# LEKARZ WOJSKOWY

MILITARY PHYSICIAN

2024

NR 2 VOL. 102

ISSN 0024-0745




WOJSKOWY INSTYTUT MEDYCZNY
PAŃSTWOWY INSTYTUT BADAWCZY

# Informacje dla autorów

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„Lekarz Wojskowy" jest czasopismem ukazującym się nieprzerwanie od 1920 r., obecnie jako kwartalnik wydawany przez Wojskowy Instytut Medyczny w Warszawie.

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   Książki:
   Rudzki E. Alergia na leki: z uwzględnieniem odczynów anafilaktycznych i idiosynkrazji. Lublin, Wydawnictwo Czelej, 2002

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   Journal articles:
   Calpin C, Macarthur C, Stephens D, et al. Effectiveness of prophylactic inhaled steroids in childhood asthma: a systemic review of the literature. J Allergy Clin Immunol, 1997; 100: 452–457 . doi: 10.1016/s0091-6749(97)70134-9

   Books:
   Rudzki E. Alergia na leki: z uwzględnieniem odczynów anafilaktycznych i idiosynkrazji. Lublin, Wydawnictwo Czelej, 2002

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## Letter from the Editor-in-Chief

Dear Readers,

We are pleased to deliver another issue of “Military Physician”, the second this year, to you just in time for the summer holiday season, without the delays experienced with the previous issue due to a change in the publishing contractor. Thanks to organisational improvements, we are now able to provide you with both language versions of the journal – Polish and English – simultaneously.

The second quarter of the year marks the spring semester in academic life, filled with conferences and training sessions. For students, it is a period dedicated to preparing for the upcoming examination session. In this issue’s review papers section, we feature the first part of an article discussing the applications of thermography in medicine. Also deserving attention are original papers exploring future evacuation possibilities using unmanned aerial systems, as well as analyses of the healthcare needs of children from immigrant families escaping war-torn regions. The didactic part is complemented by interesting case reports on scar treatment in burn patients and a rare case of cancer of the nasal cavities and the frontal sinus region. Additionally, I recommend reading the report from the scientific conference “Role of Psychiatry in Neonatal and Early Childhood Disorders,” as well as the review of Anna Wacławik’s book “Doctors: Fight for Life,” which provides a compelling account of the wartime efforts of Polish civilian doctors on the front lines in Ukraine.

I wish you enjoyable reading, a pleasant summer break, and exciting new plans for the upcoming academic year.

*Prof. Bolesław Kalicki, MD, PhD*

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Military Physician – 20 points Ministry of Science and Education



"Military Physician" is partially financed by the Military Medical Chamber.

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## REPORT



## OTHER

# APPLICATION OF THERMOGRAPHY IN MEDICINE. PART I

## Zastosowanie termografii w medycynie. Część I

**Małgorzata Chochowska[1], Dagmara Porada[1], Krzysztof Rujna[1,2], Leszek Kubisz[2]**

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**Abstract**

Infrared thermography is an imaging technique that utilizes the distribution of infrared radiation emitted by an object. Any body with a temperature higher than 0 K emits electromagnetic radiation, the spectrum of which depends on its temperature and emissivity. A thermal imaging device (thermal imaging camera/infrared radiation detector) detects infrared radiation emitted by the examined body, based on thermal or quantum effects. The result of infrared thermography measurement is referred to as a thermogram, or thermal image, where different temperatures are represented in different colours or shades of grey. Infrared thermography can detect changes in the temperatures of different parts of the body. Increased warmth is usually associated with enhanced vascular perfusion and inflammation (autoimmune diseases, endocrine disorders, orthopedic injuries). At the same time, infrared thermography can also locate areas characterized by reduced blood flow. The first part of the article presents the basics of infrared thermography and describes the possibilities of its use in angiology, internal diseases, aesthetic and reconstructive surgery, dermatology, as well as physiotherapy and rehabilitation.

**Streszczenie**

Termografia to technika obrazowania wykorzystująca rozkład promieniowania cieplnego emitowanego przez dany obiekt. Każde ciało o temperaturze wyższej niż 0 K emituje promieniowanie elektromagnetyczne, którego widmo jest zależne od temperatury i zdolności emisyjnej. Urządzenie termowizyjne (tzw. kamera termowizyjna/detektor promieniowania cieplnego) wykrywa promieniowanie cieplne emitowane przez badane ciało w oparciu o efekty termiczne lub kwantowe. Wynikiem termografii jest termogram, czyli obraz termiczny, w którym różne temperatury są przedstawione w różnych kolorach lub odcieniach szarości. Termografia pozwala wykryć zmiany temperatur różnych części ciała. Zwiększone ucieplenie zwykle jest powiązane z nasiloną perfuzją naczyniową oraz stanem zapalnym (choroby autoimmunologiczne, zaburzenia hormonalne, urazy ortopedyczne). Jednocześnie termografia pozwala wykryć obszary cechujące się zmniejszonym przepływem krwi. W pierwszej części artykułu przedstawiono podstawy termografii oraz opisano możliwości jej wykorzystania w angiologii, chorobach wewnętrznych, chirurgii estetycznej i rekonstrukcyjnej, dermatologii oraz fizjoterapii i rehabilitacji.

**Keywords:** thermography, angiology, internal diseases, dermatology, physiotherapy and rehabilitation

**Słowa kluczowe:** termografia, angiologia, choroby wewnętrzne, dermatologia, fizjoterapia i rehabilitacja

**DOI** 10.53301/lw/175039

**Received:** 11.10.2023

**Accepted:** 09.11.2023

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## Introduction

Infrared thermography (IRT) is an imaging technique that utilizes the distribution of infrared radiation (IR) emitted by an object. Any body with a temperature greater than 0 kelvin (K) emits electromagnetic radiation, the spectrum of which depends on the temperature and its specific properties (emissivity). Bodies below 700°C emit radiation mainly in the infrared and microwave ranges [1, 2].

According to Stefan-Boltzmann law, the total amount of radiation generated by an object per unit area is directly related to its emissivity and the fourth power of its absolute temperature. Thus, when the emissivity and the total amount of radiation emitted by an object are known, its temperature can be estimated, which is used in IRT.

A thermal imaging device (the so-called thermal camera/IR detector) detects thermal radiation emitted by the investigated body based on thermal or quantum effects. ITR result is presented in the form of a thermogram, or thermal image, where different temperatures are represented by different colours or shades of grey [2]. Modern thermographs designed to radiometrically (quantitatively) reproduce the temperature fields of investigated objects operate in the 2–5 micrometre (μm) (medium-wave infrared, MWIR) or 8–12 μm (long-wave infrared, LWIR) bands. The sensor in a thermal camera can be made of different materials. Microbolometer matrices, consisting of hundreds of thousands of pixels, capture IR and transmit the signal to a processor, which converts the signal into a thermogram. Cooled matrices, on the other hand, use nitrogen or helium cooling systems, which allows for higher sensitivity and resolution [3]. The thermal camera must be properly calibrated so that the image displayed reflects the actual temperatures. Additionally, it is worth following the principles of image optimisation and considering factors that may affect the final temperature range readout. A calibration source with a known temperature (reference) is used for this purpose. Lens, which allows for focusing the IR on the detectors, is also an important component of a thermal camera. Thermal lenses are made of materials that are permeable to IR, such as germanium, silica or polyamide [4].

## Aim

The aim of this study was to present the current state of knowledge on the applicability of thermography in various medical departments.

## Review methods

Polish, German and English-language articles ($n$ = 86) from PubMed and Google Scholar electronic databases, all with abstracts in English, were included in the review. The following keywords were used as search criteria: thermography, followed by thermography in combination with: *angiology*, *internal medicine*, *aesthetic surgery*, *reconstructive surgery*, *dermatology*, *physiotherapy*, *rehabilitation*, *gynaecology*, *obstetrics*, *cardiology*, *cardiac surgery*, *oncology*, *orthopaedics*, *paediatrics*, *rheumatology*, *dentistry*, *urology*.

