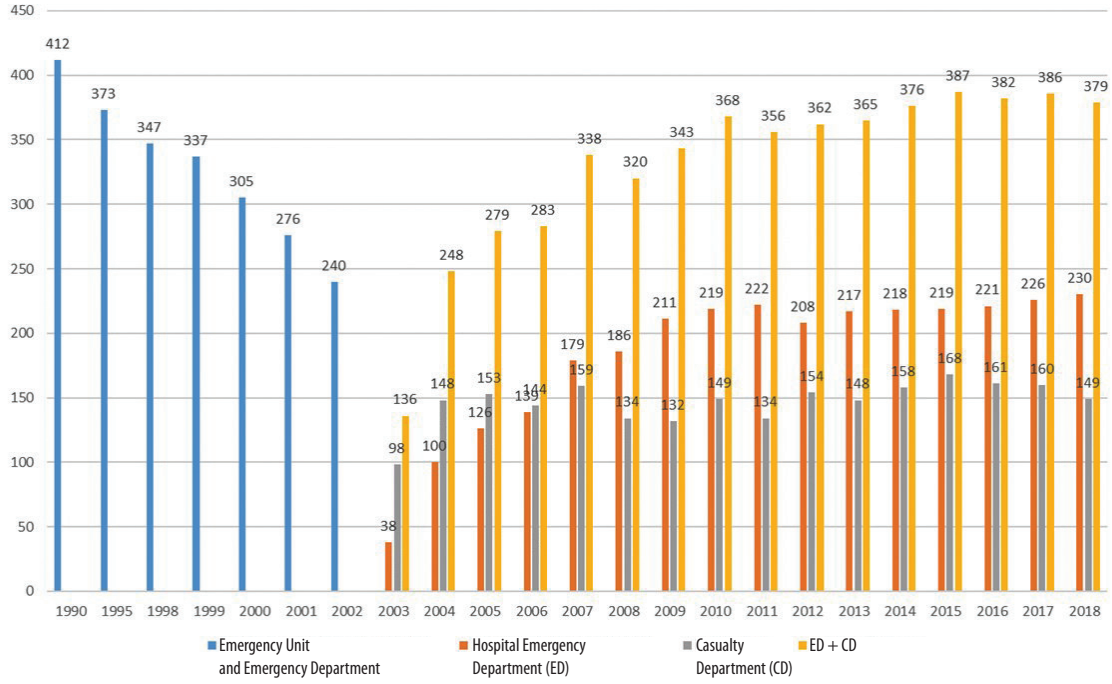

Fig. 2. The number of Emergency Departments in Poland in 1990-2018 [7].

EMS, which was the first unit of this type in Europe (it operated since 1883). The Cracow EMS had its base in the Fire Brigade building. It had a waiting room, dispensary, and a room for senior students of the Medical Faculty of the Jagiellonian University because they were on duty there. One ambulance belonged to the Krakow Volunteer Rescue Association, which was pulled by a pair of horses (Fig. 1). There were five pairs of stretchers. A white cross on a blue background became the symbol of the unit [3].

In 1896 the regulations of the service in the Cracow EMS were published. Their universal message would be applicable in the 21st century. From 1903, rescuers underwent first aid courses, which ended with an exam and a diploma. On the other hand, since 1904, work in the EMS was a paid occupation. The unit grew to such an extent that an administrator was employed who managed the EMS and was responsible for supplying dressings, medical tools, medicines, and animal feed. At that time, the EMS had a litter on rubber wheels, four horse ambulances with four pairs of stretchers, a folding armchair, and seven traveling trunks [4]. The Cracow Volunteer Rescue Association ceased operations in 1950. A few months later, it opened its unit in the Health Center, in which it operated until 1977 [3]. Currently, the Cracow EMS has several departments (including helicopters of the Air Ambulance Service) managed by a 12-position dispatch office. It annually receives over 350 thousand calls from the area of 7161 sq. km, inhabited by over 2 million people [4].

The Cracow success of the EMS was an impulse for the formation of other units:

- in 1893 in Lviv,
- in 1897 in Warsaw,
- in 1899 in Łódź,
- in 1917 in Lublin,
- in 1928 in Poznań.

They were independent institutions with legal personality. They were financed from many sources: social contributions, municipal subsidies, social insurance fees, own funds, and donations. Their task was to provide free 24-hour help in case of emergencies [5].

The Polish Red Cross Society (PTCK), founded in 1919, was the first Polish humanitarian organization. Its task was to help war victims and run medical facilities. PTCK also opened EMS stations, set up rescue teams, searched for missing persons, and conducted sanitary training. The medical infrastructure built by the society was taken over by the government in 1948–1951 (177 ambulance stations, 280 outpatient clinics, and 30 hospitals). It was handed over to the Ministry of Health, which divided rescue units into voivodship, poviat, and municipal ones. Stationary outpatient departments and outgoing EMS teams operated in each of them [3].

In the years 1951–1999, Voivodship Sanitary Transport Columns (WKTS) operated. They were independent budgetary units subject to the competent voivode. Their task was to meet transport needs for the entire healthcare system. Since 1992, they possessed

modern ambulances, which allowed them to undertake rescue operations during transport of the injured person to a hospital. The last decade of the WKTS working was recorded in history as a time of chaotic activities that did not allow the provision of specialist help. It was caused by the lack of legal regulations and a certain amount of financial resources. It was not until the beginning of the 20th century that the concept of the EMS system known to us today began to shape [6].

The introduction of the "Integrated Medical Rescue for 1999-2003" program resulted in the establishment of hospital ED. The first wards were opened in 1999 as a result of the transformation of functioning emergency rooms. The project involved the formation of about 278 ED in Poland [8]. In 2003 in Poland, there were 38 ED and 98 emergency rooms [7].

