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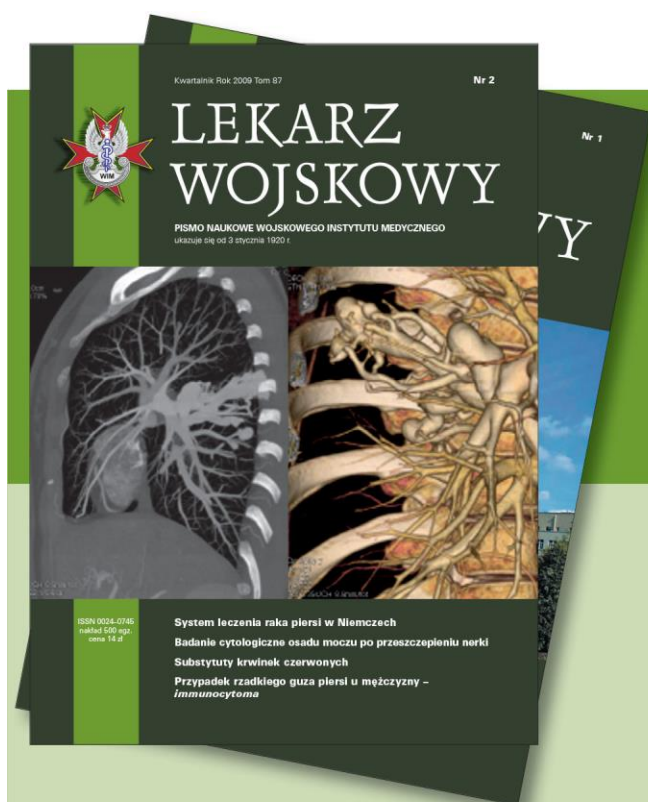
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Assessment of social demand for telephone helplines to provide support for individuals with mental health problems

Ocena zapotrzebowania społecznego na instytucje telefonów zaufania świadczące wsparcie osobom z problemami zdrowia psychicznego

Anna Nycz, Radosław Tworus

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Abstract. Telephone helplines represent the simplest form of psychiatric and psychological telemedical assistance for individuals with mental health problems. The aim of the study was to assess the actual demand for psychological support via helplines in this group, their knowledge of such services and the relationship between the needs they declare and their current knowledge of the available forms of support via helplines. An anonymous survey was carried out between February and June 2015 that included 43 veteran patients in the Day Care Unit of the Clinic of Psychiatry, Combat Stress and Psychotraumatology, Central Clinical Hospital of the Ministry of National Defence, Military Institute of Medicine and 32 patients of the Neurotic Disorders Day Care Unit. The study revealed the positive attitude of the respondents to the psychological telemedicine tools, with their relatively limited knowledge of tool availability and low index of the use of such tools.

Keywords: acceptance, e-Health, mental health, telephone helpline, telepsychiatry, usefulness

Streszczenie. Telefony zaufania należą do najprostszej formy telemedycznej pomocy psychiatryczno-psychologicznej dla osób z problemami zdrowia psychicznego. Celem pracy było zbadanie faktycznego zapotrzebowania tej grupy pacjentów na wsparcie psychiczne w postaci telefonów zaufania, stanu ich wiedzy w tym zakresie oraz zależności między deklarowanym zapotrzebowaniem a aktualnym poziomem wiedzy o dostępnych formach wsparcia w postaci telefonów zaufania. Do anonimowego badania ankietowego przeprowadzonego w okresie od lutego do czerwca 2015 r. włączono 43 weteranów - pacjentów Oddziału Całodobowego Kliniki Psychiatrii, Stresu Bojowego i Psychotraumatologii CSK MON WIM, oraz 32 pacjentów Oddziału Dziennego Zaburzeń Nerwicowych. Badanie wykazało pozytywny stosunek respondentów do wykorzystywania narzędzi telemedycznych w psychiatrii przy stosunkowo małej wiedzy o ich dostępności i niskim wskaźniku korzystania.

Słowa kluczowe: telefony zaufania, zdrowie psychiczne, telepsychiatria, e-zdrowie, przydatność, akceptacja

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Introduction

Telephone helplines for individuals with mental disorders are organisationally the simplest and most cost-effective form of telemedical psychiatric and psychological assistance [1]. Telepsychiatry is a relatively new concept in health service provision. It involves the delivery of

mental health care services with the use of information technology. Reports regarding the number of innovative telemedical solutions implemented in recent years in this field of medicine suggest its rapid development in the future [2-5].

Previous studies analysing the acceptance of telemedicine among patients reveal an increasing interest in this type of solution. A study conducted in 2008 by Zdrojewicz et al. [6] demonstrated that 68% of the surveyed people in Poland had heard about telemedicine, but 67% believed it was not available in Poland, and only 42% declared a positive attitude to the opportunities created by this form of assistance. The results of "Telemedicine in the eyes of Poles" study [7] conducted 10 years later demonstrate a dynamic increase in trust for telemedical solutions.

They indicate that, according to 67.4% of the respondents, the development of telemedicine in Poland has a beneficial effect on the lives of its citizens, and that over 70% accept e-health services, e.g. e-prescriptions or e-leaves. Patients also trust that the implementation of an integrated system of electronic medical records will improve the health care system by increasing the amount of time devoted only to patients. These findings are consistent with the statistical data regarding the information society in Poland. It appears that in 2017 nearly 82% of households had at least one computer. The percentage of regular users, i.e. individuals using a computer at least once a week, continues to grow systematically, reaching 71.2% in 2017, i.e. 2.1% more than in 2016, and 10% more than in 2013. The highest number of computer users is found among pupils and students (98.8%), as well as among people aged 16-24 years old (97.1%) [8]. In 2017, 82% of households had a permanent Internet connection, and nearly 78% had access to broadband Internet, which indicates an increase by 9% compared to 2013. Considering all the households with Internet access, 95% had broadband Internet [8]. This data confirms that everyday activities are performed remotely / via electronic routes, which may translate to increased popularity in e-health services, also in psychiatry.

This study describes the opinions of patients with mental disorders regarding this form of support, and it is probably the first such analysis in Poland conducted among this type of patient.

Aim of the study

The aim of the study was to collect information about the need for telephone helplines for individuals with mental disorders, to determine their awareness regarding the

currently available services of medical helplines, and to examine the correlations between the declared need and the present level of awareness. The study was designed as a pilot study, and its results are expected to inspire further research in this field, i.e. starting a helpline for individuals with mental health problems.

Materials and methods

The study involved 2 groups of patients. The first group comprised veterans of Polish Military Contingents (PMC) hospitalised in the Department of Psychiatry, Combat Stress and Psychotraumatology of the Central Clinical Hospital of the National Ministry of Defence, Military Institute of Medicine (N = 43). The second group comprised non-soldier patients of the Neurotic Disorders Therapy Day Unit at the Central Clinical Hospital of the National Ministry of Defence, Military Institute of Medicine (N = 32). The control group comprised parents and guardians of the patients treated in one of children's hospitals in Warsaw (N = 35). The choice of the control group was deliberate: we intended to find young people, potentially in good somatic and mental health, in the period of maximum activity, but also confronting a health problem – in this case regarding the health of a child. The study was conducted using an original survey questionnaire about helplines and other indirect forms of specialist assistance for people with mental health problems (Fig. 1). The questionnaire comprised 10 short questions regarding the actual need for telemedical psychiatric services provided via helplines, the respondents' awareness of the working helplines offering assistance to individuals with mental health problems, the most common barriers that prevent use of helplines, and the principal motivators. All participants were anonymous and took part in the study on a voluntary basis. The study was conducted between February and September 2015.

Results

To ensure clarity and to facilitate the analysis, the results are presented in detail in figures 2-11. The outcomes are presented as aggregated data, i.e. responses such as: "definitely yes" and "rather yes", "definitely no" and "rather no", "very much needed" and "useful" were included in the same categories.

Questionnaire

1. **In your opinion, are helplines for people with mental health problems:**
 - a) very much needed
 - b) useful
 - c) unnecessary
2. **Have you ever used any helpline?**
 - a) multiple times
 - b) once
 - c) never
3. **Would you recommend calling a helpline for people close to you with mental health problems?**
 - a) definitely yes
 - b) rather yes
 - c) rather no
 - d) definitely no
4. **Would you call a helpline if you had problems with your mental health?**
 - a) definitely yes
 - b) rather yes
 - c) rather no
 - d) definitely no
5. **Do you know any helplines offering mental health support? (Please list all the names of helplines, especially those dedicated to mental health)**

6. **In your opinion, is the number of helplines available in Poland:**
 - a) excessive
 - b) sufficient
 - c) definitely insufficient
7. **What would be your main motivator to call a helpline? (Please mark 1 answer)**
 - a) Helplines are operated by experts and professionals – they offer professional help.
 - b) It would be easier to talk about my problems with a stranger who cannot recognise me.
 - c) Helplines provide assistance without waiting lists.
 - d) Assistance via a helpline is offered immediately, practically as soon as the call is connected.
8. **What would be the main barrier for you to call a helpline? (Please mark 1 answer)**
 - a) Talking to a consultant on the phone will never be equivalent to a face-to-face conversation in a doctor's office.
 - b) I do not know who the person on the other end is and whether they are trustworthy.
 - c) I'm afraid my close ones might find out about the call.
 - d) I have no faith in assistance offered via helplines.
 - e) I'm afraid the cost of the call will be high.
 - f) There is no central register of helplines available, or for the scope of services provided by them.
9. **If there were a commonly accessible register of free helplines, would you use it?**
 - a) Yes
 - b) No
10. **If there were a commonly accessible register of paid helplines, would you use it?**
 - c) Yes
 - d) No

Figure 1. Survey on telephone helplines and other indirect forms of specialist assistance for individuals with mental health problems

Rycina 1. Ankieta dotycząca telefonów zaufania i innych niebezpośrednich form pomocy specjalistycznej dla osób z problemami zdrowia psychicznego

- 97.7% of veterans (N = 42), 100% of day unit patients (N = 32) and 85.7% of control group participants (N=30) declared helplines are very much needed and useful (Fig. 2).

- 95.3% of veterans (N = 41), 81.3% of day unit patients (N = 26) and 82.9% of control group participants never used this form of mental health support (Fig. 3).

- 93% of veterans (N = 40), 81.3% of day unit patients (N = 26) and 74.3% of control group participants (N = 26) would recommend a helpline to their close ones (Fig. 4).

- In answering the question: "Would you call a helpline if you had mental health problems?", 76.7% of veterans (N = 33), 59.4% of day unit patients (N = 19) and 80% of control group participants (N = 28) offered positive responses (Fig. 5).

- 11.6% of veterans (N = 5), 40.6% of day unit patients (N = 13) and 42.9% of control group participants (N = 15) confirmed the awareness of at least one helpline offering mental health support (Fig. 6).

- Regarding the number of helplines available in Poland, 67.4% of veterans (N = 29) and 53% of day unit patients (N = 17) considered it sufficient, whereas 51% of control group participants (N = 18) declared it was insufficient (Fig. 7).

- According to the veterans and control group participants the greatest advantage of this form of support was the anonymity of the consultant – 44% (N = 19) and 40% (N = 14) of the respondents, respectively – whereas according to 50% (N = 16) of day unit patients the greatest asset was the professional character of the help offered (Fig. 8).

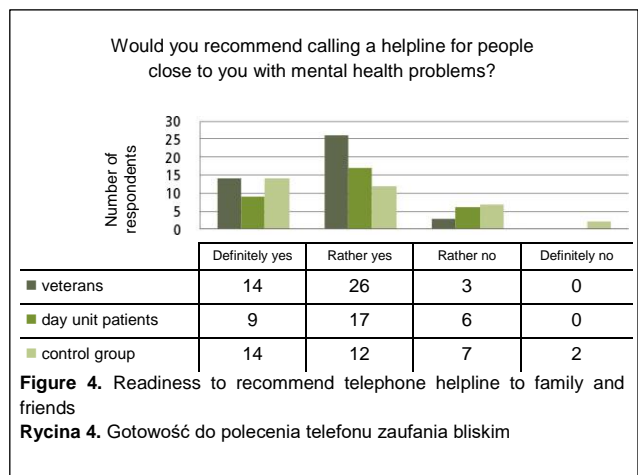
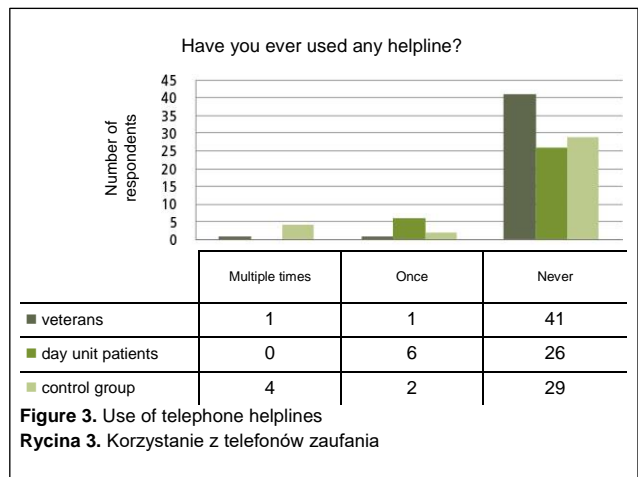
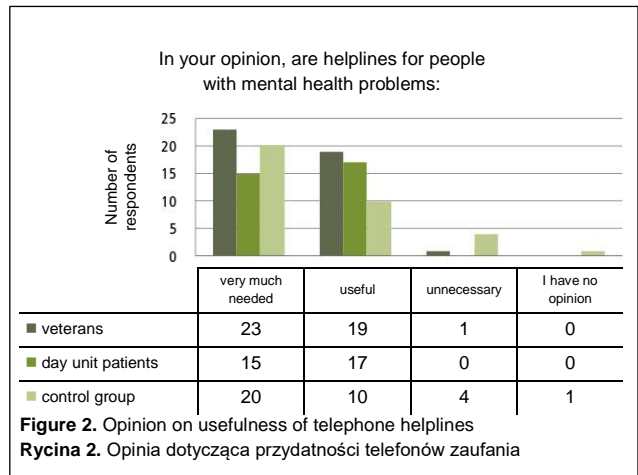
- In all three groups the greatest barrier to using helplines was the belief that a phone conversation cannot be an equivalent of a traditional visit to a doctor's office; this was true according to 32.5% of veterans (N = 14), 46.9% of day unit patients (N = 15) and 28.6% of control group participants (N = 10) (Fig. 9).

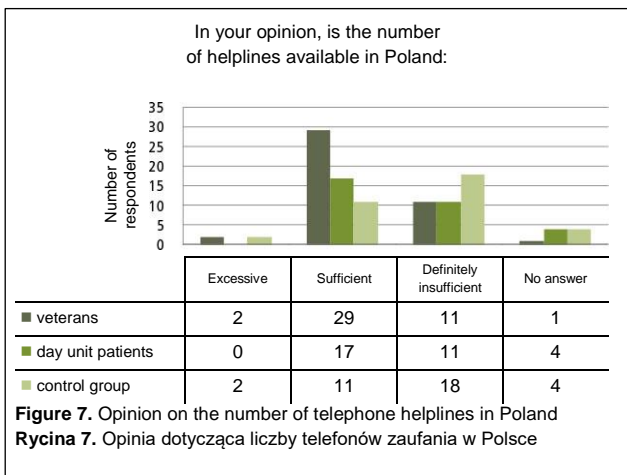
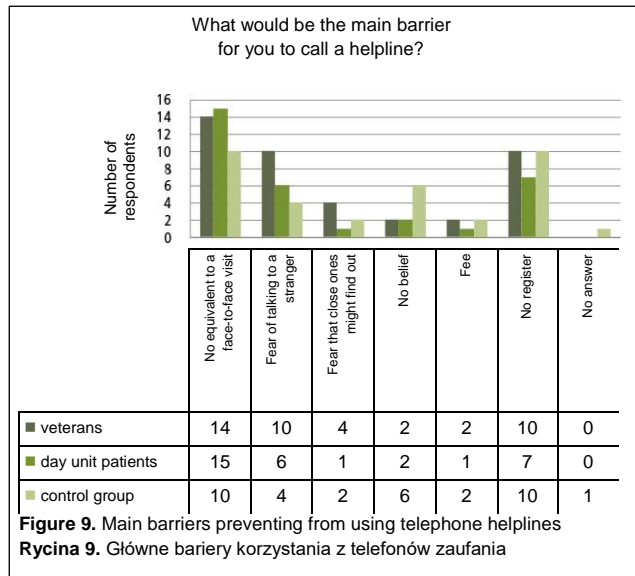
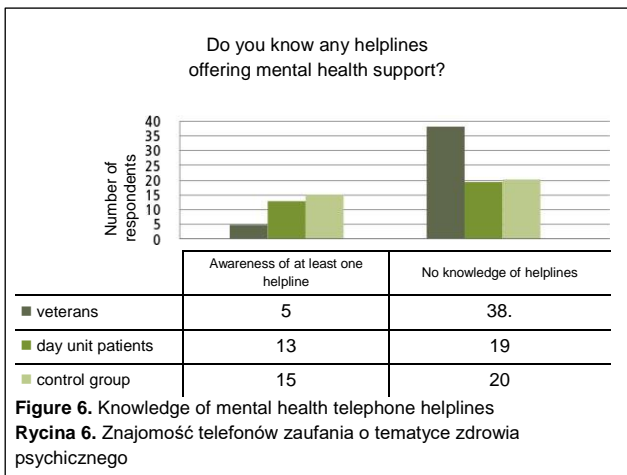
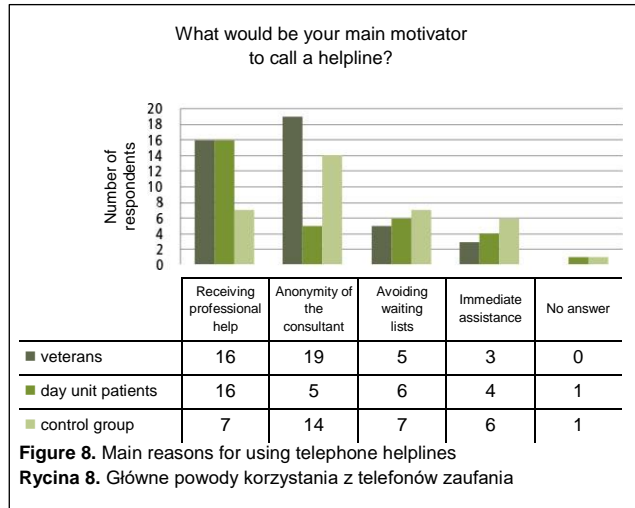
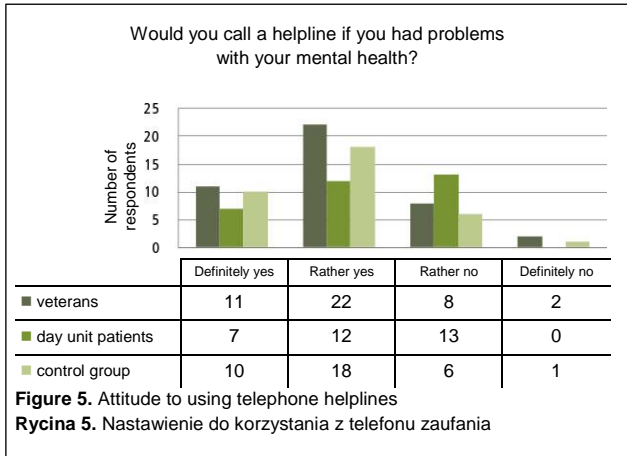
- With regard to the fee for helpline calls, 67.4% of veterans (N = 29), 78% of day unit patients (N = 25) and 82.9% of control group participants (N = 29) declared a willingness to use free helplines (Fig. 10).

- 53.5% of veterans (N = 23), 56% of day unit patients (N = 18) and 45.7% of control group participants (N = 16) would be willing to call a paid helpline (Fig. 11).

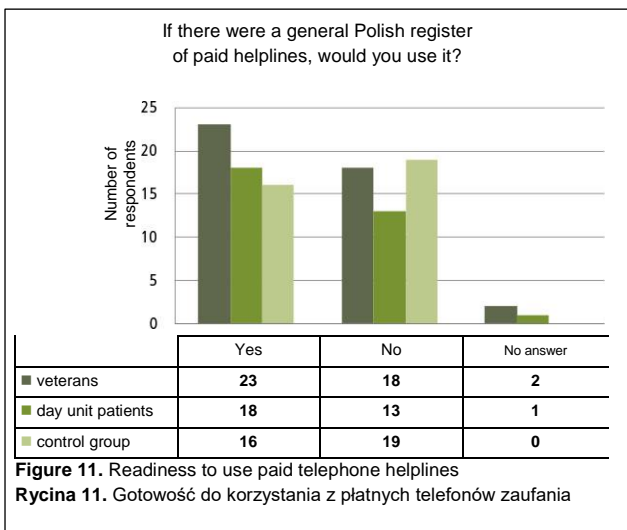
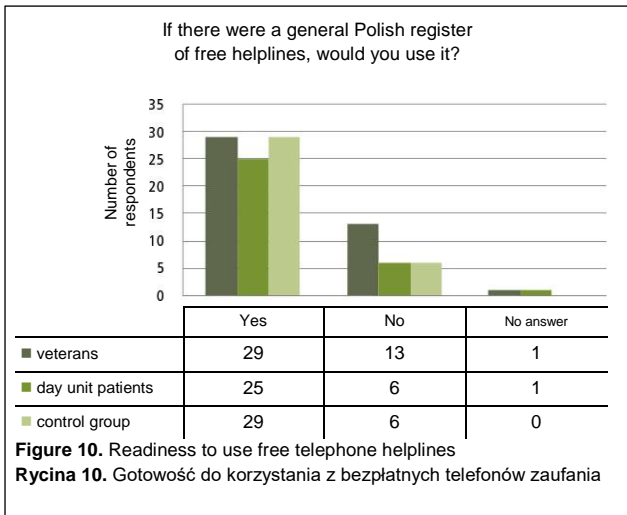
Discussion

The results of the study clearly confirmed that in the time of global digitalisation the development of telemedicine, including telepsychiatry, is not only needed, but necessary. In both groups of patients, as well as in the control group, the dominant belief is that helplines are a useful tool offering support to individuals with mental health problems.





The positive opinion about the usefulness of helplines is associated with the trust of different groups in this form of assistance. This trust is reflected in the opinion of the majority of respondents (>75%) that they would be willing to call helplines to seek mental health support and would recommend this form of help to their close ones. Day unit patients provided different answers: 100% of them considered helplines to be useful; however, less than 60% would call a helpline. This result should not be treated as distrust in helplines, but rather as the attitude of this group of patients, whose declared needs may differ from the actual use of helplines.



Interestingly, despite the declared positive attitude to the use of helplines, the respondents' awareness of the currently available helplines is low. Over 88% veterans do not know of any mental health helplines. 41% of day unit patients and 43% of respondents from the control group knew at least one helpline. The most common one was Blue Line, and occasionally helplines for individuals with dependencies. It is surprising, as according to studies by Jurczak A. et al. [9], nearly 60% of respondents were familiar with the concept of e-health. It should also be emphasised that despite the growing social approval for telemedical tools, including helplines, and the declared willingness to use them in emotional crises, most study participants never call a helpline.

The dominant view in the analysed groups is that the number of helplines available in the medical service market is sufficient. 67% of veterans and 53% of day unit patients were of that opinion. 51% of respondents in the control group claimed the number was too low. These

findings are inconsistent with the data regarding the study participants' awareness of the helplines available in Poland. This raises the question: on what basis did the respondents base their opinions regarding the number of helplines? It may be suspected that the responses were random or intuitive, unsupported by any actual knowledge.

The principal motivation of the study participants to use a helpline is the anonymity of the consultant. Talking about difficult matters is often easier if the other person is not involved emotionally, as then patients may discuss problems they may not reveal to close ones, due to the fear of rejection. It should also be stressed that according to respondents in all three groups the lowest motivator is avoiding the waiting list system and the speed of assistance, provided practically at the moment of the call. This is surprising, as the prevailing opinion is that access to health care, especially regarding health, is generally limited, both due to long waiting lists, the need for early registration, and often a lack of psychiatric care institutions near the patient's place of residence. The main barrier mentioned by the respondents was their conviction that even the best conversation over the phone cannot substitute a traditional visit to a doctor's office. This may be due to the fact that the doctor-patient / therapist-patient relationship in psychiatric care is complex, and based on mutual trust. Although in many areas of medicine the quality of the specialist-patient relationship does not have to directly impact the consultation quality (e.g. a visit at the dentist), in the case of people in difficult life situations, who are psychically unstable, a lack of contact may greatly affect the therapeutic process.

The analysis of the effect of helpline fees demonstrates that respondents would be more willing to use free of charge helplines, which is understandable. However, considering the high rate of positive responses regarding the use of paid helplines, the financial question does not seem to be the decisive matter. It may be assumed that when a mental health problem occurs, the decisive factor would not be the price, but trust in this form of support.

The results obtained from the group of veterans are noteworthy. Although this was not the aim of the study, the outcomes for this group should be discussed separately. These are the individuals who most frequently declared the need for psychiatric helplines, and would recommend using this form of assistance to their close ones. Interestingly, this is the group where the awareness of existing helplines is the lowest, and the willingness to use telepsychiatric support in case of mental health problem is relatively limited, despite the emphasised benefit of anonymous assistance.

Conclusions

- The declared social need for helplines offering assistance to individuals with mental health problems is high, although the awareness of their availability is low.
- Starting an anonymous intervention helpline for individuals with mental health problems would be justified, especially to help veterans of foreign missions.

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Analysis of environmental risk factors and health problems in PMC Afghanistan personnel

Analiza zagrożeń środowiskowych oraz problemów zdrowotnych personelu PKW Afganistan

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Abstract. The article presents the characteristics of environmental risk factors and health problems in the personnel of the Polish Military Contingent (PMC) deployed as part of operation Resolute Support Mission in Afghanistan. The retrospective analysis was based on the GIDEON database and medical records of soldiers and employees of the Polish Ministry of National Defence who had performed mandated tasks during four 6-month rotations of the contingents (n=250-330) between 2017 and 2018. The intensity indexes of PMC Afghanistan were 37-39 cases/100 patients/month. The most common health problems in the analysed group included upper respiratory tract infections (9-13 cases/100 patients/month), musculoskeletal injuries/diseases (6-7/100/month), gastrointestinal diseases (4-6/100/month) and dermatoses (5-6/100/month). Health problems occurring in PMC personnel were connected with the effects of environmental conditions and neglecting the rules of health prophylaxis. The greatest epidemiological hazard for participants of military operation in Afghanistan are infectious and parasitic diseases of the gastrointestinal tract, malaria, leishmaniasis and Crimean-Congo haemorrhagic fever.

Key words: Afghanistan, environmental hazards, health problems, Polish Military Contingent

Streszczenie. Cel. W pracy przedstawiono charakterystykę zagrożeń środowiskowych oraz problemów zdrowotnych personelu Polskiego Kontyngentu Wojskowego (PKW) biorącego udział w operacji Resolute Support Mission w Afganistanie. Materiał i metody. Analiza retrospektywna została oparta na bazie danych GIDEON oraz dokumentacji medycznej żołnierzy i pracowników resortu obrony narodowej wykonujących zadania mandatowe w czterech 6-miesięcznych zmianach rotacyjnych kontyngentów (n = 250-330) w latach 2017-2018. Wyniki. Wskaźniki natężenia zachorowań personelu PKW Afganistan wynosiły 37-39 przypadków/100 pacjentów/miesiąc. Do najczęściej zgłaszanych problemów zdrowotnych należały stany zapalne górnych dróg oddechowych (9-13 przypadków/100 pacjentów/miesiąc), urazy i choroby narządu ruchu (6-7/100/miesiąc), choroby układu pokarmowego (4-6/100/miesiąc) oraz zmiany skórne (5-6/100/miesiąc). Wnioski. Zachorowania personelu PKW były związane z działaniem czynników środowiskowych oraz brakiem przestrzegania zasad profilaktyki zdrowotnej. Największym zagrożeniem epidemiologicznym dla uczestników operacji wojskowej w Afganistanie są zakaźne i pasożytnicze choroby przewodu pokarmowego, malaria, leiszmanioza oraz krymsko-kongijska gorączka krwotoczna.

Słowa kluczowe: Afganistan, Polski Kontyngent Wojskowy, problemy zdrowotne, zagrożenia środowiskowe

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Introduction

The Polish Military Contingent (PMC) was formed by a decision of the President of the Republic of Poland, under the Act on the principles of the use or stay of Polish armed forces outside the country (Journal of Laws of 2014, item

1510), as part of Resolute Support Mission in the Republic of Afghanistan. The main PMC Afghanistan force, numbering over 300 soldiers and military employees, stationed in the provinces of Parwan, Kabul, Nangarhar and Kandahar, perform advisory mandatory

tasks (offering counselling and training to the Afghan security forces) [1].

Aim of the study

The aim of the study was to present the environmental hazards and health problems of the personnel of PMC Afghanistan in Central Asia.

Material and methods

The retrospective analysis was based on the GIDEON epidemiological database and medical records of the soldiers and employees of the Ministry of National Defence treated in the outpatient clinic of PMC Afghanistan (Bagram Airfield military base in the Parwan Province, 60 km north of Kabul) who were performing mandatory tasks during four 6-month rotations ($n = 250-330$) in the years 2017-2018. The morbidity profile was assessed using the records documenting visits of the personnel treated in the analysed period. The calculations were based on the structure index and intensity index per 100 patients. The main diagnoses of diseases and injuries were analysed according to the ICD-10 classification of diseases and health problems: diseases of the respiratory system, circulatory system, gastrointestinal system, musculoskeletal system, skin, nervous system, genitourinary system, eye and ear, mental and behavioural disorders, infectious and parasitic diseases, and injuries. Specific diagnoses were analysed following the same classification. The intensity index was calculated based on the number of initial visits due to certain disorders or injuries (including follow-up visits due to the same disease, taking place within 2 weeks) used as a numerator, and the total number of patients in the analysed period ($n = 250$) as a denominator, multiplied by $C = 10^k$ ($k = 0, 1, 2, 3, \dots$; in the statistical analysis $k = 2$ was used). This index was used to determine the incidence of disorders and injuries per 100 patients in a given population. The calculations were performed with STATISTICA PL software.

Environmental conditions in Afghanistan

Afghanistan, with an area of 652,230 km², is a landlocked country in Central Asia, without access to the sea. It is bordered by Pakistan (2429 km), China (76 km), Tajikistan (1206 km), Turkmenistan (744 km), Uzbekistan (137 km) and Iran (936 km). 80% of the country is covered by mountains (the highest point is Noshaq 7492

m a.s.l. in the Hindu Kush range) and plateaus, with a subtropical, continental, dry climate (high daily and annual temperature amplitudes; maximum temperature of 38-43°C in July, minimum temperature of -30°C in January). In eastern Afghanistan (Laghman and Nangarhar provinces) the climate is subtropical, continental, with monsoons (high humidity and temperature exceeding 45°C in the summer). Dust storms are frequent. From June to September, a constant northern wind, called the wind of 120 days (*seistan*), is observed.

Health risks in Afghanistan

Food-borne diseases

According to data from the Geo-Sentinel Surveillance Network, the prevalence of infectious and invasive gastrointestinal diseases in South-East Asia is the highest in the world. Studies conducted in 2012-2014 by the Institute of Epidemiology and Tropical Medicine of the Military Institute of Medicine demonstrated enteral parasitic infestation in the Afghan population (Afghan National Army, patients of the Ghazni Provincial Hospital, school students in the Ghazni Province, and patients of the Korean Hospital at Bagram Airfield) of 36-45% [4, 5]. Since 2014, the number of new cases of cholera has been increasing considerably in Afghanistan. Low sanitary standards regarding food and nutrition among the local population, and water contamination with excrement contribute to the spread of the disease. New cases are reported in the provinces of Badakshan, Baghlan, Balkh, Bamyan, Helmand, Herat, Kabul, Kandahar, Kapisa, Kunduz, Logar, Nangarhar, Uruzgan and Zabul. In 2015, over 58 cases were detected in Afghanistan [6]. It is still one of two countries in the world (with Pakistan) where new cases of *poliomyelitis* are observed. The infection spreads via the gastrointestinal route and through droplet spread, by contact with an infected individual or with objects contaminated with faeces or secretions from the throat. For over two decades the World Health Organisation has been making efforts to eradicate *poliomyelitis*; however, eliminating the transmission of the diseases in Afghanistan and Pakistan, together with prevention of infection spread to other countries, are prerequisites for achieving this goal. In 2018, 21 new cases were reported in Afghanistan, mainly in the Kandahar, Helmand and Kunar provinces [7].

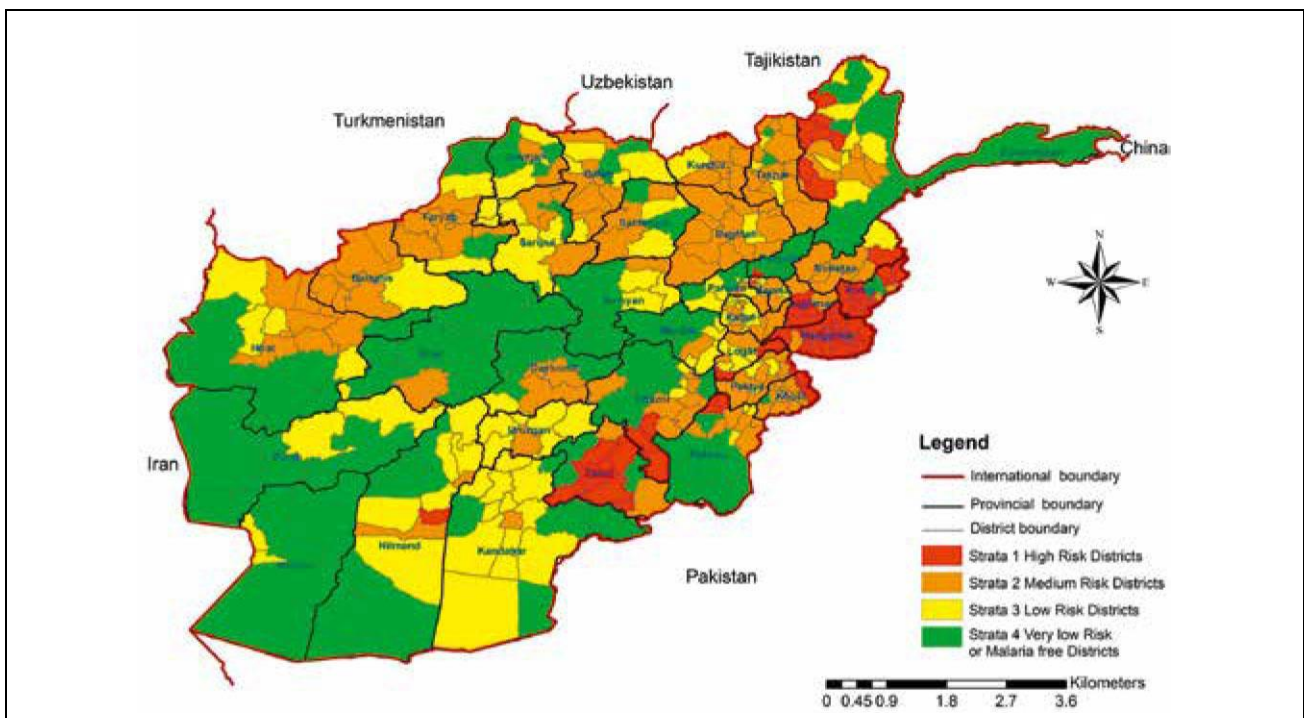


Figure 1. Malaria risk stratification by district in Afghanistan [8]

Rycina 1. Ryzyko zachorowań na malarię w poszczególnych prowincjach Afganistanu [8]

Transmissible diseases

Malaria is endemic to Afghanistan in areas located above 2500 m a.s.l. The disease is transmitted from early April to late November. The aetiological factor is *Plasmodium vivax* (80-95% of cases) and *P. falciparum* (5-20% of cases). The risk of infection in Afghanistan (approx. 30 thousand cases annually) is estimated at four levels (Fig. 1) [8,9].