## Medical applications of thermography

The link between raised human body temperature and disease has been known since the dawn of medicine (Hippocrates devoted much space to fever and classified it as malignant, mild and acute) [1]. The first simple instrument for assessing temperature ("thermoscope") was built by Galileo Galilei in 1595. Later, in 1871, Wunderlich constructed a clinical thermometer and postulated that body temperature should be measured in every patient.

The history of IRT dates back to Herschel (detection of IR and obtaining a thermal image of solar radiation - a "thermogram"). In 1959, IRT was first used in medicine to assess the increased heat of arthritic joints (the "Pyroskan" device, developed in 1942, and its successor "Pyroskan Mark2"). It took 3–4 minutes to obtain each thermogram, and its interpretation was highly challenging. Further improvements in imaging conditions allowed for obtaining better-quality thermograms, which are now a valuable complement to other imaging studies (US, MRI, CT) [1].

IRT detects temperature changes in various parts of the human body. A local rise in temperature is usually associated with increased vascular perfusion and inflammation [2]. This may be seen in autoimmune and endocrine disorders accompanied by thermoregulatory disorders (e.g., thyroid diseases), as well as in orthopaedic injuries (fractures and sprains, muscle and tendon injuries), in which case temperature changes near the site of the injury are a prognostic factor in determining its severity and further development or the healing process [5]. IRT can also detect areas characterized by reduced blood flow (e.g., renal flow in patients with diabetes or heart disease [6, 7]). For this reason, IRT is used as a diagnostic tool (currently as an additional/supplementary tool) in many fields of medicine, the most important of which are presented below.

## Thermography in angiology

In angiology, IRT has a high potential for use in screening for carotid artery stenosis (since the skin surface temperature is higher in healthy subjects and lower in patients with stenosis) [8]. Active dynamic thermography (ADT), during which a slower return of normal temperature on the stenotic side is recorded after an external cold stimulus, is also used for this purpose [9].

IRT is also highly effective in assessing vascular function after allografts (e.g. limbs), monitoring the effectiveness of revascularisation in patients with diabetes or peripheral artery disease [10], imaging peripheral vascular malformations (PVM) and assessing their progression, detecting abdominal aortic aneurysms (earlier than other techniques) by assessing the increase in temperature on the abdominal skin during the systolic phase compared to a healthy aorta [11], as well as in predicting the stage of venous ulcer (a complication of chronic venous disease of the lower extremities), where non-healing wounds with poorer prognosis show a greater temperature difference compared to normal skin than shallow, healing ulcers [12].

## Thermography in internal medicine

IRT is increasingly used to quickly and conveniently detect fever and thus possible infections. A breakthrough in such use of this method occurred during the COVID-19

pandemic, when it became necessary to maximize non-contact diagnosis. Combining thermography with advanced algorithms may allow for simple, non-invasive, automated and non-contact real-time monitoring of vital signs (skin temperature and respiratory rate) in ICU patients; however, it is burdened with an absolute error, which may generate false results [13].

IRT is also used to:

- assess treatment efficacy in the form of reduced local inflammation in viral and bacterial infections (by detecting a decrease in temperature) [14];
- monitor temperature in patients with hyperthyroidism or hypothyroidism to assess treatment efficacy and the metabolic activity of brown adipose tissue (responsible for heat production) [15];
- confirm and automatically classify allergic reactions (which reduces the risk of physician's subjectivity when making a diagnosis) [16];
- assess neural function in neuropathic pain (resulting from altered microcirculatory flow) [17];
- detect and control diabetic complications: retinopathy, vascular disorders in the diabetic foot, polyneuropathy [18, 19] and hypoglycaemia in patients with type 1 diabetes mellitus (a drop in skin temperature) [20].

Thermography also offers hope for an accurate diagnosis (as an imaging modality) of metabolic syndrome (inflammation of adipose tissue is detected by the camera and presented on the monitor in the form of a higher temperature compared to healthy individuals) and monitoring of treatment efficacy [21].

**Thermography in aesthetic and reconstructive surgery**

IRT is used in aesthetic surgery to map the course of skin perforators during preparation for surgery (usually on the anterolateral thigh and abdominal wall) [22]. This increases surgical safety and contributes to the final outcome, which is crucial in this specialty, especially in breast reconstruction [23].

**Thermography in dermatology**

Dermatology represents one of the key medical fields that make use of IRT. Thermography helps effectively diagnose, classify and treat many skin diseases [24], including:

- frontal fibrosing alopecia (FFA), by detecting inflammation and quick implementation of pharmacotherapy [25];
- acne inversa, hidradenitis suppurativa [26];
- decubitus ulcers (lower temperature at the edge of the wound compared to its centre or the surrounding skin indicates better healing prognosis) [27].

IRT also offers the possibility of detecting fungal infections in patients with subungual hyperkeratosis (the temperature of the affected toes is lower than that of healthy toes) [28], and obtaining a complete picture of herpes zoster skin lesions, which allows for the implementation of appropriate treatment (or its intensification) and minimization of the risk of complications [29].

**Thermography in physiotherapy and rehabilitation**

In physiotherapy, IRT is used to control the patient's body temperature when applying thermal stimuli (e.g., high-energy laser therapy, microwave therapy and electrotherapy) [30], thus avoiding the risk of burns and other complications associated with elevating local tissue temperature [31]. In sports physiotherapy, IRT is used for preventing muscle and tendon damage (e.g., in football players), to evaluate the effectiveness of physiotherapy and its programming in the post-traumatic period, as well as during preparation for physical exercise and sports training [32] (it allows identification of areas that require further or intensified treatment [33]). This method is helpful in the screening diagnosis of idiopathic scoliosis (increased warmth of the paraspinal tissues on the convex side of the curvature [34]), as well as in paediatric physiotherapy, for example, to evaluate the efficacy of new therapeutic methods in children with cerebral palsy [35].

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# ON THE POSSIBILITY OF ABUSE OR VIOLATION OF PATIENT RIGHTS IN CONNECTION WITH THE USE OF TELECONSULTATIONS – LEGAL ASPECTS AND *DE LEGE FERENDA* DEMANDS

## O możliwości nadużycia lub naruszenia praw pacjenta w związku z korzystaniem z teleporad – aspekty prawne i postulaty *de lege ferenda*

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**Abstract**

**Introduction:** Telemedicine can increase the patient's safety and comfort, as well as facilitate access to medical services and improve their quality. On the other hand, the use of tools offered by telemedicine may, if used incorrectly, give rise to a number of threats. Teleconsultations are generally a very convenient tool, thanks to which a patient can obtain a medical consultation in a convenient place, remotely, without the need to come to the doctor's office, nevertheless despite many facilitations, the provision of medical services in the form of telemedicine can also situations related to violation of patients' rights by a doctor or abuse of these rights by the patient himself. This study aims to identify the most important manifestations of this type of threats (limited to abuses by the patient and violations by the doctor) related to the provision of medical in the form of teleconsultation and areas where these risks may occur. **Material and methods:** The work uses the dogmatic-legal method. The work contains a number of references to procedural regulations and practice in the researched area. **Results:** Health protection requires the legislator to create mechanisms adequate to the changes caused by scientific progress, and at the same time ensuring patient safety. In this dimension, teleconsultation should be treated as a tool primarily supporting "classic" treatment. **Conclusion:** It is necessary to undertake legislative work aimed at a more detailed implementation of telemedicine in the health care system. In the current legal status, the lack of detailed procedures for providing medical teleconsultation poses numerous risks to the patient and may be the cause of numerous errors in the process of their proper diagnosis. It seems reasonable to postulate *de lege ferenda*, specifying in detail the areas that may be covered by telemedical services.