HOSPITAL EMERGENCY DEPARTMENTS

The first Act on the State Emergency Medical Service in Poland, which was adopted in 2001, defined the hospital ED as the organizational unit of the hospital, which was created to undertake rescue operations in hospital conditions. The health insurance funds were responsible for its financing [9]. The tasks of the hospital ED included [10]:

1. initial diagnostics and treatment necessary to stabilize the vital functions of patients in a state of sudden life threat, in particular as a result of poisoning, injury or accident,
2. providing health services to victims of disasters and states of emergency,
3. medical provision of patients and the organization of possible transport of patients to other health care facilities.

The regulation of 2002 also determined the ward specification. It should be located on the ground floor and have easy access to anesthesiology wards, intensive care units, an operating team, and an imaging diagnostics department. Also, a helicopter landing pad had to be nearby. Wards were established in facilities where at least internal medicine, anesthesiology, and surgery were located. The hospital ED was divided into the areas of resuscitation and surgery, medical segregation and admissions, observation, short-term intensive therapy, diagnostic and laboratory, consulting, stationing of the EMS teams, and economic and administrative facilities [10].

The imperfection of the first act normalizing the EMS system in Poland forced the creation of a new law, which entered into force together with the Act of 8 September 2006 on the State Emergency Medical Service [11]. This act is valid until today (September 30, 2019). It did not introduce any radical changes in the functioning of hospital ED. The original scope of tasks was retained, while the process of medical segregation was systematized, and a definition of the system managing patient service modes in the ward was introduced. Attention was also paid to the need to protect personal data and adequately dispose of it. A change in the payer was also introduced – the National Health Fund [11]. On the other hand, in the Regulation of the Minister of Health of November 3, 2011, on the hospital ED, detailed requirements for hospital landing pads at ED were added [12]. The regulation of June 27, 2019 announced the introduction of a uniform triage system from October 1, 2019, i.e., determining the urgency of the patient's waiting for medical consultation. It will rely more on the TOPSOR system, which is to analyze the patient's medical parameters, forecast waiting time, and assign the patient to the appropriate categories. A new system is to help identify the group of the most emergent patients and refer selected cases to primary health care. Also, the powers of ED doctors to place patients in hospital wards were strengthened, and a more significant share of doctors and nurses specializing in emergency medicine in the ward was agreed [13].

Legal acts conditioning the functioning of hospital ED were usually a response to changes that took place in them. The accession of Poland to the European Union in 2004 was significant for the modernization and expansion of the ED. Numerous subsidies, subsidies, and structural programs allowed to improve the condition of infrastructure in half of the units in Poland. Financial means obtained from EU funds resulted in expanding hospitals with new departments, renovating older rooms, building airstrips, and purchasing specialized equipment (ultrasound scanners, respirators, cardiomonitors, etc.). Only under the "Infrastructure and Environment" program of the priority "Health security and improving the effectiveness of the healthcare system" EUR 395.72 million was received for the development of the healthcare sector [14]. The investments brought many benefits, among others [15]:

1. increasing the number of specialized equipment in hospital ED,
2. increasing the quality of medical services provided,
3. increasing the safety of employees and improving working conditions at ED,
4. increasing the number of specialist medical tests performed with the equipment purchased,
5. covering more patients with medical services.

The number of Emergency Departments in Poland in 1990-2018 is showing on Figure 2.

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PROVIDING HEALTH SERVICES BY PARAMEDIC WITHOUT PATIENT'S CONSENT

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Abstract

The basis for the legal provision of health services is the patient's (statutory representative) expressing informed consent to the specific benefit. However, the law in exceptional circumstances allows the possibility of providing health services without the aforementioned consent. In particular, the Act on State Emergency Medical Services (after the amendment in 2018) allows a paramedic to provide health services in certain situations despite the patient's disagreement. The purpose of the article is to present legal regulations regarding the possibility of providing medical services by a paramedic without the patient's consent.

Key words

patient rights, consent, health services, paramedic, act

INTRODUCTION

Respecting patient's autonomous will regarding health services is a core standard for medical professionals, therein emergency paramedics. Legal standards of performing the job of paramedic were regulated on September 8th, 2006 by the respective act (Ustawa Państwowym Ratownictwie Medycznym, tekst jednolity, Dziennik Ustaw 2019, pozycja 993), further called the EMS Act. Further regulations important for proper paramedics' work can be found in the 2008 Act On Patients' Rights And The Commissioner For Patients' Rights (Ustawa z dnia 6 listopada 2008 r. o prawach pacjenta i Rzeczniku Praw Pacjenta, tekst jednolity, Dziennik Ustaw 2019, pozycja 1127), further called the Patients' Rights Act. Paramedic has to perform service duties with respect to patients' rights. Polish law does not define the concept of patients' rights. It has to be assumed, that patients' rights are a set of rights, which an individual (patient) has while claiming or being administered medical provisions. Patients' rights are individual rights, as well as a special category of human rights [1]. Patients' rights are related to benefiting from healthcare services, as the abovementioned definition implies. Healthcare services are measures aiming at preserving, rescuing, recovering or improving health, as well as other actions resulting from treatment process or from separate regulations regarding healthcare administration [2]. According to enactment-based definition, a patient is an individual claiming or benefiting from healthcare measures administered by healthcare facility or a medical professional [3]. A patient is every person benefiting from healthcare measures, either subjected to full payment, partial payment or free (patients reassured by the National Health Fund and commercial ones). Patients' rights are a correlate of medical personnel's duties, therein paramedics'. These are regulated mainly by the 2008 Patients' Rights Act, as well as by pragmatics concerning respective medical professions, therein the 2006 EMS Act. The basic common patients' rights are the right to: information, expressing consent for medical intervention, respecting dignity and having access to medical documentation. Moreover patient has the right to the so called "medical secret" being kept confidential by medical personnel. Patient is given this right by the Article 13 of Patients' Rights Act, which obliges medical personnel to keep information about the patient gathered while treating him or her confidential.