In Afghanistan, the incidence of leishmaniasis (a disease caused by *Leishmania*, parasites, transmitted by *Phlebotomus* sandflies; 113-226 thousand cases annually). The main endemic foci of the disease are found in the provinces of Kabul, Parwan, Kandahar, Kunduz, Balkh, Badakhshan and Herat [10].

Crimean-Congo haemorrhagic fever (CCHF) is a particularly dangerous infectious disease of this region, associated with high mortality rates (up to 15-40%) Its vectors are *Hyalomma* ticks, bird parasites that may transmit the infection to humans. Another route of transmission is through droplet spread and direct contact with the infectious material (meat and body fluids of sick animals). In 2017, 237 new cases (including 41 deaths)

were reported in 27 Afghan provinces, including 71 cases (13 deaths) in Kabul. In 2018, the incidence increased further to 455 cases (including 56 deaths), found in most provinces [11].

Results

The diseases most frequently reported among the personnel of PMC Afghanistan included upper respiratory inflammations, injuries and musculoskeletal diseases, acute gastroenteritis, and purulent and allergic skin lesions. The infection rate among the personnel of PMC Afghanistan between January and December 2017 was 39 cases / 100 patients / month. The most commonly reported health problems included:

- respiratory system diseases: 9 cases / 100 patients / month,
- musculoskeletal diseases: 7 cases / 100 patients / month,
- gastrointestinal diseases: 6 cases / 100 patients / month,
- skin diseases: 6 cases / 100 patients / month (Fig. 2, Table 1).

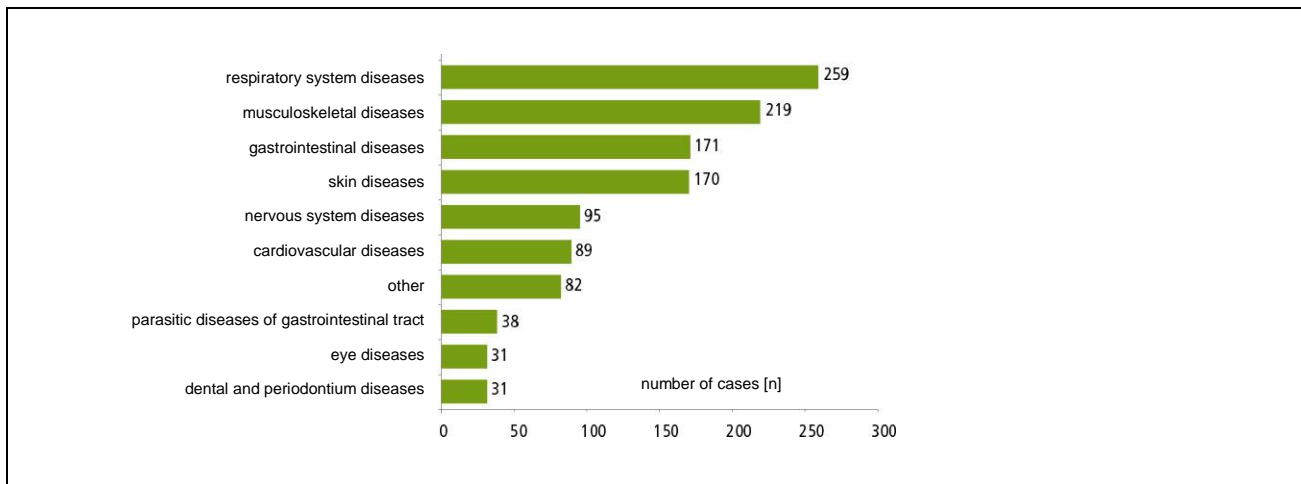


Figure 2. Morbidity in PMC Afghanistan personnel in the period January-December 2017

Rycina 2. Zachorowalność personelu PKW Afganistan w okresie I-XII 2017 r.

Table 1. Morbidity in PMC Afghanistan personnel in the period January-December 2017

Tabela 1. Zachorowalność personelu PKW Afganistan w okresie I-XII 2017 r.

Code disease / month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
A Respiratory system diseases	39	32	24	10	13	17	6	10	24	24	11	49	259
B Cardiovascular diseases		13	42	12	8				1	2		11	89
C Gastrointestinal diseases	24	16	16	15	21	19	7	20	7	19	4	3	171
D Dental and periodontium diseases	2	1	2	1	5	1	4	3		2	3	7	31
E Musculoskeletal diseases	23	17	26	24	25	19	19	21	11	18	5	11	219
F Skin diseases	29	12	9	17	13	14	13	9	10	21	5	18	170
G Nervous system diseases	3	10	1	12	2	5		16	16	23	2	5	95
H Genitourinary diseases	1	1	2		1	2	1	1	1	2	1	2	15
I Eye diseases	4	3	2	1	7	5	1	1	1	1		5	31
J Ear diseases	2		2		4	3		1		3		4	19
K Mental disorders	1	1											2
L1 Infectious diseases of gastrointestinal tract													
L2 Other infectious diseases													
M1 Parasitic diseases of gastrointestinal tract					11		9				18		38*
M2 Other parasitic diseases													
N Combat injuries													
O Non-combat injuries	11	1	3	2	3			3		1		4	28
P Other diseases not classified above	1				1	1			2			13	18
TOTAL	140	107	129	94	114	86	60	85	73	116	49	132	1185
R Other prophylactic measures, medical advice	25	19	86	27	9	204	22	14	43	28	11	71	559
S Vaccinations	31	6	36	21	29	70	16	204	102	52	26	15	608

38* – intestinal parasitic infestations; screening conducted by the Military Institute of Medicine

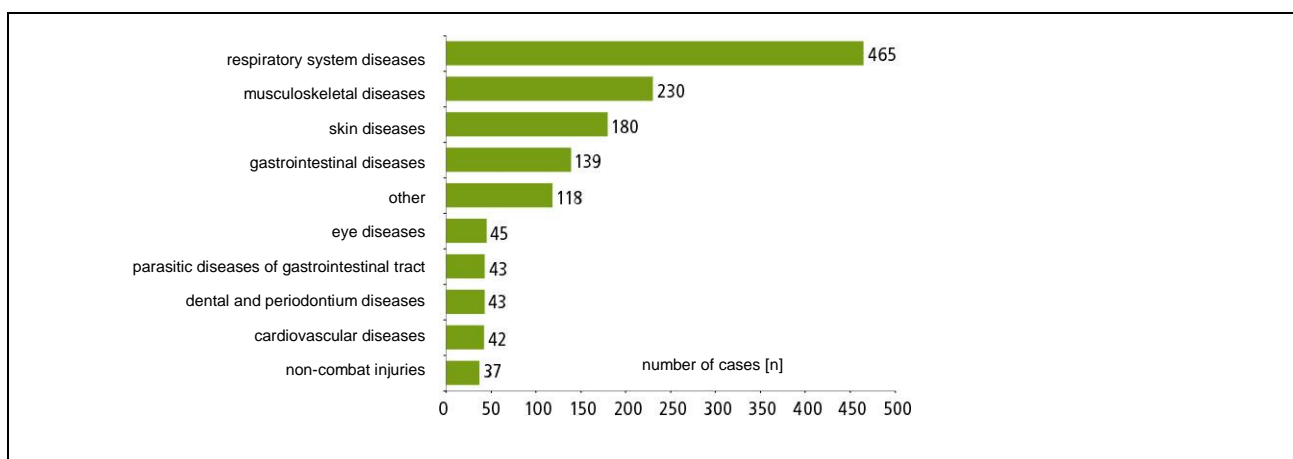


Figure 3. Morbidity in PMC Afghanistan personnel in the period January-December 2018

Rycina 3. Zachorowalność personelu PKW Afganistan w okresie I-XII 2018 r.

Table 2. Morbidity in PMC Afghanistan personnel in the period January-December 2018

Tabela 2. Zachorowalność personelu PKW Afganistan w okresie I-XII.2018 r.

Code	disease / month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
A	Respiratory system diseases	29	48	5	10	14	21	14	17	27	51	91	138	465
B	Cardiovascular diseases	11	4	1	4	4		2	3	5	3		5	42
C	Gastrointestinal diseases	6	5	2	14	9	32	7	19	8	15	7	15	139
D	Dental and periodontium diseases	6	2	2	3	3	2	1	7	5			12	43
E	Musculoskeletal diseases	11	26	15	9	12	16	19	20	29	21	18	34	230
F	Skin diseases	5	8	1	12	17	35	25	27	20	13	14	3	180
G	Nervous system diseases				11	4		1	3	1	1	4	2	27
H	Genitourinary diseases			1				1	1		2	3	3	11
I	Eye diseases	2	2	1		1	8	4	8	7	6	4	2	45
J	Ear diseases		2	1	2	1	1	2			1			10
K	Mental disorders					3	1	3			1	2		10
L1	Infectious diseases of gastrointestinal tract													
L2	Other infectious diseases													
M1	Parasitic diseases of gastrointestinal tract					19				1		23		43*
M2	Other parasitic diseases								1	1				2***
N	Combat injuries													
O	Non-combat injuries	6		3	7	3	6	3	2	1	3		3	37
P	Other diseases not classified above	7	5	3	4	3	7	1	9	10	6	1	2	58
	TOTAL	83	102	35	76	93	129	83	117	115	123	167	219	1342
R	Other prophylactic measures, medical advice	35	47	24	12	28	193	152	289	21	58	75	165	1099
S	Vaccinations	65	114	123	155	75	162	271	126	167	98	66	16	1438

43* – intestinal parasitic infestations; screening conducted by the Military Institute of Medicine

2** - malaria (TB Gamberi)

The infection rate among the personnel of PMC Afghanistan between January and December 2018 was 37 cases / 100 patients / month. The most commonly reported health problems included:

- respiratory system diseases: 13 cases / 100 patients / month,
- musculoskeletal diseases: 6 cases / 100 patients / month,
- skin diseases: 5 cases / 100 patients / month,
- parasitic diseases of gastrointestinal tract: 4 cases / 100 patients / month (Fig. 3, Table 2).

Gastrointestinal diseases

In the analysed period, 38 infections (2017) and 43 infections (2018) with intestinal parasites (nematelminthes, platyhelminthes and protozoa) were detected among the personnel of PMC Afghanistan. Acute gastroenteritis was also reported (diarrhoea, abdominal pain; 4-6 cases / 100 patients / month). Due to a likely risk of spreading carbapenemase-producing or P-lactamase producing intestinal bacilli and vancomycin-resistant enterococci (commonly found in the population of Central-Southern Asia) to Poland by the personnel of the PMC Afghanistan, which would contribute to the development of drug-resistance in Poland, the Military Institute of Medicine introduced diagnostics of alert pathogens (CPE, ESBL, VRE) among Polish soldiers stationed in Afghanistan, to be performed in the years 2019-2021.

Malaria

In 2018, two members of the 7th rotation of the PMC Afghanistan, stationed in TB Gamberi, were diagnosed with malaria infection. Both soldiers received targeted treatment in the base, according to the diagnosis (*Plasmodium vivax* infection). The risk of malaria is present in all the regions where PMC Afghanistan soldiers are stationed above an altitude of 2500 m a.s.l.; the risk is high in the Laghman and Nangarhar provinces, it is moderate in the Kandahar and Kabul provinces, and low in the Parwan Province. All soldiers and civil employees of the PMC Afghanistan must receive antimalarial chemoprophylaxis from April to November, 1-2 days before entering a region endemic to malaria, daily during the stay, and for 7 days after the return from the endemic region to Poland (1 tablet per day with a meal, at the same time of day). Before the end of service/work, in the last week of their stay in the operation theatre, every PMC member receives an immunochromatographic peripheral blood test (Malaria Test Ag P.f./Pan).

Immunoprophylaxis

The records of preventive vaccinations in PMC Afghanistan are only on paper (vaccination forms are completed by the personnel of the PMC Medical Support Group, and sent to the Epidemiological Response Centre of the Armed Forces in Warsaw, the unit responsible for keeping the Central Vaccination Register of the Polish Army). Based on the analysis of data from the vaccination cards of the soldiers deployed abroad, the level of immunoprophylaxis in the Polish Armed Forces is still quite low. The immunisation cycles are incomplete or repeated; the vaccination cards are not monitored in the military units for the date of the next immunisation (30% of the personnel of PMC Afghanistan deployed for service in this theatre of operations have no records of vaccinations, and in the case of another 70%, the documentation of vaccinations in the on-line military record system is incomplete; only 30% of the personnel of PMC is deployed abroad with a complete immunisation cycle or completes it within the first 2 months of their stay in the theatre of operations, whereas 70% of the personnel of PMC need to have their vaccinations completed or restarted, according to the schedule). Additional documentation introduced in 2018 for the entire personnel of PMC Afghanistan, in the form of tables containing standard vaccinations, booster vaccinations and revaccinations already administered and planned for the future, as well as adjustment of incorrect vaccinations performed in the past, made it possible to ensure complete vaccination of the entire personnel of the PMC during the 7th and 8th rotations (a significant increase in the number of vaccinations: 608 in 2017 vs 1438 in 2018).

Conclusions

Morbidity in the PMC Afghanistan personnel is associated primarily with environmental factors (high and low temperatures, high solar exposure, wind, dust, local fauna, endemic infectious and invasive diseases), and ignoring the principles of health prophylaxis. The greatest epidemiological hazard for the participants of the Resolute Support Mission in Afghanistan are infectious and parasitic diseases of the gastrointestinal tract, malaria, leishmaniasis and Crimean-Congo haemorrhagic fever.

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Expectations of hematologic patients towards stem cell transplantation and their assessment after treatment

Oczekiwania pacjentów hematologicznych wobec przeszczepienia komórek macierzystych i jego ocena po przebytych leczeniu

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Abstract. In many cases of hematopoietic and lymphatic system disease, stem cell transplantation may be the most effective method of medical treatment. This study included thirty-one patients treated in the Haematology Department and the Bone Marrow Transplantation Centre (OPS) at the Central Clinical Hospital of the Military Institute of Medicine in Warsaw in 2018 and 2019. The study was based on two questionnaires for the patients, prepared for this purpose, the first completed on admission to the centre and the second prior to leaving.

Key words: expectation of treatment efficacy, hematologic diseases, stem cell transplantation, treatment assessment

Streszczenie. W wielu przypadkach chorób układu krwiotwórczego oraz chłonnego przeszczepienie komórek macierzystych może być najbardziej skuteczną metodą leczenia. Prezentowane badania objęły 31 pacjentów leczonych w Klinice Hematologii i Ośrodka Przeszczepiania Szpiku (OPS) w CSKWIM w Warszawie w latach 2018-2019. Badania zostały przeprowadzone indywidualnie za pomocą skonstruowanego w tym celu kwestionariusza. Przeprowadzono je dwukrotnie: przy przyjęciu do ośrodka oraz przed wypisaniem do domu.

Słowa kluczowe: choroby hematologiczne, przeszczepienie komórek macierzystych, oczekiwania wobec leczenia, ocena przebytej terapii

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Introduction

The therapeutic process in patients with neoplasms of the haematopoietic or lymphatic system often prepares them for the most effective, final stage of their treatment: transplantation of stem cells. Haematopoietic stem cell transplantation is becoming an increasingly popular treatment option in haematological diseases, but only for life-threatening situations. The risk of failure increases in patients in poor general health prior to the procedure. The important quality of stem cells is their ability to preserve all their properties during division, and to create functional, mature blood cells. Their principal

characteristics include self-renewal, which enables tissues such as bone marrow to preserve an appropriate number of stem cells for haematopoiesis. Therefore, the production of mature blood cells is adjusted to the requirements of the organism. The aim of transplantation is complete recovery from the disease, with the exception of neoplasms originating from plasma cells, e.g. multiple myeloma, where the goal of transplantation is to prolong survival, not cure the disease [1]. In Poland bone marrow transplantation is presently performed in 17 centres, usually with haematology or paediatric haematology departments. The largest bone marrow transplantation

centres are in Katowice, Wrocław, Warsaw, Poznań, Lublin, Gdańsk and Krakow, which perform approximately 800 procedures annually, including 500 autologous and 300 allogeneic transplantations. Each year approximately 17 thousand allotransplantations and 30 thousand autotransplantations are performed across the world. Recently, the number of allotransplantations from unrelated donors has been growing [2]. The number of procedures performed in Poland has also been increasing for a number of years. Unfortunately, compared to other EU countries, the situation is still not satisfactory. Despite many actions and social campaigns, we cannot attract enough organ or stem cell donors [3].

Apart from somatic contraindications (e.g. insufficiency of any organ), there are also psychological contraindications for the procedure. The most common ones include:

- low motivation resulting in poor co-operation with the therapeutic team,
- adaptation problems (several weeks of isolation),
- mental disorders or a major personality disorder.

The scope of the patient's ability, reaction to the diagnosis and course of treatment of the neoplastic disease depend on numerous factors, including:

- general somatic condition, existing conditions,
- current mental status, level of emotional maturity,
- patient's age, previous experiences and trauma,
- disease stage, available treatment options,
- general knowledge and beliefs and expectations associated with the disease and its therapy,
- relationship with close ones, as well as the support they can offer,
- relationship and co-operation with the therapeutic team,
- the developed and currently used coping strategies.

Haematological disease **affects every part of the body** (vs kidney cancer = I am healthy, only my kidney has a disease...). The most common mental states we witness in the haematology department and the bone marrow transplantation centre include:

- fear of therapy, pain, loneliness and death (a 30-year-old patient asks: "Is this my last autumn?"; a 56-year-old patient asks: "Did you come to prepare me for death?"),
- dependence on the family and medical personnel (quality of life, quality of disease, quality of dying),
- fear of becoming unattractive (loss of hair, skin lesions), fear of infertility,
- distorted self-image, new identity in the familial, professional, social and personal dimension (not a father/mother, daughter/son, colleague, specialist,

friend any more, but a severely or terminally ill patient),

- a complete change of the system of values: life and health replace dreams, plans, carrier, trips, hobbies; what is the relevance of a pay raise or increased pension compared to the current threat?
- disturbed relationship with close ones (limitations due to the disease, hospitalisations, usually increasingly frequent and long),
- weakness, fatigue and limited independence in the physical dimension,
- and the most difficult aspect: limited control and sense of helplessness in the context of one's lifestyle and ways of spending time [4, 5].

For patients who are qualified for stem cell transplantation and decide to undergo the procedure, the awareness of a few weeks in isolation, fear of an unfavourable course of the treatment, and anxiety related to the expected adverse effects and potential complications following the transplantation all pose significant challenges [6, 7].

Research questions

1. What are the expectations of patients in a life-threatening condition towards the therapy with stem cell transplantation?
2. How do they assess their stay at the Bone Marrow Transplantation Centre, and would they agree to such difficult treatment again?
3. What is their opinion on the effectiveness of stem cell transplantation, and what is their life expectancy?

Material and methods

The study involved 31 patients diagnosed with plasma cell myeloma (15), testicular neoplasm (5), non-Hodgkin lymphoma (3), mantle cell lymphoma (3), acute myeloid leukaemia (3) and lymphocytic leukaemia (2). The average age of the study subjects was 51 years, within the range 20 to 72 years. Three patients received allotransplantation, and the other 28 patients received autotransplantation. The study was conducted in the years 2018-2019 in the Bone Marrow Transplantation Centre, Department of Haematology, Military Institute of Medicine in Warsaw. An original, two-part questionnaire was used for the study. Part one comprised three statements, and a five-point response scale. The individual items concerned the ability to bear the isolation, the course of treatment and the evaluation of disease severity (QUESTIONNAIRE 1).

Table 1. Expectations of haematological patients before starting treatment in Bone Marrow Transplantation Centre
Tabela 1. Oczekiwania pacjentów hematologicznych w OPS przed rozpoczęciem leczenia

Assessment prior to the treatment	Assessment of hospitalisation	Assessment of the approaching stem cell transplantation	Assessment of disease severity
M	3.26	3.89	2.81
Positive responses	13 (41.9%)	22 (70.96%)	3 (9.38%)

Table 2. Evaluation of therapy in Bone Marrow Transplantation Centre and expectations for the future
Tabela 2. Ocena przebytego leczenia w OPS oraz oczekiwania na przyszłość

Assessment prior to discharge	I endured the hospitalisation	Transplantation was successful	I would agree again	Current assessment of health	Long life expectancy
M	3.15	3.92	4.00	3.46	4.08
Positive responses	16 (51.61%)	21 (67.74%)	22 (70.97%)	28 (90.32%)	25 (80.64%)

Before leaving the Bone Marrow Transplantation Centre, the study subjects assessed their stay, received treatment, hypothetical repeat decision for transplantation, current well-being and expectations regarding the length of survival (QUESTIONNAIRE 2). Apart from completing the questionnaires, the patients were under psychological observation, and many of them received continuous support, which greatly enriched the material for analysis.

Results and discussion

The study results are presented in two tables: the first one summarises the survey at admission to the centre, and the second one before discharge.

The assessment at the beginning of hospitalisation at the centre was difficult: a small majority of study participants could not evaluate this new and unique experience, and a few patients (5) expected the stay to be difficult. However, over 40% expected to cope with it quite easily. The majority of participants believed that their stem cell transplantation would be successful (71%), and 9 patients could not express their opinion. Nobody had negative expectations regarding the success of the transplantation. One in three study subjects felt severely ill or ill, only 2 patients could not determine their condition, and 1 person declared that he/she was not very ill.

QUESTIONNAIRE 1

1. I am convinced that I will endure a few weeks in the Bone Marrow Transplantation Centre:

- Very easily
- Easily
- It's hard to tell
- Rather with difficulty
- With great difficulty

2. I am convinced that the course of my transplantation will be:

- Very good
- Good
- I don't know
- Rather not good
- A failure

3. In my opinion, at the moment I am:

- Very severely ill
- Severely ill
- Rather ill
- It's hard to tell
- Not very ill

Before discharge, a slight majority of subjects (approximately 52%) evaluated their hospitalisation as easy or very easy to endure. Eleven out of 31 participants declared that the past few weeks were difficult to endure.

QUESTIONNAIRE 2

1. I endured the hospitalisation:

- Very easily
 Easily
 It's hard to tell
 Rather with difficulty
 With great difficulty

2. I am convinced that the transplantation:

- Was completely successful
 Was successful
 I cannot tell
 Was rather unsuccessful
 Was unsuccessful

3. Presently I feel:

- Completely healthy
 Healthy
 Rather ill
 Still ill
 Very ill

4. I am convinced I will live:

- For many years
 For at least a few years
 For not a long time
 I'm afraid I have a very short time to live

Four patients could not assess the previous weeks. A majority (over 2/3) of the study subjects were convinced that their stem cell transplantation was successful. Ten participants did not want to or were not able to assess the effectiveness of the procedure. If the subjects were to decide again to undergo the procedure, based on their knowledge and experience gained in the Bone Marrow Transplantation Centre, the majority of them (71%) would choose to have the procedure. Eight patients (25.8%) had doubts, and 1 would rather not agree to a transplantation. Twenty eight patients (over 90%) after the stem cell transplantation felt rather healthy or very healthy. Two participants still felt ill, and 1 subject could not assess their health status. The last question concerned life expectancy. The largest group of subjects hoped for "at least a few years" (61.29%). Six patients following stem cell transplantation hoped for many years (19.35%). "I am

not likely to live long" – was the opinion of 4 patients (12.90%). Two patients were convinced they had a very short time to live.

Conclusions

- The majority of patients were well prepared for the difficult treatment with stem cell transplantation. Therefore, they tolerated the chemotherapy and transplantation quite well [8, 9].
- Several weeks of the hospitalisation at the Bone Marrow Transplantation Centre are spent in isolation. In many cases the personnel need special methods of engagement to ensure a sense of safety and care in a difficult time involving potential complications and adverse effects. As demonstrated by the above study outcomes, the patients felt supported and cared for.
- In the therapy of difficult diseases, such as conditions treated at the Department of Haematology and Bone Marrow Transplantation Centre, it is difficult to establish a patient/doctor relationship that maintains hope while also avoiding the creation of naive illusions. This applies to all the medical personnel, and entails a highly individualised approach to the patient.
- The large majority of patients (over 80%) leave the centre with a deep belief that they still have years of life ahead.

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Correlation of intra-abdominal pressure parameters measured by direct and indirect methods during laparoscopic cholecystectomy

Korelacja parametrów ciśnienia wewnątrzbrzusznego mierzona sposobem bezpośrednim i pośrednim w trakcie cholecystektomii laparoskopowej

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Abstract. The main aim of the study was to assess the correlation of intra-abdominal pressure (IAP) between direct measurement in the peritoneal cavity and intermediate measurement in the bladder. The relation was examined of intra-abdominal pressure measured indirectly in the bladder and directly in the peritoneal cavity. Intra-abdominal hypertension (IAH) exceeding the limit of 12 mm Hg may cause visceral disturbances, leading to dysfunction of the circulatory system, respiratory system and disorders of the secretory functions of the kidneys. Capturing the IAH at the right time based on the clinical picture and related measurements can accelerate the inclusion of appropriate therapeutic procedures, including surgical treatment.

Keywords: intra-abdominal hypertension, intra-abdominal pressure, laparoscopic cholecystectomy

Streszczenie. Podstawowym celem pracy była ocena korelacji wartości ciśnienia wewnątrzbrzusznego pomiędzy pomiarem bezpośrednim w jamie otrzewnej i pomiarem pośrednim w pęcherzu moczowym. Przeprowadzenie tego typu badania miało ocenić zależność pomiaru ciśnienia wewnątrzbrzusznego (IAP) mierzonego pośrednio w pęcherzu moczowym od pomiaru bezpośredniego w jamie otrzewnej. Objawy nadciśnienia wewnątrzbrzusznego (IAH), przekraczając graniczne 12 mm Hg, mogą wywoływać zaburzenia przepływu trzewnego, a w konsekwencji doprowadzić do dysfunkcji układu krążenia, oddechowego oraz zaburzać funkcje wydzielnicze nerek. Wychwycenie w odpowiednim momencie IAH na podstawie obrazu klinicznego oraz odpowiednich pomiarów może przyspieszyć włączenie właściwego postępowania terapeutycznego, z leczeniem chirurgicznym włącznie.

Słowa kluczowe: ciśnienie wewnątrzbrzuszne, nadciśnienie wewnątrzbrzuszne, cholecystektomia laparoskopowa

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Introduction

Over the past three decades, we have witnessed a significant development in the assessment of the pathomechanisms of the symptoms resulting from intra-abdominal pressure (IAP) disorders.

Intra-abdominal hypertension (IAH), associated with the symptoms of organ failure, may cause abdominal compartment syndrome (ACS). The most frequent and most dangerous ones are the symptoms of concurrent cardiovascular and respiratory failure, and impaired secretory renal function. It has been established that the

IAP value resulting in ACS is >20 mm Hg, as this is when the blood flow through organs is disturbed, affecting the patient's clinical status [1, 2, 13, 29]. Normal intra-abdominal pressure is 0-5 mm Hg, while values exceeding 12 mm Hg may disturb visceral flow, gradually leading to impaired organ perfusion and to organ damage. If the IAP exceeds 25 mm Hg, and cannot be corrected conservatively, surgical decompression is required [7, 29]. Due to the need to monitor IAP, attempts were made to introduce potentially precise, non-invasive and easy measurement methods reflecting the actual IAP. In 1987, Lacey et al. measured pressure in the stomach, rectum, urinary bladder, superior and inferior vena cava, femoral artery and brachial artery, and in the peritoneal cavity. The measurements in the urinary bladder and inferior vena cava demonstrated the best correlation with IAP. Due to the similarity of results, as well as the non-invasive and easy measuring process, IAP measurement in the urinary bladder was introduced on a larger scale [1, 2, 8, 19, 22, 29]. Over the years the technique of IAP measurement in the urinary bladder has evolved, and the current standard was used in this study.

Aim of the study

Assessment of the correlation between the direct and indirect measurement of intra-abdominal pressure.

Material

The study involved 20 randomly selected patients with symptomatic cholecystolithiasis, qualified for elective laparoscopic cholecystectomy. The group comprised 11 females and 8 males aged 28-73 years. Exclusion criteria included a history of urinary bladder injury, neoplastic disease or inflammatory disease of the genitourinary system. The study was conducted in the operation theatre of the Department of General, Surgical and Vascular Surgery, Central Clinical Hospital, Military Institute of Medicine in Warsaw.

Study method

Elements used to measure IAP in the urinary bladder

- Foley catheter
- Sensor for invasive blood pressure measurement
- Set of drains (fluid transfusion set)
- Monitor (with the option of invasive blood pressure measurement)
- Syringes, 10 ml and 100 ml
- 3-way tap
- 500 ml flask with saline (0.9% NaCl)
- Urine bag
- A tool to clamp the catheter (Pean clamp) [29].

The patient was in the supine position on the operating table. After the induction of anaesthesia, a Foley catheter was introduced into the urinary bladder. After filling of the stabilising and tightening balloon with 10 ml of 0.9 NaCl solution, all urine was removed from the bladder. The catheter was then connected to the sensor for invasive blood pressure measurement using a fluid transfusion set. The sensor was located on the level of the symphysis pubis and connected to the monitor. The entire system was filled with a saline solution. The urinary bladder was then filled with 100 ml of 0.9% NaCl solution, so that the opening of the catheter was below the fluid surface [4, 17]. The measuring tools were sterile. After two calibrations of the system, measurements were started [11, 14]. Using a skin incision in the inferior umbilical fold, a Veress needle was introduced into the peritoneal cavity. The measurement was made after the needle had been introduced into the peritoneal cavity, and the insufflator display showed the pressure values of 5, 10, 12 mm Hg. Continuous variables were processed using descriptive statistics: means, standard deviations, medians and quartiles. Sex distribution was presented as a percentage. Linear regression was analysed to assess the relationship between the pressure from the insufflator and the pressure in the urinary bladder. The measure of this relationship was expressed using the R-squared determination coefficient. The nature of the relationship was determined using Pearson's correlation. Statistical significance was set at $p < 0.05$.

The statistical analysis was performed using SAS University Edition software.

Results

The final assessment included the results tests conducted in all the operated patients, following the methodology of the study. The detailed analyses are presented in the tables, starting with the percentage distribution of the study group by sex, with 60% being female and 40% being male (Table 1).

Table 1. Percentage distribution of the group by sex
Tabela 1. Rozkład procentowy grupy badanej względem płci

Sex	Number	Percentage	Cumulated number	Cumulated percentage
Female	12	60.00	12	60.00
Male	8	40.00	20	100.00

Table 2. Study group patients by age and bladder pressure measurement with fixed insufflator pressure
Tabela 2. Zobrazowanie badanej grupy chorych pod względem wieku oraz pomiaru ciśnienia w pęcherzu przy zadanym ciśnieniu na insuflatorze

Variable	Mean	SD	Median	Bottom quartile	Upper quartile	Min.	Max.
Age	52.60	13.30	53.00	43.50 0 1.50 5.50 8.00	64.50	28.00	73.00
Measurement (0 mm Hg)	1.45	1.84	1.00		2.50	0	6.00
Measurement (5 mm Hg)	3.25	2.05	3.00		4.00	1.00	8.00
Measurement (10 mm Hg)	6.90	1.74	6.00		8.50	5.00	10.00
Measurement (12 mm Hg)	9.65	1.98	9.00		11.00	7.00	14.00

Table 3. Study group patients by age, sex and bladder pressure measurement with fixed insufflator pressure
Tabela 3. Zobrazowanie badanej grupy chorych pod względem wieku, płci oraz pomiaru ciśnienia w pęcherzu przy ciśnieniu zadanym na insuflatorze

Sex	n	Variable	Mean	SD	Median	Bottom quartile	Upper quartile	Min.	Max.
Female	12	Age	50.58	15.03	48.00	39.00	64.00	28.00	73.00
		Measurement (0 mm Hg)	0.83	1.11	0.50	0	1.00	0	3.00
		Measurement (5 mm Hg)	2.58	1.44	2.50	1.00	4.00	1.00	5.00
		Measurement (10 mm Hg)	6.25	1.54	6.00	5.00	7.00	5.00	9.00
		Measurement (12 mm Hg)	9.16	1.80	9.00	8.00	10.50	7.00	13.00
Male	8	Age	55.62	10.38	55.00	52.00	64.50	35.00	67.00
		Measurement (0 mm Hg)	2.37	2.39	2.00	0	4.50	0	6.00
		Measurement (5 mm Hg)	4.25	2.49	3.50	2.50	6.50	1.00	8.00
		Measurement (10 mm Hg)	7.87	1.64	7.50	6.50	9.50	6.00	10.00
		Measurement (12 mm Hg)	10.37	2.13	9.50	9.00	12.00	8.00	14.00

Table 2 presents a statistical description of the age variable and the IAP values measured using the indirect method in the urinary bladder, with a fixed reference pressure, based on the values read on the insufflator measuring the intraperitoneal pressure.

Table 3 presents the statistical description of the IAP values measured using the indirect method, according to sex, in order to assess possible differences in the IAP distribution due to anatomical differences.

It was demonstrated that sex affects the pressure in the urinary bladder. Females had significantly lower IAP

values compared to males, based on the randomly selected study population ($p = 0.045$). Linear regression was analysed to determine a relationship between the pressure from the insufflator and the pressure in the urinary bladder. The analysis clearly demonstrated that the correlation between the pressure measured by insufflator and the pressure measured in the urinary bladder was statistically significant ($p < 0.001$). The power of this correlation, expressed by R-squared (adjusted R-sq.) of 0.7001, was high. The correlation analysis was illustrated based on the assessment of Pearson's

correlation coefficient, which determined the nature of the relationship between the examined variables, i.e. the intraperitoneal pressure measured by the insufflator, and the pressure in the urinary bladder. In this case, Pearson's correlation coefficient between the pressure measured with insufflator and the pressure in the urinary bladder was 0.83897. It clearly indicated that there was a positive correlation between the pressure from the insufflator and that in the urinary bladder. This correlation was statistically significant ($p < 0.0001$). Pressure in the urinary bladder increased together with increasing pressure in the insufflator (Fig. 1).

In addition, the analysis of the linear regression demonstrated that pressure changes in the urinary bladder during insufflation had the same dynamics in both groups ($p = 0.867$).

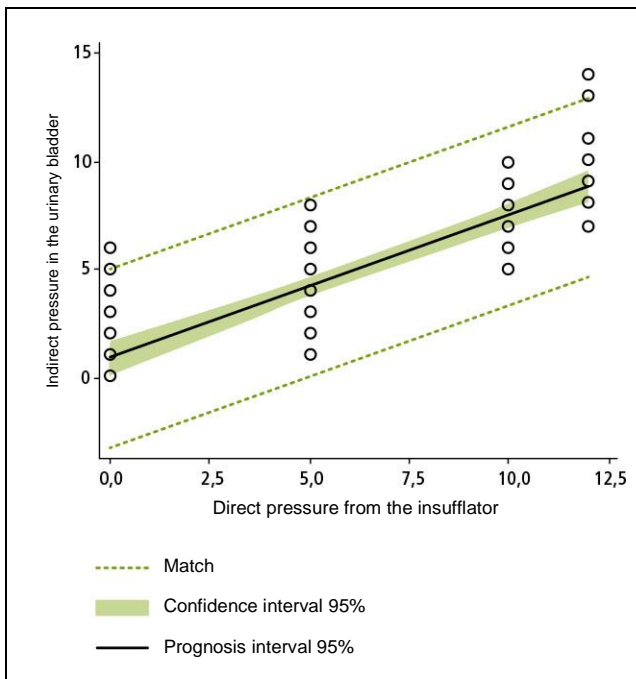


Figure 1. Linear increase in bladder pressure vs pressure measured in peritoneal cavity

Rycina 1. Liniowy wzrost ciśnienia w pęcherzu moczowym względem ciśnienia zmierzonego w jamie otrzewnej

Discussion

The study conducted in 1987 by Lacey et al. measured the pressure in the stomach, rectum, urinary bladder, superior and inferior vena cava, femoral and brachial artery and peritoneal cavity, demonstrating that the best correspondence with intra-abdominal blood pressure can be observed for the urinary bladder and inferior vena cava. Considering how easy and relatively non-invasive the process is, indirect measurement in the urinary

bladder has become a widely used method [1, 2, 8, 19, 22, 29].