**Streszczenie**

**Wstęp:** Telemedycyna może zwiększać bezpieczeństwo pacjenta i ułatwiać dostęp do świadczeń zdrowotnych oraz poprawiać ich jakość. Z drugiej strony korzystanie z narzędzi, jakie daje, może – przy niewłaściwym ich zastosowaniu – rodzić szereg zagrożeń, choćby w obszarze ochrony prywatności czy zachowania odpowiednich standardów jakości świadczonych e-konsultacji. Jakkolwiek bowiem teleporady to generalnie bardzo wygodne narzędzie, dzięki któremu pacjent w dogodnym dla siebie miejscu, na odległość, bez potrzeby przychodzenia do gabinetu lekarskiego, może uzyskać konsultację medyczną, jednak (niestety) mimo wielu ułatwień, świadczenie usług medycznych w formie telemedycyny może też sprzyjać sytuacjom związanym z naruszaniem praw pacjentów przez lekarza lub nadużyciem tych praw przez samego pacjenta. Niniejsze opracowanie ma na celu zidentyfikowanie najważniejszych przejawów tego rodzaju zagrożeń (ograniczonych do nadużyć ze strony pacjenta i naruszeń ze strony lekarza) związanych ze świadczeniem usług medycznych w formie teleporady oraz obszarów, w których do tych zagrożeń może dochodzić. Zawarto w nim także postulaty, jak należy zorganizować proces udzielania tego typu porad oraz jak informować pacjenta o zasadach ich udzielania. **Materiał i metody:** W pracy wykorzystano metodę dogmatyczno-prawną. Polegała ona na wnikliwej analizie obowiązującej literatury oraz aktów prawnych. W pracy odnaleźć można szereg odniesień do przepisów proceduralnych oraz praktyki w badanym zakresie. **Wyniki:** Ochrona zdrowia wymaga od ustawodawcy stworzenia mechanizmów adekwatnych do zmian, jakie wywołuje postęp naukowy, a jednocześnie zapewniających bezpieczeństwo pacjentom. W tym wymiarze teleporadę należy traktować jako narzędzie mające przede wszystkim charakter wspomagający „klasyczne" leczenie. **Wnioski:** Konieczne jest podjęcie prac legislacyjnych mających na celu bardziej szczegółową implementację telemedycyny do systemu ochrony zdrowia. W aktualnym stanie prawnym brak szczegółowych procedur dotyczących udzielania teleporad medycznych stwarza liczne zagrożenia dla pacjenta i może być przyczyną wielu błędów w procesie ich właściwej diagnostyki. Zasadnym wydaje się postulat *de lege ferenda*, uszczegółowienia dziedzin, które mogą być objęte świadczeniem telemedycznym.

**Keywords:** patient, break the law, teleconsultation, abuse of law, patient's right

**Słowa kluczowe:** pacjent, naruszenie prawa, teleporada, nadużycie prawa, prawo pacjenta

**DOI** 10.53301/lw/176497

**Received:** 29.08.2023

**Accepted:** 07.12.2023

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## Introduction

Progress observed in medical knowledge, as well as intensive technological development, widespread access to mobile devices and new communication channels, ensure unique opportunities for the development of new methods of healthcare provision. The impact of technology on medical services will be deepened and intensified. Undoubtedly, such social phenomena also favour the development of telemedicine.

It was mandatory for primary health care (PHC) facilities to provide teleconsultations since 1 January 2020 onwards. However, the declaration of a state of the epidemic and the need to ensure a mechanism to provide healthcare services safe for the patient and medical staff led to the large-scale implementation of this form of medical advice in PHC in March 2020. Thus, teleconsultations in PHC became one of the measures to prevent the spread of SARS-CoV-2 by:

- limiting the contact between patients waiting for appointments at PHC facilities;
- isolating people who could infect others with the virus;
- allaying fears if the patient's situation turns out to be harmless;
- reducing waiting times for face-to-face appointments with doctors [1].

According to the legal definition, provided for in § 2(3) of the Regulation of the Minister of Health of 12 August 2020 on the organisational standard for teleconsultation within the PHC [2], a teleconsultation is a medical service provided remotely using ICT systems or communication systems. It is, therefore, the remote consultation of a patient and a medical professional, constituting a medical service provided via ICT and communication systems, in particular by means of audio, video, telephone or other online solutions.

There is no doubt that telemedicine can increase patient safety and comfort, as well as facilitate access to and improve the quality of medical services. The main advantages of teleconsultation include, for example, shorter waiting times for medical consultations – with little effort and without the patient having to leave home.

On the other hand, the use of the tools provided by telemedicine may, when used incorrectly, give rise to a number of risks, for example with regard to the protection of privacy and compliance with appropriate quality standards for e-consultations. Although teleconsultation constitutes, generally, a very convenient tool, whereby a patient can get a medical consultation at his or her convenience, remotely, without having to visit a doctor's surgery, despite its many advantages, the provision of medical services in the form of teleconsultation may also lead to situations when patients' rights are violated by the doctor or by the patients themselves – often to a greater extent than in case consultation is conducted face-to-face.

This calls for reflection on the issue of both potential violations of patients' rights involving provided teleconsultations, as well as on possible manifestations of abuse of subjective rights by the patient in this area [3]. Within the scope of the analysis of the above-mentioned issues, the legal dogmatic method was used as the basic research method, which assumes the study of the applicable normative material and is appropriate for the analysis of legal regulations and case law. In addition, theoretical legal methods and, to a small extent, the method of system analysis were also used in the conducted analysis.

## Organisational standard for teleconsultation

Modern health care systems define standards for the provision of medical service services understood as patterns of behaviour of health care providers, determined by the current level of medical knowledge.

It can be assumed that a standard is a set of rules of conduct and good practice, the observance of which is to ensure that telemedicine services are provided in a manner consistent with the current state of knowledge, due diligence, legal regulations and respect for patient rights and interests.

In the light of the jurisprudence of the Constitutional Tribunal, Article 68(2) of the Constitution of the Republic of Poland of 2 April 1997 at the same time imposes on public authorities, in particular the legislator, the obligation to determine the principles of exercising the entitlement to health protection, and this involves the necessity to determine both conditions and scope for medical services provision [4].

In order to ensure the quality of medical services provided in the form of teleconsultation, the Minister of Health issued a regulation on 12 August 2020 on the organisational standard of teleconsultation within the PHC, supplemented by the Guidelines of the national family medicine consultant on teleconsultation in the PHC provided during an epidemic caused by the SARS-CoV-2 virus. The provisions contained therein address, among other things, the question of a doctor providing the teleconsultation to decide whether it is sufficient to address the patient's health problem or whether it proves necessary to inform the patient that he or she should have the medical service provided directly, and whether the teleconsultation should be carried out under conditions that guarantee confidentiality. The Regulation also gov-

erns the disclosure of information on the patient's health status, so that the flow of electronic records is protected against unauthorised use, disclosure or access.

A detailed discussion of all the issues related to the standards for the provision of teleconsultations is beyond the scope of this paper, but the most important issues in this area will nevertheless be mentioned below.

**The concept of patient rights, their abuse and violation**

The terms 'patient's right' and 'patient's rights' denote sets of functionally related entitlements of a person the medical services are provided to, recognised by the legal order and protecting primarily moral rights. They are closely related to fundamental human moral rights, such as dignity, life, physical and mental integrity, health and freedom. At the same time, the patient's rights constitute an essential element of the content of the legal relationship between the patient and healthcare providers. The catalogue of patients' rights is broad [5].

As regards the issue of rights' abuse, it is widely addressed in the literature on the subject [6]. Being the starting point of many discussions, it has also given rise to an analysis in the field of teleconsultation-related issues.

The teleconsultation tool has made it possible to ensure continuity of care for the patients and, at the same time, patients have also gained new rights in this respect. However, having a specific right does not mean that it can be used completely freely. First and foremost, it cannot be used for purposes incompatible with its content, but there is more to it. As stipulated in Article 5 of the Civil Code [7], a person may not make use of their own right in a way that would be contrary to the social and economic purpose of the said right or to the principles of community life. Exercise a subjective right in a manner contrary to these criteria is unlawful and therefore is not covered by jurisdictional protection.