Modern healthcare systems, therein the Polish one, treat respecting patients' will as fundamental concept in patient-medic relations. Respecting patients' autonomy is opposed to medical paternalism. Currently it is the patient who decides at his or her own discretion where and what medical interventions is he or she going to benefit from. His or her will (consent) is the base of legal intervention by medical personnel. However in medical practice there are frequent situations, when it is not possible to be given consent by the patient, mainly due to his or her condition (for example when the patient is unconscious), yet there is a need to save his or her health or life. The problem occurs also, when the patient presents a hazard to himself/herself or other individuals due to mental distress or disorder. Under such conditions the entitled medical personnel may

overrule patient's autonomous will, but only basing on legal acts, and to the extent predicted by the law.

The main goal of this article is to present legal regulations concerning the legitimate violation of patients' autonomous will, undertaken by a paramedic while providing healthcare services. The specific goal of the article is to present and analyze the legal norms concerning healthcare services without patients' consent, and directly related to the job of paramedic, therefore having great practical importance for individuals performing this job. The article analyzes current legal norms concerning medical interventions undertaken by paramedics, found mainly in the 2006 EMS act. The research has been based on the analytical-synthetic method.

PATIENTS' CONSENT FOR HEALTHCARE SERVICE

Expressing consent for healthcare service needs to be considered the most important among patients' rights. This right means that medical personnel is legally obliged to be given such consent by the patient (or other entitled party) [4]. The term „consent" means approval, acceptance. In legal doctrine, the patients consent is expressed in conjunction with the term „autonomy". This autonomy is defined as patient's right to decide on his or her own about patient's rights, with the ability to give consent for compromising inviolability and integrity being the key aspect [5]. Since many years ago Polish medical law widely accepts, that nobody can be imposed administering an intervention without his or her consent. Patient should have the possibility to express consent or lack thereof, concerning any healthcare service regarding him or her. This rule appears as patient's autonomy in his or her relations with healthcare facilities and professionals, leading to limiting the paternalistic approach [6].

The right to express consent for healthcare services emerges from patient's right of self-determination (autonomy). The right of self-determination is derived from the innate and indefeasible human dignity, which (regarding to Article 30 of the Constitution of the Republic of Poland) is the source of human and citizens' freedom and rights. It is inviolable, and its respecting and protection is the obligation of public authorities. Basic regulations directly regarding patients' autonomous will can be found in 2008 Patients' Rights Act, along with pragmatics concerning medical professions, especially the profession of physician. Patients' will autonomy is also protected by the criminal law. According to Article 192 of Penal Code (Kodeks Karny) performing medical intervention without patient's consent is punishable by fine, non-custodial sentence or up to 2-year imprisonment [7].

According to the regulation stated in Article 16 of Patients' Rights Act (universal for medical professions) patient is entitled to express consent (or lack thereof) for healthcare services after being given information determined by the law. Article 9 of Patients' Rights Act constitutes the patient's general right to be informed about his or her health condition. According to this act the patient, also juvenile at the age over 16, or his/her statutory representative are entitled to receive information from medical professional. This information needs to be clear, and cover patient's health condition, diagnosis, proposed and available diagnostic and therapeutic methods along with foreseeable effects of introducing or withdrawing from introducing these methods, treatment results and prognosis. Information has to be in accordance with spectrum of healthcare services provided by the medical professional involved and his/her qualifications. After being given the above information, patient has the right to present his or her opinion in the subject matter to the medical professional (i.e. physician).

According to currently accepted legal standards there are two basic conditions required for the consent to be effective. These are the "awareness" and "freedom" of expressing consent. Aware consent is preceded by information, and is expressed by an individual whose awareness is not impaired (for example by the use of intoxicants). Effective consent cannot be expressed by an unaware patient or in case of inability to express conscious statements of knowledge and will.

Another condition of legal effectiveness of patient's consent, is expressing it in proper form (predicted by the law) and by the entitled subject. Medical law distinguishes the following forms of consent: oral, implied and written. Consent or objection may be expressed orally; patient and/or his/her representative say: I agree/I disagree (or use similar phrases). In case of implied consent entitled individuals behave in a manner which beyond doubt indicates the will (or lack thereof) to be administered services proposed by the medical personnel. Oral or implied form is sufficient if legal regulation does not clearly demand expressing consent in special form. Special form recognized by the medical law is written form.

Patient's autonomy is closely related to the right of withdrawing from prior consent. It is not directly regulated by Polish law, except for the case of participation in medical experiment. It has to be

assumed, that patient's consent for particular medical service is revocable in nature. Patient may revoke it both before the medical service being initiated, and during the procedure. For example on the way to the hospital patient may revoke the consent of being transported (as long as legal criteria, therein the ability to make conscious decision, are met). In practice, before taking any action, the EMS team needs to inform the patient about possible medical outcome of not being admitted to the hospital. Giving consent, as well as withdrawing from such decision has to be conscious. Patient should make decision based on analyzing the information acquired form physician or paramedic.

According to the Article 17 of Patients' Rights Act the patient (therein juvenile, over the age of 16) has the right to express consent for being examined or treated medically in other way. Consent for particular medical procedure should in principle be expressed by the patient himself/herself, as long as he or she is mature, non-incapacitated and capable of expressing conscious consent. If the patient is juvenile, fully incapacitated or not capable of expressing conscious consent, then either a substitutional consent is required (expressed by statutory representative or the entitled court) or a consent of both the patient and his/her statutory representative (if the patient is aged between 16 and 18).