This article assessed the correlation between intra-abdominal pressure measured indirectly in the urinary bladder and the direct IAP, measured using laparoscopic insufflator.

The IAP results in patients having operations due to symptomatic cholecystolithiasis demonstrated, based on statistical analysis, that the relationship between the direct blood pressure, measured by an insufflator, and the pressure measured indirectly in the urinary bladder is statistically significant, strong, and characterised by the same dynamics. It is also documented that the sex of the patient affects the variations in blood pressure values in the urinary bladder, resulting in a statistically significant difference in the fixed pressure in females and males, the latter obtaining higher IAP parameters. These findings allow us to obtain robust IAP values measured indirectly in the urinary bladder. As a consequence, they enable reliable IAP measurements to be conducted in severely ill patients with IAH or ACS.

Conclusions

The study revealed a strong positive correlation between the pressure measured directly by an insufflator, and the pressure measured indirectly in the urinary bladder. IAP measurement in the urinary bladder is a reliable assessment tool for assessing the intra-abdominal pressure value.

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Impact of endoscopic sinus surgery on lung function and bronchial reactivity in patients with chronic rhinosinusitis

Wpływ leczenia przewlekłego zapalenia błony śluzowej nosa i zatok przynosowych metodą endoskopową na czynność płuc oraz reaktywność oskrzeli

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Abstract. Chronic sinusitis is a condition in which the cavities around the nasal passages as well as the nasal and paranasal sinus mucosa become inflamed for over 12 weeks. The EPOS classification (European Position Paper on Rhinosinusitis and Nasal Polyps of 2012) distinguishes chronic rhinosinusitis without nasal polyps (CRSsNP) and chronic rhinosinusitis with nasal polyps (CRSwNP). Today, in the supplementary treatment of both disorders, the Endoscopic Sinus Surgery (ESS) is the treatment of choice. The work presents an analysis of the impact of ESS on the pulmonary function and airway responsiveness in patients with CRSsNP, CRSwNP and nasal septum deviation treated with septoplasty. All of the patients underwent skin testing with inhalant allergens, spirometry, and bronchial challenge test with methacholine. The ESS procedure in patients suffering from CRSsNP and CRSwNP did not have a significant impact on improving the pulmonary function, but considerably contributed to the reduction in bronchial responsiveness, particularly in patients with CRSwNP.

Key words: bronchial challenge test with methacholine, chronic rhinosinusitis with nasal polyps (CRSwNP), chronic rhinosinusitis without nasal polyps (CRSsNP), spirometry

Streszczenie. Przewlekłe zapalenie błony śluzowej nosa i zatok przynosowych charakteryzuje się stanem zapalnym trwającym powyżej 12 tygodni, obejmującym błonę śluzową nosa i zatok przynosowych. Według przyjętej klasyfikacji EPOS - European Position Paper on Rhinosinusitis and Nasal Polyps 2012 - europejskich wytycznych dotyczących zapalenia błony śluzowej nosa i zatok oraz polipów nosa z 2012 r., wyróżnia się przewlekłe zapalenie błony śluzowej nosa i zatok przynosowych (PZZP) oraz przewlekłe zapalenie błony śluzowej nosa i zatok przynosowych z obecnością polipów (PZZP z PN). Obecnie, w określonych sytuacjach, w leczeniu uzupełniającym obu schorzeń metodą z wyboru jest czynnościowa chirurgia endoskopową zatok przynosowych (ESS). W pracy przedstawiono analizę wpływu zabiegu metodą ESS na funkcję płuc oraz reaktywność oskrzeli u chorych z PZZP oraz PZZP z NP i ze skrzywioną przegrodą nosa leczonych metodą septoplastyki. U wszystkich dodatkowo wykonano testy skórne z alergenami wziewnymi, badanie spirometryczne oraz metacholinową próbę prowokacyjną oskrzeli. Zabieg ESS u chorych z PZZP oraz PZZP z PN nie wpływa w istotny sposób na poprawę funkcji płuc, przyczynia się natomiast istotnie do zmniejszenia reaktywności oskrzeli, zwłaszcza u chorych z PZZP z PN.

Słowa kluczowe: przewlekłe zapalenie zatok (PZZP), przewlekłe zapalenie zatok z polipami nosa (PZZP z PN), spirometria, metacholinową próba prowokacyjna

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Introduction

According to EPOS European Position Paper on Rhinosinusitis and Nasal Polyps 2012, chronic rhinosinusitis is characterised by inflammation persisting for over 12 weeks, involving the mucosal membranes lining the nose and paranasal sinuses [1]. The condition may be classified as chronic rhinosinusitis without nasal polyps (CRSsNP) and chronic rhinosinusitis with nasal polyps (CRSwNP). Its clinical symptoms include nasal congestion, nasal discharge and/or postnasal drip. They may be accompanied by facial pressure or reduction or loss of smell [1]. Based on current knowledge, the presence of polyps in chronic rhinosinusitis results from a local inflammatory process [1]. It has been established that diseases of the nasal and sinus mucosa affect the lower respiratory tract, especially the bronchi. Previous studies usually analysed the most thoroughly examined relationship between allergic rhinitis (AR) and bronchial asthma (BA) [2]. Few observations focus on the concurrence of CRS/CRSwNP with lower respiratory tract diseases, or its potential promotion effect on the development of lower respiratory tract diseases or their exacerbation [3]. Previous hypotheses attempted to explain these potential mechanisms, considering the effect of direct transmission of the infected material from the nose [4], disturbed mucociliary transport [5], and the role of inflammatory cells present in the respiratory tract due to various factors, e.g. allergens [6]. Frequent concurrence of BA with AR may result from the similarity of the Th2-mediated inflammatory reactions [6]. Bronchial hyperreactivity is observed not only in BA, but also in other diseases of the lower respiratory tract, and it may be due to persistent subclinical inflammation and reaction to inadequate temperature and humidity of the air.

Aim of the study

Upper respiratory tract infections adversely affect the quality of life. Patients who do not achieve satisfactory treatment outcomes, and the increased local symptoms they experience include the feeling of nasal blockage, obstruction of the ostio-meatal complex and its consequences, or the presence of nasal polyps, are qualified for surgical treatment [1, 7]. Presently, the method of choice is endoscopic sinus surgery (ESS) [8, 9]. The aim of the study was to analyse the effect of the ESS procedure on the pulmonary function and bronchial reactivity in patients with CRS and CRSwNP.

Material and methods

The study involved 76 patients hospitalised over a period of 4 years (June 2014 – June 2018) at the Clinical Department of Otolaryngology of the 10th Military Clinical Hospital with Polyclinic in Bydgoszcz due to a planned endoscopic procedure. Patients were assigned to two subgroups, according to the type of disease: chronic rhinosinusitis with or without polyps. Subgroup A comprised 31 patients with chronic rhinosinusitis, including 20 males and 11 females, 26 – 71 years old, and subgroup B comprised 29 patients with chronic rhinosinusitis with polyps, including 21 males and 8 women, 26 – 77 years old. The control group included 16 patients 21 – 68 years old, undergoing septoplasty. The study was conducted according to a study protocol, with the approval of the Bioethical Committee of the Military Institute of Medicine in Warsaw, chaired by Col Prof. Dariusz Jurkiewicz MD, PhD (Resolution no. 15/WIM/2014 of 21/05/2014). All patients received information about the aim and details of the study, and signed an informed consent form.

Inclusion criteria:

- over 18 years of age,
- presence of chronic rhinosinusitis with or without polyps, following unsuccessful conservative therapy for at least 2 years, qualified for surgical treatment, or presence of septal deviation that requires surgical treatment.

Exclusion criteria:

- lack of consent to participate in the study, or withdrawal from the study, without having to give an explanation,
- bronchial asthma, aspirin triad,
- Impaired air flow through the respiratory tract in a spirometry test $FEV_1 < 80\%$ or $FEV_1 < 1.5\text{ l}$,
- pregnancy and breastfeeding,
- previous or current use of cholinesterase inhibitors (e.g. due to miastenia gravis),
- miastenia gravis,
- signs of NYHA III or IV chronic heart failure,
- uncontrolled arterial hypertension, systolic blood pressure of $> 180\text{ mm Hg}$ or diastolic blood pressure of $> 100\text{ mm Hg}$,
- using antihistamines for approximately 2 weeks before the planned hospitalisation, and other medicines that could affect the results of prick skin tests,
- diseases in which spirometry is contraindicated [10, 11].

Methods

All patients in subgroups A and B received ESS procedure. 29 patients in subgroup A underwent bilateral ESS, and 2 patients received unilateral ESS. In subgroup B 27 patients underwent a bilateral procedure, and 2 patients underwent unilateral ESS. The initial examination prior to the procedure comprised taking a detailed medical history, physical examination, laryngological assessment with anterior rhinomanometry, spirometry with bronchial challenge test, prick skin test, and collection of blood for analysis. The follow-up was performed 4 months after the procedure, and involved a medical history analysis and physical examination, laryngological assessment with anterior rhinomanometry, spirometry and bronchial challenge test with methacholine.

Prick skin tests

Prick skin tests were performed simultaneously, using standardised ALLERGOpharma allergen extracts. A single drop (i.e. 0.05 ml) of the solution used to dilute allergen extracts was applied on healthy skin, to provide a negative control; the same volume of histamine solution (2.7 mg/ml) was used as a positive control, and one drop of each allergen solution was applied, in two rows. Next, single skin punctures were performed, each with a different lancet, following the modified method, i.e. the punctures were slanted at 45 degrees. The results were checked after 20 minutes, by measuring the wheal diameter in the longest dimension, and perpendicularly. The results were expressed in millimetres. According to guidelines [23], a wheal diameter of > 3 mm compared to the negative control was considered a positive result [25].

Spirometry

All patients received a spirometry test using a MasterScope (JLAB version 5.21) by Jaeger before the procedure and 4 months after the procedure. The measurement of the volume and flow values was conducted during a forced expiration manoeuvre, registered as a flow-volume curve. The acceptability criteria for the spirometry test were consistent with the recommendations of the Polish Respiratory Society [26], including:

- a proper shape of the flow-volume curve (no artefacts and cough in the initial expiration phase, flattened end-expiration),
- normal beginning of expiration (the time to PEF no more than 0.3 sec., back extrapolated volume of <5% FVC or 150 ml),
- normal end-expiration (the time of forced expiration no shorter than 6 sec., volume change in 1 sec. < 25 ml).

The assessment of the spirometry results involved:

- pseudo-Tiffeneau index, i.e. FEV_1/FVC – the ratio of forced expiratory volume per second to forced vital capacity,
- forced expiration volume per 1 second (FEV_1),
- forced vital capacity (FVC).

The above parameters were presented as absolute values, expressed in litres and as a percentage, normal for age, sex and height, following the European Community for Steel and Coal (ECCS) standards. Assessment of individual spirometry parameters was performed in compliance with the recommendations of the American Thoracic Society and European Respiratory Society (ATS/ERS) [10, 11].

Bronchial challenge test with methacholine

The spirometry and bronchial challenge test prior to the surgery and 4 month follow-up after the procedure were performed in the Laboratory of Functional Tests, equipped with appropriate monitoring devices, i.e. pulse oximeter, blood pressure monitor, nebuliser and medications required in case of dyspnoea or other alarming symptoms. The spirometer used in the study was a MasterScope (JLAB version 5.21) by Jaeger with additional APS head (Asthma Provocation System), with a nebuliser producing molecules of 2-5 μ m, and with the flow rate of 0.13 ml/min \pm 10%. Each patient had a methacholine challenge according to the study protocol, including 5 methacholine (by Sigma) concentrations: 0.25 mg/ml, 1.0 mg/ml, 4.0 mg/ml, 8.0 mg/ml and 16.0 mg/ml in continuous nebulisation while tidal breathing for 2 min, with a programmed nebulisation time [27]. The actual test was performed after a bronchial challenge performed with the use of 3 ml of physiological NaCl solution, in order to exclude bronchial non-specific hyperreactivity to methacholine solvent. After each of the 2-minute nebulisations was completed with the above concentrations of methacholine, a spirometry test was performed [27]. Whenever the FEV_1 value decreased by 20%, or below the baseline value, the challenge test was finished, and considered positive, regardless of the methacholine concentration used. In such a case, the patient received an inhaled short-acting β_2 -mimetic at a total dose of 400 μ g. A follow-up spirometry was performed after 15 minutes.

Statistical analysis

The study results were analysed statistically. The Shapiro-Wilk test was used to verify the normality of the distribution of variables. For the tests with a distribution similar to normal, the arithmetic mean and standard deviation were derived, and t-Student's test for independent variables and variance analysis (ANOVA) were used to compare the means. Levene's test was used to assess the equality of variances. The Tukey procedure was used as a *post-hoc* test. If the distribution varied considerably from the normal range, the median, the bottom and upper quartiles were calculated, and the significance of differences between the groups was verified using the non-parametric ANOVA Kruskal-Wallis test. It was also applied when variances were not homogeneous. The Chi-square test was used to assess the proportions in the groups. The statistical significance was established at $p = 0.05$. The statistical trend was established at $p = 0.1$. The calculations were performed using Statistica software.

Results

Out of the 76 patients qualified for the study, 1 subject from the control group did not meet the repeatability criterion regarding the spirometry test. Moreover, 3 patients in subgroup A, 4 patients in subgroup B, and 2 patients in the control group did not attend the follow-up tests 4 months after the procedure. Some patients refused to continue the challenge test due to fatigue after the spirometry. The final analysis with challenge test involved 23 patients from subgroup A, 18 patients from subgroup B, and 12 patients from the control group.

Group characteristics

Demographic data and smoking

Subgroup A comprised 31 subjects, including 20 (64.5%) men and 11 (35.5%) women, whose mean age was 47.3 ± 11.9 years. The women were significantly younger than the men (41.1 ± 9.6 vs 50.7 ± 11.9 years; $p = 0.0291$). Subgroup B comprised 29 subjects, including 21 (72.4%) men, whose mean age was 54.0 ± 12.4 , and 8 (27.6%) women, whose mean age was 53.0 ± 9.4 years. There was no significant difference between the ages of the men and women ($p = 0.7944$). The control group comprised 16 patients, whose mean age was 43.8 ± 13.0 years, including 5 (31.2%) women aged 43.4 ± 19.2 years,

and 11 (68.8%) men aged 44.0 ± 10.2 years. Also in this group the age of the men and women did not differ significantly ($p = 0.9350$) (Table 1). No significant difference was found between the age of patients in subgroup A and subgroup B. Such a difference ($p = 0.0086$) was observed, however, between subgroup B and the control group (Fig. 1).

In subgroup A, 5 subjects (16.1%) admitted to smoking (9.4 ± 5.6 pack-years), compared to 9 subjects in subgroup B (31.0%) (11.6 ± 6.1 pack-years). None of the subjects in the control group were smokers.

Hypersensitivity to allergens

All patients received a skin test with inhaled allergens. They revealed hypersensitivity in 82.8% of the subjects in subgroup B, in 64.5% of the subjects in subgroup A, and in 37.5% of the subjects in the control group. A significant difference in hypersensitivity to allergens was observed between subgroups A and B, and the control group ($p = 0.0090$). Such differences were not found between subgroups A and B. The results are presented in Table 2. Group diagnostics included allergens such as grass and cereal, weed, dust mites, animal allergens and mould spores. Hypersensitivity to individual groups of allergens in the study subjects are presented in Fig. 2. A significant difference in hypersensitivity to grass and cereal allergens ($p = 0.0493$) was observed between the study groups, as well as a difference in the form of statistical tendency in the hypersensitivity to dust mites ($p = 0.0534$).

In patients with hypersensitivity it typically involved 3 allergens, in the study groups and the control group.

Spirometry

Before the procedure

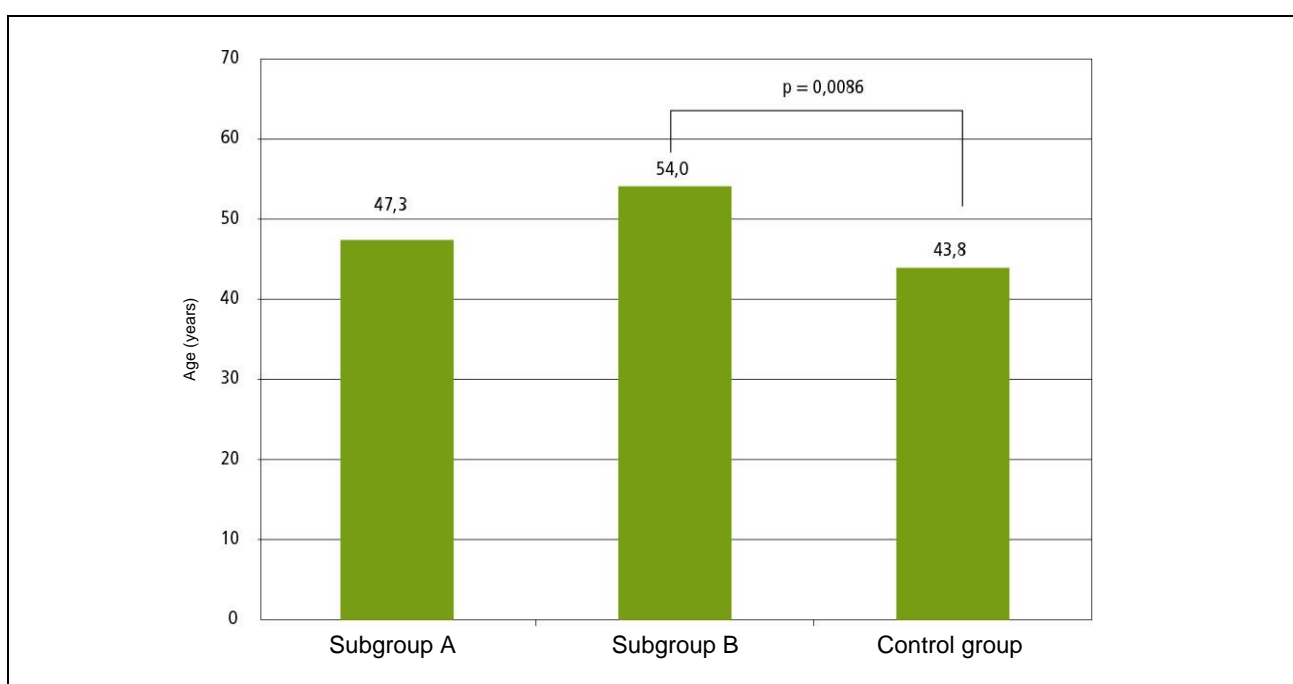
Spirometry revealed a significant difference in the absolute and percentage value of FEV_1 between subgroup B and the control group, as well as in the pseudo-Tiffeneau index FEV_1/FVC between subgroups A and B. The results of the spirometry tests are presented in Table 3.

Effects of the surgery on the spirometry results

The surgery did not significantly affect the spirometry parameters in the analysed subgroups; however, a significant change in FEV_1 was observed in the control group, both regarding the absolute value and percentage. The results are presented in Table 4.

Table 1. Study group demographics**Tabela 1. Dane demograficzne badanych grup**

	Subgroup A n/%X±SD	Subgroup B n/%X±SD	Control group n/%X±SD
Male	20 (64.5%)	21 (72.4%)	11 (68.8%)
Female	11 (35.5%)	8 (27.6%)	5 (31.2%)
Mean age	47.3 ± 11.9	54 ± 11.2	43.8 ± 13.0
Mean age of males (years)	41 ± 9.6	54.0 ± 12.4	44.0 ± 10.2
Mean age of females (years)	50.7 ± 11.9	53.0 ± 9.4	43.4 ± 19.2

**Figure 1. Study group patient age****Rycina 1. Wiek chorych w badanych grupach****Table 2. Hypersensitivity to allergens in the analysed groups****Tabela 2. Nadwrażliwość na alergeny w analizowanych grupach**

	Hypersensitivity to allergens			
	NO		YES	
	n	%	n	%
Subgroup A	11	35.5%	20	64.5%
Subgroup B	5	17.2%	24	82.8%
Control group	10	62.5%	6	37.5%

Effect of the procedure on bronchial reactivity

Challenge test before the surgery

A challenge test before the surgery was performed in 26 (83.9%) patients in subgroup A, 21 (72.4%) patients in subgroup B, and 15 (93.8%) patients in the control group. In subgroup A the test was not performed in 5 subjects, in group B in 8 subjects, and in the control group the test was not performed in 1 subject. Positive results were observed in nearly half of the patients in subgroups A and B. In the control group only 20.0% of the patients demonstrated positive results. The results are presented in Figure 3.

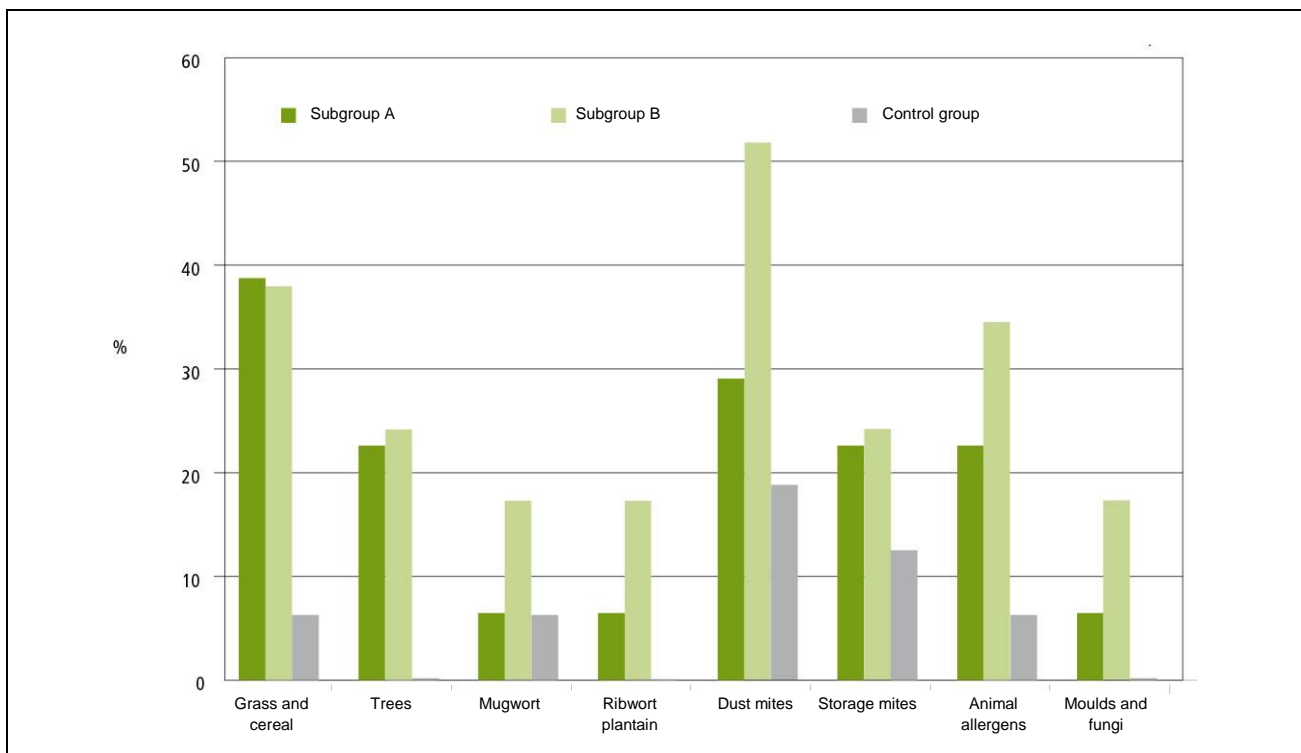


Figure 2. Percentage of study group patients indicating hypersensitivity to selected groups of allergens

Rycina 2. Odsetek pacjentów w badanych grupach wykazujących nadwrażliwość na poszczególne grupy alergenów

Table 3. Spirometry parameters in study groups

Tabela 3. Parametry spirometryczne w badanych grupach

	Subgroup A n= 31	Subgroup B n= 29	Control group n= 15	ANOVA
	Mean \pm SD	Mean \pm SD	Mean \pm SD	
FEV ₁ , [l]	3.39 \pm 0.68	2.97 ^a \pm 0.71	3.76 ^a \pm 0.82	0.0031
FEV ₁ , [%]	99.0 \pm 13.1	94.5 ^a \pm 16.0	109.0 ^a \pm 15.9	0.0116
FEV ₁ , percentile	46.3 \pm 27.8	39.9 ^a \pm 26.6	68.5 ^a \pm 26.5	0.0053
FVC [l]	4.52 \pm 1.04	4.19 \pm 0.99	4.89 \pm 1.05	0.0978
FVC, [%]	108.8 \pm 17.3	107.5 \pm 14.2	117.5 \pm 15.0	0.1201
FVC, percentile	66.0 \pm 31.0	65.0 \pm 25.1	80.5 \pm 21.6	0.1659
FEV ₁ /FVC [%]	75.8 ^a \pm 6.6	71.5 ^a \pm 7.8	76.9 \pm 4.8	0.0171

^a p < 0.05

Challenge test after the surgery

The results of the challenge tests after the surgery were analysed in 23 patients in subgroup A, 18 patients in subgroup B, and 12 patients in the control group. In the control group, no effect of the procedure on bronchial reactivity was observed. In subgroup A the surgery resulted in a bronchial reactivity change in 3 patients (from 12 subjects with positive results to the test before the procedure, to 9 after the treatment), and a similar outcome was observed in subgroup B (from 9 subjects

with positive results to the test before the procedure to 6 patients after the surgery). The results are presented in Figure 4.

Changes in the methacholine concentrations used for the challenge test were observed in the groups. In subgroup A in 3 patients with positive methacholine test results obtained with the concentration of 1 mg/ml before the surgery, after the procedure the concentration was 4 mg/ml; in 1 patient the concentration had to be increased from 4 mg/ml to 8 mg/ml, and in another one from 4 mg/ml

to 16 mg/ml. In 4 patients the dose required for a spastic reaction was 16 mg/ml, instead of the baseline 8 mg/ml. In one patient, who obtained a positive result at 16 mg/ml before the procedure, after the surgery the test was negative. In subgroup B in 1 patient with a positive challenge test result obtained at 4 mg/ml before the procedure, after the surgery a positive reaction was induced by 8 mg/ml. In 2 patients the concentration was increased from 4 mg/ml to 16 mg/ml, and in other 2

subjects the dose was increased from 8 mg/ml to 16 mg/ml. In two patients, who obtained a positive result at 16 mg/ml before the procedure, after the surgery the test result was negative. The surgery significantly increased the threshold of methacholine concentration required for a positive reaction to the challenge test only in group B; in subgroup A the difference was nearly significant. The results are presented in Figure 5.

Table 4. Impact of surgical procedure on spirometry parameters in study groups

Tabela 4. Wpływ zabiegu operacyjnego na parametry spirometryczne w badanych grupach

		Subgroup A n = 28	Subgroup B n = 25	Control group n = 14
		Mean ±SD	Mean ±SD	Mean ±SD
FEV ₁ [l]	Before the procedure	3.42 ±0.67	2.98 ±0.68	3.86 ±0.76
	After the procedure	3.39 ±0.62	2.96 ±0.67	3.76 ±0.79
	P	0.5303	0.5304	0.0004
FEV ₁ [%]	Before the procedure	99.7 ±12.9	93.1 ±13.7	111.5 ±13.0
	After the procedure	98.9 ±11.5	92.6 ±11.6	108.3 ±12.7
	P	0.5226	0.6298	0.0003
FEV ₁ percentile	Before the procedure	49.3 ±28.5	38.4 ±25.8	73.0 ±20.8
	After the procedure	49.0 ±28.2	38.4 ±22.8	71.1 ±20.2
	P	0.8536	0.9900	0.0006
FVC [l]	Before the procedure	4.54 ±1.00	4.19 ±0.96	4.97 ±1.04
	After the procedure	4.49 ±0.81	4.19 ±0.98	4.86 ±1.11
	P	0.3756	0.9265	0.0667
FVC [%]	Before the procedure	109.2 ±17.1	105.6 ±12.5	119.3 ±13.8
	After the procedure	108.2 ±13.1	105.6 ±13.0	116.0 ±13.9
	P	0.4689	0.9962	0.0916
FEC, percentile	Before the procedure	66.4 ±30.3	62.9 ±25.5	84.0 ±17.4
	After the procedure	66.9 ±27.5	64.3 ±26.8	81.3 ±16.3
	P	0.8295	0.5761	0.1947
FEV ₁ /FVC [%]	Before the procedure	76.0 ±6.5	71.8 ±8.2	77.8 ±3.3
	After the procedure	76.1 ±7.6	71.4 ±7.2	77.8 ±4.9
	P	0.9118	0.4643	0.9413

Discussion

Chronic rhinosinusitis with or without polyps is a significant health, social and economic problem. Untreated or insufficiently treated, the disease may have health-threatening consequences, such as orbital abscess or meningitis [1]. Proper functioning of the respiratory system is determined by anatomical

connections between its individual organs, and their functional relationships. A reduced flow of inadequately prepared air, changes in the breathing route, and the presence of chronic inflammation of the nasal and sinusal mucosa may imply changes in the lower respiratory tract.

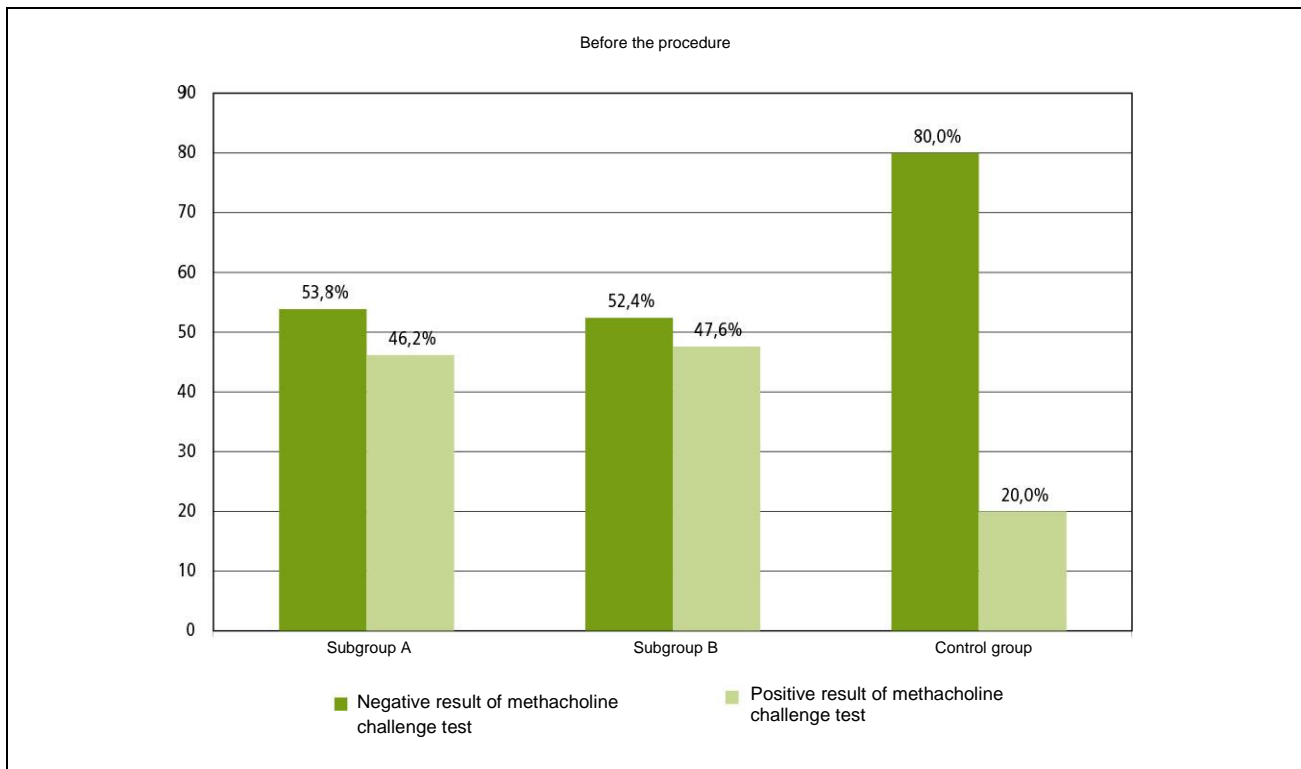


Figure 3. Result of methacholine challenge test before surgical procedure in study groups

Rycina 3. Wynik próby metacholinowej przed zabiegiem operacyjnym w badanych grupach

In a study published in 2019, Unsal et al. [28] demonstrated an improvement in pulmonary ventilation parameters in patients after surgical bilateral reduction of the hypertrophic inferior nasal turbinate. In the subject literature some authors emphasise a potential predisposition to chronic sinusitis in patients with atopy [12], whereas others, e.g. Karlsson et al., question such a relationship [29]. However, oedema of the nasal mucosa observed in rhinitis, especially in the area of sinus ostia, may impair ventilation and sinus clearance, resulting in an increased risk of infection. Scientific studies provide information about a more frequent (10 – 82.4%) incidence of atopy in patients with CRS and CRSwNP. Bruce et al. [30] made an interesting observation: they demonstrated hypersensitivity to at least one allergen in 82.4% of patients with CRSwNP undergoing surgical treatment, whereas in patients with allergic rhinitis hypersensitivity was found in 72% of cases. Hypersensitivity was most commonly caused by dust mites [30].

The outcomes of our study are similar to the observations by Bruce et al.: hypersensitivity to allergens was found in 82.8% of subjects in subgroup B, in 64.5% subjects in subgroup A, and in 37.5% of subjects in the

control group. It should be emphasised that a large proportion of patients declared allergies prior to the study; 12 patients (38.7%) in subgroup A, 17 patients (58.6%) in subgroup B, and 4 patients in the control group (25%). Further study revealed that patients in subgroup A were most frequently hypersensitive to grass and cereal (38.7%), whereas subjects in subgroup B and in the control group were mostly hypersensitive to dust mites (51.7% vs 18.75%) [30]. Clinical observation reveals the concurrence of chronic sinusitis and lower respiratory tract diseases. Errikson et al. assessed that the incidence of CRS in patients with BA was 8.4%, whereas asthma in patients with CRS was found in 24.4% of cases [13]. In the presented analysis, BA was an exclusion criterion. Observations by Kariya et al. demonstrate that in patients with chronic sinusitis asymptomatic changes in the form of mild obstruction are observed considerably more frequently than in the healthy population [14]. In the presented study the FEV₁ parameters before the surgery were significantly different, both in absolute values and as percentage, between subgroup B and the control group.