It is a well-established view in the judicature that Article 5 of the Civil Code – which contains a general clause referring to the principles of community life – regulates the issue of abuse of a right in the subjective sense [8]. The solution adopted in Article 5 of the Civil Code is a manifestation of the so-called internal concept of subjective right abuse. It assumes that exercising a right involves making use of it which is not contrary to the principles of community life and the social and economic purpose of the right *per se*. Thereby, this means that exercising a given right must fall within a set of socially approved forms of exercising a subjective right. On the other hand, all other (i.e. disapproved, reprehensible) manifestations of exercising a subjective right cannot be considered as its exercising and, consequently, do not enjoy the protection inherent in subjective rights [9]. Thus, abusing a right involves an action only apparently compliant with the content of the entitlements vested in a given person [10].

The assessment of what is perceived as an abuse of rights must relate to specific cases and must therefore be decided on a case-by-case basis. In this respect, it is also necessary to refer to extra-legal rules. When assessing the behaviour of an entitled person, not only the principles of community life, but also the legal norms applicable to a given situation should be taken into account. Consequently, abusing a right may be perceived as crossing certain boundaries from the ethical, socio-economic sphere, which often cannot be precisely specified in law.

Of course, it should also be borne in mind that the regulation of Article 5 of the Civil Code does not constitute an independent basis for the right acquisition, nor can it be regarded as a general way of eliminating certain axiologically negatively assessed behaviour from civil law transactions [11]. It is a well-established view that by means of the construction of the prohibition of a subjective right abuse it is not possible to justify the establishment of a subjective right against the other party [12].

At the same time, it is accepted in the civil law science that the scope of application of Article 5 of the Civil Code is very broad and covers all categories of civil law relations from all branches of civil law [13]. Indeed, it does not follow from the interpretation of Article 5 of the Civil Code that its application is excluded in any particular type of civil cases. In its judgement of 3 October 2000, I CKN 287/00, the Supreme Court stated that the content of Article 5 of the Civil Code enables to assess the compatibility of exercising any subjective right with the principles of community life [14].

In this context, it seems that the application of the model adopted in Article 5 of the Civil Code for assessing the behaviour of an entitled person in medical law relations is not excluded. Thus, the patient's behaviour may also be assessed through the prism of Article 5 of the Civil Code and whether, in specific relations with the doctor, it constitutes an adequate reaction, i.e. which is not inconsistent with the principles of community life.

On the other hand, we can speak of a violation of the patient's rights in every case in which a doctor violates the right to an appropriate standard of medical care, including in the case of teleconsultation, and this regardless of whether such behaviour of the doctor caused a possible negative effect for the patient in a given situation, even in the form of his or her health condition deterioration.

In this context, it should be made clear that, pursuant to Article 2 of the Law of 6 November 2008 on patient's rights and patient's ombudsman [15] in conjunction with Article 2(2) of the Law of 15 April 2011 on medical activity [16], a doctor – as a medical practitioner and therefore a person authorised under separate regulations to provide medical service services – is under a statutory obligation to respect patients' rights. The duty to respect patients' rights is also imposed on the doctor by the Medical Code of Ethics, adopted by the resolution of the Extraordinary Second National Congress of Physicians of 14 December 1991 on the Medical Code of Ethics.

It should therefore be emphasised that, in general, when providing medical services in the form of telemedicine, the principles of services provision and the scope of the doctor's duties remain unchanged in relation to the provision of medical services in the form of personal contact with the patient. This means that also when providing telemedical services, the doctor should bear in mind the

basic duties, including, in particular, acting in accordance with current medical knowledge, available methods and means of preventing, diagnosing and treating diseases, as well as in accordance with the principles of professional ethics and with due diligence.

This is expressly stipulated in Article 4 of the Law of 5 December 1996 on the professions of a physician and a dentist [17], according to which the physician is obliged to practice his/her profession in accordance with current medical knowledge, available methods and means of preventing, diagnosing and treating diseases, in accordance with the principles of professional ethics and with due diligence

There is therefore no doubt that also when providing teleconsultations , the doctor shall act with due diligence and in accordance with the current state of medical knowledge. At the same time, numerous statements of the judicature regarding the scope of diligence required of a professional doctor also assert that the high diligence expected of doctors must not translate into ascribing to them duties that are practically impossible to perform. Indeed, there is an inherent increased risk of harm associated with certain types of medical activities, which often cannot be excluded or avoided, even with maximum diligence.

Regardless of the legal basis for the medical services provision and the nature of the doctor–patient relationship, the doctor's duty towards the patient remains a duty of diligence and not of result.

It is also worth emphasising that the doctor's duty to act in accordance with current medical knowledge corresponds to the patient's entitlement to receive medical services of relevant quality.

**Manifestations of potential violations of patients' rights and possible abuses of the law by patients in relation to provided teleconsultation**

***Risks associated with the choice of location for teleconsultation provision***

The starting point for the analysis of possible risks related to teleconsultation provision involves the patient's basic rights, such as, **inter alia**, the right to information on health condition, the content of which, in accordance with Article 9 of the Law on patient's rights and Article 31 of the Law on the professions of a physician and a dentist, includes the right to information on health condition, diagnosis, proposed and possible diagnostic and therapeutic methods, foreseeable consequences of the application of the aforementioned methods or their abandonment, results of treatment, as well as the prognosis [18]. Furthermore, according to Article 20(1) of the Law on patient's rights, the patient has the right to have his/her intimacy and dignity respected, in particular during the provision of medical services. The patient has the right to have a next-of-kin present when the medical service is provided. It is up to the patient to decide on the presence of a next-of-kin, having freedom to exercise this right but not obliged to do so. The patient's rights to have his/her intimacy and dignity respected constitute the general basis for good interpersonal relations and guarantee the fulfilment of other patient's rights [19].

Therefore, from the perspective of the science of law and the related possible risks, it must be stated that the protection of privacy is necessary for the preservation of a proper doctor–patient relationship, which serves to protect health in individual cases, and is also important for the protection of public health. The need to protect the doctor–patient relationship is based on the recognition of trust as a pre-requisite for effective treatment. This trust determines the willingness of the patient to share complete and truthful information at the time of the interview accompanying medical service provision. At the same time, it must be borne in mind that such information can often be of a very intimate nature [13]. Nowadays, the doctor should be aware of the danger inherent in practising the profession of a 'situation of dependence' formed between him/her and the patient. The provisions of the Medical Code of Ethics, stating in Article 14 (in a way preventing possible abuse in this respect) that 'A doctor may not use his/her influence on a patient for any purpose other than a therapeutic one', are important in this respect.

Undoubtedly, solely from the point of view of respecting the referred to rights of the patient (but not only), the choice of the place where the medical service is provided as a teleconsultation should be ascribed significant importance. This applies both to the location of the doctor providing the teleconsultation and to the location of the patient receiving this type of consultation. In both situations, the patient's rights may be violated or abused by the patient.

In this regard, it should be emphasised that current legislation does not specify either the place where the patient is to stay during teleconsultation or the place where the person providing medical services by means of teleconsultation is to provide the said services. It should also be noted that neither the provisions of the Law on medical activity, allowing the provision of medical services via ICT systems or communication systems, nor the rules set out, for example, by the National Health Fund with regard to the provision of teleconsultation, nor, finally, the guidelines of the Minister of Health concerning the organisational standard of teleconsultation, impose the manner of organisation of this type of medical service in the discussed aspect. By virtue of the very nature of the teleconsultation, it is only obvious that the doctor providing this type of consultation should be in a different place from the patient.

The above dictates that the place where the doctor should stay when providing the teleconsultation will be determined each time by arrangements made between the doctor and the clinic through which such teleconsultation is to be provided.