Statutory representative of juvenile patient, fully incapacitated patient or the one incapable of expressing conscious consent is entitled to express consent. If the statutory representative is unavailable, consent limited to medical examination may be expressed by the actual caretaker (such as grandmother taking care of the child while parents are at work). Juvenile patient over the age of 16, incapacitated person, handicapped patient or patient with mental illness (providing they have sufficient insight) is allowed to express objection against medical procedure, despite consent given by the statutory representative or actual caretaker. In such case permission given by an entitled court is required. Statutory representative of the juvenile is in general parent (having full loco parentis) or a legal guardian indicated by the court. Individuals fully incapacitated have a legal guardian. An actual caretaker (according to the Article 3 of Patients' Rights Act) is a person taking (without statutory obligation) constant care of the patient who is in need of such care due to age, physical or mental condition.

Patient should express consent for medical service before any procedure being undertaken. Consent expressed after provision (the follow-up consent) has no legal force [8].

The law (EMS Act in particular) includes no regulation directly concerning acquiring consent for medical procedures by paramedic. The act does however name situations of extraordinary character, when a paramedic is entitled to legally provide services without patient's consent (these situations are considered an exception from providing services on the basis of consent). This leads to an assumption, that paramedics should act accordingly to the general norms in the field of patients' consent included in Articles 16 and 17 of Patients' Rights Act. Patient's right to express consent is inherent in his/her right to being informed about the medical condition. The obligation to inform is generally regulated by the Patients' Rights Act, as well as in EMS Act (where the regulation has a more narrow scope and concerns paramedics directly). According to Article 11, Paragraph 9 of the EMS Act, the paramedic is obliged to inform patient, his/her statutory representative or the individual indicated by the patient about patient's health condition. Information should cover aspects related to procedures undertaken by the paramedic EMS team. This obligation is expressed only with regard to paramedic serving within the paramedic EMS team (a State Emergency Medical System unit), and is justified by the lack of physician in such team (as the physician would be at first statutory obliged to provide information about patient's condition).

To overview the considerations about patient's consent, a verdict of the Polish Supreme Court from October 27th, 2005 (sygnatura akt III CK 155/05) will be evoked. The Supreme Court has stated, that the right to self-decide, therein to choose treatment method, is one of the expressions of individual's autonomy and freedom of choice. This right is reflected in the concept of expressing consent for medical procedure, being one of conditions necessary for healthcare services recognized as legal. The rule of respecting autonomy calls for abiding patient's will, regardless of motivation (religious, ideological, health-related etc.). Therefore it has to be assumed that patient's lack of consent for particular procedure (or type of procedures) is binding for the physician and overrules the risk of legal liability or criminal responsibility, and in the event of initiating procedure – makes it illegal [9].

CIRCUMSTANCES AND PROCEDURE OF PROVIDING HEALTH SERVICES WITHOUT PATIENT'S CONSENT

According to Article 11 Paragraph 1 of the EMS Act, performing the job of paramedic (also called a medical rescuer) consists in particular of providing health services, therein the emergency medical

procedures (unassisted or upon physician's order), securing people on the incident scene and undertaking action preventing the increase in casualties, transporting people in medical distress, providing psychological support in medical emergency, providing medical education and promoting health. Paramedic may realize the abovementioned tasks within:

1. healthcare facilities,
2. mountain and ski rescue units,
3. water rescue units,
4. mountain rescue units,
5. Maritime Search and Rescue units,
6. units subordinate to the Minister of National Defense (not being healthcare facilities),
7. firefighting units being part of National Firefighting Rescue System (during firefighting/ rescue action and training);
8. anti-terrorist action realized by services subordinate to or supervised by the minister proper for internal affairs,
9. separate prevention units of the police, BOA Central Counter-terrorist Police Unit (Centralny Pododdział Kontrterrorystyczny Policji "BOA") and independent counter-terrorist police units.
10. State Protection Service (Służba Ochrony Państwa) tasks,
11. Border Guard tasks,
12. airports,
13. healthcare facility realizing tasks of providing medical support for mass event,
14. medical transport,
15. detoxification detention center,
16. medical dispatch service [10].

After EMS Act update of May 10th, 2018 regulations concerning providing medical services by paramedic without patient's consent were added (these are effective since June 26th, 2018). Currently paramedic working in places listed above under numbers 1-15 is allowed to provide medical services without patient's consent [11]. Such provision is possible only if:

1. Patient requires immediate help, and is incapable of expressing consent due to medical condition or age,
2. There is no possibility of consulting patient's statutory representative or actual caretaker.

Both abovementioned criteria have to occur simultaneously. Considering medical condition it should be assumed that it excludes conscious decision making and expressing will (consent for health service) by the patient. This covers for example individuals unconscious, with high fever (and no response), with dementia, shocked, under the influence of intoxicants etc. Age is related mainly to not having become an adult yet (juvenile patient). Mature patient (so called an adult) is the one who have reached the age of 18 and has – according to civil law – full legal capacity. Please remember, that incapacitated individuals have no legal capacity. Juvenile patient is an individual under the age of 18 (with the exception of woman over the age of 16, who got married being granted the right to do so by the court). Juvenile patients have statutory representatives, who make decisions i.e. regarding treatment and other health services. There are two following categories of statutory representatives:

1. parents (representing the interest of biological and adopted children),
2. legal guardians (representing the interest of orphans and children not subjected to loco parentis and incapacitated individuals)[12].

According to Article 98 Paragraph 1 of Family And Caretaking Act (Ustawa z dnia 25 lutego 1964 r. – Kodeks rodzinny i opiekuńczy Tekst jednolity: Dziennik Ustaw z 2017 r., pozycja 682), parents are statutory representatives of children under their loco parentis. Article 97 of the same act states, that if loco parentis inheres both parents, each of them is obliged and allowed to execute it (this concerns realizing the tasks of statutory representative). However substantial aspects concerning child (such as medical treatment) are subjected to common decision of parents. If there is lack of consensus between them, issue is settled by the entitled court. If none of parents has the loco parentis or if parents are unknown, care is settled for the child (by indicating particular person as the legal guardian). Such guardian, appointed by the court, has a document proving the right to care which should be presented to the medical services provider. The fact of having a legal guardian by the juvenile patient should be recorded in his or her medical documentation. In practice both the medical personnel and patients' relatives frequently "equalize" two separate entities – the legal guardian and the actual caretaker. According to the abovementioned statutory definition an actual caretaker is a person taking (without statutory obligation) constant care of the patient who is in need of such care due to age, physical or mental condition. For example a grandmother or aunt, who takes care over a child during holidays or while parents are at work is an actual caretaker. For realizing the paramedic's right discussed, there has to be no possibility of contacting statutory representative or actual caretaker of the patient. It needs to be assumed, that this concerns both the objective

inability to make contact in person and by the phone.