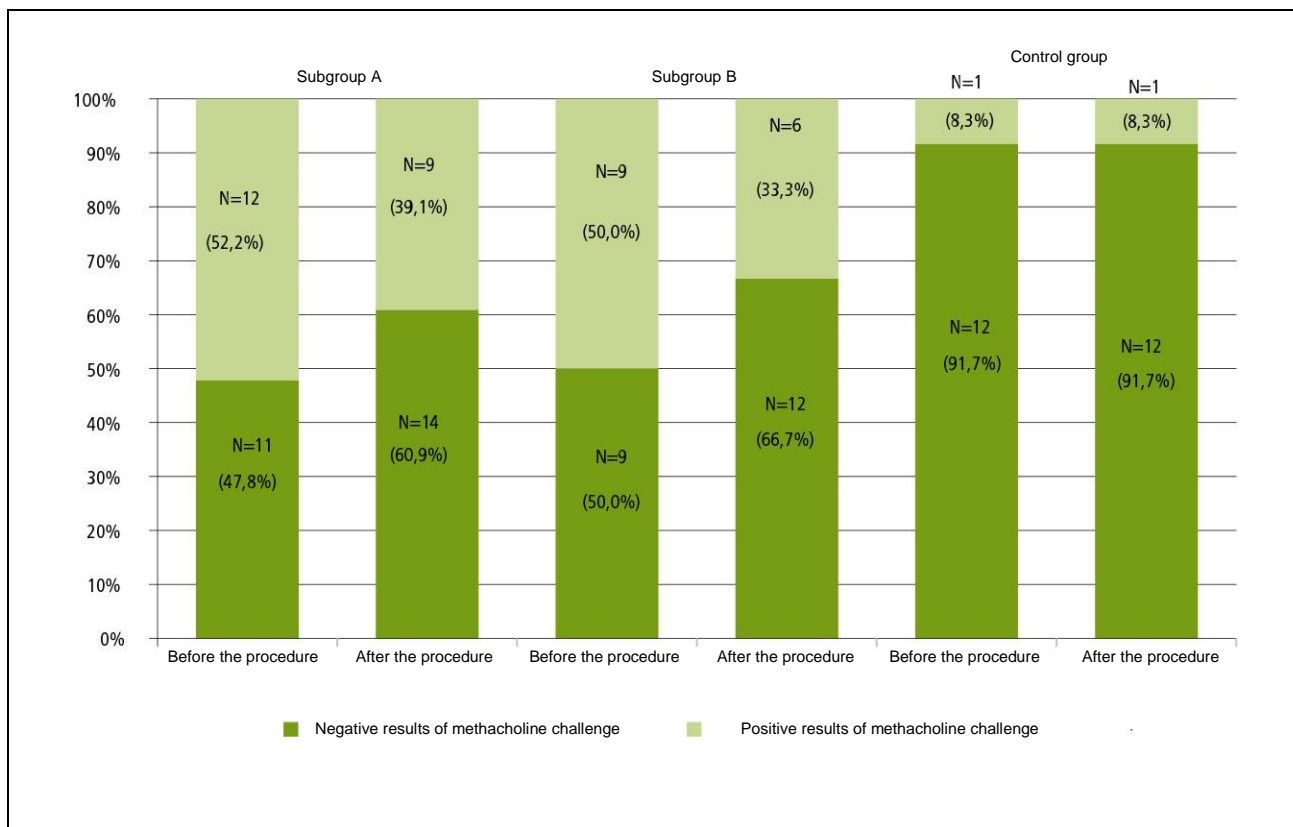


Figure 4. Bronchial responsiveness changes after surgery in study groups
Rycina 4. Zmiana reaktywności oskrzeli w badanych grupach po zabiegu

Moreover, a significant difference was observed in pseudo-Tiffeneau index (FEV_1/FVC) between subgroups A and B. The absolute and percentage values of the differing parameters had no clinical significance, as they were within the normal range for the population. Based on the analysis, the surgical procedure did not affect significantly the above spirometry parameters in the analysed subgroups, and the effect was significant only for FEV_1 in the control group. Reports are available of a beneficial effect of septoplasty on the respiratory function [15]. Our analysis demonstrated that the difference in FEV_1 values was only 100 ml, so it was clinically insignificant, and the values remained above the normal range: 111% before the procedure, compared to 108% after the surgery. The study results are consistent with the findings of other authors, who concluded that surgery does not contribute to a significant improvement in spirometry parameters [16]. As airways form one system, bronchial reactivity is closely related with the activity of the upper respiratory tract. Bronchial hyperreactivity is not typical for a specific disease, but is usually associated with BA. The presence of nasal polyps is an independent factor that increases the reactivity of the bronchi [17]. In

our study this could be observed in subgroup B. Due to nasal blockage and impaired functions of the nose associated with chronic rhinosinusitis, it may contribute to bronchial hyperreactivity. Ponikau et al. observed asthma or bronchial hyperreactivity in 91% of patients with CSR or CRSwNP [18]. Munoz et al. found that in 50% of cases bronchial hyperreactivity was concurrent with CRSwNP [19]. Other authors report changes in spirometry parameters and bronchial hyperreactivity in 60% of patients with chronic sinusitis [17]. This study provided similar results. Positive results of the challenge test were observed in nearly half of the patients in subgroup A (53.8%) and subgroup B (52.4%). In the control group only 20% of the patients demonstrated positive results to the challenge test. Clinical studies emphasise the relationship between Th2-mediated eosinophilic inflammation and bronchial hyperreactivity [20, 31]. Both conditions are characterised by a chronic inflammatory process, but the pathophysiological mechanisms are different. In CRS, due to activation of the cellular response involving Th0 and Th1 lymphocytes and synthesised interleukins IL-4, IL-6 and INF-gamma (interferon-gamma), as well as growth mediators and

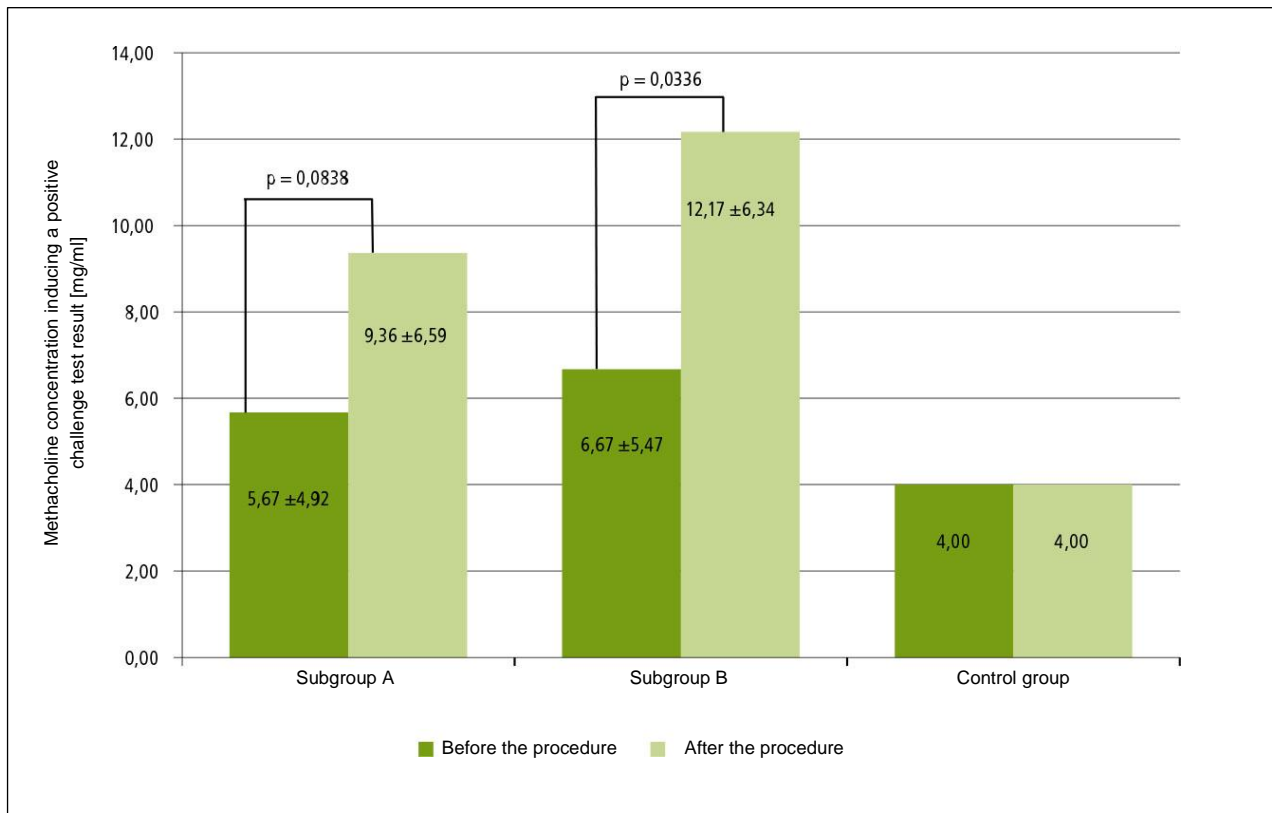


Figure 5. Surgery impact on concentration of methacholine causing positive challenge test in study groups

Rycina 5. Wpływ zabiegu na stężenie metacholiny wywołujące dodatnią próbę prowokacyjną w badanych grupach

growth factors, especially TGF- β 1 (transforming growth factor β 7), chronic inflammation and remodelling of the mucosal membrane are observed [4], whereas in CRSwNP, as a result of epithelial damage caused by bacteria, fungi, toxic substances and allergens, Th2 lymphocytes are activated and cytokines IL-5, IL-4 and IL-13 are synthesised, promoting Th2-mediated inflammation, in which eosinophils play a major role [20, 31].

In patients with nasal polyps bronchial hyperreactivity is more frequent, which results from the type of inflammation, primarily associated with eosinophilic activity in the nasal mucosa [21]. Lamblin et al. [22] observed that patients with nasal polyps without bronchial hyperreactivity do not exhibit eosinophilic bronchitis, compared to those with asthma or bronchial hyperreactivity. Conversely, Togias et al. found inflammatory lesions in the bronchial mucosa in patients with CRS without history of asthma and without bronchial hyperreactivity [23]. In the presented study no changes of bronchial reactivity were observed during the 4 months of follow-up in the control group; however, in the study groups a change in reactivity to the methacholine challenge test was found in subgroup A (from positive to

negative in 3 patients) and in group B (also in 3 patients). In addition, the procedure significantly affected the need to increase the methacholine concentrations necessary to induce a positive reaction in subgroup B, and in subgroup A the effect of the procedure was nearly statistically significant. Bonfils et al. also observed a change in bronchial hyperreactivity after polypectomy [24]. It appears to result from improved nasal passage after the surgery, and reduced bronchial reactivity to the better moistened and cleared air reaching the lower respiratory tract. Based on the data from the literature and 4 months of follow-up in this study, it appears that the surgical procedure does not eliminate or reduce the existing inflammatory process in the airways.

Conclusion

Endoscopic sinus surgery as a supplementary therapy of chronic sinusitis with and without polyps does not improve significantly the pulmonary function, as illustrated by the spirometry parameters, but it reduces bronchial reactivity, especially in patients with chronic rhinosinusitis with polyps.

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Plasma cell myeloma with coexisting amyloidosis – the role of modern echocardiography in difficult diagnostics. A case study

Szpiczak plazmocytowy ze współistniejącą amyloidozą – rola nowoczesnej echokardiografii w trudnej diagnostyce. Opis przypadku

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Abstract. A 52-year-old man, without any history of chronic diseases, was admitted to the Gastroenterology Department due to recurrent abdominal pain, numerous dyspeptic symptoms, weight loss and oedema around the ankles. Laboratory blood tests showed exponents of chronic kidney disease and gastrointestinal inflammation (suggesting Crohn's disease) was found in the endoscopic examination of the gastrointestinal tract. Due to ECG abnormalities and increased cardiac troponin concentration, the patient was referred for cardiology consultation. Based on the echo result, considering the overall clinical presentation, heart amyloidosis was suspected. No amyloid deposits have been identified in further diagnostic tests but the kappa light chains have been identified by immunofixation of serum proteins. The patient was transferred to the Haematology Department where the diagnosis of myeloma (IgG kappa) was made based on a bone marrow biopsy. Multiple myeloma and amyloidosis are diseases belonging to the group of plasma cell dyscrasias, which may coexist, and therefore should be taken into account during the differential diagnosis.

Keywords: amyloidosis, bone marrow biopsy, global longitudinal strain, myeloma

Streszczenie. 52-letni mężczyzna, bez wywiadu chorób przewlekłych, został przyjęty na Oddział Gastrologii z powodu nawracających bólów brzucha, dyspepsji, zmniejszenia masy ciała oraz obrzęków kończyn dolnych wokół kostek. W badaniach laboratoryjnych krwi stwierdzono wykładniki choroby nerek, a w badaniu endoskopowym przewodu pokarmowego zapalenie błony śluzowej żołądka oraz zmiany nasuwające podejrzenie choroby Leśniowskiego i Crohna. Ze względu na nieprawidłowości w zapisie EKG oraz zwiększone stężenie troponiny sercowej chorego skierowano na konsultację kardiologiczną. Na podstawie wyniku badania echokardiograficznego, uwzględniając całokształt obrazu klinicznego, wysunięto podejrzenie amyloidozy serca. W toku dalszej diagnostyki nie zidentyfikowano złogów amyloidu w biopsjach błony śluzowej przewodu pokarmowego, natomiast metodą immunofiksacji białek surowicy stwierdzono obecność łańcuchów lekkich kappa. Pacjenta przekazano na Oddział Hematologii, gdzie na podstawie biopsji szpiku ustalono rozpoznanie szpiczaka plazmocyтового (IgG kappa). Szpiczak plazmocytowy i amyloidozą to choroby należące do dyskrazji plazmocytowych, mogące współwystępować, dlatego należy je uwzględnić w diagnostyce różnicowej.

Słowa kluczowe: amyloidaza, szpiczak mnogi, globalne odkształcenie podłużne, biopsja szpiku kostnego

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Introduction

Plasma cell myeloma (multiple myeloma, MM) and light-chain amyloidosis (AL) are plasma cell dyscrasias. They consist of the production of M protein, a homogeneous monoclonal protein, by clones of plasma cells. The diseases are often difficult to diagnose, and their diagnosis requires the engagement of an interdisciplinary diagnostic team [1]. As multiple myeloma and amyloidosis share certain similarities, such as the presence of monoclonal plasma cells and production of monoclonal immunoglobulins, they should always be considered in differential diagnosis. The spectrum of the clinical symptoms of these diseases may partially overlap, and may also co-exist. Primary amyloidosis may be concomitant with multiple myeloma as in 10-15% of cases it may also occur after the diagnosis of multiple myeloma (6%), or develop prior to MM (0.4%) [2]. In up to 30% of the patients diagnosed with multiple myeloma in tissue biopsies collected from organs such as the heart, kidneys, liver or fat tissue, amyloid deposits are found. Subclinical amyloidosis is often undiagnosed in this group of patients. Careful observation for its presence is very important, as it may affect the choice of treatment and dosing of medicines. In patients with myeloma with concomitant heart amyloidosis, a reduction in melphalan may be required, to prevent life-threatening complications after the stem cell transplantation. In the group of patients treated with thalidomide, careful monitoring for bradycardia is required. It should also be emphasised that concurrent amyloidosis and multiple myeloma adversely affect the prognosis [3].

Multiple myeloma is a malignant, multi-stage monoclonal gammopathy, starting with the uncontrollable proliferation and accumulation of monoclonal plasma cells producing monoclonal immunoglobulin or monoclonal light chains of immunoglobulins (M protein). Plasma cell myeloma constitutes approximately 1% of malignant neoplasms and 13% of all the neoplasms of the haematopoietic system. In Western countries the annual incidence, adjusted for age, is 5.6 per 100,000 people. Median age at the diagnosis is approximately 70 years; 37% of patients are under 65 years old, 26% are 65-74 years old, and 37% are at least 75 years old [2, 4, 5]. The symptoms observed in patients diagnosed with plasma cell myeloma are usually due to reduced blood viscosity, and substitution of normal haematopoietic line cells by neoplastic plasma cells. Infiltration of the bone structures by neoplastic foci and stimulation of osteoclasts by the secreted cytokines result in chronic bone pain, early osteoporosis, characteristic hypercalcaemia, and an increased risk of pathological fractures. Disturbed effective erythropoiesis causes anaemia, whereas impaired haematopoiesis of the white cell line leads to

reduced immune function [5, 6]. Due to the absence of specific symptoms, the disease is often diagnosed in the late stages. European Network Myeloma Patient (ENMP) data demonstrate that one in four patients with myeloma visits at least four doctors before the final diagnosis.

Primary amyloidosis (AL) consists in the collection of protein in the form of amyloid fibres in the extracellular space of tissues and organs. This protein, called amyloid, is derived from light chains of immunoglobulins. In the diagnostics of AL patients, the assessment of internal organ involvement at the moment of diagnosis is of crucial importance. Presently, the most important prognostic factor is the presence of amyloid in the cardiac muscle, as exacerbated heart failure and life-threatening dysrhythmias are the most common cause of death in AL patients. Echocardiographic examination reveals a concentric left ventricular hypertrophy, unrelated to increased afterload. In 20% of patients cardiac invasion is found during the diagnosis, whereas in 90% it develops in the course of the disease. Localised amyloidosis (LA) is one of the types of the disease, in which the monoclonal protein is not found in the serum or urine and amyloid aggregates in one system or organ (e.g. the heart) [2, 7, 8].

A case study

A 52-year-old male visited the family physician due to recurrent diffused abdominal pains, symptoms of dyspepsia, abnormal stool frequency, unintentional significant weight loss (15% in 4 months) and ankle oedema. The patient had no history of chronic diseases, and no family history of gastrointestinal diseases. Based on the medical interview and physical examination, the physician qualified the case for oncological alert and referred the patient urgently to the hospital.

Gastroenterological diagnostics

Following the admission to the Department of Gastrology at Military Research Hospital No.1 in Lublin, a number of basic tests were performed. They revealed a mild anaemia with Hb concentration of 12.2 g/dl, hypoproteinemia of 4.6 g/dl, hypoalbuminemia of 3.0 g/dl, proteinuria of 0.67 g/24 h and biochemical signs of renal failure, with creatinine level of 2.52 mg/dl and eGFR of 27 ml/min/1.73 m². An endoscopic examination of the gastrointestinal tract revealed stiffening and impairment of gastric peristalsis in the body, oedema of the gastric mucosa, with increased lichenification in the fundus and body, as well as frailty of the mucosa while collecting specimens. The antral region was congested, with an ulcer niche of 5 mm in diameter, covered with fibrin, located near the pylorus (Fig. 1). Moreover, oedema of the pylorus was observed. The duodenal bulb was normal, in the upper flexure region with aphthae and cobblestone pattern. Aphthous ulceration and clear cobblestone pattern were found in the descending duodenum (Fig. 2). No relevant pathology was observed in the colon. The endoscopic picture was not specific for any disease unit, and histopathological examination of the specimens revealed chronic inflammatory lesions.

The ECG examination performed at admission demonstrated sinus rhythm, intermediate heart axis, low voltage of the QRS complexes, and non-specific changes of the ST segment (Fig. 3).

Based on the ECG results, and increased concentrations of high-sensitivity troponin T in two tests (98 ng/l and 88 ng/l, normal range up to 14 ng/l), the patient was referred to urgent consultation with a cardiologist.

Radiological diagnostics

The physical examination revealed a regular heartbeat of approximately 95/min, arterial pressure of 90/60 mm Hg, oedema of the lower limbs up to the level of ankles, no murmur over the heart. The patient reported symptoms of NYHA functional class II heart failure. Transthoracic echocardiography demonstrated a concentric left ventricular hypertrophy up to 19 mm, thickening of the right ventricular muscle up to 8 mm, normal left ventricular ejection fraction (LVEF = 60%) and a small amount of fluid in the pericardium. The interatrial septum was thickened, the atria were enlarged, and the myocardial rates were reduced. Due to the characteristic left ventricular global longitudinal 2D strain, considering the clinical and endoscopic presentation, cardiac amyloidosis was suspected (Fig. 4-7).



Figure 1. Antrum area with ulcer niche at pylorus
Rycina 1. Okolice antrum z niszą wrzodową przy odźwierniku

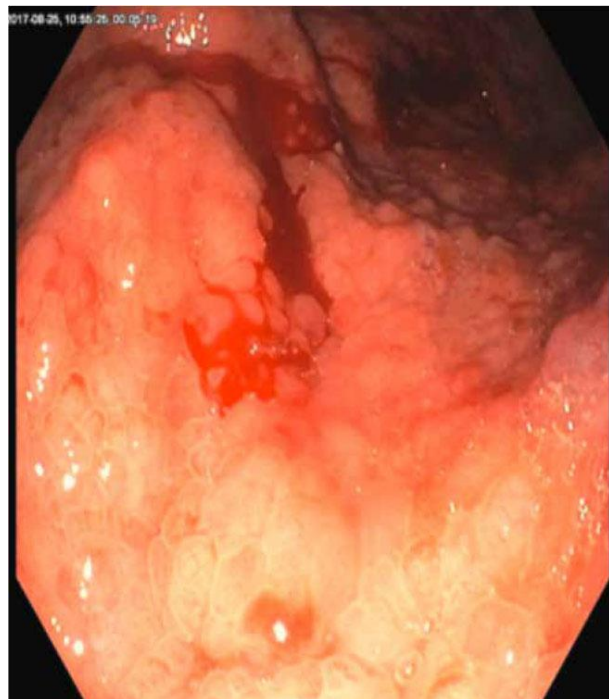


Figure 2. Aphthous ulcers in descending part of duodenum
Rycina 2. Aftowe owrzodzenia części zstępującej dwunastnicy

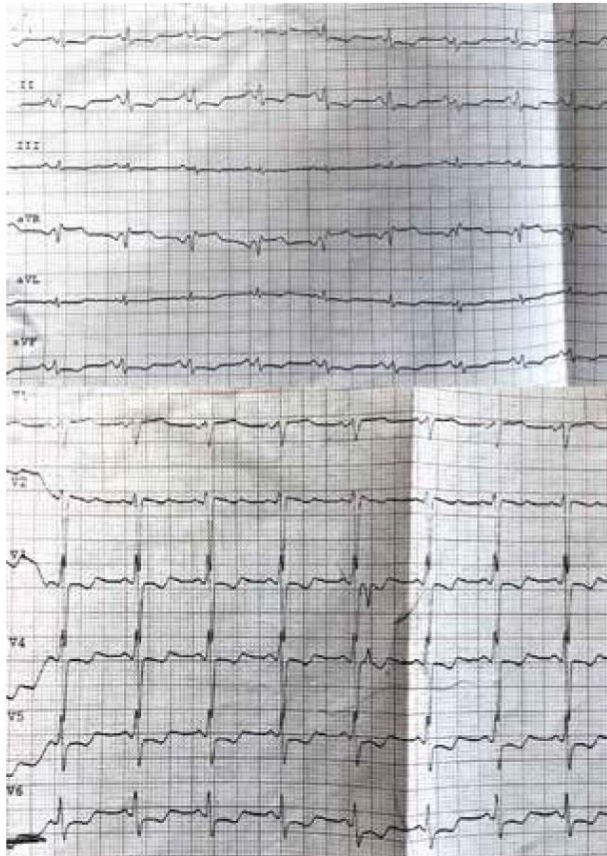


Figure 3. Patient's ECG at admission
Rycina 3. Zapis EKG pacjenta przy przyjęciu

Conclusion of the cardiological consultation set a new course for diagnostics. Congo red stain of specimens from the rectal, gastric and duodenum mucosa did not reveal deposits of amyloid; therefore, the diagnostics were extended to include proteinogram of the blood serum and protein immunofixation, which revealed the presence of kappa light chains.

Haematooncological diagnostics

Two months after the suspicion of AL with cardiac invasion, the patient was admitted to the Department of Haematooncology of the Medical University in Lublin for further diagnostics and treatment. Based on the results of bone marrow trephine biopsy, the patient was diagnosed with plasma cell myeloma. Plasma cells constituted 30% of the histological structure. A Congo red stain did not reveal any amyloid deposits in the examined specimen. The patient was qualified for emergency therapy with VD-bortezomib + dexamethasone (twice a week, on 1, 4, 8, 11). Since the admission to the Department of Haematooncology, the patient's status gradually deteriorated, with signs of decompensated heart failure. A significant reduction in the left ventricular ejection fraction to 30% was observed. In the third week of hospitalisation the patient experienced cardiogenic shock, followed by a sudden cardiac arrest. After effective resuscitation and temporary treatment under intensive cardiological supervision, with the use of pressor amines, preliminary clinical stabilisation was achieved, which enabled the administration of the second VD cycle.

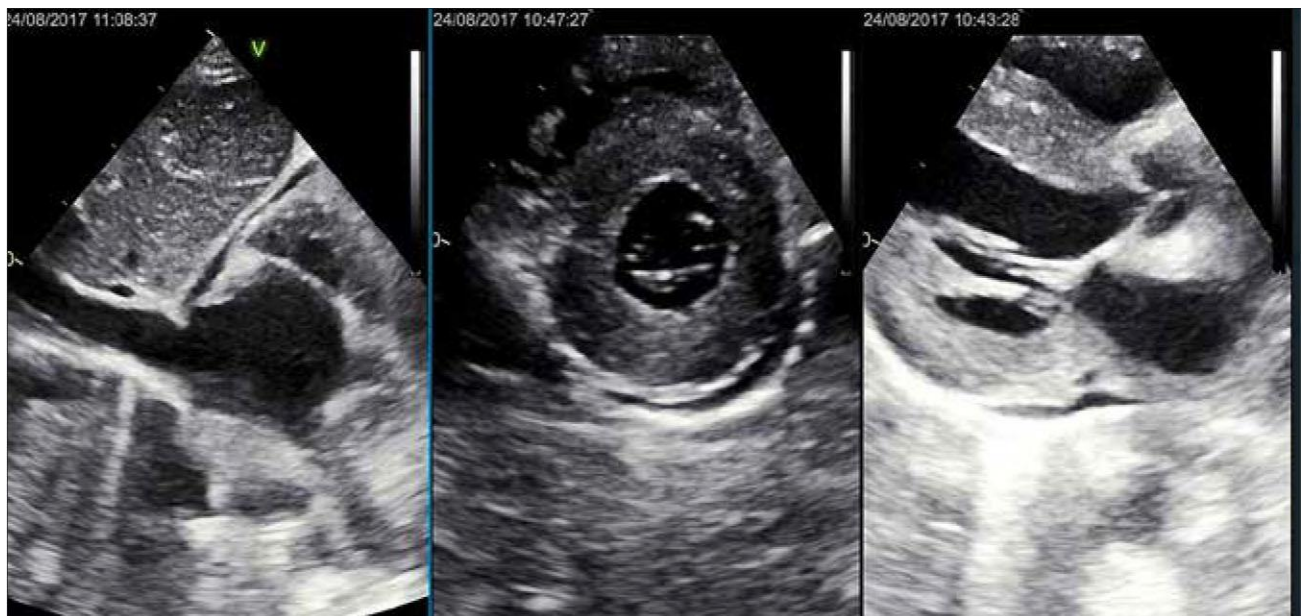


Figure 4. Standard echocardiographic projections - cardiac hypertrophy, pericardial fluid
Rycina 4. Standardowe projekcje echokardiograficzne - przerost mięśnia sercowego, płyn w osierdziu



Figure 5. ECHO - assessment of left ventricular ejection fraction
Rycina 5. ECHO - ocena frakcji wyrzutowej lewej komory

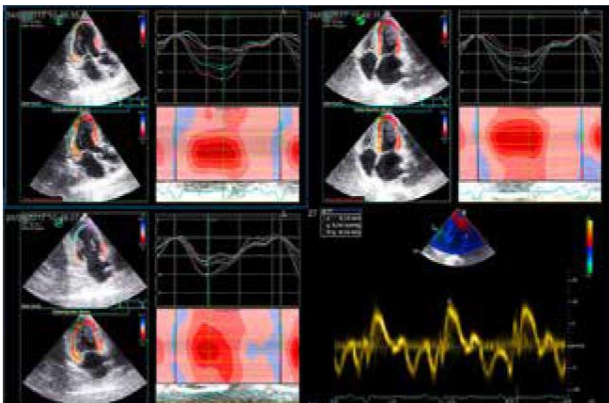


Figure 6. ECHO - concentric hypertrophy of left ventricle
Rycina 6. ECHO - koncentryczny przerost mięśnia lewej komory

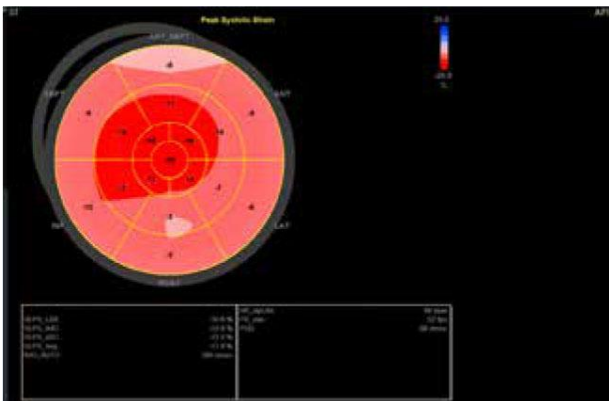


Figure 7. Bullseye representation of GLS
Rycina 7. Rozkład globalnego odkształcenia podłużnego w formie wykresu „byczego oka”

During the two months of hospitalisation, due to signs of acute renal failure, the patient required several haemolyses. Finally, a follow-up test revealed a FLC kappa of 81.19 mg/l, a kappa/lambda ratio of 3.58 (compared to the initial FLC kappa >600 ng/ml, kappa/lambda >53), and restoration of a normal renal function. The patient was transferred to the Department of Internal Diseases for further rehabilitation, with the intent to prepare him for the next cycle of chemotherapy in 2 weeks. Following the return to the Department of Haematology, the symptoms of multiple organ failure increased. The patient died 4 months after the diagnosis.

Discussion

In presenting this clinical case we wanted to illustrate the diagnostic challenges associated with the diagnosis of plasma cell myeloma in the context of concomitant amyloidosis limited to the cardiac muscle, and to point to the role of new imaging studies as useful tools for solving these problems.

The lack of specific clinical symptoms of myeloma requires a multidisciplinary and holistic approach to the patient. The presented patient went through a long process – from the family physician, through gastrological and cardiological diagnostics – until the final, accurate diagnosis was established and targeted treatment could be introduced. The turning point in this case was the cardiological consultation, followed by re-assessment of the results of the gastrointestinal endoscopy.

As plasma cell myeloma and amyloidosis are frequently concomitant, and their clinical symptoms overlap, they should always be considered in the differential diagnosis. Gastrointestinal amyloidosis triggers numerous symptoms that significantly impair the patient's quality of life, such as reduced body weight, haemorrhaging, gastrooesophageal reflux, constipation or diarrhoea, and recurrent abdominal pain. In the biopsies collected in endoscopic tests, amyloid deposits are usually found in the small intestine, stomach, colon and oesophagus [9]. Typical lesions presented in endoscopic examinations include thickening of the folds of the mucosal membrane and its frailty, as well as numerous whitish-yellow, polyp-like bulging of the mucosa in the duodenum, and ulcerations and linear erythematous lesions on the mucosa in the gastric antrum. In the colon submucosal haematomas, ulcerations and haemorrhagic blisters are found in the mucosal membrane, as well as flat, yellowish or light pink lesions, reflecting amyloid deposits in the mucosa [10]. In the presented case, the images from videogastroscopy could be consistent with gastrointestinal amyloidosis, but the histopathological examination did not confirm this diagnosis. No amyloid deposits were found in the

collected specimens, only non-specific glowing of the connective tissue was observed in Congo red stain.

The echocardiographic examination proved crucial for the diagnosis, as together with the ECG record, it suggested cardiac amyloidosis. Due to clinical reasons (the urgent need for chemotherapy), and technical problems with endomyocardial biopsy, the initial diagnosis of cardiac amyloidosis could not be confirmed.

Differential diagnosis should include hypertrophic cardiomyopathy, but most cardiac symptoms in this patient supported cardiac amyloidosis [11]. The ECG records revealed low voltage of the QRS complexes, atypical for myocardial hypertrophy. Amyloid aggregates in the intercellular space and, despite a significant hypertrophy of the cardiac muscle, the weight of electrically active cells remains unchanged, while in advanced stages of the disease it may even decrease. The echocardiographic examination demonstrated a concentric left ventricular hypertrophy, and right ventricular hypertrophy. A granular, shiny structure, typical for amyloidosis (sparkling) was observed, as well as significant thickening of the heart walls, with normal ventricle sizes. By tracking acoustic markers using strain 2D, a global longitudinal strain (GLS), typical for amyloidosis (almost pathognomonic), was registered: globally lowered, with relatively normal values (close to the normal range, i.e. 20%) in the left ventricular apex, which is described in the literature as the "cherry on the top" [12]. The characteristic echocardiographic feature of cardiac amyloidosis is the LVEF:GLS ratio of >4 ; in the presented case the ratio was 5:2.

Without a histopathological examination of the cardiac muscle biopate, the diagnosis of cardiac amyloidosis cannot be fully confirmed, especially considering a lack of amyloid deposits in the histological assessment of the gastrointestinal mucosa and bone marrow biopsy. The likelihood of amyloidosis in this case was based on the literature data: in 10-15% of patients with multiple myeloma light chain amyloidosis (AL) is concomitant, and in AL heart involvement is observed most frequently (in 755 of patients) [13].

Conclusion

In summing up, it should be emphasised that cardiological evaluation was the key stage in the diagnostics. Advanced imaging methods, such as ultrasound assessment of myocardial strain, until recently available only for scientific research, are becoming widely used in everyday medical practice, significantly increasing diagnostic accuracy. We would also like to note that identification of patients diagnosed with multiple myeloma with concurrent amyloidosis is very important, as it determines the choice of induction therapy and the intensity of consolidated treatment. Therefore, it enables provision of a suitable therapy for these patients, and offers better chances of therapeutic success.

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Arteriovenous fistula as a late complication of an air gun wound

Przetoka tętniczo-żylna jako późne powikłanie postrzału ze śrutowej broni pneumatycznej

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Abstract. The article presents the case of a 40-year-old patient, who at the age of 11 accidentally shot himself in the right groin area with an air gun. Apart from an entry wound, he has not suffered any serious injuries. The first symptoms of the right lower limb swelling appeared eighteen years after the accident. Confirmed diagnosis and the exact location of an arteriovenous fistula with diagnostic imaging (Doppler ultrasound, Angio CT, selective lower limb artery angiography) allowed to qualify the patient for and perform surgery, i.e. fistula closure.

Keywords: arteriovenous fistula, selective lower limb artery angiography, surgical fistula closure

Streszczenie. W artykule przedstawiono przypadek 40-letniego pacjenta, który w wieku 11 lat przypadkowo postrzelił się w okolicy prawej pachwiny z pneumatycznej broni śrutowej. Poza raną wlotową nie doznał żadnych poważniejszych urazów. Pierwsze dolegliwości w postaci obrzęku prawej kończyny dolnej pojawiły się 18 lat po postrzale. Potwierdzone rozpoznanie i dokładna lokalizacja przetoki tętniczo-żylny za pomocą diagnostyki obrazowej (USG dopler, angio-TK, wybiórcza arteriografia tętnic kończyn dolnych) pozwoliły zakwalifikować pacjenta do zabiegu i wdrożyć leczenie operacyjne - likwidację przetoki.

Słowa kluczowe: przetoka tętniczo-żylna, wybiórcza arteriografia tętnic kończyny dolnej, likwidacja operacyjna przetoki

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Introduction

Arteriovenous fistula is a pathological connection between an artery and a vein. It may be non-iatrogenic (after an injury) or iatrogenic (e.g. following catheterisation). Most frequently it is a result of arterial injury: gunshot wound, puncture wound or crushing [1, 2, 5]. A post-injury fistula is usually found in a lower limb. The characteristic symptoms include: oedema of the lower limbs, varicose veins, trophic ulceration, reduced blood pressure, tachycardia and cardiovascular insufficiency (major arteriovenous leak) [1]. A physical

examination reveals: vascular murmur and increased skin temperature over the fistula, reduced temperature of the limb distally from the fistula, and Branham sign (pressing the fistula with a finger results in increased blood pressure and slower heart rate) [3, 4].

Diagnosis of fistula confirmed by the available imaging diagnostic methods allows the patient to be qualified for proper surgical treatment [6].