In general, therefore, there are no legal obstacles to the provision of teleconsultations by a doctor outside a clinic, as long as the doctor providing the teleconsultation has access to a database containing all the information necessary for the provision of medical services, while ensuring conditions favourable to respecting the patient's

rights to privacy, as well as intimacy and dignity [13]. If such requirements are not ensured, there is a risk that information given during the teleconsultation or data from the medical records will be disclosed to outsiders. If these conditions are not met, there is also a risk that the conversation with the patient will not be free and unfettered.

Undoubtedly, the patient, too, if he or she wishes to have his or her rights to privacy and dignity be ensured during the teleconsultation in a place where he or she will be able to have his or her medical consultation with the doctor in conditions ensuring full confidentiality of the information provided.

In view of the above, it is appropriate that the person providing the medical service in the form of a teleconsultation stays in a doctor's surgery or in another place where it can be guaranteed that the information provided during the teleconsultation or the medical records will not reach outsiders, while at the same time the conditions are provided for a free, unhindered and undisturbed conversation with the patient. On the other hand, during the teleconsultation the patient should stay in a place where he or she can have a medical consultation respecting his or her right to privacy and dignity, in a free conversation with the doctor, undisturbed by external factors. Indeed, it goes without saying that, in any case, teleconsultation must be provided under conditions of confidentiality, and the solutions used to transmit electronic documents in graphic and textual form should ensure their integrity and protection against destruction, loss, modification, unauthorised disclosure or unauthorised access.

It should also be emphasised that, although it is obvious that the doctor has no influence on whether the patient benefiting from the teleconsultation actually stays in conditions ensuring conversation confidentiality, it seems advisable to formulate a request to doctors that during the teleconsultation they pay particular attention to whether the environment in which the patient is staying is conducive to taking care of the abovementioned rights of the patient, precisely because of the potential threats to his or her rights in this respect.

However, it is also important to realise that it is, undoubtedly, a difficult task for the doctor to carry out the above task in the current legal state. Currently, the doctor does not really have any legal tools at his disposal that would allow him to control where the patient stays during the teleconsultation. It also seems difficult, and sometimes even impossible, for the doctor to verify that the patient is not in the company of other persons, often outsiders, during the conversation (e.g. by telephone), and this even despite the patient's having been first clearly instructed about such an obligation. After all, the patient may disregard such information (despite being instructed to do so), while the doctor providing the teleconsultation does not have any legal instruments allowing verification of where the patient actually is during the e-consultation [20].

***Risks associated with the qualification of patients for teleconsultation***

The current rules for the qualification of patients for teleconsultation also seem to provide ample scope for potential violations of patients' rights and their abuse by patients themselves. From media reports alone, it is possible to learn about situations in which doctors even 'force' their patients – against their explicit will – to carry out visits in the form of teleconsultation, thus refusing direct contact in the doctor'surgery and, a *contrario*, require to carry out a direct consultation with the patient in a situation in which a visit in the form of teleconsultation would be sufficient in a given case. On the other hand, the problem of a kind of 'phishing' by patients – by means of teleconsultations – for e-prescriptions and e-referrals has also been widely discussed recently.

The above, of course, forces a reflection on whether teleconsultation should be regarded as a necessity or just a possibility [20], and whether teleconsultation is de facto a doctor's or patient's choice.

The legal solutions currently in force with regard to teleconsultations do not explicitly specify who is explicitly responsible for the qualification of the patient for teleconsultation. For on the one hand, in the light of § 3 of the aforementioned Regulation of the Minister of Health of 12 August 2020 on the organisational standard of teleconsultation within the PHC, the legislator granted the patient the right to choose the most convenient form of contact with the doctor. Indeed, he or she may not agree to the teleconsultation. On the other hand, both Article 42(1) of the Law on the professions of a physician and a dentist and Article 3(1) of the Law on medical activity generally grant the right to choose the way in which medical services are provided to physicians.

Thus, both the Law on the profession of a physician and a dentist and the Law on medical activity, on the one hand, generally grant doctors the right to choose the way in which they provide medical services, while on the other hand, they do not state any restrictions as to the use of the teleconsultation system, which may also become a source of risks to patients' rights. At the same time, in § 3(1a) of the aforementioned Regulation of the Minister of Health of 12 August 2020 on the organisational standard of teleconsultation within the PHC, the legislator introduced legal restrictions as to the principles of using teleconsultation. This provision namely stipulates that the doctor is obliged to provide the service in the form of a direct contact with the patient (and thus also to refuse to provide the medical service in the form of e-consultation, i.e. remotely) in five cases. This applies when:

- in general, the patient or the patient's legal guardian has not consented to the provision of the service in the form of teleconsultation (with the exception of situations relating in particular to the certificate issue);
- the patient is a child under 6 years of age (except in the case of follow-up consultation in the course of treatment, established as a result of the patient's personal examination, the provision of which is possible without a physical examination);
- the patient is suspected of having cancer;
- the patient's condition deteriorated or the symptoms in a patient who has a chronic illness have changed;
- it is the first visit to a doctor who was stated in the so-called declaration of choice.

Against the background of the afore-quoted provisions, there is no doubt that the legal solutions concerning teleconsultation do not specify the standards for their provision and do not directly state (which, as it seems, should be required of a rational legislator) who is explicitly responsible for the patient's qualification for teleconsultation, which, in a further step, may give rise to the formulation of further potential risks to patients' rights against this background.

In this context, the question therefore arises as to how far a doctor should retain professional autonomy when deciding whether a teleconsultation or in-person consultation is appropriate in a given case. All the more so as it is argued in the literature that any kind of recommendations or guidelines of scientific societies, even those covered by the provisions of implementing acts, cannot be treated as absolutely binding in a specific case [21].

Analysing the above-mentioned problem, one should be in favour of the recognition that it should be the physician's duty to assess in the first place, of course taking into account the entire factual circumstances of a given case (in particular, the analysis of the available medical data, including the patient's medical records), whether it is possible to provide teleconsultation in a given situation and whether the telemedical service is an appropriate (optimal) solution for a given medical case and in accordance with the current medical knowledge, understood as the knowledge of the best treatment methods and the best therapeutic and technical means available at the time [22]. There is no doubt that – by virtue of professionalism and medical knowledge – a doctor is in a better position to assess which course of action should be chosen in the case of medical services provided to a particular patient. Thus, it is the doctor who should, in the first instance, decide whether it is possible and reasonable in a given case to provide a medical service remotely (by means of ICT systems) or whether the patient's situation requires a face-to-face medical consultation in a doctor's surgery.

In order to avoid possible violations of the patient's rights, the doctor's decision on the choice of the appropriate form of medical consultation should be taken with due diligence and the state of the art, as required, for example, by the Medical Code of Ethics. This means that the choice of a doctor in this respect should take into account the specific personal situation of the patient in each case and, in order to exercise due diligence, adapt the manner of providing these services to the individual patient.

Current medical knowledge is the knowledge of medical procedures that have been recognised on the basis of the results of properly conducted scientific studies, as the optimal solutions from the point of view of the balance of benefits and risks in relation to their use in a given clinical indication. It is objective in nature, meaning that it does not depend on the subjective beliefs of the medical professional or the patient [23].

At the same time, Widłak also aptly points out that although the up-to-dateness of medical knowledge has an objectivised nature, 'with the extremely dynamic development of modern medicine, it has long been impossible to expect a single person to have full up-to-date medical knowledge in the entire field of medicine, and more and more often even within individual, especially broader medical specialisations', and moreover, 'a doctors may find themselves in a situation in which they face subjective limitations for the application of up-to-date medical knowledge in the form of e.g. no appropriate medical equipment or access to the latest drugs or treatments even despite their knowledge and skills in applying them' [24]. Furthermore, the literature aptly emphasises that the order to be guided by the indications of current medical knowledge 'does not imply a requirement of medical omniscience' [25].