To summarize – according to Article 11 Paragraph 10a of the EMS Act, paramedic at service is entitled to provide health services without patient's consent if the patient requires immediate help, is incapable of expressing consent due to medical condition or age and there is no possibility of consulting patient's statutory representative or actual caretaker.

Paramedic is obliged (within possibility) to consult providing health services in the abovementioned circumstances with a physician indicated by the EMS teams' operator. Such an operator is (according to Article 3, Point 1 of the EMS Act) an entitled healthcare facility. Circumstances discussed have to be recorded by the paramedic in patient's medical documentation.

According to the author the EMS act regulation should indicate more precisely (like in the act regarding physicians) what sort of "immediate help" does the patient need, for example "immediate medical help". According to the current regulation paramedic may provide health service without patient's consent if the patient requires immediate help (what kind of?).

Regulations of article 11/10a of EMS act are based a regulation from the Act On Physician And Dentist Professions, introduced years ago – on December 5th, 1996 (Ustawa z dnia 5 grudnia 1996 r. o zawodach lekarza i lekarza dentysty, tekst jednolity 2019; pozycja 537). Article 33 of the latter it is allowed to examine or treat patient without his/her consent, if the patient requires immediate medical assistance, but is incapable of expressing consent due to medical condition or age, and there is no possibility to consult statutory representative or actual caretaker. If possible, decision of initiating medical action under such circumstances should be consulted with another physician. The abovementioned situation is to be recorded in patient's medical documentation. This regulation enables physician to undertake medical intervention without being given consent by the patient or other entitled individual, as long as the procedure presents no risk, that is when examination is necessary (either physical or with the use of equipment which bears no hazard for life or health) or administering other health service (for example giving medication, installing medical device, issuing prescription or referral) [13].

If patient has full legal capacity and is capable of expressing conscious consent it has to be assumed that he or she is also capable of using the right to deny (for example being transported to the hospital). In case of such patients (mature and not-incapacitated) family is not allowed to effectively give consent in the name of patient/against patient's will. In EMS team practice it sometimes takes place, that patient refuses to sign written denial (statement). In such case physician or paramedic should make a record in medical documentation. Moreover, if there is no written expression of patients will expressed orally, in case of an argument, testimony of witnesses will become an effective proof.

A serious practical problem will occur, if the patient refuses to be transported, and his or her condition indicates possible sudden deterioration. At first the patient has to be informed about risk for his/her health and life. Generally a conscious and clear refusal of an entitled person is binding for the medical personnel. However if criteria of sudden life distress are met, and the patient is not fully aware (for medical reasons), author believes that transporting the patient to hospital against his/her will should be allowed for the patient's benefit.

Situations when paramedic (medical personnel) provides services without patient's consent have to be distinguished from legally acclaimed forced medical services (medical coercion). Medical coercion is used toward people who cannot cope with themselves, and toward people who present a hazard for their own or someone else's health or life. Common feature of all forms of medical coercion (in healthcare) is an intervention undertaken regardless of (therein against) patient's will. Such situation takes place mainly in psychiatry (toward individuals with mental distress), in the field of infectious illnesses (obligatory treatment of some infectious diseases) and in relation to penal conduct (concerning the suspected, accused and inmates). A particular form of coercion used by paramedics in their practice is the direct use of force. Its question is regulated mainly by the Mental Health Protection Act of 1994 (Ustawa z dnia 19 sierpnia 1994 r. o ochronie zdrowia psychicznego, tekst jednolity Dziennik Ustaw 2018; pozycja 1878) along with a further act issued in 2018 by the Ministry of Health, concerning the use of direct force toward an individual with mental distress (Rozporządzenie Ministra Zdrowia z dnia 21 grudnia 2018 r. w sprawie stosowania przymusu bezpośredniego wobec osoby z zaburzeniami psychicznymi, Dziennik Ustaw 2018; pozycja 2459).

After statutory criteria being fulfilled, direct use of force may be implemented by the EMS team while transporting patient to psychiatric hospital (admission without patient's consent). Moreover, force may be used against an individual perpetrating an attempt against his/her own or someone else's life or health or against public order,

or an individual violently destroying or damaging surrounding objects while being helped by an EMS team. If obtaining immediate decision by the physician/nurse is not possible, decision about the use of force is taken in person by the medic in charge of EMS team, who further supervises the use of force execution and has to immediately inform the medical dispatcher.

Under circumstances regulated by the law paramedic is allowed to take patient's blood sample in order to make an alcohol blood level test. If there is a suspicion that law violation occurred after consuming alcohol, the suspect may be put under examination necessary to determine alcohol blood level, especially by taking blood sample, based on the 192 Act On Sober Upbringing and Alcohol Abuse Prevention (Ustawa z dnia 26 października 1982 r. o wychowaniu w trzeźwości i przeciwdziałaniu alkoholizmowi, artykuł 47). Taking blood sample is performed by person having proper qualifications (for example by a paramedic). Currently details of testing blood for alcohol level are regulated by the act issued in 2018 by the Minister of Health and the Minister of Internal Affairs and Administration (Rozporządzenie Ministra Zdrowia i Ministra Spraw Wewnętrznych i Administracji z dnia 28 grudnia 2018 r. w sprawie badań na zawartość alkoholu w organizmie, Dziennik Ustaw 2018; pozycja 2472). Providing health services by force is of an extraordinary character, as the general provision is based on patient's conscious and self-imposed consent.