Case report

A 40-year-old male was admitted to the Clinical Department of Vascular Surgery of the 4th Military Research Hospital with Polyclinic in Wrocław, due to increasing oedema of the right lower limb. The patient had a history involving an accidental air gun shot in the right groin area at the age of 11 years old (Fig. 1). Apart from the cutaneous and subcutaneous injury at the entry wound he did not suffer from any other trauma; he was not hospitalised at that time, and the wound healed spontaneously by first intention. A Doppler ultrasound examination demonstrated a significant dilation of the right femoral vein and the right common femoral artery. An Angio-CT scan of the lower limbs confirmed the presence of a metallic foreign body of approximately 5 mm in diameter, located in the proximal 1/3 of the thigh, closer to the posterior surface, as well as dilation of the following vessels: right common iliac artery (27 mm), right external iliac artery (25 mm), right deep femoral artery (24 mm), external iliac vein (65 mm), deep vein of the right thigh (16 mm) and common iliac vein (25 mm) (Fig. 2). Based on this presentation, arteriovenous fistula at the dilation of the deep artery of the right thigh and the beginning of dilation of the deep femoral vein. In order to locate the fistula precisely before the planned surgery, a selective arteriography of the right limb arteries was performed (Fig. 3 and 4). The arteriovenous fistula was detected between the significantly dilated right deep femoral artery and the right femoral vein, at approximately 12 cm below the inguinal ligament. Moreover, the pellet remaining in the body was located precisely in two projections.

The patient was qualified for surgical treatment. In intratracheal general anaesthesia, via an arched cut in the right groin, below the inguinal ligament, the aneurysmally dilated common femoral artery and deep femoral artery was exposed (>3 cm in diameter), as well as the normal superficial femoral artery. Intraoperatively it was found that the deep femoral vein was significantly dilated, with a clear vascular murmur. Approximately 10 cm of deep femoral artery was exposed, and the fistula was localised between the deep femoral artery and the deep femoral vein, right over the femoral bone at 1/3 of its proximal length (Fig. 5). The fistula was closed with a few single vascular sutures. The murmur on the femoral vein disappeared. No early complications were observed in the post-operative period, the wound healed normally by first intention, and the oedema of the right lower limb subsided. The patient was discharged on day 5 after the surgery, in a good general and local condition.



Figure 1. Gunshot scar near right groin (photo from the collection of the Clinical Department of Vascular Surgery 4WSKzP in Wrocław)
Rycina 1. Blizna po postrzale w okolicy prawej pachwiny (zdjęcie ze zbiorów Klinicznego Oddziału Chirurgii Naczyniowej 4. WSKzP we Wrocławiu)

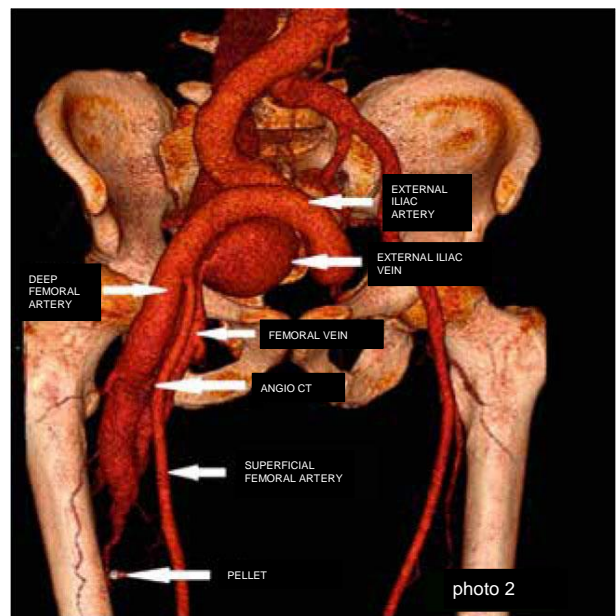


Figure 2. Angio CT image of arteriovenous fistula and right lower limb vasodilatation (photo from the collection of the Clinical Department of Vascular Surgery 4WSKzP in Wrocław)
Rycina 2. Przetoka a-v oraz poszerzenie naczyń kończyny dolnej prawej uwidocznione w badaniu angio-TK (zdjęcie ze zbiorów Klinicznego Oddziału Chirurgii Naczyniowej 4. WSKzP we Wrocławiu)

During the outpatient follow-up, 14 days after the surgery, a massive haematoma in the operated area was evacuated. The patient had no other complaints. No late complications occurred, the wound healed properly, and no limb oedema was found.

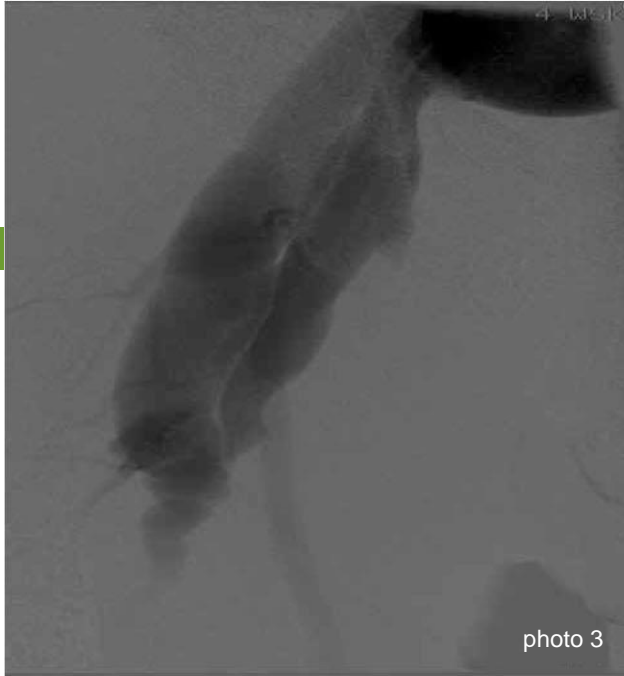


Figure 3. Selective right lower limb artery angiography image of arteriovenous fistula (photo from the collection of the Clinical Department of Vascular Surgery 4WSKzP in Wrocław)

Rycina 3. Przetoka a-v uwidoczniła w wybiórczej angiografii tętnicy kończyny dolnej prawej (zdjęcie ze zbiorów Klinicznego Oddziału Chirurgii Naczyniowej 4. WSKzP we Wrocławiu)

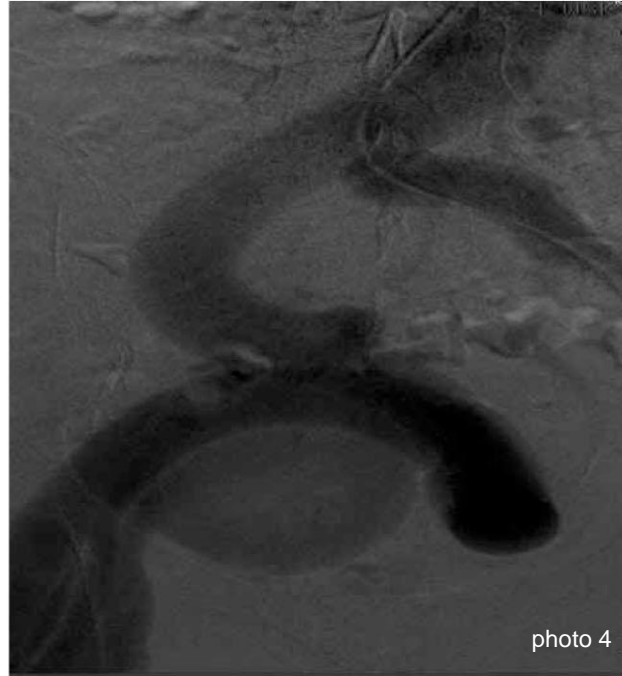


Figure 4. Selective arteriography image of iliac vessel vasodilatation (photo from the collection of the Clinical Department of Vascular Surgery 4WSKzP in Wrocław)

Rycina 4. Poszerzenie naczyń biodrowych widoczne w wybiórczej angiografii (zdjęcie ze zbiorów Klinicznego Oddziału Chirurgii Naczyniowej 4. WSKzP we Wrocławiu)

From 2015 to 2018 the patient was under constant supervision of the Outpatient Vascular Clinic of the 4th Military Research Hospital with Polyclinic in Wrocław. In 2017, a follow-up Angio-CT scan of the lower limb arteries revealed a small flow of the contrasting medium in the region of the operated fistula. The next tomography in 2018 demonstrated a significant aneurysmal dilation (50 mm) of the deep femoral artery. The patient was re-admitted to the Clinical Department of Vascular Surgery. On 12 October 2019, the aneurysm was removed, and the deep femoral artery was ligated. No complications were observed in the post-operative period. The patient was discharged in a good general and local condition.

Conclusions

The risk of arteriovenous fistula should always be considered in any trauma, especially penetrating injury such as a puncture or shot wound [5]. The diagnosis is usually established long after the injury, when first symptoms develop [3, 4]. Despite the commonly available imaging tests, precise localisation of the fistula, especially a chronic one, may be challenging. Late diagnosis of arteriovenous fistula may result in serious complications, e.g. cardiovascular failure [1, 4]. Presently, endovascular therapy is considered a valid treatment option, but in some cases open surgery is a preferred method of managing fistulas and their consequences, e.g. aneurysms [7, 8].



Figure 5. Arteriovenous fistula between right femur artery and deep vein (photo from the collection of the Clinical Department of Vascular Surgery 4WSKzP in Wrocław)

Rycina 5. Przetoka a-v pomiędzy tętnicą i żyłą głęboką uda prawego (zdjęcie ze zbiorów Klinicznego Oddziału Chirurgii Naczyniowej 4. WSKzP we Wrocławiu)

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Medical care of the civilian population in relation to the military medical service needs in support of defence operations – an outline of the problem

Opieka medyczna nad ludnością cywilną a potrzeby wojskowej służby zdrowia w zabezpieczeniu operacji obronnej - zarys problemu

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Abstract. The armed conflicts in the modern world cause an increasing number of civilian casualties. The authors suggest potential problems related to medical care availability for the civilian population during military operations within Poland, in combination with the medical support system needs of the Polish Armed Forces. They try to define basic directions of necessary activities that may significantly improve current shortfalls within the wartime medical support system.

Keywords: casualties, civilian medical care, military medical service

Streszczenie. Działania wojenne we współczesnym świecie pociągają za sobą coraz większe liczby ofiar wśród ludności cywilnej. Autorzy zwracają uwagę na potencjalne problemy ludności cywilnej związane z dostępem do opieki zdrowotnej w trakcie działań wojennych na terenie kraju w korelacji z niezbędnymi potrzebami Sił Zbrojnych RP w zakresie zabezpieczenia medycznego wojsk. Starają się określić kierunki podstawowych, niezbędnych działań, które w sposób zdecydowany mogą poprawić trudną sytuację w zakresie zabezpieczenia medycznego wojsk w czasie wojny.

Słowa kluczowe: ochrona zdrowia ludności, straty sanitarne, wojskowa służba zdrowia

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Introduction

Recently, the number of dangerous incidents involving the Armed Forces of the Russian Federation by the Baltic Sea and the territories of the Baltic states has increased. This creates the need to expand the defence systems of these countries [1, 2]. Near the Polish border, the Russian Armed Forces and the Belarusian army are conducting

exercises without informing NATO or inviting its observers. During these exercises, attacks on specific targets in neighbouring countries are simulated, which increases tension in international relations [3]. The question arising ever more frequently is whether Western countries would be able to react in a timely manner if aggression by the exercising special and armoured troops of the potential enemy were to begin.

A similar scenario was employed during the conflict in Georgia. The experience derived by the Russian Armed Forces from five days of combat operations has led to their increased operability, changes in the command system of the army and modernisation of the military capabilities. It should be particularly emphasised that owing to the participation in armed conflicts at the end of the 20th century and the beginning of the 21st century the Russian Armed Forces has had an opportunity to practise all forms of operations recognised by analysts, from asymmetrical to hybrid operations, with particular attention to attacks on cyber systems, with the offensive actions finishing in more or less intensified attacks by conventional forces.

The amendment to the Military Doctrine of the Russian Federation (FR) signed by the President of the Russian Federation on 26 December 2014 includes provisions sanctioning the use of particular types of operations; the situations in which they may be conducted are also described [5]. Some offensive and provocative events allow us to presume that the FR is consciously provoking and checking NATO's combat readiness [2]. Because of such incidents, more Poles are increasingly looking to the future with anxiety [4]. The military importance of Poland as a NATO border state is recognised by politicians and commanders of the organisation. They note that the north-eastern part of Poland may be an area for potential combat operations. Regardless of whether the epicentre of a conflict would be the so-called Suwałki Gap, or, as predicted by General Skrzypczak, the direction of action could potentially be different, coalition forces are stationed in Poland on a rotating basis to support the Polish army in the initial phase of its operations [6]. Section 15 of the Military Doctrine describes the characteristics of modern armed conflicts, which, in order to make it more difficult for Western support forces to join the fight and maintain the occupied area, allow for the following:

- all-out use of weapon systems and military equipment, supersonic precision weapons, means of radio-electronic combat, weapons based on new physical principles that are comparable in efficiency to nuclear weapons, automated steering systems, as well as unmanned aerial vehicles and autonomous naval vessels and remote-controlled combat equipment,
- simultaneous impact on the enemy throughout the entire territorial depth of the global information space, airspace, land and sea,
- selectivity and a high degree of target impact, manoeuvrability of troops (forces) and fire, use of various mobile groups of troops (forces),
- reducing the time parameters of preparation for warfare,

- creating a permanently active war zone on the territories of the conflicting parties,
- participation of irregular armed forces and private military formations in warfare,
- use of indirect and asymmetrical modes of action [5].

Experience collected to date from the armed conflicts from the end of the 20th and the beginning of the 21st centuries suggests that possible military solutions generate significant losses to the civilian population.

Civilians in armed conflicts of the 20th and 21st centuries

According to data from the Peace Research Institute Oslo (PRIO), there has been an increase in the number of conflicts, mainly internal ones, since the end of World War II. Among the almost two thousand armed conflicts registered in the Institute's database which took place in the years 1945-2008, as many as 78.5% were internal conflicts. In the same period, internationalised internal conflicts constituted 9.2%, while international conflicts only 6.2% [7]. The percentage of civilians among the victims of armed conflicts, according to various sources, is increasing in relation to military fatalities. At the beginning of the twentieth century, the losses in fighting troops accounted for 85-90% of all war victims in relation to the civilian population, i.e. in an 8:1 ratio, compared to 1:1 in World War II, and 1:8 in the conflicts at the end of the twentieth century, to the detriment of the civilian population. In internal and ethnic conflicts, civilian casualties are assumed to amount to about 90%. It is estimated that in armed conflicts at the beginning of the 21st century, the share of civilian deaths remains at 90% of the total losses [8]. Military analysts predict that in future armed conflicts, high-precision, intelligent weapons will be used, limiting the enemy's loss of human lives. Experience from the conflicts in former Yugoslavia, Iraq and Afghanistan shows that such claims are not always correct. Despite the use of modern weapons in former Yugoslavia, the losses among the civilian population after NATO bombings were significant, and the situation was similar in Iraq and Afghanistan [8, 9]. The inability to exclude armed conflicts from international relations have led to attempts to humanise conflicts, i.e. to make them less cruel [10]. The international community is trying to protect civilians, victims of conflicts, through legal acts comprised in the international humanitarian law (IHL). Basic issues covering the protection of civilians in armed conflicts are regulated by:

- Fourth Geneva Convention of 1949 relative to the Protection of Civilian Persons in Time of War, and
- both Amendment Protocols of 1977 to the Geneva Conventions of 1949, concerning the protection of

victims of international and non-international armed conflicts [11].

Despite extensive legal and customary protection, this law has been violated in armed conflicts in the twentieth and twenty-first centuries, even in armed activities carried out by Western countries, which generally apply the principles of the IHL. On the other hand, the Armed Forces of the Russian Federation and formerly of the USSR, participating in the conflicts in Chechnya, Afghanistan, Georgia and now, indirectly, in the conflict in Ukraine, show that the overriding principle is to achieve the assumed military goal, regardless of the means used and the sacrifices they require [12, 13].

Taking into account the above mentioned provisions included in the Military Doctrine of the Russian Federation, which allow for the application of the above mentioned measures in combat during an armed conflict, it should be assumed that a possible armed conflict will result not only in civilian deaths, but also in rising migration of the population, and the related increased trauma and morbidity rate caused by difficult living conditions, stress and fatigue, and other misfortunes described in the IHL.

All these factors will increase the demand for medical assistance, from basic healthcare to specialised hospital treatment. However, the provision of medical assistance will be hindered by the military impact, especially in the area of combat operations, but also in the remaining part of the country. The effects will inevitably include:

- losses of healthcare personnel caused by combat operations, accidents, illness, mobilisation, etc.,
- destruction of medical facilities and health care infrastructure in the country,
- damage to and loss of standard and adapted medical transport,
- destruction of the network of transport and evacuation routes, affecting both the injured and the health service.

The unfavourable ratio of doctors per 1,000 inhabitants of Poland, the lowest in Europe according to the data from the Health at a Glance 2018 report, considered a hindrance for access to medical care in peacetime, will become a frustrating factor, negatively affecting the morale of citizens during warfare [14].

Needs of the military health service in providing medical security for a defence operation

Military health care should be an integral part of the Polish Armed Forces and it should ensure the protection of troops during peace and wartime. During peacetime, medical assistance for soldiers is provided within the system of universal insurance, and doctors who are soldiers serving in the Ministry of National Defence hospitals receive remuneration under contracts with the National Health Fund. Doctors in military units are financed from the budget of the Ministry of National Defence, however, they cannot provide health services to the extent that they are provided by entities which have entered into contracts with the National Health Fund. At the end of April 2018, there were 1,228 posts for military doctors in the Polish Army. The number of doctors serving was 735 and the number of vacancies was 493 – the manning level was therefore 59.8%. More than 400 military doctors serve in research institutes, military hospitals and independent public health care institutions. Some doctors from the Land Forces work in Medical Security Groups, training and working in hospitals during peacetime; however, in seven brigades there are no such groups [15]. Structural and personnel problems also occur in other armed forces. The potential of the Polish Armed Forces is supposed to increase during military operations, and this is also reflected in the doctrinal document DD 4.10 (A), which states that the medical potential of the military health service must rise in parallel [16].

It is assumed in the wartime medical and evacuation protection system of the Polish Armed Forces that successive levels of security from 1 to 3 are developed at the tactical level and hospital treatment is organised as the fourth level of medical assistance within Prevention and Treatment Districts. Assuming an increase in military headcount to 200,000, which corresponds to 46-50 brigades, it should be assumed that approximately 1,242-1,350 doctors will be needed. Taking into account the need for the military health service to have at least 5 battalions of medical reinforcements, each with 90 doctors, this means the need for an additional 450 doctors of various specialities. It should be assumed that in the event of the mobilisation of the Polish Armed Forces, in the first days of operation, about 1,800 physicians will be needed to provide care at the 1st and 2nd level of medical security. Making up for the shortages of medical personnel of the Polish Armed Forces by appointing certain specialists from civilian health care institutions, which is possible in organisational terms, will be objectionable and morally questionable for the public opinion and will weaken the civilian health service and

cause serious problems for the health situation of citizens, who will also be subject to war conditions and whom the Armed Forces are to protect. This will have a direct impact on the morale of both society and Polish troops.

Conclusions

Medical security is a key element of military security. The complicated staffing situation of the military health service due to a shortage of physicians, especially specialists at medical security levels, puts into question the operational capabilities of the Polish Armed Forces in combat operations. The authors believe that the solution to the current predicament requires in-depth changes regarding:

- legislative changes concerning medical care in the Polish Armed Forces and its financing principles,
- assessing the needs and capabilities of military health care,
- developing a coherent system of medical protection for combat operations,
- designing and creating compatible medical structures for the modern battlefield,
- restoring legitimate higher military and medical education with graduate service closely linked to the Armed Forces,
- setting out attractive career paths for military doctors in the specialities necessary for the army,
- producing compatible procedures for cooperation between civilian and military health services in wartime conditions.

Literature

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Telemedicine, with emphasis on telepsychiatry, in the light of personal data protection regulations

Telemedycyna w świetle przepisów o ochronie danych osobowych ze szczególnym uwzględnieniem telepsychiatrii

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Abstract. The European Union Data Protection Directive, which came into force on 25 May 2019, casts new light on the aspect of data security in modern medicine and imposes a range of requirements on the controllers and subjects involved in personal data processing. This study discusses selected issues of personal medical data security with an emphasis on the area as sensitive as data security of psychiatric patients. The study underlines that the correctness and efficiency of personal data processing relies heavily on the cooperation of interdisciplinary teams, i.e. medical staff, health informatics specialists, specialists responsible for the implementation of the policy of medical systems security and personal data processing, and lawyers.

Keywords: cybercrime, GDPR (General Data Protection Regulation), information security, personal data, telemedicine, telepsychiatry

Streszczenie. Unijne rozporządzenie dotyczące przetwarzania danych osobowych, które weszło w życie 25 maja 2018 r., rzuca nowe światło na aspekt bezpieczeństwa danych w nowoczesnej medycynie, nakładając szereg wymogów na administratorów oraz podmioty przetwarzające dane osobowe. W publikacji przedstawiono wybrane zagadnienia bezpieczeństwa medycznych danych osobowych z uwzględnieniem newralgicznego obszaru ochrony danych, tj. pacjentów leczonych psychiatrycznie. W pracy podkreślono, że zapewnienie prawidłowego i skutecznego przetwarzania danych osobowych jest uwarunkowane współdziałaniem zespołów interdyscyplinarnych, tj. środowiska medycznego, specjalistów z zakresu informatyki medycznej, specjalistów zajmujących się wdrażaniem polityki ochrony systemów medycznych i przetwarzania danych oraz prawników.

Słowa kluczowe: telemedycyna, telepsychiatria, dane osobowe, bezpieczeństwo informacji, cyberprzestępczość, RODO

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Introduction

Responsibility for the security of data contained in patients' medical records, whether kept in a traditional, i.e. paper, or electronic form, should be a priority for any protection system. In the era of continuous and rapid technological development, ensuring data security,

especially in modern telemedicine, can be a major challenge. Technological progress and globalisation have resulted in a significant increase in the scale and scope of data, both in terms of their collection and exchange. Another challenge is that legal regulations concerning data processing using modern telemedicine solutions are created at a slower rate than the solutions. In addition,

emerging technologies should always be carefully analysed with regard to potential threats to data privacy and data protection. According to the GDPR, data concerning health is defined as a special category of personal data and therefore requires special protection.

Security of data processing – Article 32 of the GDPR

Proper and careful design of the ICT systems used to transmit medical data is a basic determinant of personal data security when telemedicine solutions are applied. This encompasses not only computer systems and the software supporting the hospital area and outpatient treatment, but also modern medical applications, patient portals, doctor-patient chats or video conference systems. It is advisable that the security of personal data processed with the use of telemedicine tools should be dealt with by professional companies with many years of experience in this field. They should implement technical measures in the design and updating of systems in accordance with Article 32 of the GDPR [1]:

- pseudonymisation, i.e. processing of personal data in such a way that it is impossible to identify who they belong to without access to information stored securely elsewhere (e.g. encryption using a key, tokenisation, shortening),
- personal data encryption,
- the ability to ensure ongoing confidentiality, integrity, availability and resilience of processing systems and services,
- the ability to quickly restore the availability of and access to personal data in the event of a physical or technical incident,
- regular test, measurement and evaluation of the effectiveness of technical and organisational measures to ensure the security of processing.

All the elements listed above are intended to make maximum use of proven organisational and technical solutions in order to reduce the risk of inappropriate data processing. What is more, it is not enough to introduce solutions once and for all – controllers should continue to analyse potential risks on an ongoing basis and adapt their solutions to the changing environment.

Organisational and technical solutions for the processing of personal data in telemedical services

The provisions of the GDPR do not provide specific solutions – either technical or organisational – that should be applied by the controller in order to ensure appropriate protection in the processing of personal data. The GDPR only indicates that the state of the art, the implementation costs and the real consequences of errors in the processing of personal data should be taken into account when assessing risks and establishing safeguards [2]. For this reason, international security standards should be utilised with regard to the choice of technical means used in telemedicine solutions, i.e.:

- for cryptographic solutions – encryption, authentication techniques (ISO/IEC 29192),
- for solutions related to medical data breach – managing, documenting, explaining incidents (ISO/IEC 27001),
- for solutions which enable securing medical data processing hardware (ISO/IEC 15408, 20243, 27036),
- for IT systems security assessment solutions (ISO/IEC 15408, 17825, 18367 etc.).

All the standards described above have been designed to minimise the risks associated with the processing of medical personal data and to protect data subjects against the main cyber threats associated with e-Health services, which include:

- unauthorised modification of medical data,
- unauthorised access to medical data and the associated risk of disclosure,
- ransomware attacks, which consist of the encryption of personal medical data and then demanding a ransom in exchange for access thereto,
- connecting an e-Health feature to a botnet, i.e. a botmaster machine which executes operations and commands illegally,
- refusal to provide a service resulting from its unavailability due to overloaded system infrastructure [3, 4].

Each of these risks is not only a violation of Article 5 of the GDPR, which deals with the lawfulness of processing, limiting the purpose of the processing, integrity, confidentiality and accountability, but may also pose a real threat to the life and health of the patient [5]. This has already happened previously. One such example may be 12 May 2017, when a massive cyber attack took place – with approximately 75,000 systems in almost 100 countries being encrypted and about 25 London hospitals losing access to their patients' data, which caused chaos in their functioning.

Moreover, in the case of theft of medical data, the consequences are much more serious than, for example,

in the case of financial data leakage. Medical data can become the subject of repeated criminal processing and analysis and, as a result, of long-term use, this can prevent the restoration of the situation prevailing prior to the theft. All entities carrying out therapeutic activities should be aware of the current cyber threats, which may be aimed at creating an actual standstill in the state of providing medical care to the citizens [6].

Protection of sensitive data – GDPR in telepsychiatry

When addressing the issue of personal data processing in telephone hotlines, several aspects should be taken into account, including the type and scope of collected data, the size of the data filing system, the team of persons authorised to process the obtained data, as well as possible safeguards and technical and organisational solutions used to secure them. The type and scope of personal data collected depend on the specific nature of the hotline and of the provided assistance.

Certainly, a mental health intervention line undoubtedly involves the processing of a huge amount of medical data – sensitive data in particular – because it is related to the field of general mental health. The size of such datasets is strictly dependent on the intensity with which the hotline operates. Taking into account the detail and insight necessary to collect a clinical history, the amount of sensitive data obtained during a single intervention is enormous. This includes not only strictly medical data, i.e. the course of the disease or the drugs taken, but also the entire lifestyle of the patient. Data concerning the worldview, religion or sexual preferences is also provided as part of a psychiatric history. This is data that is not normally included in the scope of a history in the case of somatic diseases, but is inherent in psychiatric treatment. As a consequence, it is particularly important that the utmost care be taken to protect these data.

Another aspect worth emphasising in the context of information security is the way in which information is recorded, either in a computer system or in a paper version, and the related security aspect of data storage. Access to the data should be restricted to persons who have been authorised in connection with an intervention, i.e. line consultants, coordinators, psychologists and psychiatrists deciding on further actions to be taken with regard to the caller. In view of the principle of voluntary participation and anonymity of persons calling the hotlines, it is worth using pseudonymisation, which will make it impossible to directly identify a given person, but will enable reconstructing the history of calls, for example in the case of repeated interventions.

Current guidelines and recommendations

The most important standards of conduct in the processing of personal data include the following soft law documents:

- Recommendation of the Polish Centre of Health Information Systems on the security and technological solutions used in the processing of medical records in an electronic form – 28 September 2017,
- ISO standards,
- NIST Cyber Security Framework,
- Healthcare Industry Code – the project was submitted to the President of the Personal Data Protection Office on 13 November 2018. [7]

Conclusions

Comprehensive use of modern medical technologies must be closely correlated with ensuring the highest level of security of the medical data processed. The greatest threats to the provision of e-Health services concern defective information systems and cyber-crime.

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Use of ultrasound in the differentiation of respiratory and cardiovascular diseases

Zastosowanie ultrasonografii w różnicowaniu chorób układu oddechowego i krążenia

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Abstract. Ultrasonography is a commonly used diagnostic method. It has many advantages, including availability, safety and user-friendliness. Research protocols were drawn up in life-threatening situations, including the BLUE-protocol to allow the differentiation of pleural pneumothorax, fluid in the pleural cavity, pulmonary oedema, pulmonary embolism or pneumonia and exacerbation of COPD. Pulmonary ultrasound also enables monitoring of the patient's condition and level of fluid management.

Key words: BLUE-protocol, lung ultrasound

Streszczenie. Ultrasonografia jest powszechnie stosowaną metodą diagnostyczną. Ma wiele zalet wynikających z jej dostępności, bezpieczeństwa i łatwości wykonania. Opracowano protokoły badań wykonywane w sytuacjach zagrożenia życia chorego, w tym protokół BLUE, pozwalający zróżnicować między innymi odmę opłucnową, płyn w jamie opłucnowej, obrzęk płuc, zatorowość płucną czy zapalenie płuc i zaostrzenie POChP. USG płuc umożliwia ponadto monitorowanie stanu chorego oraz jego gospodarki płynowej.

Słowa kluczowe: ultrasonografia płuc, protokół BLUE

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Introduction

Ultrasonography is a non-invasive imaging diagnostics technique, allowing us to obtain a cross-sectional image of the examined object. It is characterised by high accuracy, as it enables detection of changes in organs as small as 0.1 mm. The ultrasound scanner was invented in a field other than medicine, when during the First World War American, Russian and German engineers were working on how to detect defects in metals. The first experiments with the use of ultrasonography in imaging diagnostics were carried out during the Second World War, and ultrasound machines were introduced to hospitals in the late 1960s and early 1970s.

One of the first clinical applications of ultrasonography included foetal diagnosis. In 1951, the first scanner was created to show a B-mode image of the examined organs. At the time when ultrasound diagnostics in obstetrics was

being introduced, nipple tumours and stones in the gallbladder and kidneys were beginning to be examined. Three years later, in 1954, the Swedish researchers Edler and Hertz built the first M-mode ultrasound scanner to show the movement of the heart valves. A year later, the first analysis of heart valve motion was performed in Japan using the Doppler effect [1].

For many years there was a conviction that ultrasound was of little use in the diagnosis of air organs such as the lungs. In the 1990s, works describing ultrasound images in pneumonia or pneumothorax were published. The method has gained many supporters for several reasons: it is easily accessible both in the laboratory and at the bedside, there is no need to transport the patient, it allows the user to establish an initial diagnosis in patients with acute respiratory failure quickly, before a chest X-ray, it is possible to repeat the examination many times and

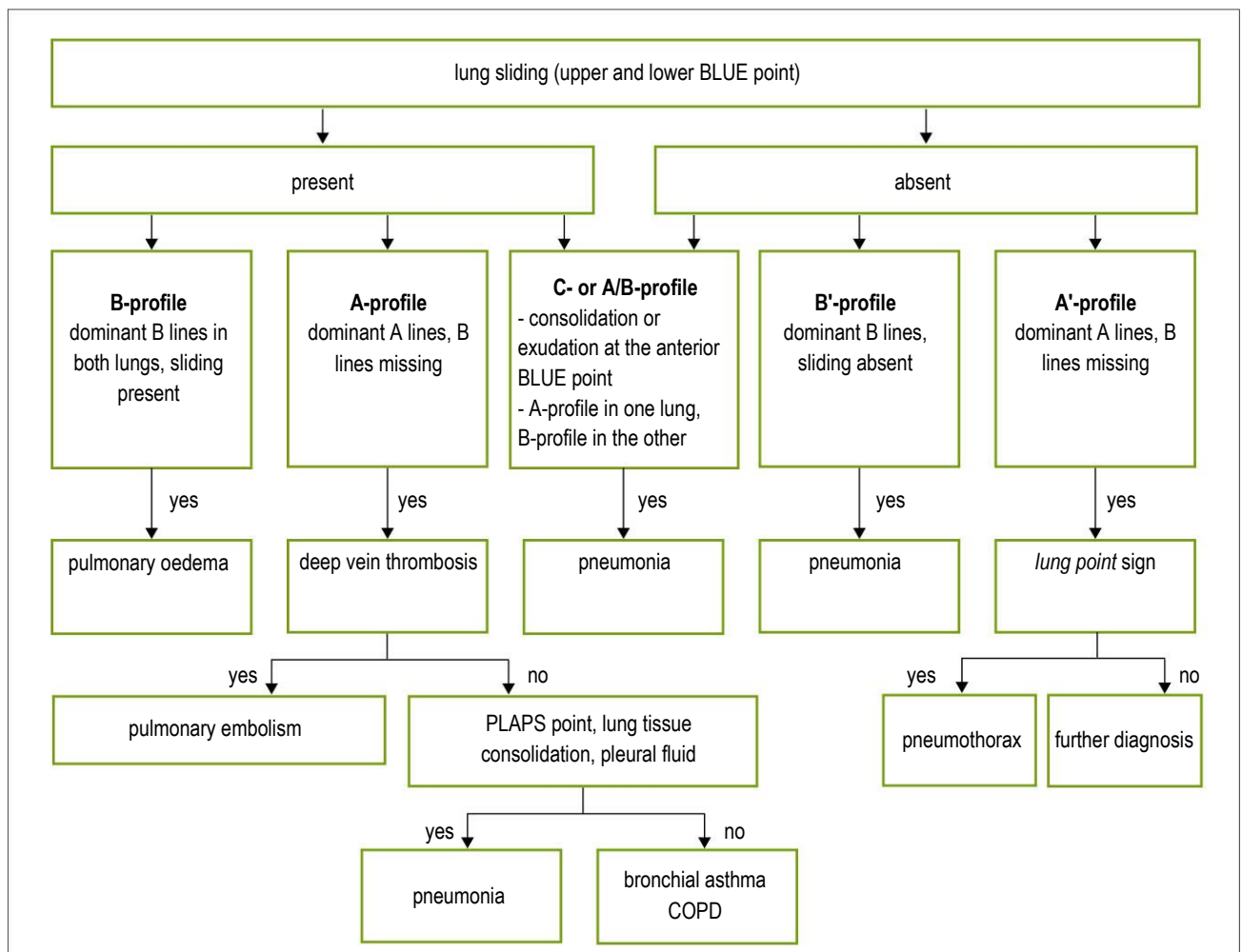


Figure 1. BLUE-protocol
Rycina 1. Protokół BLUE

monitor the effects of treatment and it carries no risk for the patient or the personnel.

Ultrasonography is the preferred method for rapid initial diagnosis in life-threatening conditions – with FAST (Focused Assessment with Sonography in Trauma) and BLUE (Bedside Lung Ultrasonography in Emergency) test protocols being developed.

Equipment

Ultrasound machines, depending on their purpose, are equipped with a sector, convex or linear probe. Each of them has its advantages. A high-frequency ultrasonic linear head (8-11 MHz) helps obtain a better image of the shallow layers, so it is more accurate in assessing, for example, the pleural line and lung sliding, which helps rule out pneumothorax. Convex (3.5-5 MHz) and sector probes are used for deeper layers. They provide a better

image of fluid in the pleura, the B line and areas of lung tissue consolidation; however, they show lung sliding or the pleural line with less accuracy. Cardiac sector probes are well suited for intensive care units due to their small size, with small touch-up area and easy manoeuvrability in intercostal spaces. As far as ultrasound settings are concerned, the abdominal settings are used for convex probes, the heart or abdominal settings for sector probes, and the superficial settings may be used for linear probes.

Lung ultrasonography is based on the evaluation of artefacts formed at the borderline of areas with different impedances for ultrasound waves. Modern ultrasound machines are equipped with advanced imaging technologies that reduce the formation of artefacts, so it is often necessary to turn off image optimisation functions [2, 3].

Testing technique

A lung ultrasound can be performed with the patient lying, standing or sitting. There are different testing techniques, depending on the clinical situation. A detailed lung ultrasound examination is similar to auscultation with a stethoscope. All intercostal spaces in the parasternal, mid-clavicular, axillary, anterior, central and posterior axillary, scapular and spinal lines are assessed successively. Wide-spread changes can be localised on the chest by dividing it into an upper field, located between the supraclavicular fossa and the first rib; the middle field, located between the first and the third rib; and the lower field, located between the fourth rib and the diaphragm [5]. In life-threatening situations, the BLUE-protocol applies (Fig. 1). Two palms placed side by side on the chest are used to determine the points so that the little finger of the upper hand is under the clavicle and the fingertips of both hands on the midline of the sternum. In this way we can locate the BLUE points (Fig. 2A): upper frontal point, located at the base of the third and fourth finger, lower frontal point, located in the middle of the lower hand, PLAPS (posterolateral alveolar and/or pleural syndrome [Fig. 2B.]), i.e. the third point, being the place of the perpendicular intersection of the posterior axillary line and the line intersecting the lower anterior point [4].