Undoubtedly, in view of the doctor's professionalism, the assessment of which treatment scheme should be chosen for the provision of services to a particular patient should be left to the doctor's discretion, taking into account the circumstances of the particular case. Thus, it is the doctor who should, in the first instance, decide whether it is possible and justifiable in a given case to provide a medical service by means of ICT systems.

There is no doubt that it is not an easy matter for a doctor to decide whether in a specific clinical situation of a patient the very implementation of an innovative diagnostic/treatment method or a traditional one would be more appropriate. Therefore, the doctor should choose the most appropriate method from among the existing several ones, taking into account, first of all, medical contraindications to the use of a specific therapeutic method and the possible comorbidities. As the Supreme Court stated in its unpublished judgement of 5 February 1957, IK 1011/530: 'Treatment cannot be limited by the prevailing methods and ways, either because of the individual nature of the cases, or because of the development of medical treatment' [26]. The doctor's experience in the use of a particular treatment method is also not without significance [27].

Undoubtedly, when providing medical services – including when deciding on the appropriate form of medical consultation – a physician should each time take into account the specific personal situation of the patient and, in order to exercise due diligence, adapt the manner of providing these services to the individual patient.

It is also aptly indicated in the guidelines of the Supreme Medical Council incorporated in Resolution No. 89/20/P-VIII of the Presidium of the Supreme Medical Council of 24 July 2020 on the adoption of guidelines for the provision of telemedical services that the patient–doctor relationship should be based on effective communication and mutual trust. The medical care process can be carried out using various organisational and technical solutions that enable effective patient management and ensure continuity of treatment. Telemedicine is for medicine, not instead of medicine. It is meant to enhance, to complement traditional service provision options, not replace them. Personal contact should be the most important and optimal way of the patient–doctor relationship. This is because it not only minimises the risk of violations of the patient's rights, but also possible abuses of rights by patients themselves.

In this context, further doubts also arise as to how far the patient's autonomy should extend when deciding on

the type of medical service he or she wishes to use, i.e. a medical consultation during a personal visit to a doctor's surgery or a remote consultation.

Undoubtedly, due to no professional medical knowledge on part of patients, they are not in a position to objectively assess whether and what type of medical service they need. Therefore, in order for the patient to be able to make an informed decision regarding consent or refusal of consent to the method of diagnosis or treatment chosen by the doctor, medical information should serve the purpose. As rightly emphasised by legal scholars, 'an essential element for the legal validity of consent is that the patient and other persons deciding to subject him or her to medical services are informed in advance' [28]. This is because only if they have adequate knowledge of their situation, potential treatment alternatives and the consequences of a possible outcome, can they give so-called 'informed consent'. In other words, the doctor's duty to provide medical information enables the idea of patient autonomy to be realised. This position has also been consistently adopted by case law, which emphasises that: 'One of the manifestations of an individual's autonomy and freedom of choice is the right to decide for oneself, including the choice of treatment method [29]. Undoubtedly, patients' rights can be abused in this area, too.

**Risks associated with the choice of communication system in the provision of a teleconsultation**

Another extremely important aspect of the analysis of the present study is the issue of the choice of communication medium to have the service provided in the form of teleconsultation, because even here there certain violations of patients' rights or abuse of the law by patients themselves may occur. Unfortunately, the Regulation of the Minister of Health on the organisational standard of teleconsultation does not clarify this issue or specify this very important element of the organisation of teleconsultation, which is the communication system. This makes it possible to consider that it is in fact permissible to use any kind of telephone calls or video call applications or even electronic communicators to provide a service in the form of a teleconsultation, i.e. any solution that takes into account the development of digital techniques, and to this extent this may constitute another sphere of risk to patients' rights. Based on the guidelines of the Supreme Medical Council in the aforementioned Resolution of 24 July 2020, it is possible to conclude that teleconsultations can be provided using ordinary telephones and telephone lines, and online consultations (video, chat, email) can be carried out using secure internet connections within secure telemedical platforms, applications or communication systems. However, as is aptly emphasised, these must 'meet the conditions not only for a secure connection, but also for secure identity verification, etc., in accordance with the general applicable standards for communication systems.

The assessment of whether a communication application or system meets the requirements for a secure connection is particularly relevant in the case of free, publicly available instant messaging services, which may not guarantee adequate standards of security and confidentiality. For the above reasons, it seems advisable to postulate that before using a communicator, a doctor should verify that the equipment used to provide teleconsultation ensures security and confidentiality standards.

It is also important to bear in mind that the use of messengers that are not optimised for the provision of medical services (e.g. Messenger) may generate a risk of breaching the security of the provided teleconsultation. The doctor should also not use open e-mail or contact the patient using a private email account or a private telephone number as part of the teleconsultation. If the doctor is using a device that can be accessed by a third party, he/she should ensure that he/she uses his/her own account on the system before commencing the teleconsultation. The use of a shared account (or a third-party account) generates the risk of violating medical confidentiality and the confidentiality of the conversation with the patient.

It seems that, taking into account the need for due diligence on the part of the doctor, the most optimal solution should be the use of videoconsultation, which ensures simultaneous audio and video transmission. Such a solution allows not only an ongoing analysis of the patient's behaviour, but also an assessment of his/her verbal relationship and facial expressions during the provided consultation. It also makes it possible to better prevent patients from abusing their rights in this respect (since it is more difficult for a patient in such a situation to hide his/her actual physical health condition from the doctor). On the other hand, it also makes it possible to protect the patient to a greater extent against a possible infringement of his/her rights (e.g. to receive information on his/her health condition or to privacy) on part of the doctor (since the patient in such a situation is also able to observe the doctor, his/her reactions, his/her preparation, as well as the environment where the doctor stays) [20].

***Patient identification related risks***

The issue of verification of the patient's and doctor's identity constitutes another important element in the provision of medical service, as it affects the assurance of confidentiality of teleconsultation, safety of the service, possibility of making an entry in the medical records and retaining the patient's right to privacy. Adequate verification of the patient's identity also affects the possible confirmation of the patient's entitlement to publicly funded medical services.

There is no doubt that there may be potential violations of patient's rights and possible abuses relating to patient's and doctor's identification in this area when providing teleconsultations. It is clear that in the case of providing medical services in the form of teleconsultation, there is a greater risk of 'identity theft' (impersonation) than in the case of an in-person consultation in a doctor's surgery. Consequently, it cannot be excluded that a teleconsultation may be provided by a person who is not actually a doctor (or by a different doctor than the patient is expecting), in particular if it is only given by telephone or on-line – via the Internet. On the other hand, the possibility cannot be ruled out that the doctor will provide teleconsultation to the wrong person (according to the documentation).

The Polish legislator does not seem to recognise the importance of the issue in question concerning verification of the identity of the patient and the doctor during a teleconsultation. Since there are no statutory solutions in this respect. Only the mentioned guidelines of the Supreme Medical Council provide that the doctor should assess on his/her own whether the person the connection was established with is definitely the patient the teleconsultation was to be provided for. However, it is no longer specified how such verification on the part of the doctor should be processed. There are also no arrangements in place to allow the patient to verify that the teleconsultation provider is, in fact, a doctor.

In practice, in the current state of the law, the question of identification is generally resolved by healthcare facilities depending on the form of teleconsultation provided: via an on-line portal or by telephone. Undoubtedly, however, it seems reasonable to conclude that this mechanism is not sufficient and the adoption by the legislator of tools aimed at minimising the risk of so-called 'identity theft' in this area is required. Additionally, this will undoubtedly be a difficult task.

***Risks in terms of personal data protection***

When analysing the possible violations of patient's rights, attention should also be paid to data protection issues. Since in the course of a teleconsultation conversation, a very large amount of personal data, including sensitive medical data, is being processed. The above raises the question of the possible eligibility of recording such conversations. It seems that the possible recording of conversations in this case should be carried out on a specific legal basis and, which is particularly important, it should have a defined purpose within the framework of the applicable legislation on personal data (GDPR).