CONCLUSION

In Poland several acts, with Constitution being the foremost, regulate an obligation to respect patient's will. Imposing any limitation on patient's will autonomy has to be based on statutory regulations, not on arbitrary decision of medical personnel.

The base of legal provision of healthcare services to any patient is being granted permission for particular procedure by the patient or his/her statutory representative. Still the law predicts extraordinary situations, when provisions may be undertaken without patient's consent or even against his or her will (coercion).

Relation between medical personnel and patient should be based on respecting patient's autonomous will and the right to keep self-determination. The self-determination right is not absolute and is subjected to some limitations. Both the national and international law allows for autonomy violation. The obligation of treatment without patient's consent (or against patient's will) has been introduced because of the need to protect health interest of the society, as well as the patient. Execution of such treatment should be implemented as extraordinary, careful and only within legal restrictions.

Paramedics did not have legal regulation concerning provision of healthcare services without patient's consent regarding their profession directly. Since June 26th, 2018 such regulation can be found in EMS Act (Article 11/10a) and this needs to be acclaimed. Regulation is of great practical significance, especially for the EMS teams not having a physician on board. Emergency nurses are bound by the same regulations as paramedics. Paramedic may provide healthcare service without patient's consent only when being given such consent is not possible due to patient's medical condition or age. Moreover there should be a coexisting impossibility to obtain consent from "other entitled individuals", which takes place when there is no contact with patient's statutory representative or actual caretaker. EMS Act regulations presented in the article are within the category of regulations limiting patients' autonomy – the right of self-determination.

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CONFLICT OF INTEREST

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DEATH BEFORE THE ARRIVAL OF THE BASIC EMERGENCY MEDICAL SERVICES TEAM

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Abstract

Mostly, specialist emergency medical services (EMS) teams perform cardiopulmonary resuscitation. However, due to the reduction of specialist EMS teams by transforming them into basic EMS teams, paramedics are increasingly called to sudden cardiac arrests, and also to deaths. This publication is intended to be a reminder of basic knowledge in the field of forensic medicine, also in the context of law. The aim of the work is to remind basic legal and medical knowledge in order to minimize and maybe even avoid future medical errors. The authors focused on a detailed discussion of the signs of death and giving tips on how to fill out a medical rescue card.

Key words

death,
signs of death,
emergency medical services team

INTRODUCTION

Forensic medicine is a branch of medicine that combines legal and medical sciences in its practice. Its main goal is to adapt broadly understood medical knowledge for the purposes of justice. Forensic doctors not only perform autopsies, but also issue forensic and medical opinions regarding the appropriateness of medical proceedings. It should be emphasized that the course of the preparatory (police, prosecutor's) and subsequent court proceedings depends largely on the opinion of the expert or team of experts. In addition to specialist doctors, such teams usually include a forensic doctor who coordinates the activities of experts and prepares the final opinion. One of the basic issues of forensic medicine is the study of death and changes that occur in the human body after death, i.e. forensic tanatology, as well as determining the cause, type and time of death [1].

Definitions

- Death – permanent, irreversible cessation of vital functions;
- Vita reducta (reduced life) – weakening of the functions of basic body systems (cardiovascular, respiratory, central nervous system);
- Vita minima (minimal life) – dysregulation of the functions of basic systems and a further decrease in their efficiency, so that observing the body's vital functions by routine medical methods can be challenging;
- Clinical death – potentially reversible cessation of vital functions (e.g., sudden cardiac arrest);
- Biological death – the extinction of all vital functions of tissues and cells;
- Indirect life – a period in which tissue-specific interlethal (inter-mortal) responses can be triggered.

Types of death

- Natural death – a consequence of physiological aging of the body or disease progression. One can distinguish:
  - natural slow death – usually preceded by long-lasting agony, e.g., in cancer and inflammatory diseases;
  - sudden natural death – e.g., heart attack, stroke.
- Violent death is a consequence of trauma, e.g. mechanical (e.g., traffic accident) or thermal (e.g., extensive burns), but also toxic substances (e.g., intoxication) and electricity. From a medical and legal point of view, violent death is the result of a murder, suicide or accident, and can be divided into:
  - violent, slow death – usually preceded by agony, e.g., growing subdural hematoma, late sequelae of intoxication;
  - violent death – e.g., hanging, head or heart shot, acute intoxication [2].

CHARACTERISTICS OF DEATH SIGNS

We divide death sings into early and late. Early changes include those that develop within the first 12 hours. Therefore, legal regulations do not allow autopsies until 12 hours have elapsed since clinical death was confirmed. In turn, early signs of death can be divided into uncertain and certain (undoubted).

The early uncertain signs of death

Among the early uncertain signs of death are:

a. Pallor mortis – is the result of a sudden cardiac arrest, which causes the blood to drop to the lowest parts of the body. Pallor has a characteristic "grayish", sometimes "waxy" hue. It can also occur when blood pressure drops significantly or in anemia, and therefore it is an uncertain sign of death.
b. Cooling – it is postmortal heat loss due to the cessation of metabolic processes, which results in equalizing the corpse temperature to the ambient temperature. It appears in exposed parts of the body after 1-2 hours, and the remaining parts of the body cool down after about 5 hours. Processes such as conduction, convection, radiation, and evaporation lead to it.
c. Postmortal drying – the reason is the progressive loss of water due to evaporation. Drying of corpses is mainly presented as yellowish-brown, parchment-like hardening of coatings in places without keratinized epidermis, as well as in the form of matte corneal surface and sagging of the eyeball. The cornea dries the fastest – after 1 hour from death [1, 4−7].