The BLUE-protocol enables the diagnosis of the most common causes of respiratory failure: pulmonary oedema, pneumonia, pulmonary embolism, exacerbation of COPD or asthma, or pneumothorax [6]. As shown by the latest prospective research by Bekoz B. [7], the sensitivity and specificity of the BLUE-protocol are 87.6% and 96.2% for pulmonary oedema respectively, 85.7% and 99% for pneumonia, 98.2% and 67.3% for asthma/COPD, 46.2% and 100% for pulmonary embolism and 71.4% and 100% for pneumothorax. The study also assessed the presence of fluid in the pericardium and pleura (found in 21.4% of patients), which is not included in the BLUE-protocol.

During the ultrasound examination in accordance with the BLUE-protocol, the probe is placed longitudinally to the long axis of the body at the BLUE points, so that the two adjacent ribs and the space between them are visible, thus obtaining the so-called bat sign. Firstly, the presence of lung sliding is checked. It is an artefact resulting from the movement of the pulmonary pleura relative to the parietal pleura. In the M-mode, this is called the seashore sign. The next step involves searching for pathological artefacts or subpleural consolidation and, therefore, the diagnosis of, for example, pneumonia, pulmonary oedema or pneumothorax. If the diagnosis cannot be formulated at this stage, it is necessary to proceed to vascular analysis, i.e. a compression test of the deep

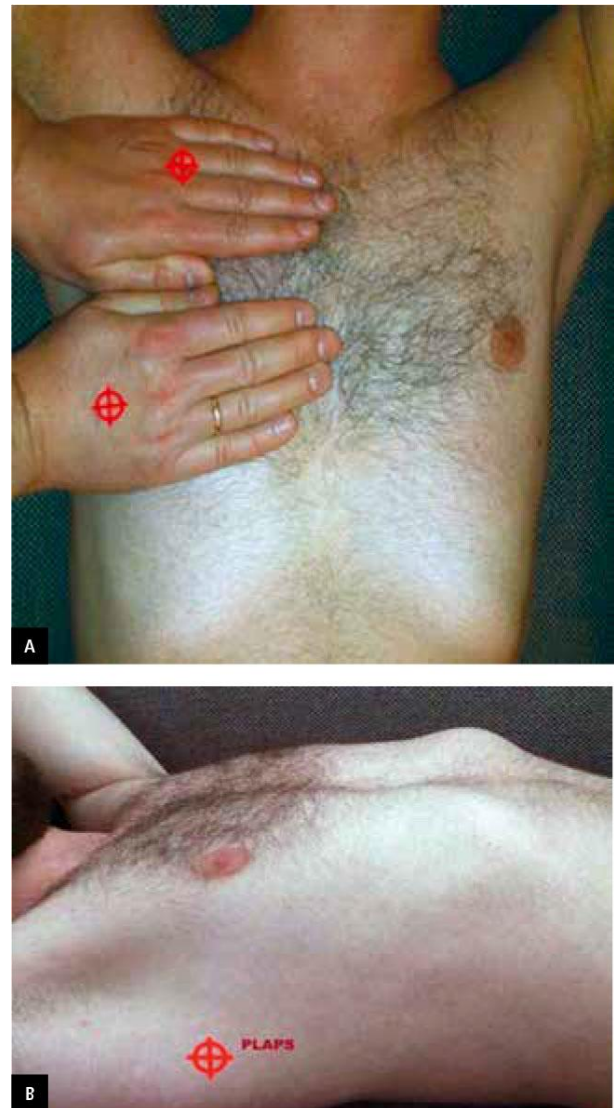


Figure 2. Lung ultrasound technique **A.** BLUE-points, **B.** PLAPS-point (photos with permission of Prof. Wojciech Kosiak)

Rycina 2. Technika ultrasonografii płuc **A.** Punkty BLUE **B.** Punkt PLAPS (za zgodą prof. Wojciecha Kosiaka)

veins of the lower limbs (common femoral arteries, femoral arteries, posterior tibial arteries, fibular arteries). A positive compression test suggests pulmonary embolism, a negative scan shows 80% sensitivity and requires PLAPS testing on both sides of the chest. If fluid or consolidation is found at this point, pneumonia is diagnosed; the absence of consolidation is consistent with exacerbation of COPD or asthma.

The BLUE-protocol technique including vascular analysis takes about 1-3 minutes [8].

Another protocol is the FALLS protocol (Fluid Administration Limited by Lung Sonography), designed

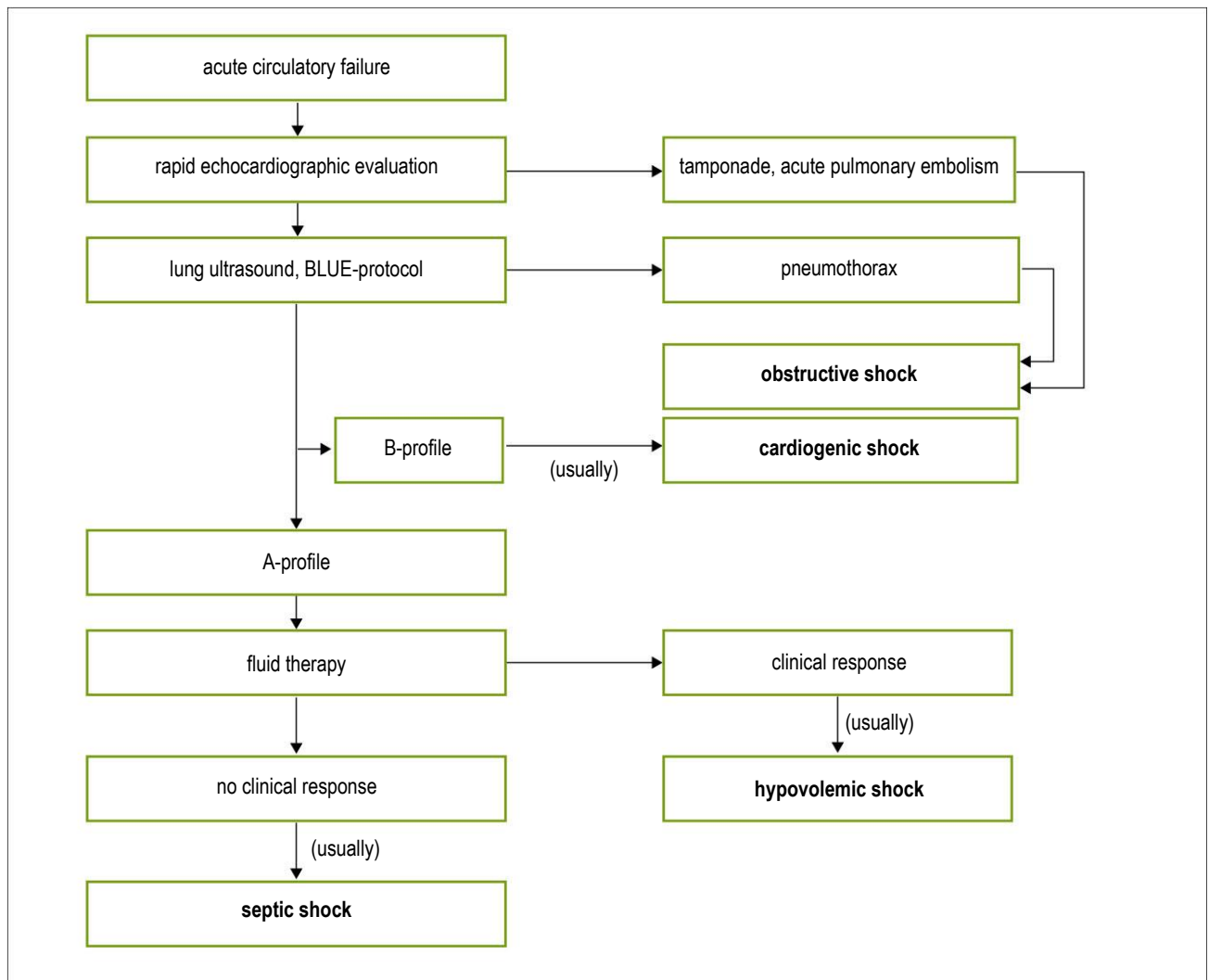


Figure 3. FALLS-protocol
Rycina 3. Protokól FALLS

for quick diagnostics of causes of acute circulatory failure [13]. The FALLS-protocol (Fig. 3) complies with Weil's shock classification and helps to rule out obstructive, cardiogenic, hypovolemic and septic shock.

The first step in this protocol is the assessment of pericardial effusion followed by the assessment of right ventricular overload and pneumothorax. This step helps rule out obstructive shock. The next stage involves establishing the presence of a B-profile to exclude cardiogenic shock. After this stage, fluid therapy is introduced, which confirms the diagnosis of hypovolemic shock when the patient's clinical condition improves. If the patient does not show improvement despite the treatment, fluid resuscitation is stopped and analyses aimed at determining the type of shock continues.

The main limitations of this protocol are that it does not provide for a comprehensive haemodynamic evaluation of patients. Further clinical tests are needed to determine the accuracy and effectiveness of this protocol.

Artefact types

The ultrasound image of the lungs is affected by imbalances between the water and air regions. The lung loses its aeration due to inflammatory changes, pulmonary embolism, compression atelectasis, resorption atelectasis and neoplastic infiltration. When there is a change in lung conditions, the ultrasound shows artefacts and/or subpleural changes. The basic artefact is the previously mentioned bat sign (Fig. 4A), a physiological sign showing acoustic shadows of two

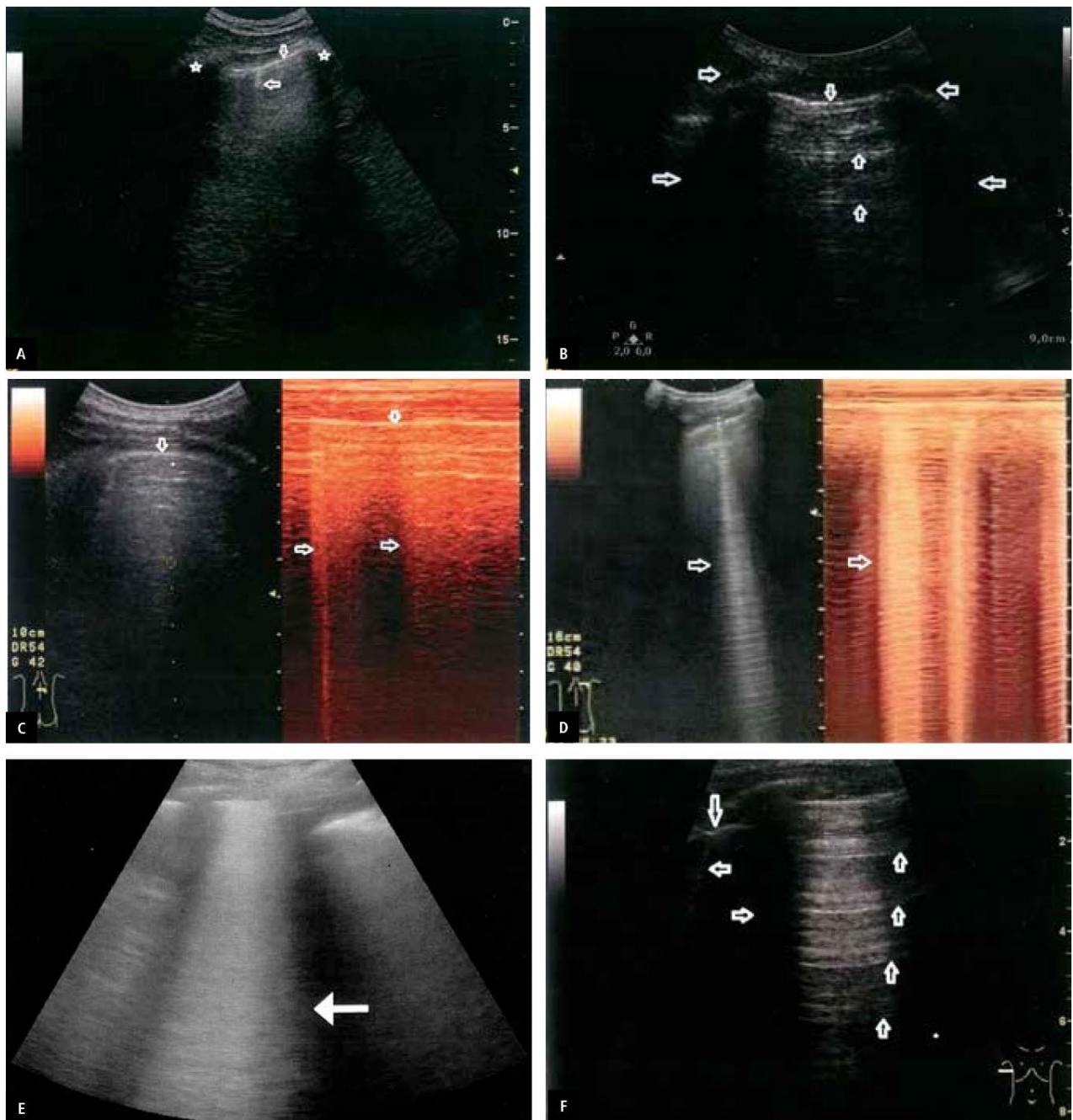


Figure 4. Signs and phenomena observed in ultrasound of lungs. **A.** Bat sign, **B.** Seashore sign, **C.** A-lines, **D.** B-lines, **E.** White lung sign, **F.** Pneumothorax – lung point sign (photos with permission of Prof. Wojciech Kosiak)

Rycina 4. Objawy i zjawiska obserwowane w ultrasonografii płuc. **A.** Objaw nietoperza. **B.** Objaw brzegu morskiego. **C.** Linie A. **D.** Linie B. **E.** Objaw białego płuca. **F.** Odma opłucnowa - objaw *lung point* (za zgodą prof. Wojciecha Kosiaka)

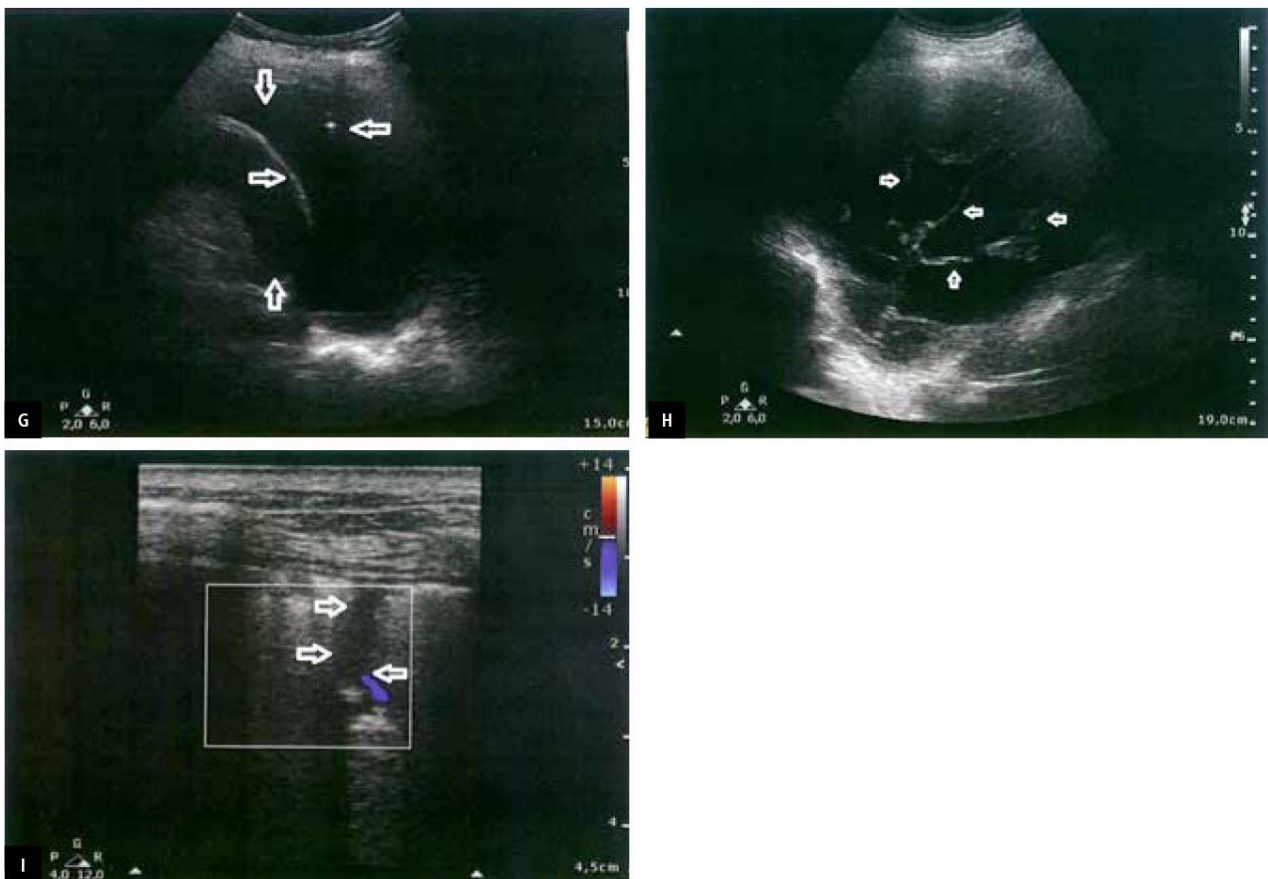


Figure 4. Continued. G. Nonechogenic fluid in pleural cavity, H. Fluid containing fibrin in pleural cavity, I. Pulmonary embolism, vascular sign (photos with permission of Prof. Wojciech Kosiak)

Rycina 4. G. Bezechowy płyn opłucnej H. Płyn w opłucnej z obecnością włóknika. I. Zatorowość płucna, objaw *vascular sign* (za zgodą prof. Wojciecha Kosiaka)

Table 1. Degrees of hydration and amount of extravascular lung water

Tabela 1. Stopnie uwodnienia i ilość pozanaczyniowej wody płucnej (EVLW)

	B-line count	amount of EVLW
0	≤5	none
1	6-15	small
2	16-30	medium
3	>30	large

Conclusions

Ultrasonography is a common tool that enables diagnosis and monitoring of the treatment process. It provides insight into the pathophysiology of the respiratory and circulatory systems. Lung ultrasound is a very helpful method to be used in intensive care units, known as LUCI

(lung ultrasound in the critically ill). The ultrasound can be used at the patient's bedside to solve clinical problems whenever the word 'lung' appears in intensive care settings. This technique provides means for quick diagnosis, financial savings and reduction of patient suffering and the medical staff's exposure to adverse radiation. In experienced hands, ultrasound can replace X-rays and sometimes CT scans. Both clinicians and radiologists are faced with the challenge of accepting the role of lung ultrasonography. Therefore, more efforts are needed to facilitate the spread of lung ultrasound in the medical community, which allows for a quick diagnosis in patients with acute respiratory and circulatory dysfunction.

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Transfusion-related acute lung injury associated with intravenous infusion of human immunoglobulin

Ostra potransfuzyjna niewydolność oddechowa związana z przetoczeniem preparatu immunoglobulin ludzkich

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Abstract. Transfusion-related acute lung injury (TRALI) is a very important and often underestimated problem in modern transfusion medicine, also burdened with a high mortality rate. This complication may occur after a transfusion of any blood component as well as plasma-derived blood products such as human immunoglobulins. The article reviews the literature related to the subject of TRALI: its clinical picture, causes, prophylaxis and treatment.

Keywords: acute lung injury, human immunoglobulins, TRALI

Streszczenie. Ostra potransfuzyjna niewydolność oddechowa lub ostre poprzetoczeniowe uszkodzenie płuc (TRALI) jest bardzo ważnym, obciążonym dużą śmiertelnością, często niedoszacowanym problemem współczesnej transfuzjologii. Powikłanie to może się pojawić po przetoczeniu każdego składnika krwi, jak również preparatu krwiopochodnego, jakim są immunoglobuliny ludzkie. W artykule dokonano przeglądu piśmiennictwa związanego z tematyką TRALI, obrazem klinicznym, przyczynami, profilaktyką i sposobem postępowania w tym powikłaniu.

Słowa kluczowe: TRALI, immunoglobuliny ludzkie, ostra niewydolność oddechowa.

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Introduction

Transfusion-related acute lung injury (TRALI) is defined as the occurrence of acute lung injury (ALI) during or up to 6 hours after a blood transfusion, unexplained by other risks of acute lung injury [1]. This complication may occur after a transfusion of any blood component or blood product: plasma, packed red blood cells, platelets, cryoprecipitate, or human immunoglobulins.

The **symptoms** indicating TRALI include dyspnea, hypoxaemia of <90% of peripheral capillary oxygen saturation, bilateral noncardiogenic pulmonary oedema, hypotension or increased blood pressure and fever. The chest X-ray shows bilateral interstitial changes, usually resolving after 5-7 days.

Pathogenesis

Although this complication was first described by American physicians over 30 years ago (in 1985), its pathogenesis is not yet fully understood [2].

In 2004, a panel of experts at a Canadian conference established the criteria for identifying TRALI. At that time, **TRALI** denoted **acute lung damage (ALI)** occurring up to 6 hours after a transfusion of blood components or blood products without predisposing risk factors of acute lung damage. On the other hand, acute lung damage occurring within 6 hours of transfusion, but with the presence of one or more time-related risk factors of acute lung damage, was defined as **possible TRALI**. **ALI** is defined as the new onset of respiratory failure with hypoxaemia of $SpO_2 < 90\%$ or $PaO_2/FiO_2 < 300$ mm Hg with bilateral interstitial changes in the chest X-ray [3]. Hydrostatic pulmonary oedema must be ruled out to ensure a correct diagnosis of TRALI and possible TRALI.

In 2017, Toy and Kleinman proposed a change in the TRALI nomenclature to:

- **TRALI, antibody mediated**, and
- **TRALI, non-antibody mediated**, previously referred to as '**possible TRALI**', although nowadays the term '**post-transfusion ARDS**' seems more accurate [4].

In most cases of **antibody mediated TRALI**, anti-HLA class I and II or anti-granulocyte anti-HNA antibodies are found in the transfused blood component, i.e. circulating in the donor's blood. In this case, while it seems reasonable to state that antibodies will appear in the plasma of female blood donors after pregnancy (foetal antigen stimulation), it has also been proved that male donor sera may also contain anti-HLA and anti-HNA antibodies, even without a history of alloimmunity following organ transplantation or transfusion. Nakamura's study shows that some male donors have anti-HLA antibodies present in their serum, which are likely to have been produced by reactions to environmental factors (microorganisms). These antibodies are not present permanently in the plasma from male donors, unlike those from female donors, which remain for a longer period of time [5]. Environmental (microbial) antigens stimulate the body to produce antibodies through the similarity of bacterial wall epitopes and HLA. In the case of female donors, the production of anti-HLA antibodies takes place through the presence of maternal and foetal microchimerism encountered by maternal lymphocytes [6].

The pathogenesis of TRALI is often explained by a 'two-hit' hypothesis:

- the recipient is at risk of neutrophil adhesion to the activated lung endothelium (mechanically ventilated patients, after cardiac surgery),

- the presence of anti-HLA class I and anti-HNA antibodies in the preparation activates neutrophils, monocytes and tissue macrophages, and initiates the inflammation cascade; neutrophil degranulation causes lung endothelial damage; the antibodies can also directly bind to the vascular endothelium and form immune complexes to which circulating neutrophils migrate [7, 8]; it has also been demonstrated that anti-HLA class II antibodies activate monocytes, which in turn stimulate neutrophils to produce active oxygen species (HLA class II antigens do not occur on neutrophils) [9].

In the case of **non-antibody mediated TRALI**, the factors involved are the cytokines and biologically active lipids (lysophosphatidylcholine) contained in blood products stored for a long time [10]. The lung endothelium is damaged due to the activation of leukocytes and the release of inflammatory reaction mediators as a consequence of lung oedema in all the above processes, both antibody mediated and non-antibody mediated.

TRALI related to intravenous immunoglobulin infusion

Intravenous immune globulin (IVIG) has been used for treatments in many medical fields, including diseases of the nervous system, the haematopoietic system, immunological diseases, immunodeficiency and both post-organ and marrow transplantation. The preparations are obtained by the fractionation of large quantities (>10,000 L) of plasma from donors (from at least 1,000 to 100,000 donors) tested for hepatitis C and B viruses, HIV, stored for several months at $< -20^\circ\text{C}$ [11,12]. Immunoglobulin preparations contain IgG with different amounts of IgA, IgM, other proteins, sugars and solvents, which may affect tolerance to IVIG treatment [13].

Most physicians recognise TRALI as a complication of the transfusion of blood and its components, and consider IVIG as a medicinal product, without drawing a close link to the blood donors.

IVIG infusions can only lead to antibody mediated TRALI. Non-antibody mediated TRALI applies exclusively to long-stored packed red blood cells with an increased content of biologically active lipids.

Management

When IVIG side effects occur, the management is symptomatic and rarely requires aggressive treatment, except for rare anaphylactic reactions or cardiovascular or respiratory complications. IVIG-related adverse reactions occur in less than 5% of patients [14]. In most cases, mild reactions occur within the first 30 minutes after the infusion and the proper management is to

reduce the rate of infusion or temporarily stop it [15]. Adverse effects are particularly likely in a patient who has not received IVIG before or has recently developed a bacterial infection [16]. To prevent these reactions, antihistamines, corticosteroids or non-steroidal anti-inflammatory drugs may be used or, alternatively, the route of administration of immunoglobulins may be changed to treatment with subcutaneous immunoglobulin (SCIG). IVIG fractionation from thousands of plasma donations increases the risk of alloantibodies that may be reactive in the recipient's body and cause TRALI. Elimination of donors with a confirmed presence of antibodies and the use of leukoreduced preparations minimise the risk of TRALI occurrence after transfusion of blood preparations. In some countries, including Canada, fresh frozen plasma from male donors is used, while plasma from female donors is used for fractionation to produce plasma-derived clotting factors, albumin, immunoglobulins and anti-D globulins. On the other hand, the purpose of pooling thousands of plasma units is to dilute and reduce the anti-HLA and anti-HNA antibodies levels, but it may also pose the risk of synergistic action of the antibodies and induce TRALI in some patients [17].

TRALI is a rare post-transfusion complication, and the occurrence of IVIG-related TRALI has been reported rarely (only in a few patients). The literature describes several examples of TRALI after IVIG infusions, especially in patients in whom they are used, often due to congenital or acquired immune disorders [17-22]. In all cases, the symptoms of suddenly developing respiratory failure appeared in relation to the intravenous infusion of human immunoglobulins and required the use of oxygen therapy, with typical changes in lung X-ray imaging (bilateral interstitial and alveolar changes), without changes in the size of the heart or the mediastinum. It is possible to visualise ground glass opacities in the CT scan. Neither an increase in NTproBNP concentration nor contractility abnormalities in the echo study are observed, which distinguishes TRALI from transfusion associated circulatory overload (TACO) [23].

Prevention and treatment of IVIG-related TRALI

Different hypoxaemia levels require immediate initiation of oxygen therapy or even mechanical ventilation. TRALI is still associated with high mortality rates, reaching over 20% of cases. Diuretics, which are effective in TACO, are contraindicated; corticosteroids are ineffective as well [24].

In the case of TRALI after a blood product transfusion, a transfusion reaction report is drawn up. The competent blood donation centre secures other blood components from that donor and performs antibody tests on recipients

and donors. With IVIG, it is impossible to test a large number of donors. However, the presence of antibodies in the recipient's plasma can be marked down and, if possible, an immunoglobulin preparation from a given series can be tested for anti-HLA and anti-HNA antibodies.

Discussion

TRALI has a high mortality rate of over 20%, but its incidence still appears underestimated. The typical symptoms of acute respiratory failure within 6 hours after a transfusion are important in the clinical picture. As the presence of anti-HLA and anti-HNA antibodies from donor plasma is important in pathogenesis, diagnosed TRALI should be considered as a possible cause of respiratory complications following an IVIG infusion. This complication is considered severe – and the infusion of immunoglobulins should be discontinued and not repeated, oxygen therapy should be applied and, if necessary, the patient should be treated in an intensive care unit.

Making the physicians using infusions of immunoglobulins aware that TRALI does not only concern blood transfusions, but also human immunoglobulin preparations, may significantly affect the prognosis in this complication through the application of appropriate management.

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Influenza

Grypa

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Abstract. Influenza is an acute viral respiratory disease. It is common among both adults and children, which results in an increased number of medical visits, hundreds of thousands of unplanned hospitalizations and thousands of deaths of patients all over the world. The highest hospitalization and mortality rates are observed among geriatric patients. Immunoprophylaxis is a fundamental form of influenza prevention. Antiviral drugs are available, and are considered most successful when introduced in the early stages of the disease. A crucial aspect of influenza is the ongoing risk of a pandemic outbreak. On account of the risks related to influenza and the reluctance to vaccinate among patients and medical personnel, it seems reasonable to outline the current facts about the disease.

Keywords: antigenic variability, antiviral drugs, epidemic, influenza, pandemic, vaccination

Streszczenie. Grypa jest ostrą chorobą wirusową układu oddechowego. Zachorowania występują powszechnie u dorosłych i dzieci, co wiąże się ze zwiększoną ilością wizyt lekarskich, setkami tysięcy nieplanowych hospitalizacji oraz tysiącami zgonów pacjentów na całym świecie. Najwyższe wskaźniki hospitalizacji i śmiertelności stwierdza się w populacji geriatrycznej. Podstawową metodą zapobiegania zachorowaniom na grypę jest immunoprofilaktyka. Dostępne są również leki o działaniu przeciwwirusowym, które dają największe korzyści, gdy są włączone we wczesnej fazie choroby. Niezwykle istotnym aspektem zachorowalności jest stale istniejące zagrożenie pandemią. Wobec nieświadomości zagrożeń, które niesie ze sobą grypa, oraz niechęci do szczepień obserwowanej zarówno wśród pacjentów, jak i personelu medycznego, zasadne wydaje się przybliżenie aktualnych informacji na temat ww. choroby zakaźnej.

Słowa kluczowe: grypa, pandemia, epidemia, szczepienia, leki przeciwwirusowe, zmienność antygenowa

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Introduction

Influenza is a common acute viral respiratory infection. It is still seen by many doctors and patients as a commonplace infection of the nasopharynx with fever. From an epidemiological point of view, influenza occurs every year in the form of local outbreaks and epidemics, as well as pandemics that appear every dozen or so years. This is due to the natural antigenic variability of the influenza virus. There are two types of change that take place in its genetic material.

The first one is antigenic drift, which involves the formation of small changes in the genome segments encoding viral surface antigens. This is associated with the imperfect functioning of viral ribonucleic acid

polymerase (RNA), which causes numerous transcription errors and incorrect incorporation of nitrogen bases during the synthesis of the daughter RNA strands. At the same time, it is not capable of correction, i.e. the removal of the abnormalities. This leads to point mutations and changes in single amino acids in the antigenic protein chains or to a shift in the pattern of their glycosylation. The subsequent changes in the virus genome accumulate. Antigenic drift is a continuous process and occurs within influenza type A and type B viruses [1]. Modified forms of hemagglutinin (H) and neuraminidase (N) on the surface of the virus are responsible for avoiding the immune mechanisms produced by the host organism as a result of previous exposure to infection or due to prior vaccination. Antigenic shift explains the occurrence of

diseases of the epidemic type. In temperate climates, epidemics appear seasonally, while in tropical regions they occur throughout the year [2]. A typical epidemic lasts about 5-6 weeks in a given area. The peak of the disease is in the second to third weeks. During an epidemic, the number of emergency hospitalisations and deaths increases significantly. There is a high morbidity in children and an increased number of hospitalisations in the age group up to 5 years, especially up to 2 years. The highest number of hospitalisations among adults and the highest number of deaths are in patients over 65 years of age [3].

Epidemiology of the influenza virus

The annual number of seasonal influenza cases in the world is estimated by the World Health Organization (WHO) at 3-5 million people, with a mortality rate at about 0.1-0.5% [4]. In European Union countries, about 10-30% of the population falls ill every year, with a particularly high morbidity in children under the age of 6 reaching on average 32%. Reports from the European Centre for Disease Prevention and Control (ECDC) record 15,000 to 70,000 deaths per year due to seasonal influenza among European citizens [5]. Data from the Polish National Institute of Public Health – National Institute of Hygiene (NIZP – PZH) shows that an increased incidence of influenza and flu-like diseases has been observed in Poland in recent years (Table 1). In the 2018/2019 season, about 3.7 million cases were reported until 7 April 2019. In the age group 0-14 years, 1,668,666 cases were reported. The total number of hospitalisations due to influenza was 14,976. The main reason for hospital referrals were respiratory complications, at 13,976 cases (93%). Cardiovascular complications accounted for 2.9% of hospitalisation causes. From 1 September 2018 to 7 April 2019 an exceptionally high number of deaths was recorded, at 143 instances. This value exceeds the number of influenza-related deaths in each of the previous five full influenza seasons. More than half (as much as 52%) of the deaths concerned patients over 65 years of age. In addition to the more severe course of influenza in the current season, the high statistical data relating to deaths should also be associated with increased awareness of physicians, who increasingly frequently identify influenza virus infection as the cause of complications leading to patient death [6].

The second type of antigenic variation typical of the influenza virus is antigenic shift. It appears suddenly, every dozen or so years. Moreover, it is an occasional, non-continuous phenomenon and concerns only influenza type A viruses. It is linked with the segmental structure of the virus genome. Antigenic shift may occur when the host cell is simultaneously infected with more

than one type of virus. This enables the exchange of individual RNA segments between them. Reassortment of genetic material is possible between virus strains from different susceptible animal and human species. The newly formed virus has completely new features, making it unrecognisable to the human immune system [7]. It can cause the uncontrolled spread of the disease, i.e. a pandemic, by attacking immunologically incompetent populations. It is a series of epidemics of infectious diseases found in different environments, over a large area, on different continents at the same time. The disease is caused by a new, hitherto unknown variety of the virus, which has the ability to be transmitted from human to human. Its characteristic features include extremely high morbidity and increased mortality, especially among young adults (20-40 years old) [3]. There have been four influenza pandemics worldwide in the last 100 years. During each of them, a new influenza virus appeared: directly from an avian host (AH1N1 virus in 1918), formed due to reassortment between an avian virus and a human virus circulating in the population (AH2N2 virus in 1957 and AH3N2 virus in 1968) or an assortment from a swine influenza virus (AH1N1 virus in 2009). The most serious flu pandemic in history was the Spanish flu pandemic, a 1918 plague that caused 50-100 million deaths worldwide [8].

After the end of each pandemic, the viruses formed from pandemic strains form a new strain of influenza type A virus, replacing the viruses circulating previously in nature, or appearing as another type alongside the virus already circulating. Currently, the most common influenza viruses in the environment are AH1N1pdm09 (since 2009), the AH3N2 influenza virus (originating from the 1968 virus) and 2 lines of the influenza type B virus – Yamagata and Victoria [4]. In the 2018/2019 season, laboratory-confirmed influenza virus infections in Poland were found to be predominantly type A, with the AH1N1pdm09 virus dominating – 77.8%, while the AH3N2 type was responsible for 3.8% of illnesses. A small number of infections in the current season (1.2%) were caused by Yamagata influenza type B viruses, in contrast to the last epidemiological season, when an influenza type B virus was responsible for over 70% of infections [6].