In accordance with Article 5(1)(a) of Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC, i.e. the General Data Protection Regulation, Official Journal of the EU L. 2016, No. 119 p. 1, as amended, personal data must be processed lawfully, fairly and in a transparent manner for the data subject. Furthermore, pursuant to Article 5(1)(f) of Regulation 2016/679, personal data must be processed in a manner ensuring appropriate security of personal data, including protection against unauthorised or unlawful processing and against accidental loss, destruction or damage, by means of appropriate technical or organisational measures.

In practice, there is a viewpoint that the legal basis for data processing is the patient's consent. While the said viewpoint may be accepted with regard to the patient's use of the telephone in the context of activities related, for example, to making appointments with doctors, scheduling appointments, etc., already at the stage of the provision of the medical service itself in the form of teleconsultation, conditioning its provision on the patient's consent may both raise doubts with regard to the freedom of consent and, which seems even more important, constitute a source of recognition of an attempt to restrict access to the service. It is also difficult to identify the proper purpose of recording the teleconsultation.

**Summary**

Healthcare is a sensitive area which requires the legislator to create mechanisms appropriately addressing the changes brought about by scientific progress, while at the same time ensuring patient's safety.

There is no doubt that the development of telemedicine cannot replace the primary form of service provision, which is personal contact between the doctor and the patient. In this respect, teleconsultation should be seen as a tool that primarily supports 'classical' treatment.

However, it is really necessary to undertake legislative work aimed at a more detailed implementation of telemedicine into the health care system. This is because the current legal state lacks detailed procedures (guidelines) for providing medical teleconsultations, which pose numerous risks for the patient and may be the cause of numerous errors in the process of their proper diagnostics. This is evidenced, for example, by the information contained in a report dated as of December 2022, prepared by the Ombudsman for Patients' Rights and concerning his investigations of individual cases in 2019–2021 [30]. The document concludes (rather worryingly, one has to admit) that the scale of reported and simultaneously ascertained cases of violations of patients' rights has been on an upward trend since 2017. The data from the Report also show that in the period under review, as many as 93% of the cases involved a finding of a violation of patients' rights in the investigations completed by the Ombudsman within the framework of the PHC. The report also shows that within the framework of remote services provision (teleconsultation) in the analysed period, the detected irregularities concerned mainly: no telephone contact with the facility, no information about the standard of the teleconsultation, impossibility to use the teleconsultation, as well as no due diligence during the teleconsultation.

Given the above, it should be borne in mind that, with technological developments, patients are exposed to a greater risk of lack of professionalism and, consequently, patients' trust may be abused. Therefore, a *de lege ferenda* demand to clarify, as soon as possible, the areas that can be covered by telemedical services, as well as the conditions for qualifying patients for such diagnostics and the manner in which it is carried out, seems undoubtedly justified.

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REVIEW ARTICLE

# BARODONTALGIA AND OTHER DENTAL PROBLEMS DURING MILITARY SERVICE: A LITERATURE REVIEW

## Barodontalgia i inne stomatologiczne problemy żołnierzy: przegląd literatury

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**Abstract**

**Introduction:** Military service carries health risks that extend beyond the hazards associated with direct combat. Insights into the history of military medicine reveal the evolution of medical practices and surgery, particularly in the field of maxillofacial surgery. This specialty owes its advancement to pioneers such as Harold Gillies and Johannes Esser, whose innovations reached their peak during periods of armed conflicts. **Objective:** The review aims to raise awareness of the specific dental health needs of military personnel, with a particular focus on barodontalgia, dental pain caused by changes in ambient pressure, common among military pilots and divers. **Methods:** The literature on dental challenges among military personnel was analysed, considering the impact of working conditions on oral health (searched phrases: health problems in the military, military dentistry, barodontalgia). Common issues such as dental caries, periodontal diseases, and barodontalgia were identified, suggesting the need for better dental care and further research. **Conclusions:** Complex health challenges in military communities, from post-traumatic stress disorder to dental problems were identified. There is a need for continuous development of military medicine, a holistic approach to the health of soldiers, including oral health, to improve their quality of life and operational readiness. Research findings indicate the need to develop dedicated diagnostic and therapeutic protocols, adapted to the unique conditions of military service.

**Streszczenie**

**Wstęp:** Służba wojskowa niesie za sobą zagrożenia zdrowotne wykraczające poza ryzyko związane z bezpośrednim udziałem w działaniach bojowych. Wgląd w historię medycyny wojskowej pozwala zrozumieć rozwój praktyk medycznych oraz chirurgii, w szczególności w dziedzinie chirurgii szczękowo-twarzowej. Przełom w tej specjalizacji zawdzięczamy pionierom, takim jak Harold Gillies i Johannes Esser, których innowacje osiągnęły szczyt w okresie konfliktów zbrojnych. **Cel:** Przegląd ma na celu podniesienie świadomości na temat specyficznych potrzeb zdrowotnych personelu wojskowego w obszarze stomatologii, ze szczególnym skupieniem na barodontalgii, czyli bólu zębów wywołanym przez zmiany ciśnienia, występującym często u wojskowych pilotów i nurków. **Metody:** Przeanalizowano literaturę dotyczącą stomatologicznych wyzwań dla personelu wojskowego, uwzględniając wpływ warunków pracy na zdrowie jamy ustnej (wyszukiwane frazy: zdrowotne problemy w wojsku, stomatologia wojskowa, barodontalgia). Wskazano na powszechne problemy, takie jak próchnica, choroby przyzębia i barodontalgia, sugerujące potrzebę zapewnienia lepszej opieki stomatologicznej oraz prowadzenia dalszych badań. **Wnioski:** Zidentyfikowano złożoność wyzwań zdrowotnych w służbie wojskowej, od zespołu stresu pourazowego po problemy stomatologiczne. Podkreślono potrzebę ciągłego rozwoju medycyny wojskowej, holistycznego podejścia do zdrowia żołnierzy, w tym zdrowia jamy ustnej, aby poprawić ich jakość życia i gotowość operacyjną. Wyniki badań wskazują na konieczność opracowania specjalnych protokołów diagnostycznych i terapeutycznych, dostosowanych do specyficznych warunków służby.

**Keywords:** military dentistry, barodontalgia, pressure changes, health problems in the military

**Słowa kluczowe:** stomatologia w wojsku, barodontalgia, zmiany ciśnienia, problemy zdrowotne w wojsku

**DOI** 10.53301/lw/188302

**Received:** 08.04.2024

**Accepted:** 06.05.2024

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## Introduction

Military service carries health risks that extend beyond injuries associated with direct combat. Knowledge of the history of military medicine helps understand the specific health problems that armed force personnel may face. The words of General Władysław Sikorski: 'From the beginning of human existence and from the moment human history is known, war has been regarded as one of the principles of human development' also pertain directly to medicine [1]. The First World War was a turning point that changed the approach to health and hygiene, especially with regard to disinfection and the prevention of infectious diseases [2]. The importance of military medicine increases during times of armed conflicts, as evidenced by its considerable development during these periods. Armed conflicts, World War I and World War II in particular, had a significant impact on the development of surgery, especially in the field of maxillofacial surgery. Pioneers such as Harold Gillies and Johannes Esser contributed to many innovations in reconstructive surgery. Their revolutionary facial reconstruction techniques not only saved the lives of many soldiers, but also shaped modern maxillofacial surgery [3]. In more recent times, it has been noted that approximately 8% of veterans from missions in Iraq and Afghanistan developed symptoms of post-traumatic stress disorder (PTSD) and other mental health problems, highlighting the impact of wartime experiences on mental health [4]. Soldiers also struggle with a variety of oral problems both during peacetime and war.