Early certain signs of death

The early certain signs of death include:

a. Livor mortis (lividity) – livid-cherry (or purple or vivid red) coloration of the skin resulting from gravitational dropping of blood into the capillaries of the lowest parts of the body after cessation of heart activity. They appear after about 20 minutes after death; after about 4-6 hours they become fully formed, and after the next 12-14 hours they should no longer be displaced after changing the position of the body (so-called fixed lividity – postmortal dislocation of blood outside the blood vessels). One of the features of lividity useful for determining the time of death is their "squeezability," i.e., paleness of the lividity under pressure, e.g., with a finger or tweezers, and its return to the initial state after the appropriate time has elapsed. Lividity initially appears in the auricles and neck, then gradually merges and covers the area around the body until fully developed. After approx. 2 hours, due to the accumulation of blood in the lowest areas of the body, when the pressure can cause the rupture of small blood vessels, Tardieu spots appear – bloody petechiae within the lividity. One must remember that lividity does not arise in areas of the body that are compressed (visible white areas), e.g., by the ground (shoulders, buttocks, calves), as well as objects adhering to the body and tightly fitting clothing. Sometimes the appearance of lividity allows us to conclude on the cause of death. Scarce lividity or lack thereof suggests an acute internal or external hemorrhage. In turn, raspberry or vivid red color may indicate poisoning with carbon monoxide (less often hydrogen cyanide), and chocolate or chocolate-brown color occurs in poisoning with potent oxidizing compounds that cause the formation of methemoglobin (e.g., nitrite, aniline). On the other hand, in the case of drowning, lividity is usually located around the head and face and the upper part of the chest, which is related to the body positioning with the head downwards.

From the legal and criminological point of view, it is worth paying attention to the location of lividity, e.g., if lividity is present on both the front and back surfaces of the body or their distribution is inconsistent with the position in which the corpse was revealed. This indicates that the body was moved after death [1−7].

b. Rigor mortis – shortening and stiffening of muscles due to postmortal changes. Most often, it appears after 2-3 hours from death and first affects the muscles that are most active in life (i.e., the muscles of the fingers, toes, and jaw). After 6-8 hours, the rigor mortis is present in all muscle groups and develops fully after about 6-12 hours. It begins to subside after about 36-48 hours as a result of the beginning of autolysis and decaying processes.

The severity of rigor mortis depends on muscle mass (therefore, it is less pronounced in children, the elderly, and the cachectic, while in athletic people it is more pronounced) and on muscle activity before death. It appears quickly after tetanus or epilepsy attack, after physical effort or after an electric shock, and also after poisoning with organophosphate compounds or strychnine. This type of rigor mortis, in forensic medicine, is called cataleptic and presents immediately, as a result of which objects held by the deceased in his hand at the time of death may remain clamped in it [5−8].

Late signs of death

Among the late signs of death we can distinguish:

a. decaying changes, which include:
- autolysis – spontaneous decomposition of tissues and cells due to the action of own enzymes. The most rapid tissue autolysis occurs in the tissues most sensitive to lack of oxygen, i.e. in the structures of the central nervous system (after just a few minutes),
- putrefaction – tissue breakdown caused by bacterial enzymes produced by so-called putrefactive bacteria that live in the digestive tract, respiratory tract as well as on the skin. Decay changes are most quickly observed in the right iliac fossa, in the area of the appendix, in the form of greenish tinting of the skin. According to a long-known regularity (Casper's law), corpses found in the open-air decays twice as fast as in cold water, while corpses found in water are broken down four times faster than buried in dry soil.

b. fixative changes, including:
- adipocere – occurs in corpses in a very humid and relatively cold environment, and involves the transformation of adipose tissue into gray-white fat-wax masses composed of saturated fatty acids with the addition of calcium and magnesium soaps. Initial fat-wax changes can be observed after 2-3 months from death, and complete adipocere takes from several months to several years.
- scabbing (mummification) – it arises as a result of rapid and significant loss of corpse water before the body decomposes due to putrefaction. It occurs in a dry, relatively warm and ventilated environment. In Polish climate conditions, mummification is rare.
- sphagnum – it occurs in corpses located on peat bogs. This process involves the tanning of the skin and demineralization of bone tissue, as a result of the action of acid components of peat soil.

INTERLETHAL PERIOD

Human death is stretched over a period of time when a number of changes occur throughout the body. Forensic medicine uses knowledge of interlethal reactions, which, along with an assessment of livor mortis, rigor mortis, and sometimes also corpse temperature, helps determine the time of death. The most common use for this purpose is muscle reaction to a mechanical stimulus (or a test for myotonic roller), which is positive within the arm up to 3 hours after death, and within the thigh – up to 6 hours. In addition, the following can be applied: muscle response to electrical stimuli (5–8 hours), inflammatory response to turpentine (10–20 hours), pupil response to chemical stimuli (4 hours / 20 hours, reversal of action to 11 hours), sweat glands reaction to chemical stimuli (8−16 hours), and sperm movement (30-80, max. 120 hours) [1, 9].

WHEN TO BACKTRACK FROM MEDICAL RESCUE ACTIVITIES?