Structure of the influenza virus

Influenza viruses belong to the *Orthomyxoviridae* family. The genetic material of the virus is negatively polarised, single stranded, linear RNA (ssRNA⁻) divided into segments. Based on the information contained therein, the protein components of the virus particles are produced. Taking into account the antigenic differences between the main virus proteins and nucleoproteins,

Table 1. Influenza-related morbidity, hospitalisations and deaths in Poland. Comparison of full epidemiological influenza seasons 2013/2014-2017/2018 with current epidemiological season 2018/2019 (from 1/09/2018 to 7/04/2019)

Tabela 1. Zachorowania, hospitalizacje i zgony z powodu grypy w Polsce. Porównanie pełnych sezonów grypowych 2013/2014-2017/2018 z aktualnym sezonem epidemiologicznym 2018/2019 (od 1.09.2018 r. do 7.04.2019 r.)

influenza season	morbidity and suspected cases of influenza and flu-like diseases in Poland	influenza-related hospitalisations	influenza-related deaths
2013/2014	2,761,523	9,374	15
2014/2015	3,774,798	12,227	11
2015/2016	4,069,654	16,156	140
2016/2017	4,844,024	16,970	25
2017/2018	5,415,933	18,555	47
2018/2019 (period from 1 Sept to 7 April)	3,692,199	14976	143

Source: Material presented during Flu Meeting 2019 (10/04/2019, Warsaw), based on epidemiological report of National Institute of Public Health – National Institute of Hygiene [6].

Źródło: Materiały przedstawione podczas Flu Meeting Warszawa 10.04.2019. Na podstawie meldunków epidemiologicznych NIZP-PZH [6].

influenza viruses of types A, B, C and D can be distinguished. Details of the structure and characteristics of the different virus types are shown in Table 2. The influenza type A virus, the only one with pandemic potential, has many subtypes, classified according to the properties of the surface antigens – hemagglutinin and neuraminidase. Eighteen subtypes of hemagglutinin of the influenza type A virus have been isolated. Viruses causing human disease contain hemagglutinins of subtypes H1, H2 and H3. The others are found among viruses widespread in animals (numerous mammals and birds), the last two of which – H17 and H18 – have been identified in bats. Eleven subtypes of neuraminidase have also been discovered. Similarly, human viruses contain N1 and N2, the remaining subtypes are found in the animal reservoir, and N10 and N11 have been recently discovered in bats [9]. Influenza type B and C viruses have no reservoir in the animal world, but cause disease in sensitive species. The animal reservoir of the influenza type D virus (cattle) requires monitoring, although its pathogenicity for humans has not been demonstrated so far [10].

Surface haemagglutinin mediates the binding of the virus particle to its receptors in the host cells. Sialic acid molecules, which form bonds with the oligosaccharides of cell membranes, are the receptor. Human viruses preferentially bind to receptors with alpha 2,6 conformation, which are found in the upper airways of humans. Avian viruses exhibit affinity for the most common alpha 2,3 receptor structures, which in humans are located in the lower airways [11]. The function of neuraminidase is to facilitate the adhesion of the virus to the target cells and the release of the virus progeny by

cutting the oligosaccharide residue on the surface of the attacked cell and decomposing the mucus covering it. Hemagglutinin and neuraminidase, similarly to the M2 matrix protein, are the targets of the immune response involving protective antibodies. On the other hand, virus nucleoproteins and the M1 protein are the target in the host cellular response [3].

Course of infection with the influenza virus

The source of seasonal flu virus infection is an infected person. The period of infectivity of a patient with symptoms or subclinical disease course lasts from a day before the symptoms occur to 3-5 days after their occurrence. Virus shedding is longer in children and immunocompromised patients [12, 13]. The underlying condition for the spread of influenza in the population is the effective ability to transmit the virus from human to human. Three mechanisms of infection spread have been identified: in aerosols, via droplets and by direct contact. Aerosols, small secretion particles released from the upper respiratory tract during coughing and sneezing, up to 5 µm in diameter, are capable of persisting in the air even for several hours, sensitive to temperature and humidity, before they are inhaled [14]. Larger drops of secretion land immediately in the upper respiratory tract of persons present in the patient's environment or settle on surfaces located 2-3 m from the infected person. In this form, the virus remains infectious in secretion deposited on smooth surfaces for up to 48 hours. The patient's vomit may also be an infectious material. The incubation time of influenza viruses in the host organism depends on the amount of the pathogen ingested and

Table 2. Types and characteristics of influenza viruses

Tabela 2. Typy wirusów grypy i ich charakterystyka

	influenza type A virus	influenza type B virus	influenza type C virus	influenza type D virus
genetic material	ssRNA(-)	ssRNA(-)	ssRNA(-)	ssRNA(-)
genome structure	8 segments	8 segments	7 segments	7 segments
number of coded proteins	10	10	9	9
characteristic determinants	hemagglutinin type 1-18 neuraminidase type 1-11	hemagglutinin one type neuraminidase one type non-structural NB protein	HEF*	HEF*
influenza virus strains	AH1N1, AH3N2 – causing typical human epidemics, plus many strains of different antigenic structures circulating in animal populations	2 lineages: Yamagata and Victoria	6 lineages	2 lineages
animal reservoir	birds	-	-	cattle
species susceptible to virus infection	human, various mammals, birds	human, seal, ferret	human, pig	cattle, pig
clinical symptoms in humans	fever disease with airway infection	fever disease with airway infection	mild catarrhal infection, conjunctivitis	no human symptoms
antigenic variability	drift – continuous shift – occasional, sudden, every several decades high antigenic variability	antigenic drift, a variability of 2-3 times less than the influenza type A virus	N.A.	N.A.
ability to cause mass outbreaks in humans	epidemics and pandemics	epidemics	occasionally epidemics	N.A.

HEF* (hemagglutinin-esterase-fusion protein) – a protein that combines the function of hemagglutinin and esterase

Source: Own research based on [3, 4, 7, 9, 10]

Źródło: Opracowanie własne na podstawie 3., 4., 7., 9. i 10. pozycji piśmiennictwa

lasts 1-4 days. The influenza virus multiplies in the upper respiratory tract epithelial cells, causing their necrosis. It also damages goblet cells, impairing mucus production. As a result, most of the epithelial cells undergo necrosis and exfoliation, exposing the mucous membrane of the airways. Diffuse inflammation of the nasopharynx, larynx, trachea and bronchi develops. The virus produces either a short-lived viraemia or none whatsoever. The general symptoms of the disease are the effect of cytokines released in the course of the inflammatory reaction.

Clinical picture of influenza

Influenza virus infection can be asymptomatic, but it can also take a striking course. The clinical picture depends on the virus and host characteristics. Table 3 shows the diagnostic criteria for influenza. Early differentiation of the disease from the common cold is particularly important as, in contrast, influenza has a high morbidity and serious complications.

The disease usually takes the form of upper respiratory tract rhinitis with dominant general symptoms. High fever, chills, headaches, eyeball aches, muscle aches, malaise and lack of appetite, accompanied by sore throat and dry, persistent cough, appear from the very beginning. Rarely, rhinitis and conjunctivitis are found. Additionally, gastrointestinal symptoms and febrile convulsions are observed in children [4]. Complications often develop in the course of influenza, most of them respiratory.

Table 3. Diagnostic criteria of influenza by ECDC, Polish and WHO criteria [4, 5]

Tabela 3. Kryteria rozpoznawania grypy wg ECDC, kryteria polskie i WHO [4, 5]

symptoms	ECDC	Polish criteria	WHO
onset of disease	sudden	typically sudden	<10 days
fever	>37.8°C	high	>38°C
other symptoms	cough and/or sore throat	coughing, headaches, muscle pains	cough

Viral pneumonia is characteristic. In such cases, features indicating progressive respiratory failure quickly appear among the influenza symptoms. No growth of bacterial cultures is observed in airway secretion cultures. The chest X-ray shows diffuse bilateral infiltrates in the lung parenchyma. The death rate is high. Post-mortem examinations reveal necrotising bronchitis, interstitial changes in the lungs, presence of hyaline membrane and alveolar haemorrhages and pulmonary oedema [15]. Bacterial pneumonia is also a typical complication of influenza. Secondary infections are usually caused by *Streptococcus pneumoniae*, *Staphylococcus aureus* and *Haemophilus influenzae* and gram-negative rods. The clinical course of this complication is split to two phases. Initially, flu symptoms are dominant and gradually disappear, and after several days there is a recurrence of fever with dyspnoea and typical increased inflammation-related density in the lung X-ray. The course of influenza may lead to inflammation of the middle ear, the paranasal sinuses, the larynx, the trachea, the bronchi and the bronchioles, as well as to a worsening course of chronic respiratory diseases – bronchial asthma, chronic obstructive lung disease or cystic fibrosis. Extrapulmonary complications of influenza affect many systems and organs. In the cardiovascular system, myocarditis and pericarditis may occur, the probability of myocardial infarction increases, symptoms of circulatory failure are intensified. Neurological complications are also significant, including viral encephalomyelitis, myelitis, transverse myelitis, meningitis or Guillain-Barre syndrome. Other complications found are muscle inflammation and rhabdomyolysis, kidney failure and Reye's syndrome in children, today rarer due to the non-use of acetylsalicylic acid in this age group. Patients predisposed to the occurrence of complications are those with coexisting chronic respiratory and circulatory system diseases, diabetes, kidney and liver diseases, obesity, alcohol abuse, neuromuscular diseases, bed-bound, patients over 65 years of age, children under 5 years of age, pregnant women and patients with impaired congenital immunity and immunity acquired as a result of disease or as a result of the applied treatment [3].

Virological diagnostics

Due to the lack of pathognomonic clinical signs, influenza may be a diagnostic problem, especially in the period when no mass morbidity is observed. The correct diagnosis of the disease and implementation of early, appropriate antiviral treatment may prevent severe course of the disease and the development of serious complications. The sensitivity of the diagnosis based on clinical criteria is estimated at 29-80% [3]. The available diagnostic tests are based on virus cultures but also on the detection of its antigens or genetic material. Serological tests are not applicable in the acute phase of the disease. For virological tests, biological material containing potentially the most virus particles is used, i.e. nasopharyngeal swab or aspirate, nasal washings, tracheal aspirate or bronchoalveolar washings. Blood is not suitable for the detection of influenza viruses because they cause only a short-lived viraemia or none at all in the course of infection. The Rapid Influenza Diagnostic Test (RIDT), which has been widely used so far to identify influenza virus antigens and has been particularly useful because it is simple, does not require the biological material to be stored and transported and produces results in a short time, has unsatisfactory sensitivity despite significant specificity. It is estimated at 59-93%, a higher level for influenza type A viruses than for influenza type B viruses; greater sensitivity is also obtained in tests performed in children than in adults. Therefore, there are recommendations for routine use of kits for rapid flu diagnosis using molecular methods. Fast Nucleic Acid Amplification Test (NAAT) is available, is simple to perform and can be read after 2-4 hours. The most commonly used methods are based on the amplification of viral nucleic acids. These include: reverse transcriptase polymerase chain reaction (RT-PCR) – a qualitative method, real-time RT-PCR – a quantitative method combined with real-time analysis and identification of amplification products and a method for determining the amount of material transcribed based on the nucleic acid sequence (NASBA). The sensitivity and specificity of these methods reach 96-100%. The results do not differ statistically depending on the age of the patient. The genetic material of the virus is detected at a very early stage of the disease. In the diagnosis of respiratory tract infections, tests based on multiplex real-time PCR technique have become particularly valuable, enabling simultaneous identification of multiple respiratory viruses and other infectious agents (*Mycoplasma*, *Chlamydia*). They optimise the costs of molecular diagnostics and provide comprehensive advice on how to carry out the right treatment for the patient. Therefore, classical virus culture methods are losing their importance due to the need for proper protection and

transport of the collected biological material to specialised centres, the workload of the method and, above all, its time-consuming nature (the waiting time for confirmation of the diagnosis is 3-10 days, and up to 3 days in a rapid culture method). Of course, they are still a reference point for other diagnostic methods and the most reliable method of detailed virus characterisation.

Influenza prevention

The most effective way to combat influenza is to prevent it by protective vaccination. Vaccines are substances whose purpose is to stimulate the immune system to produce antibodies specific to the selected pathogen. Suffering through an influenza outbreak does not guarantee permanent immunity to the disease. The constant variability of the influenza virus is responsible for human susceptibility to new diseases and necessitates seasonal modification of the composition of recommended vaccines, which must contain the currently circulating virus types. The degree of protection achieved by vaccination depends on how well the virus variants contained in the preparations match the seasonally circulating viruses. Two types of vaccines are used for influenza prevention: live attenuated and inactivated, either whole-virus or split-virion vaccines, or subunit vaccines containing purified subunits of virus antigens (HA, N). Inactivated vaccines contain antigens of three or four viruses – trivalent or quadrivalent. For the 2018/2019 season, the influenza vaccine was composed of an A/Michigan/45/2015(H1N1)pdm09-like virus, an A/Singapore/INFIMH-16-0019/2016(H3N2)-like virus, a B/Colorado/06/2017-like virus (B/Victoria/2/87 lineage) in accordance with the recommendations issued by the WHO, and additionally in the quadrivalent one a B/Phuket/3073/2013-like virus (B/Yamagata/16/88 lineage). For the 2019/2020 season, WHO recommends new strains of influenza type A viruses, i.e. A/Brisbane/02/2018 (H1 N1)pdm09-like virus and A/Kansas/14/2017 (H3N2)-like virus [4]. Vaccination is recommended in the period from September to November, preceding the time of increased morbidity. Worldwide guidelines for influenza vaccination recommend universal vaccination in people over 6 months of age.

In Poland, influenza vaccination is a recommended vaccination, which means that the cost of the vaccine is covered by the patient, while the cost of a medical visit and the procedure is financed from public funds.

The groups of people who are particularly recommended for vaccination are divided according to clinical and epidemiological criteria. Among the clinical patients, the age criterion stands out – children from 6 months to 5 years of age and people over 50 years of

age, and the criterion of health condition – chronic patients (heart failure, bronchial asthma, chronic obstructive pulmonary disease, atherosclerosis, coronary artery disease, kidney diseases, liver diseases, haematological diseases, diabetes, neurological diseases and neurological disorders), children requiring chronic treatment with acetylsalicylic acid, pregnant women, organ transplantation patients, immunosuppressed patients, obese people (BMI >40) and nursing home and care home residents. Clinical criteria concern groups of patients with increased risk of morbidity or severe disease and frequent complications and deaths. The epidemiological criteria relate to the profession. This group includes health workers who may transmit influenza to people at risk or be a source of infection for them. These include healthcare workers as well as non-medical workers in healthcare facilities, nursing homes, public service workers, people in large population centres, people in direct contact with patients from higher risk groups, as well as people employed directly on farms and in contact with waterfowl or swine.

Complications related to influenza vaccination are rare if contraindications to the use of the drug (allergy to chicken egg white and antibiotics used in the production of vaccine preparations) are taken into consideration. Site reactions are most commonly observed [16]. The effectiveness of seasonal influenza vaccination is assessed in annual reports on an ongoing basis. They indicate that the vaccine prevents influenza complications requiring sudden hospitalisation rather than the occurrence of the disease itself. Based on CDC analyses of recent years, its average effectiveness in influenza prevention is estimated at 10-60% [17]. The effectiveness of vaccination is higher in people under 65 years of age. In seniors, vaccination has been shown to have a beneficial effect in reducing the number of hospitalisations and the risk of death related to influenza. The benefits of vaccination are also clearly visible in patients from higher risk groups, especially small children, pregnant women and immunocompromised patients [3].

The flu vaccination rate in Poland is relatively low. The highest value achieved in the 2010/2011 season was 5.21% and gradually decreased to 3.26% in 2015/2016 and 2016/2017. In the 2017/2018 season, the downward trend was halted and the vaccination rate among the entire Polish population was 3.8%, and in the current 2018/2019 season it increased to 3.92%. In the case of seniors >65 years of age in Poland, 13.5% of people were vaccinated against influenza last season and 14.2% in the current one [6]. Poland is one of the bottom-ranked countries when compared to other European countries, outdistancing only Bulgaria, Latvia and Estonia. The data for the previous season from the United Kingdom indicate

Table 4. Antiviral drugs registered for influenza treatment in Europe and USA
Tabela 4. Leki przeciwwirusowe zarejestrowane w leczeniu grypy w Europie i USA

drug name	administration route	treatment dose	prophylactic dose	comments
oseltamivir	orally	adults: 75 mg twice a day for 5 days children from the age of 1 year: dosage by weight for 5 days	adults: 75 mg once a day for 7-10 days children from the age of 1 year: dosage by weight for 7-10 days	available in Poland required correction of dose in renal insufficiency drug of choice for pregnant women neuropsychiatric disorders were observed side effect of the drug use in the event of a pandemic, the drug can be used in new-borns and infants
zanamivir	inhalation	above 7 years: 10 mg twice a day for 5 days	above 5 years: 10 mg once a day for 7-10 days	registered in Poland contraindicated in patients with lung disease cannot be used in intubated patients
peramivir	intravenously	above 18 years: 600 mg once a day for 5 days	N.A.	available in the US required correction of dose in renal insufficiency
baloxavir	orally	above 12 years: 40 mg (up to 80 kg body weight) or 80 mg (>80kg body weight) at a time	N.A.	available in the US

Source: Own development based on [3]

Źródło: Opracowanie własne na podstawie [3]

a total vaccination rate of 62%, and 72% in the group of people over 65 years of age, i.e. very close to the desired value – 75% [5].

Significantly, only 6-8% of healthcare workers in Poland are vaccinated [18]. Their vaccination rate is higher than in the general population of Poland, but still insufficient. This professional group is seen as sensitive to reducing the morbidity rate in society related to influenza, especially because of their ability to shape patients' attitudes and encourage them to have regular vaccinations. In the United States, the number of vaccinated hospital workers exceeds 75% [3]. In Europe, the highest percentage of vaccinated medical personnel is found in the Czech Republic, Spain, Portugal, Great Britain and France, where it is about 25% [5]. In the case of naturally occurring antigenic variability of influenza type A viruses and a huge animal reservoir of this virus (migratory waterfowl), capable of reassorting the genetic material of human, avian and swine viruses, a sudden emergence of a new antigenic variant of a highly pathogenic influenza virus, capable of spreading between humans, is probable. This is precisely why work is underway to develop a universal vaccine for rapid application in case of a pandemic outbreak. The production process takes into account more conservative elements of the influenza virus, common to seasonal and pandemic strains, such as the proximal HA, N virus, M2 ion channel protein and internal virus proteins. Moreover, stimulants of specific immunity elements necessary for the proper course of immunity acquisition by lymphocytes (adjuvants) are considered [19].

Influenza treatment

Pharmacological agents – neuraminidase inhibitors (oseltamivir and zanamivir registered in Poland) – can be used in the treatment and prophylaxis of influenza. Moreover, peramivir and laninamivir (for inhalation), i.e. neuraminidase inhibitors not registered in Poland, are used exclusively in influenza treatment. Neuraminidase inhibitors act at the stage of releasing daughter virions from the virus-infected cells, causing them to clump together on the surface of the host cell, blocking them from peeling off the membrane of the affected cell. The sensitivity of the currently circulating seasonal influenza viruses to these drugs is continuously monitored (no resistance to them has been found for influenza type A viruses since the 2009 pandemic). Resistance to the drugs used is more often observed in children under 5 years of age, in patients with immunosuppression and those who receive these drugs as prophylaxis.

It is recommended to start treatment with neuraminidase inhibitors within 48 hours after the onset of symptoms. Better efficacy of the drugs in synergistic combinations with both adamantanes and RNA polymerase inhibitors was observed. Adamantanes – amantadine and rimantadine – are currently not recommended for use because of their inactivity against influenza type B viruses and also because of the reported resistance of influenza type A viruses to these drugs. Adamantanes inhibit the activity of the M2 protein, making it impossible for the influenza virus to uncoat and release its genetic material into the cytoplasm of the infected host cell.

Clinical evaluation of other compounds blocking key stages of influenza virus development is being researched. In 2018, the results of studies confirming the efficacy of the endonuclease inhibitor (baloxavir) of the influenza virus were presented. The blocked activity of viral RNA polymerase inhibits the process of transcription and replication of viral genetic material in the host cell. Many substances are currently at an advanced stage of research, including other RNA viral polymerase inhibitors such as pimodivir (PB2 inhibitor). Favipiravir, a nucleoside analogue from the polymerase inhibitor group, is registered as an antiviral drug in Japan. The activity of monoclonal antibodies directed against stable fragments of viral proteins (hemagglutinin stem, M2 protein) is also being tested. Moreover, studies are being carried out to support the treatment of influenza by the use of sialidase with catalytic activity administered by inhalation, which splits salicylic acid receptors in the host cells, preventing the connection of respiratory viruses to airway epithelial cells, and nitazoxanide, an inhibitor of ATP synthesis in the mitochondria of virus-infected cells [17].

Conclusions

The influenza virus carries a constant threat due to dynamic changes in its antigenic structure, posing the threat of the emergence of a new virus that will defeat an immunologically unprepared population and spread efficiently between humans, and thus acquire the ability to cause mass morbidity in the human population.

Another risk is the capability of viruses typical of the animal world to cause disease in humans, as shown by history. AH5N1 viruses of avian origin are particularly monitored, as they are associated with a significant mortality rate (up to 60%), causing pneumonia with rapidly growing respiratory failure. The disease is particularly prevalent in young people who come in contact with infected poultry in South East Asia. Another virus of avian origin that causes severe human disease is AH7N9. It is a low virulence avian virus, so the infection in birds is asymptomatic, which makes it impossible to diagnose the threat to humans early. Mostly elderly people fall ill and have the burden of chronic diseases. The mortality rate in the human population is about 40% [3]. In addition to the above mentioned, human diseases caused by other avian and swine influenza type A viruses – H9N2, H10N8, H10N7 and H6N1 strains of avian origin, of which H10N8 infection was associated with severe pneumonia, and H1N1v, H3N2v and H1N2v of swine origin in employees of pig farms in the USA, manifested as a mild disease of a course similar to seasonal influenza [20]. These viruses were sensitive to oseltamivir.

A new infection agent that requires careful monitoring is the influenza AH3N8 virus, common in horses, also causing infections in dogs and seals. In the United States, antibodies against its antigens have been found in the serum of people exposed to dead seals. Additionally, simultaneous mutations in the range of genes encoding hemagglutinin and the PB2 subunit of viral polymerase were found in the genetic material of this virus, which conditioned high viral pathogenicity and the possibility of their transmission among humans [7, 20].

In conclusion, influenza, which is a common respiratory disease, is in fact an unpredictable and highly contagious disease with an animal reservoir, causing severe complications. It is the cause of unscheduled hospitalisations and the deaths of patients and is responsible for significant sickness absence of employees. For these reasons, it remains a challenge for health systems, epidemiological surveillance and the economies of countries around the world.

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City Hospital in Sobótka and its extraordinary manager – Lt Aleksandra "Wanda" Kryszkiewicz MD (1907-1991)

Szpital Miejski w Sobótce i jego niezwykła dyrektor, por. lek. Aleksandra Kryszkiewicz „Wanda” (1907-1991)

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Abstract. Sobótka is a small town in the Dolnośląskie Voivodeship, Poland. In the first years following the end of World War II, Aleksandra Kryszkiewicz (1907-1991) was the manager and main organizer of the City Hospital in Sobótka. She was a physician and officer of the First Polish Army, a soldier of the Home Army, who participated in the battle of Kołobrzeg in 1945. Kryszkiewicz was born in Mława on 29 October 1907 to Bronisław Grzeźliński and Leokadia née Drecka. In 1939, she obtained her degree at the Faculty of Medicine, at the University of Warsaw. During the German occupation, she was initially the Head of Medical Services of the underground organization known as "Grunwald", then she served in the Union of Armed Struggle, and from 1942, in the Home Army. In 1944, she was mobilized to the First Polish Army, with the rank of lieutenant, and was head of the branch of the 16th Field Mobile Surgical Hospital. In March 1945, she took part in the famous battle of Kołobrzeg. After World War II, she remained in Sobótka, where in the years 1946-1951 she was a pillar of the establishment and development of the City Hospital, as well as other health care facilities in this region. Lieutenant Aleksandra Kryszkiewicz died on 11 July 1991 and was buried in the Powązki Cemetery in Warsaw.

Keywords: 1st Polish Army, Aleksandra Kryszkiewicz, Home Army, Kołobrzeg, military physician, Sobótka

Streszczenie. Sobótka to niewielkie miasteczko położone w Polsce, w województwie dolnośląskim. W pierwszych latach po zakończeniu II wojny światowej dyrektorem i głównym organizatorem Szpitala Miejskiego w Sobótce była Aleksandra Kryszkiewicz (1907-1991), lekarz i oficer I Armii Wojska Polskiego, żołnierz Armii Krajowej, uczestniczka walk o Kołobrzeg w 1945 r. Urodziła się 29 października 1907 r. w Mławie, jej rodzicami byli Bronisław Grzeźliński i Leokadia z domu Drecka. Dyplom lekarza uzyskała na Wydziale Lekarskim Uniwersytetu Warszawskiego w 1939 r. W czasie niemieckiej okupacji początkowo pełniła funkcję Szefa Sanitariatu konspiracyjnej organizacji „Grunwald”, następnie służyła w Związku Walki Zbrojnej, zaś od 1942 r. w Armii Krajowej. W 1944 r. została zmobilizowana do I Armii Wojska Polskiego, w stopniu porucznika pełniła funkcję ordynatora w 16. Polowym Ruchomym Szpitalu Chirurgicznym. W marcu 1945 r. brała udział w słynnej bitwie o Kołobrzeg. Po zakończeniu II wojny światowej znalazła się w Sobótce, gdzie w latach 1946-1951 była filarem powstania i rozwoju Szpitala Miejskiego oraz innych placówek służby zdrowia w tym regionie. Porucznik Aleksandra Kryszkiewicz zmarła 11 lipca 1991 r., została pochowana na Cmentarzu Powązkowskim w Warszawie.

Słowa kluczowe: Aleksandra Kryszkiewicz, Sobótka, lekarz wojskowy. Armia Krajowa, I Armia Wojska Polskiego, Kołobrzeg

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Introduction

Sobótka is a small town located about 40 km south-west of Wrocław, at the foot of Ślęza Mountain, the so-called Silesian Mount Olympus. The town was granted city rights in 1399 and over the centuries was ruled by Poland, the Czech Republic and Prussia. One of the darkest episodes in Sobótka's history was undoubtedly the period of the Third Reich and Adolf Hitler's rule. At that time, the city was called Zobten and the leader of the NSDAP obtained the most votes there in democratic elections, as in the whole of Germany, although he did not hide his criminal plans in his election programme. As a result of the Second World War unleashed by Hitler and the subsequent treaties in Yalta and Potsdam, Poland lost its sovereignty and a large part of its territory – the eastern borderlands of the Second Republic. The alleged compensation for depriving Poland of these areas was the so-called Recovered Territories, i.e. the area of the eastern borders of the former Third Reich: Pomerania, the Lubuskie Region, Lower and Upper Silesia and Warmia and Masuria. The Polish population expatriated from the eastern borderlands was resettled to these new territories and had to organise Polish statehood there from scratch. The German town of Zobten thus became the Polish town of Sobótka and, after six years of war and occupation, the people who arrived there began to live their lives in a relatively normal way.

At that time it was a very dangerous region, there was no efficient administration or effective law enforcement authorities. Dangerous gangs and looters were rampant, there was a shortage of all goods and basic resources, and people still harboured a sense of temporariness to the current state of affairs. There were still many Germans in the city, who were also unsure about their fate. However, the City Hospital was an extremely important institution for everyone, regardless of nationality or region of origin.

Its creation was hindered to a large extent due to the great shortage of medical staff, as this professional group suffered huge losses during World War II. It suffices to say that during the Katyń crime the NKVD murdered several hundred doctors, while the Polish intelligentsia was also slaughtered by the Nazis as part of the infamous *AB-Aktion*. Only people who were truly determined or forced by a difficult life situation chose to return to a town destroyed during the war, or the 'wild west', as the so-called Recovered Territories were referred to back then. Among the latter group were former Home Army soldiers and Warsaw insurgents who wanted to hide from the new authority that had set out to repress them and, at the same time, were trying to at least partly resume a normal existence after their lives had been ruined in Warsaw. Therefore, it is no coincidence that two



Figure 1. Aleksandra Kryszkiewicz (1907-1991), 1940s (courtesy of Central Medical Library)

Rycina 1. Aleksandra Kryszkiewicz (1907-1991), lata 40. XX wieku (dzięki uprzejmości Głównej Biblioteki Lekarskiej)

physicians who made a major contribution to the establishment of the City Hospital in Sobótka after 1945 were officers and physicians of the Polish Army and soldiers of the Home Army: Capt Waław Żebrowski and Lt Aleksandra Kryszkiewicz. The life and achievements of the latter certainly deserve to be remembered, not only by the inhabitants of Sobótka [1-3].

Youth and education of the future manager

Aleksandra Grzelińska (she took the name Kryszkiewicz only after marrying) was born on 29 October 1907 in Mława, to the family of Bronisław Grzeliński (1874-1923) and Leokadia (1876) née Drecka. Her father was a veterinarian in the then Płock province, which suggests that the family was rather well-off. They lived in a detached house with a beautiful garden in Długa Street in Mława, where Aleksandra and her two sisters, Zofia (1902-1980) and Anna (1910-1985), were brought up. The outbreak of World War I was a big shock for the whole family. Bronisław Grzeliński was mobilised as a veterinary physician to the Tsarist army and directed to the territory of today's Ukraine. Due to the war risks associated with the possible German occupation, the whole family was evacuated to the east together with the father. When warfare ceased and Poland regained independence, the Grzeliński family returned to Mława. The parents tried to provide their three daughters with a proper education. Two of them, Aleksandra and Zofia,



Figure 2. ID (Ausweis) No 7835 issued to Aleksandra Grzeźlińska-Kryszkiewicz on 15 April 1942, confirming her membership of the Medical Chamber of the General Government (courtesy of Central Medical Library)

Rycina 2. Legitymacja (Ausweis) nr 7835 wydana Aleksandrze Grzeźlińskiej-Kryszkiewicz 15 kwietnia 1942 r., potwierdzająca jej członkostwo w Izbie Lekarskiej Generalnej Guberni (dzięki uprzejmości Głównej Biblioteki Lekarskiej)

showed interest in medicine at a very young age, which probably had something to do with the function held by their father and the fact that the girls would observe him when he treated animals. Between 1920 and 1929, Aleksandra attended a secondary school in Warsaw, where she received her secondary school certificate. She then began studies at the Faculty of Medicine of the University of Warsaw, which in 1935 adopted the name of Józef Piłsudski University (UJP). At that time, a large part of the intelligentsia had left-liberal views, which was largely the result of the authoritarian rule of the Sanation movement after 1926 and the illegal brutal crackdown on the opposition (e.g. the murder of Brig Gen Włodzimierz Zagurski, the imprisonment of Lt Gen Tadeusz Rozwadowski, an attempt to criminalise the political opposition and the notorious Brest trial etc.). In 1931, Grzeźlińska became a member of the Union of Progressive Democratic Youth, an organisation which was in opposition to the then Polish authorities [4-6]. In the first half of the 1930s, she married Hilary Kryszkiewicz (1905-1943), who also came from Mława, where his father owned a large locksmith's plant and workshops. The fate of the descendants of this multi-child family is a perfect example of the clash of left-liberal and traditional-Catholic tendencies in Poland at the time. The former were supported by Hilary and his sister Maria Buchwald (1910-2003), a well-known theatre and film actress. At the opposite end was their younger brother Zygmunt (1915-1945), who chose the path of the priesthood and, as Father Bernard of the Mother of Fair Love, died in 1945 of epidemic typhus, contracted when

he was helping the sick in a hospital (his beatification is currently underway). It can be assumed that the outlook shared by Hilary Kryszkiewicz and Aleksandra Grzeźlińska was to some extent the foundation of their marriage. Since 1934, the then medical student already relied on her husband financially, and that year she also completed a three-month course at the State School of Medical Massage in Warsaw, which probably created a certain opportunity for her to earn money and improve her household budget. In 1936, she completed her studies, but she did not pass all the scheduled exams until three years later, and on 8 February 1939, she received her medical diploma at the Faculty of Medicine of the Józef Piłsudski University. The delay in obtaining full certificates was not uncommon at the time, often due to financial or personal problems. Kryszkiewicz started her obligatory postgraduate internship in the Infant Jesus Hospital in Warsaw immediately after graduation, initially in the 1st Surgical Department. During the internship, in September 1939, the Third Reich and the USSR (together with Slovakia) invaded Poland, thus starting the Second World War [4, 5, 7, 8].

The German occupation and participation in the underground movement

Raised in the patriotic spirit, Aleksandra Kryszkiewicz was strongly involved in the underground movement since the first moments of the occupation. As early as October 1939, she became a member of the Grunwald organisation, where she took the pseudonym "Wanda" and took over the management of the medical unit. At that time, the underground movement was only developing in the occupied territories and numerous organisations were being established. Grunwald was headed by an architect, Jan Siwek "Profesor", BEng, and after his arrest Miroslaw Leśkiewicz "Młot". The combat division was commanded by Maj Edward Biernacki "Poraj" and the civilian one by Krzysztof Wysokiński "Krzysztof". At the end of 1940, Grunwald merged with the Warszawianka and Nowa Polska organisations, creating the Unia, which later became part of the Labour Party. The military division of the organisation was incorporated into the Union for Armed Struggle (ZWZ), and then into the Home Army. Taking advantage of the internship in the Infant Jesus Hospital, Aleksandra Kryszkiewicz together with her sister Zofia Orlicka, whom she also convinced to join the conspiracy, forged medical records and smuggled wounded Polish officers out of the facility in order to save them from transport to an oflag (they rescued, among others, the chief physician of the 5th Heavy Artillery Regiment, Capt Jan Sojka). She also conducted a self-help action for the most affected families of members

of the organisation, and, additionally, created the structure

of the underground medical unit. At the same time, from 1 February to 1 September 1940, Kryszkiewicz completed the second part of her post-graduate internship at Branch 3B of Internal Diseases of the Infant Jesus Hospital in Warsaw. Her closest ones: husband Lt Hilary Kryszkiewicz, sisters Zofia Orlicka and Anna Grzelińska and her sister-in-law Maria Buchwald (who at that time worked in the famous café U Aktorek) were also very much involved in the underground movement. In October 1940, the Gestapo arrested Kryszkiewicz's sister Anna and placed her in the notorious Pawiak prison. In order to avoid detention, Aleksandra immediately left Warsaw and settled in the village of Jakubów-Czarnocin in the Piotrków Poviát, where she used a false name of Magdalena Piotrowska. Meanwhile, her second sister, Zofia Orlicka, was part of the ZWZ counterintelligence unit, whose aim was to work out the Pawiak management, get in touch with the prisoners and create the possibility of releasing the detainees. In the spring of 1942, Anna Grzelińska was successfully freed, which made Kryszkiewicz feel safer. She then decided to return to her real name and register in the then Medical Chamber of the General Government (*Gesundheitskammer in Generalgouvernement*). On 10 March 1942, she submitted an appropriate application together with a written Substitute Statement in Lieu of Oath forced on Polish doctors, in which she had to state: "(...) I am of purely Aryan descent, i.e. there was not a single Jew between my four ancestors on my father and mother's side (...)" She was officially admitted to the Medical Chamber in Warsaw on 15 April 1942, and received her Ausweis No. 7835 and ration stamps for soap and spirit. In June 1942, she became district doctor and Head of the Health Centre in Parzniewice in the Piotrków Poviát, and at the same time was involved in the operations of the Home Army. A few months later, the Gestapo arrested her sister Zofia Orlicka and her husband Hilary Kryszkiewicz. They were both taken to the Pawiak prison, and then, at the beginning of 1943, they were transported to the German Majdanek concentration camp. This terrible blow did not break the brave doctor however, as she immediately made efforts to free her sister and husband through underground contacts, at the same time taking care to send food parcels to the camp. On 17 September 1943 Zofia Orlicka was released, but unfortunately, Home Army Lieutenant Hilary Kryszkiewicz was murdered by the Germans, probably in March 1943, because in April no more food parcels were accepted for him (he was only found dead by the Municipal Court in Warsaw in 1948).