In accordance with the Regulation of the Minister of Health of April 20, 2016, regarding medical emergency services and health services other than medical emergency services that may be provided by a paramedic, a paramedic cannot formally declare death, but the paramedic is entitled to backtrack from medical rescue activities. According to the provisions of the Act on the professions of physician and dentist, the declaration of death is an act that can only be taken by a physician (including a dentist) "on the basis of personally performed examinations and findings" [12]. However, it is worth noting that this right was indicated in indirect, not direct way. In fact, the regulation indicates those activities that a paramedic is allowed to do independently. In the light of current medical knowledge, a paramedic may backtrack from medical rescue activities if their taking or starting takes the signs of vanity. These include injuries excluding the chances of survival: decapitation, head crushing, excerebration, chest crushing (no chest compressions possible), body dismemberment, body decomposition, body charring, and fetal maceration [10]. In the paramedics' environment, discussions about the definition of words often arise, hence the authors of this work clarify doubts. According to the PWN Polish dictionary, to give up means to go back, resign from something, e.g. the EMS team finds a patient with decapitation at the scene of an accident, so the EMS team backtracks from medical rescue activities (resigns from taking them). This is tantamount not to taking up medical rescue activities. Another frequently occurring situation is a call to a patient without vital signs with a history of metastatic cancer disease. Upon arrival, the team finds the patient in sudden cardiac arrest (SCA), and patient records are not available immediately, often the family is just looking for it. In such a situation, a critical mistake of the team will be not to resuscitate and wait for the presentation of medical documentation confirming the metastatic neoplastic process in the terminal stage. Such action would conflict with the standard expressed in Art. 162 paragraph 1 of the Criminal Code, according to which "Who does not help a human who finds

himself in danger of imminent life loss or of severe bodily injury, being able to provide it without putting himself or another person at risk of losing his life or grievous bodily injury". It should also be added that the delay in undertaking rescue activities while waiting for more accurate information to be provided by the family, would clearly violate the patient's right to receive immediate "health services due to a threat to health or life" (compare Article 7 (1) of the Act on Patients Rights and the Patient Ombudsman). This provision fully refers to the actions taken by the EMS team taking actions without the presence of a doctor. Paramedics in accordance with Art. 2 in fine of the Act on Patients Rights are directly obliged to comply with the patient's rights enshrined in the abovementioned Act [13, 14].

According to the definition of backtracking from resuscitation activities, they should be started and when the family shows medical documentation, where one finds the record "metastatic tumor process", after taking the history regarding the course of the disease and their own assessment of the situation, the team may resign (backtrack) from conducting further resuscitation because it will probably prove ineffective. In the case of "metastasis to ...", "cancer ...", "tumor ..." entries, the decision to backtrack from medical rescue activities should be made with caution. Such a record does not clearly indicate that the patient has a metastatic neoplastic process, the more that the paramedic is not an oncologist and may misinterpret. An important criterion for undertaking rescue activities is the biological condition of the patient, not just medical documentation. It should be noted that backtracking from medical rescue activities in practice means recognition of death, which is not the same as a formal death statement, which requires the issuing of a death card [11]. It should also be mentioned here that, in fact, resignation from further actions that save the patient's life in a similar clinical condition can be de facto considered to be an action fully respecting his rights as a provider of medical services. According to the provisions of the Act expressed in Art. 20 paragraph 1 and 2 the patient has the right to respect his dignity. The implementation of this right also concerns the right to die in "peace and dignity." The last sentence of Art. 29 paragraph 2, according to which "a patient in the terminal state has the right to health services providing relief of pain and other sufferings." It should be mentioned that undertaking resuscitation activities in the clinical condition described above could have the characteristics of persistent therapy. They would be disproportionate, which at the same time would intensify the patient's suffering and would not lead to any improvement in his health or cure [13, 15].

According to the guidelines of the European Resuscitation Council, a doctor may declare death in a situation when during resuscitation asystole lasts at least 20 minutes and procedures does not bring the expected results (return of spontaneous circulation). It should be recalled that asystole is not a straight line, but a sine wave. In this situation, print out from the cardiomonitor should be obtained, but at its maximum gain.

USEFUL STATEMENTS IN MEDICAL RECORDS

Useful statements in medical records:

- death before the arrival of the EMS team – backtracking from the medical rescue activities due to certain signs of death;
- sudden cardiac arrest – this diagnosis obliges us to take advanced resuscitation activities;
- sudden cardiac arrest time unknown – witnesses of the event did not undertake basic resuscitation activities;
- I do not suspect the participation of third parties – this wording should be used very carefully. If one dies in a public place, one should almost always have doubts about the participation of others and call the police. The police are responsible for further actions and clarifying the circumstances of death. One should not succumb to the pressure of police officers regarding the modification of the information card and medical rescue card in order to exclude the participation of third parties;
- the participation of third parties cannot be excluded or I suspect the participation of third parties – this wording should be entered whenever we suspect the participation of third parties or we have doubts about the circumstances of death, e.g. deceased suspended in a loop, injured body revealed on the deceased, open door to the apartment, signs of burglary;
- ICD 10 classification:

Paramedics should use two ICD10 classification codes presented below. The commonly used code R96 (sudden cardiac death) is not entirely convincing, because the cause of death can only be determined by autopsy, not by family history or medical records. The cause of death at the scene of the accident is never known, hence the appropriate medical and legal point of view will be the use of diagnosis R98 or R99:

- R98 – Death in circumstances in which the body of a deceased person was found, but no cause of death could be determined; Finding the body of the deceased;
- R99 – Unknown cause of death.

CONCLUSIONS

Backtracking by paramedics from the medical rescue activities due to the lack of legal premises regarding this issue will remain a vague and unsolved problem for a long time. Even a number of draft amendments to the Act on Emergency Medical Services do not answer the questions regarding waiving medical rescue activities. Numerous issues related to this problem are still regulated in other acts, in particular in the Act on the profession of physician and dentist. Answering to the question posed in the title of the work, it should be stated that resuscitation should not be faked to the audience or family. It directly violates the dignity of a dying patient. The described criteria of certain signs of death, biological condition, age and chronic diseases of the patient are factors that should be taken into account in this difficult decision to backtrack from medical rescue activities. It is worth emphasizing that resuscitation should not be forced or controlled by the family, but in the event of extortion, the EMS team leader bears full responsibility for undertaking or backtracking resuscitation activities. The amendment to the Act on the State Emergency Medical Services, which would include criteria in which a paramedic could backtrack from medical rescue activities is anticipated, and thus would facilitate decision making and reduce the risk of medical error.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

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