The tragic events seriously impaired Kryszkiewicz's health, and she resigned from work in Parzniewice to

apply on 23 November 1943 to the Medical Chamber for permission to return to Warsaw due to the need of undergoing treatment in the Warsaw hospital. A few months of rest helped her regain psychophysical health so that she could return to work and re-engage in underground work in the Home Army. Her whole family: her sisters and sister-in-law with her husband, fully participated in the resistance all along, despite the atrocious experiences.

In February 1944, she moved to Osieck, Garwolin Poviát, where she ran a private medical practice. Perhaps her move was connected with the preparations for the uprising, in which she could not take an active part due to her bad health. One can only guess what she felt in August and September 1944, when at night she saw the glows over the capital and was aware of the fact that her loved ones were participating in fights in Warsaw (Zofia Orlicka in the Field Hospital of the Gurt Home Army Group at Złota Street, while Maria Buchwald in the Bartkiewicz Group) [4-5, 9-13].

In the First Polish Army

After liberation from the German occupation, Kryszkiewicz was still in Garwolin, and on 1 December 1944 she was mobilised by the local District Draft Office into the First Polish Army, initially as a physician without a rank. On 22 December 1944, she was promoted to lieutenant. She became Head of Branch of the 16th Field Mobile Surgical Hospital commanded by Capt Józef Sagajtis MD. The unit had 100 beds in two branches at its disposal, while the personnel consisted of 12 officers, 16 non-commissioned officers and 34 privates. In January 1945, during the Warsaw operation, the hospital, together with other health care facilities of the First Polish Army, was stationed on the right bank of the Vistula River in the Anin-Rembertów area. After the seizing of Warsaw by the Soviet army, the 16th Field Mobile Surgical Hospital covered the march of the troops towards the Pomeranian Wall. At the beginning of February 1945, during the fights on the Pomeranian Wall, she was stationed in Inowrocław, and then moved to Wałcz. At that time, the unit served as a general surgical hospital, which meant that it had to deal with a heavy workload. Suffice it to say that at the beginning of March 1945 there were over 5,000 patients in all the hospitals of the First Polish Army, who recuperated only thanks to the great dedication and commitment of the health care workers, including Lt A. Kryszkiewicz MD. The greatest combat success of the personnel of the 16th Field Mobile Surgical Hospital was the participation in providing medical aid in the Battle of Kołobrzeg. During this famous battle, the unit was initially stationed in Złotów, but on 15 March 1945 it moved to Gościna to provide direct support for the sanitary staff of



Figure 3. Building of former City Hospital in Sobótka as seen from Świętej Anny Avenue, currently 3rd Poviast School Complex in Sobótka, Sobótka, 2015 (photo by Z. Kopociński)

Rycina 3. Budynek dawnego Szpitala Miejskiego w Sobótce od strony alei Świętej Anny, obecnie Powiatowy Zespół Szkół nr 3 w Sobótce, Sobótka, 2015 (fot. Z. Kopociński)

the 3rd, 4th and 6th Infantry Divisions, which stormed the German Festung Kolberg. The unit served there as a first-line hospital, receiving wounded not only from the Divisional Medical Points, but also from the Regimental Medical Points and units supporting the fights.

The fact that work in the military health service of the First Polish Army was connected with great danger and risk of losing one's life while helping injured soldiers is perfectly evidenced by the fact that in the period from 1 July 1944 to 10 May 1945 as many as 239 health care workers were killed, 93 disappeared without trace, and 596 were injured (incomplete data). Despite being aware of the great danger, Polish doctors, nurses, paramedics and stretchers provided help to all those in need, taking care even of injured Germans, thus preserving the most chivalrous traditions of the Polish military health service. This remarkable group of people also included Lt A. Kryszkiewicz MD, who took part in one of the most bloody and fierce fights, that is the Battle of Kołobrzeg.

After the end of the Second World War, the mobilised doctors were not immediately discharged, as the military health service, similarly to the civilian one, faced a huge shortage of qualified medical personnel. In September 1945, Lt A. Kryszkiewicz left her home unit and assumed the function of Head of Branch of the Central Hospital of the Internal Security Corps (KBW) in Warsaw. In the opinion of Head of the HR Department of the Internal Security Corps, Lt Col Niewiadomski, she performed her duties well. Kryszkiewicz was demobilised on 10 March 1946 on the basis of the Military Medical Commission's Decision No 819 of 22 February 1946 [4, 14, 15].



Figure 4. Main entrance to former City Hospital in Sobótka from Świętego Jakuba Street (formerly 28 Armii Czerwonej Street), Sobótka, 2015 (photo by Z. Kopociński)

Rycina 4. Wejście główne do budynku dawnego Szpitala Miejskiego w Sobótce od strony ulicy Świętego Jakuba (dawniej Armii Czerwonej 28), Sobótka, 2015 (fot. Z. Kopociński)

Sobótka – creation and development of a Polish health care system in the first years after 1945

Following the discharge from military service, A. Kryszkiewicz had to decide where to start the next stage of her life, already in the context of the new political system. In Warsaw, completely ruined as a result of the insurgent fights and then deliberate destruction by the occupant, there were terrible existential conditions, so returning to the former apartment at 68 Przybyszewskiego Street or 2/6 Belgianska Street seemed rather unrealistic. At the same time, there was a growing danger connected with the possibility that Kryszkiewicz's participation in the Home Army might come to light, which was an extremely incriminating circumstance in Stalinist times, and combined with the fact that she had family in the West (Maria Buchwald,

after the uprising, was deported to Stalag X B Sandbostel; she remained in exile) could lead to her being arrested. All these factors contributed to her decision to leave for the so-called Recovered Territories. At that time, in her personal survey, she stated that there were three people in her care: Tadeusz Kryszkiewicz (born 1922, medical student), Serafin Broniarczyk (born 1922, medical student) and Henryka Robak (born 1932, student); both men were made medical doctors in 1952. It is difficult to say why she chose Sobótka. Perhaps it was due to the fact that another officer, a Home Army soldier from Warsaw, Capt Waclaw Żebrowski MD, PhD (1894-1946), whom she might have contacted or known before, was already staying there, and it was he who might have encouraged her to settle down at the foot of the Ślęza Mountain. She came to the city on 25 July 1946, and started working in the City Hospital on 1 August 1946, of which she informed the Medical Chamber in Warsaw.

As a result of warfare, the facility located at 28 Armii Czerwonej Street was heavily damaged (75%), the most basic equipment and medicines were absent. The burden of running this ruined facility was carried by former military physicians accustomed to working in extreme conditions. At that time, the city resembled the Tower of Babel, with people of different nationalities (Poles, Germans, Russians, Ukrainians) living next to each other, often burdened with very painful memories of a barely finished war, full of mutual resentment and regret. The people who were expatriated here from the eastern borderlands remembered the cruel genocide committed by the Ukrainians from the south-eastern provinces of Poland, so the situation was very tense. The Poles, after six years of German occupation, roundups, torture and mass executions, hated the Germans for everything that had been done to their lives. There was a threat of retaliation, sometimes against innocent people.

The hospital staff was also initially of mixed nationality (Polish and German), but the organisational talent, life experience and ethical principles represented by Polish doctors ensured seamless cooperation. Medical assistance was provided on the same principles to the Poles and the Germans. This should be particularly emphasised, as we must remember that A. Kryszkiewicz's husband was murdered by the Germans in the Majdanek camp. Nevertheless, the doctor never refused to help a German patient, although in the initial period it probably cost her a lot.

The organism of Capt W. Żebrowski MD, PhD, exhausted by the dramatic war experience, could not withstand the hardships – the excellent doctor died on 29 November 1946. A. Kryszkiewicz became the chief architect of the construction of Polish health services in Sobótka, and took over as manager of the City Hospital. The facility had 55 beds in four branches: the Internal

Branch, the Branch and the Isolation Branch. The major issues of that time included infectious diseases (dysentery, tuberculosis, typhoid fever, epidemic typhus, etc.), whose spread was facilitated by both a low level of hygiene (lack of cleaning products, new clothes, underwear, etc.) and exhaustion of organisms associated with the Second World War period (hunger, physical and mental damage, imprisonment, etc.). As the process of reconstruction of the city and the whole region progressed, the number of large enterprises that required the presence of an industrial doctor increased. Due to the great shortage of physicians, A. Kryszkiewicz had to spend some of her time providing medical care to the local institutions. In February 1947 she became an on-site physician of the Magnesite Mine in Sobótka, since May 1948 of the Skaleń Plant in Strzeblów, and three months later a plant physician of the Preventorium against Tuberculosis for Sugar Industry Children in Sulistrowiczki. The workload was therefore considerable and it is really difficult to imagine the development of Polish health care in the early post-war period in the Sobótka region without Aleksandra Kryszkiewicz. In May 1949, the City Hospital was transformed into a Health Centre, headed by the former manager of the hospital. At the same time, the Intercompany Mother and Childcare Station was established in Strzeblów, and the irreplaceable A. Kryszkiewicz was appointed its head.

In 1951, when social life had become more stable and the effects of the reconstruction of Warsaw became clearly visible, the doctor decided to return to her family. In the following years she found herself in Ursus and worked in civil healthcare institutions.

Lt Aleksandra Kryszkiewicz MD, a soldier of the Home Army and the First Polish Army, a participant in the fights for Kołobrzeg, died on 11 July 1991. She was buried at the Powązki Cemetery in Warsaw in the grave of the Grzeźliński and Kryszkiewicz family [1, 3, 4, 16].

Summary

Aleksandra Kryszkiewicz was born as a subject of Tsar Nicholas II Romanov (1868-1918). During her childhood, she survived the nightmare of World War I and the war of 1920. The period of her adolescence and education took place already in independent Poland. As a person deeply attached to the principles of democracy and social justice, she had a very critical attitude towards the Sanation authorities, but at the same time also a great sense of patriotism and responsibility for the fate of her country. During the German occupation, she risked her life together with her family in the ranks of the Home Army to fight for the independence of Poland – a cause for which her husband paid with his life and her sisters with imprisonment. Regardless of the danger, she saved the

lives of Polish soldiers wounded in the battle for Kołobrzeg in the field hospital of the First Polish Army. During the most difficult period of several post-war years, she was a pillar of the creation and development of the Polish health service in Sobótka. A slim and petite woman (160 cm tall) though she was, she had a great fighting spirit and personal courage, hardened in the most difficult conditions of war and occupation, and managed to survive personal tragedies without losing her professional vocation, always driven by the will to help people in need. After more than 70 years, almost no one in Sobótka knows her name or mentions her contribution to the development of this beautiful town, although she certainly left some part of her heart and soul here. Undoubtedly, it is necessary to restore the collective memory of Lt Aleksandra Kryszkiewicz MD, manager of the City Hospital in Sobótka.

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Life of Lt Col Leon Bogusław Garliński MD, PhD, as an illustration of the fate of Polish military medical personnel during war

Życie ppłk. dr. Leona Bogusława Garlińskiego jako ilustracja wojennych losów pracowników polskiej wojskowej służby zdrowia

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Abstract. Captain Leon Bogusław Garliński (1900-1989) was a dermatologist who was the last head of the Skin and Venereal Department of the 3rd Regional Hospital in Grodno, and one of the few doctors of this institution who managed to survive World War II. He was born on 1 April 1900 in Ostrołęka to Józef and Antonina Garliński. In the years 1923-1929, as a cadet of the Sanitary Cadet School, he studied at the Faculty of Medicine at the University of Warsaw. In 1930, he graduated from the University of Warsaw. In the interwar period, he served as a military doctor in the 80th Nowogródek Rifle Regiment in Słonim, the 21st Light Artillery Regiment in Oświęcim, and the 6th Light Artillery Regiment in Kraków. The crowning achievement of his military career was his appointment as the head of the Skin and Venereal Department of the 3rd Regional Hospital in Grodno in 1938. During the September Campaign of 1939, he was a physician with the 76th Lida Infantry Regiment and took part in fighting at Sulejów and Piotrków Trybunalski. After World War II, he was the head of the Skin and Venereal Department of the 3rd Regional Military Hospital in Kraków. He died on 29 January 1989 in Kraków. His biography reflects the fate of many Polish physicians who survived World War II and the German occupation.

Keywords: 3rd Regional Hospital, dermatologist, Grodno, Leon Garliński, military physician, Sanitary Cadet School

Streszczenie. Kapitan Leon Bogusław Garliński (1900-1989), dermatolog, który był ostatnim szefem oddziału skórno-wenerycznego 3. Szpitala Okręgowego w Grodnie i jednym z nielicznych lekarzy tej placówki, któremu udało się przeżyć II wojnę światową, urodził się 1 kwietnia 1900 r. w Ostrołęce, w rodzinie Józefa i Antoniny Garlińskich. W latach 1923-1929 jako podchorąży Szkoły Podchorążych Sanitarnych studiował na Wydziale Lekarskim Uniwersytetu Warszawskiego. Dyplom lekarza uzyskał w 1930 r. na Uniwersytecie Warszawskim. W okresie międzywojennym służył jako lekarz wojskowy w 80. Pułku Strzelców Nowogródzkich w Słonimiu, 21. Pułku Artylerii Lekkiej w Oświęcimiu i 6. Pułku Artylerii Lekkiej w Krakowie. Ukoronowaniem jego kariery wojskowej było objęcie w 1938 r. szefostwa oddziału skórno-wenerycznego 3. Szpitala Okręgowego w Grodnie. W czasie wojny obronnej 1939 r. był lekarzem 76. Lidzkiego Pułku Piechoty, z którym brał udział w walkach pod Sulejowem i Piotrkowem Trybunalskim. Po zakończeniu II wojny światowej pełnił funkcję kierownika oddziału skórno-wenerycznego Okręgowego Szpitala Wojskowego nr 3 w Krakowie. Zmarł 29 stycznia 1989 r. w Krakowie. Jego biografia jest odzwierciedleniem losu wielu polskich lekarzy, którzy przeżyli czas ostatniej wojny i okupacji.

Słowa kluczowe: Leon Garliński, lekarz wojskowy, dermatolog, 3. Szpital Okręgowy, Grodno, Szkoła Podchorążych Sanitarnych

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Introduction

The year 2019 marked the 80th anniversary of the outbreak of World War II, a conflict which turned almost the whole of Europe into ruins and destroyed millions of lives. For Poland, the first country to face the German and then the Soviet aggressor (to a lesser extent, proportionally to the forces of the assailant, also the Slovak one), it also meant losing sovereignty and a large part of the territory for many years to come. As a result of this conflict, the Second Republic of Poland was deprived of its eastern borderlands with its numerous Polish military health care institutions. Despite the fact that these facilities were involved in the finest events of the contemporary history of Poland, owing to the fact that the true information about those times are consistently erased from textbooks, for many years, the current generation of Poles, and especially young physicians, know very little about it.

The 3rd Regional Hospital in Grodno, which took an active part in the heroic defence of the city against the Soviet invader from 20 to 22 September 1939, was undoubtedly one of the most fascinating institutions. The facility was closed down by the occupant and the majority of its medical staff murdered. One of the few physicians who managed to survive the World War II hecatomb thanks to numerous lucky coincidences was Capt. Leon Bogusław Garliński MD, PhD, Head of the Skin and Venereal Department.

On the path to officer rank insignia and a medical diploma

Leon Bogusław Garliński (Fig. 2) was born on 1 April 1900 in Ostrołęka, Białystok Province, to the family of Józef and Antonina Garliński. He was the youngest of three sons, and his brothers Józef and Henryk, several years older than him, were probably his role models. The parents orphaned their children relatively quickly, the father – a barber-surgeon by profession – died in 1904 and the mother during the infectious diseases epidemic in 1918. Antonina Garlińska managed to raise her children well during this short time and instil in them a hunger for knowledge and intellectual development [1, 2]. The young Leon joined the State Tadeusz Kościuszko Secondary School for Boys in Łomża (formerly known as the Private Seven-Class School of Commerce, then the Eight-Class Secondary School for Boys), a school famous for its patriotic upbringing, from which he graduated in 1921. The First World War, followed by the war with the Bolshevik Russia in 1920, extended Garliński's education, who, like the majority of other students, joined the Polish Army and served his unfortunate homeland for nearly five months (several students of his school died during the struggle for independence). After graduation,



Figure 1. Lt Col Leon Bogusław Garliński MD, PhD (1900-1989), photograph taken in the uniform of a major, Kraków, first half of 1950s (courtesy of Andrzej Garliński)

Rycina 1. Pplk dr Leon Bogusław Garliński (1900-1989), fotografia w mundurze w stopniu majora, Kraków, I połowa lat 50. (dzięki uprzejmości Andrzeja Garlińskiego)

he took up legal studies at the University of Warsaw, during which he learned about the establishment of the Military Sanitary School (WSS) in Warsaw [3, 4]. This institution was founded in the autumn of 1922 and its aim was to train personnel for the military health service. Candidates in very good health (category A), under 24 years of age and, of course, holding a secondary school graduation certificate were accepted. All cadets were obliged to serve two years as professional officers of the Polish Army for each year of their studies. It was a very promising prospect, especially for the less well-off, because the army offered livelihood, accommodation and all the necessary educational materials free of charge. The studies were held at the Faculty of Medicine of the University of Warsaw, and military classes at the Military Sanitary School in the Ujazdowski Castle, as well as during firing-range drills and practice in regiments. Entering the Military Sanitary School was not easy, however; candidates who served in the army during the war of 1920 and were in a difficult financial situation were looked at and promoted more favourably.



Figure 2. Cadets of Military Sanitary School during training period at 7th Lublin Regiment of Uhlans. Cadet Leon Bogusław Garliński sits second from the left in the foreground, Mińsk Mazowiecki, 1924 (source: Englert JL, Domar Domaradzki A. *Szkola Podchorążych Sanitarnych 1922-1939*. London, 1997: 30.)

Rycina 2. Podchorążowie Wojskowej Szkoły Sanitarnej na praktyce w 7. Pułku Ułanów Lubelskich, na pierwszym planie drugi z lewej siedzi podchorąży Leon Bogusław Garliński, Mińsk Mazowiecki, 1924 (źródło: Englert JL, Domar Domaradzki A. *Szkola Podchorążych Sanitarnych 1922-1939*. Londyn, 1997: 30.)

Entrance exams passed with flying colours, and probably also the factors mentioned above, made it possible for Leon Garliński to become one of the 60 new cadets of the Military Sanitary School. On 1 August 1923, he was conscripted into the 2nd Company and with a recruit course he began his great adventure with the military health service. The barracks were located in the Ujazdowski Castle and the cadets occupied multi-bed rooms. During the academic year, they attended classes at the Faculty of Medicine of the University of Warsaw dressed in fine uniforms, and at the same time, at the school's headquarters, they took military classes and performed military service, which took up almost all of their time. Firing-range drills and regimental training were held in summer, and cadets were also given a short holiday leave [5, 6]. One great highlight of the rather mundane military life was the first summer training in the 7th Lublin Regiment of Uhlans in Mińsk Mazowiecki, during which Cadet Leon Garliński and his colleagues were given the opportunity to learn to ride a horse. The six

weeks of classes under the supervision of excellent cavalry NCOs, hours spent each day in the stables or on horseback and exercises with melee weapons made future physicians good riders and instilled a love for horse riding in the hearts of many of them (including Leon Garliński). A beautiful photograph showing cadets of the second commissioning together with their instructors from the 7th Regiment of Lublin Uhlans has been preserved. It is an excellent memento and documentation of this extraordinary time (Fig. 2.) [5, 7]. It should be noted that the authorities of the Military Sanitary School, who applied the adage 'healthy body, healthy mind', attached great importance to the development of the physical prowess of their students, and for this reason different sport disciplines were preferably chosen during training. In addition to horse riding, Leon Garliński's favourite field of physical activity was athletics – he was an 800-metre champion of the Officer Sanitary School (OSS, this was the name the Military Sanitary School adopted in 1924). He also fenced, owing to the fact that among his fellow

students was Franciszek Michał Amałowicz (1903-1975), an excellent fencer, multiple sabre fencing champion of the Polish Army, who wanted to enthuse all cadets with this wonderful sport. As we mention L. Garliński's accomplished schoolmates, attention must also be drawn to another later Home Army hero, Cyprian Sadowski "Skiba" (1902-1985), Chief Sanitary Officer of the Directorate of Diversion (Polish acronym: *Kedyw*) of the Home Army High Command.

In this noble company, after more than six years of arduous study and work, Leon Garliński graduated in 1929 from the Sanitary Cadets School (this was the name adopted by the Officer Sanitary School in 1928) and was promoted to the rank of second lieutenant with seniority of 1 October 1929. He received Diploma of a Doctor of All-Medical Sciences No. 2189 of the Faculty of Medicine of the University of Warsaw on 25 January 1930. In this way, the cadet stage of Garliński's life ended, and the newly appointed second lieutenant entered the career path of a military physician [3, 5-7].

Military health service during the interwar period

Between January 1930 and April 1931, 2Lt L. Garliński MD, PhD completed a postgraduate internship in Warsaw based in the Sanitary Training Centre (Ujazdowski Hospital) and the 1st Regional Hospital. He was then promoted to the rank of lieutenant with seniority of 1 January 1931 and transferred on 1 May 1931 to the 80th Nowogródek Rifle Regiment in Słonim to assume the position of a junior doctor of the unit. His direct superior was the chief physician of the regiment, Maj Filip Głowiński MD, PhD, and the mutual cooperation was quite successful. Garliński's duties included providing health care for the regiment's soldiers, its staff and military families, as well as serving in the local Garrison Infirmary. In recognition of his exemplary performance, he was promoted to the rank of captain with seniority of 1 January 1935, and then briefly (July-December 1935) served as a doctor of the 3rd Division of the 21st Light Artillery Regiment stationed in Oświęcim.

Leaving the borderland town of Słonim, of which he had grown fond over the years and where he had become quite familiar with the local life, was for him, on the one hand, an opportunity for further professional development, and, on the other, a sad farewell to his dear colleagues. As a token of friendship and respect for the former doctor, the officers of the regiment gave him a stunning signet ring bearing the symbol of the unit ('Cross of the 80th Infantry Regiment') and an engraved inscription: 'To Garliński Leon MD, PhD – Officers of the 80th Infantry Regiment', which has survived to this day and is one of the most valuable of family mementos.



Figure 3. Capt. Leon Bogusław Garliński MD, PhD with his wife Stanisława Jüttner, the Badge of the Sanitary Cadets School can be seen on the left pocket of Garliński's uniform, November 1936 (courtesy of Andrzej Garliński)

Rycina 3. Kpt. dr Leon Bogusław Garliński z żoną Stanisławą Jüttnerówną, na lewej kieszeni munduru Odznaka SPSan, listopad 1936 (dzięki uprzejmości Andrzeja Garlińskiego)

In December 1935, he took up the position of a physician at the 6th Light Artillery Regiment in Kraków, where he had the opportunity to return to his passion for horse riding. In his memoirs from that period, he often mentioned the 'vehicle' assigned to him, i.e. his favourite mare called Trąbka (Trumpet). During this period, the family situation of Capt. Leon Garliński MD, PhD had also stabilised – on 21 November 1936 he married Stanisława Jüttner, which is evidenced by a beautiful wedding photograph (Fig. 3.).

At the beginning of 1937, he was directed to Warsaw to acquire specialisation in skin and venereal diseases in the Sanitary Training Centre, 1st Regional Hospital and the Dermatology Clinic, which was the fulfilment of his professional dreams. It was probably one of the happiest

periods in the life of Leon Garliński – he could finally focus on his favourite medical field without carrying out other duties, and, what is more, his son Andrzej was born on 5 September 1937. At that time, the whole Garliński family lived in Żoliborz, Warsaw at 56/2 Śmiała Street.

He completed his specialisation programme in November 1938, and was thereafter directed to assume the position of Head of the Skin and Venereal Department of the 3rd Regional Hospital in Grodno. It was undoubtedly a promotion and an opportunity for further professional development, reaching the rank of major and becoming senior head of department. At the beginning of 1939, the Garliński family lived in a beautiful city on the Niemen River at 10/4 Rydza-Śmigłego Street [1-3]. The 3rd Regional Hospital, located in the beautiful New Castle in Grodno, was then one of the ten most important medical facilities of the military health service. The facility had a total of 400 beds in 7 departments: the Internal Department, the Surgical Department, the Gynaecological-Maternity Department, the Skin and Venereal Department, the Neuropathology Department, the Laryngeal Department and the Ophthalmic Department. It also had its summer branch unit, the Seasonal Military Hospital in Druskienniki (Druskininkai), very popular in Poland. The Skin and Venereal Department consisted of a hundred of beds and was one of the largest departments in the facility, alongside the Internal and Surgical Departments. The main health problems faced by L. Garliński at work were undoubtedly venereal diseases, especially syphilis and gonorrhoea. This was certainly the aftermath of the war, during which the number of venereal patients (rape, prostitution, low hygiene, low level of health education, etc.) increased rapidly, which remained a huge challenge for Polish dermatologists for many years after the end of the war. The bed occupancy rate of the Skin and Venereal Department of the 3rd Regional Hospital was about 60% in the 1930s, which shows that Garliński, being the only dermatologist, had his hands full of work. However, it was an opportunity for the freshly minted specialist to put theoretical knowledge into practice and acquire necessary experience. The end of this promising military and medical career was brought about by the aggressive policy of the Third Reich and the USSR [8-14].

War and occupation

As early as on 26 August 1939, Capt. L. Garliński MD, PhD was directed to a line unit, similarly as the majority of the staff of the 3rd Regional Hospital, and his duties in the hospital were taken over by gradually mobilised reserve officers. He became a physician of the 76th Lida Infantry Regiment assigned to the 29th Infantry Division of the Prusy Army, stationed in Grodno. During the defensive

war of 1939, he went through a trail of battles and destruction with this unit and took part in fights near Sulejów, Piotrków Trybunalski and Tomaszów Mazowiecki, in the course of which the regiment suffered huge losses (32 officers and 652 privates died only during the night of 5 to 6 September, including the regiment commander, Lt Col Stanisław Sienkiewicz [1895-1939]). The atrocities witnessed by Garliński at that time are illustrated by the account of a German officer, who stated: 'There are so many bodies of the killed Polish soldiers that even the veterans of World War I say they have not seen or have rarely seen anything like this.' On 8 September 1939, near Radom, Garliński was taken prisoner by the Germans. As a physician, he was referred to the service of the Hospital for Polish POWs, which was initially located in the buildings of the Benedictine Sisters' Order at 1 Malczewskiego Street in Radom, and then moved to the premises of the Maria Konopnicka Secondary School for Girls at 41 Żeromskiego Street. This facility, which functioned until May 1940, was managed by Lt Col Tadeusz Bętkowski (1889-1966), a superb surgeon from the 7th Regional Hospital in Poznań. The institution treated 100-500 seriously wounded Polish soldiers [3, 15-18].

While L. Garliński was already in captivity, his family in Grodno witnessed the town's heroic defence against the Red Army from 20 to 22 September 1939. The Soviet assault began on 20 September around 8 a.m. with an attack of tanks of the reconnaissance squadron the 27th Armoured Brigade from the left bank of the Niemen River, via a road bridge and then in the direction of the centre. The area defended by the Poles encompassed Rydza-Śmigłego Street, where the Garliński family lived, which means that they probably saw Polish scouts stopping Soviet tanks in the nearby Orzeszkowej Street with petrol bottles and grenades. Despite the enormous advantage of the Soviet forces (16th Rifle Corps, 6th Cavalry Corps, 27th Armoured Brigade), the ad hoc defence organised by Deputy Mayor Roman Sawicki and the local District Draft Office Commander Maj Benedykt Serafin, consisting mainly of volunteers and young people, effectively stopped the Red Army units for two long days. During the fighting, the defenders destroyed several armoured vehicles and killed or wounded about 200 Red Army men.

The personnel of the 3rd Regional Hospital in Grodno exhibited particularly humanitarian behaviour by attending to the wounded from both sides, thus preserving the most chivalrous traditions of the military health service. Garliński's colleagues also tried, unfortunately unsuccessfully, to save the life of 13-year-old Tadzio Jasiński, who was captured by the Soviets and used as a human shield on the tank turret, where he received 5 wounds from rifle bullets.

Immediately after the capture of the city, the Soviets shot approx. 300 defenders, including teenage boys. The captured officers were sent to POW camps run by the NKVD. Most of the personnel of the 3rd Regional Hospital did not survive the Second World War. The majority were victims of the Katyń Massacre, which took the lives of the commander of the facility and a few senior heads of department, and some were killed by the Germans. It can be concluded without a doubt that L. Garliński was saved from the fate of other Grodno doctors, who eventually ended up in a mass grave of NKVD victims in Katyń, Kharkiv-Piatykhvatky or other places of massacre, because he was assigned to a unit sent to the front [19-24].

However, the Soviet repression was not limited to officers. Already at the beginning of 1940, the Soviets started deporting Polish civilians deep into the USSR, firstly the families of the officers of the Polish Army, the Border Protection Corps and the State Police. Stanisława Garlińska, who was staying with her son in Grodno, was warned by her Belarusian neighbours, very decent people, about the planned deportation. They helped her and her son leave Grodno in secret and slip across the border to enter the area of the then General Government, Polish lands occupied by the Third Reich, where she found shelter with her relatives in Oświęcim. Capt. L. Garliński MD, PhD, who was in captivity at that time, had no information about the events in Grodno and did not know whether or not his family was safe. The hospital for Polish POWs in Radom was not very well guarded. As the prisoners were recovering, part of the medical staff, who did not want to stay in captivity for longer, made the decision to escape with the full consent of the Polish commandant, which was a common phenomenon in such facilities.

In October 1939, L. Garliński managed to escape from captivity and ended up in Warsaw, where he temporarily worked in the Ujazdowski Hospital. At the beginning of 1940, he found his family in Oświęcim, but was also unable to stay there permanently due to the immediate threat of arrest. With the help of a classmate from the Sanitary Cadets School, Capt. Stanisław Kostarczyk MD, PhD (1904-1976), an active member of the Polish Red Cross and later a Home Army soldier, Garliński managed to find a safe haven in Kraków. There, from 20 June 1940 to 27 January 1942, he worked at a Red Cross medical point, at the same time served as a regional doctor in the Municipal Council from July 1941 to May 1945, and was a factory doctor in the Continental Society from June 1942 to May 1945. The nature of his job guaranteed him and his family relatively safe living conditions, he did not participate in the underground movement, although it cannot be excluded that he helped his classmate Stanisław Kostarczyk "Antoni", who was involved in the Home Army. In this way, although he was a professional

officer of the Polish Army, he managed to survive the German occupation [1, 3].

After the war

As a result of the disgraceful treaties in Yalta and Potsdam, the 'great allies' of Poland, the USA and Great Britain, violating the principles of the Atlantic Charter and alliance agreements with the Republic of Poland, handed the country over to Stalin and agreed to the annexation of its Eastern Borderlands of the Second Republic by the USSR. The city of Grodno and its 3rd Regional Hospital, the last workplace of L. Garliński, were no longer located within Polish borders, so the former Grodno dermatologist had to arrange his life in a new setting. It should be noted that during the Second World War thousands of health care workers lost their lives and were killed by all occupants, which resulted in a huge shortage of trained medical personnel after the liberation. The shortage of specialists was also observed both in the civil and the military health service. It is, therefore, no coincidence that as early as on 1 June 1945, Capt. L. Garliński MD, PhD was reappointed to the Polish Army and designated as Head of the Skin and Venereal Department in the then 3rd Regional Military Hospital in Kraków (currently 5th Brig. Gen. Prof. Marian Garlicki Military Clinical Hospital with Polyclinic); his classmate from the Sanitary Cadets School, Capt. S. Kostarczyk MD, PhD was Senior Head of the Surgical Department there. Garliński was the one who organised the department and managed it until 17 February 1949, with a break of several months between July and December 1946, during which he ran the Skin and Venereal Department in the Garrison Hospital in Rzeszów. He was promoted in October 1945 to the rank of major, thereby finally fulfilling the intentions of the Commander of 3rd Regional Hospital in Grodno, Lt Col Dionizy Krechowicz (1896-1940), who unfortunately did not live to see this moment. The crowning achievement of L. Garliński's military and medical career was assuming the function of Head of the Health Service Department of a Provincial Command in 1949, and later of a Group (Kraków, Kielce and Rzeszów districts) of the Służba Polsce General Organisation, which was connected with his promotion to the rank of lieutenant colonel on 30 April 1951. There were several former Sanitary Cadets School students working in this institution, and the Head of the Health Service was Col Kazimierz Płoński MD, PhD (1901-1970), a graduate of the first commissioning of the Sanitary Cadets School. It is, therefore, clear that the friendships from the period of the 'Ujazdowska Republic' were long-lasting and helpful in many practical matters. It can be assumed that this departure from the typical military health service was what kept him safe during the most tragic period of Stalinist terror, when many officers



Figure 4. The 3rd Regional Military Hospital in Kraków, first from the left is Capt. Leon Bogusław Garliński MD, PhD, Kraków, 1945 (archives of 5th Military Clinical Hospital with Polyclinic)

Rycina 4. Okręgowy Szpital Wojskowy nr 3 w Krakowie, pierwszy z lewej kpt. dr Leon Bogusław Garliński, Kraków, 1945 (Archiwum 5. WSKzP)

from the Second Republic of Poland were arrested and even murdered by the then security authorities. He retired to reserve forces at his own request, on 1 April 1954, thus celebrating his 54th birthday. In his civilian life, he remained professionally active and worked as a venereologist at the Provincial Dermatology Clinic in Kraków, he was a consultant at the local Railway Hospital, and since 1959 also ran a private medical practice. Full of life until the very end, as his son Andrzej recalls, he could still perform a single-leg squat despite his old age.

Lt Col Leon Bogusław Garliński MD, PhD, Head of the Skin and Venereal Department of the 3rd Regional Hospital in Grodno and the 3rd Regional Military Hospital in Kraków, defender of Poland in 1920 and 1939, died on 29 January 1989 in Kraków. The funeral service took place on 2 February 1989 in the Church of the Holy Cross in Kraków. The body was then transported to Oświęcim and placed in the family tomb.

For his devoted service and work he was awarded a Knight's Cross of the Order of Polonia Restituta, a Silver Cross of Merit, a Medal of Independence, a Memorial

Medal for the 1918-1921 War and a Medal of Victory and Freedom, among others.

The family tradition of joining the medical profession has been continued by Leon Garliński's son, Andrzej Garliński MD, PhD, a graduate of the Medical Academy in Kraków and a valued gynaecologist and obstetrician, who was the joy of his father's life and a source of great pride [1, 26].

Conclusions

The tragic history of Poland in the twentieth century had a great influence on the course of L. Garliński's life. Born in the Russian Partition as a subject of Tsar Nicholas Romanov, Garliński lost his mother in connection with World War I, which caused a great epidemic of infectious diseases on the eastern borders. The armed conflict, although anticipated with hope by many Poles dreaming of regaining independence, brought negative consequences too, which in the case of the Garliński family meant a private tragedy. A spell of less than twenty years of stabilisation and normal professional progress in the interwar period was interrupted by another, even

more cruel and bloody war, which resulted in a halt in Garliński's career and for several years inspired a sense of permanent threat. Surprisingly, joining the 76th Lida Infantry Regiment and leaving the 3rd Regional Hospital in Grodno in August 1939 proved to be a stroke of luck for Garliński, as owing to this he was one of the few medical professionals of this institution who managed to survive the Second World War. Orphaned in his youth, he tried to create safe conditions of survival for himself and his family at any cost, which was probably the reason for the decision not to engage in the underground movement. It should be stressed, however, that his will to survive was never a reason for neglecting official duties, which is proved by Garliński's attitude during the bloodiest struggle of his regiment in September 1939. He was not a hero material, he did not perform spectacular deeds on the battlefield nor was he decorated with the highest combat decorations. However, despite great pressure and probably fear, he never misappropriated the principles of the code of medical ethics and tried to help all patients in the most appropriate way, regardless of the circumstances. His life may be partly a reflection of the fate of many 'ordinary' physicians, who were given a formidable task during the time of war and occupation and who delivered brilliantly.

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