It is worth mentioning that military personnel in Poland receive special dental care. The regulation of the Minister of National Defence specifies additional dental benefits for professional soldiers, including check-ups, hygiene procedures, as well as conservative and surgical treatment. These benefits are provided in military units or in cooperation with other medical entities. Soldiers holding specific functions, including pilots, divers and special forces, are entitled to an extended package of benefits. The regulation emphasises the importance of healthcare in the context of the specific nature of military service [5].

This paper presents a review of available literature on dental problems among military personnel, with particular emphasis on barodontalgia, i.e. dental pain caused by changes in ambient pressure, which is often seen in pilots and divers, and which has aroused interest among dental professionals.

## Aim

The aim of this paper is to raise awareness about the specific oral health needs among soldiers and the need to adapt dental practices to the specific conditions of their work [6].

## Dental problems among soldiers

Military personnel, including pilots and divers, are exposed to a variety of oral health problems during their career that require special attention. Armstrong and Dermont [7], as well as Khanna et al. [8] highlighted the importance of prevention, emphasising that specific working conditions, such as exposure to noise, vibration and variable pressure, can adversely affect the health of naval personnel. However, extensive data on the dental health of soldiers is missing in the literature. Research has indicated common dental problems, high rates of dental caries, periodontal disease and barodontalgia, suggesting the need for further research and improved dental care in the military.

In his study among 348 soldiers of the Armed Forces of Ukraine, Lavrin [9] assessed the efficacy of caries prevention under specific operational conditions. The study group consisted of military personnel from Ternopil who underwent a detailed dental examination using the DMF index [the sum of an individual's decayed (D), missing (M), and filled (F) permanent teeth or surfaces] to assess the intensity of caries, and the test of enamel resistance (TER) to determine enamel resistance to acid dissolution. After an initial diagnosis, the participants received comprehensive dental care, including both standard hygiene interventions and, depending on individual needs, fissure sealing and fluoride varnish application. All treatments were tailored to frontline requirements. The analysis of results showed alarmingly high caries rates, ranging from 83.08% among 20–25 year olds to 100% among 36–45 year olds. There was also a noticeable increase in the intensity of caries in each age group, although follow-up after 12 months showed a considerable reduction and an improved enamel resistance to acid.

Soldiers are also at risk of dental injuries. A case study of a 39-year-old military diver showed dental problems arising from the use of an inadequate diving mouthpiece. Its change led to the fracture of previously treated tooth with a large amalgam filling. The advanced periodontal disease discovered during a check-up highlighted the importance of regular dental screening in soldiers. The use of an appropriate mouthpiece, which reduced the risk of tooth overload, proved to be a solution. The need to extract the tooth and place an implant, followed by mouthpiece customisation, highlights the importance of adequate dental care to ensure the health and effectiveness of soldiers during their military service [10].

The difficulties of providing adequate dental care in combat settings become apparent in the course of modern military conflicts, such as the Russian-Ukrainian war. Shortcomings in routine preventive screening and

prophylactic interventions may contribute to dental problems becoming apparent during mobilisations and combat missions [11]. Research shows that regular oral hygiene and professional restorative treatment are key to maintaining the oral health and combat readiness of soldiers [12].

**Barodontalgia**

Barodontalgia, also referred to as aerodontalgia or tooth squeeze, is a specific dental pain caused by a change in ambient pressure. The pain may involve teeth that are typically asymptomatic, but when exposed to certain conditions, such as flying at an altitude of 600–1,500 m or diving at depths of 10–25 m, pre-existing conditions that did not previously produce dental symptoms become apparent. Sharp or throbbing pain often occurs as a result of an increase in the difference between the intracavitary pressure and the external pressure, which can be caused by the expansion of gases within closed dental spaces [13].

The mechanism of barodontalgia was described in detail by Strohaver [14] in 1972. He identified two forms of the disorder, i.e. direct and indirect, depending on the different causes of pain. Direct barodontalgia is due to the direct effect of pressure changes on the tooth, leading to pain, especially during take-off. The indirect form, on the other hand, can be caused by irritation of the alveolar nerves as a result of sinusitis, which manifests in dull pain, most often during landing.

Barodontalgia has been divided into four classes, depending on the condition of the pulp/periapical tissues and symptomatology. This classification allows accurate diagnosis and selection of appropriate treatment [15]. Early observations of this phenomenon mainly focused on pilots flying at altitudes > 3,000 m and divers descending to depths > 10 m. The upper lateral teeth, as well as teeth with multiple and extensive fillings, are most susceptible to barodontalgia. Despite various theories explaining the mechanism of pain, there is consensus on the role of sudden pressure changes and pulpal pathologies[16, 17].

***Diagnosis of barodontalgia***

The diagnosis of barodontalgia involves several stages of dental examination, particularly important among aircrew members who may experience long intervals between dental check-ups. Damaged fillings (e.g. cracked or broken), fillings with insufficient retention and secondary caries are key areas of such examinations. Vitality tests and/or radiographs covering the periapical tissue are recommended in the case of teeth with extensive fillings to exclude asymptomatic pulp necrosis. Orthopantomographic images can help detect dental problems that are not evident on clinical examination, as well as serve as dental records. If this imaging modality is not available, dental radiographs of the upper and lower teeth may deliver valuable data [18]. Stoetzer et al. [19] described a case of a 26-year-old patient reporting acute pain in the left mandible, which appeared during flight and increased as the aircraft ascended, reaching a VAS score of 8 (0–10). Lowering the altitude of the flight was associated with slight pain reduction, but without its complete resolution. A check-up examination revealed a filling in tooth 36, a negative pulp vitality test and a positive percussion test, in the absence of clinical periodontal disease. An X-ray was performed and showed a periapical lesion. Endodontic treatment of tooth 36 with cofferdam was initiated under local anaesthesia. No purulent exudate was found during the treatment, but significant bleeding was observed from both mesial canal orifices. Gangrenous necrosis of pulp was detected particularly in the distal root canals. After preparation of the canals, a temporary dressing was applied. The presence or absence of cracks was assessed optically using magnifying glasses and a blue-light lamp; no cracks were detected. Filling of the root canals was performed.

***Prevention and treatment of barodontalgia***

Maintenance of good oral health in individuals who work under fluctuating pressure conditions, which requires regular dental check-ups, recommended at least once a year, is essential for the effective prevention of barodontalgia. During check-ups, particular attention should be paid to the early detection of caries and damaged fillings, dentin exposure and other factors that can lead to the development of barodontalgia.

Prompt and accurate diagnosis, including radiography and pulp vitality tests, is of key importance if symptoms develop. In cases of reversible pulpitis, zinc oxide and eugenol (ZOE) may provide relief and prevent further pain. In more advanced cases in individuals exposed to significant pressure changes, endodontic treatment is preferred over procedures such as pulpectomy or direct pulp capping to effectively minimise the risk of future barodontalgia. Additionally, patients who have recently undergone dental procedures requiring anaesthesia should avoid aeroplane flights for 24 hours, while those undergoing surgery should avoid aeroplane flights for seven days to minimise the risk of barodontalgia. Taking care of their oral health and following professional dental advice can significantly contribute to reducing the risk of this painful disorder [17].

***Barodontalgia in a military setting***

Barodontalgia poses unique challenges for the military, including divers and submarine crews. A study on dental health among German sailors, which analysed 50,000 medical records, assessed the impact of the work of divers and submarine crews on their dentition. An evaluation of the results of 13,618 examinations in 2,580 patients provided a comprehensive picture of the dental health of navy personnel exposed to variable atmospheric pressures. It was found that divers, who regularly experience pressure fluctuations, had better oral health status than submarine crews operating under more stable pressure conditions. However, long-term follow-up revealed a gradual deterioration of oral health among divers and scuba divers, highlighting the occupational risks and the importance of regular dental care to maintain oral health among mariners working in a variety of pressure conditions [20].

Pilots, who may develop specific health complications due to changes in ambient pressure, especially during

high-altitude flights, are another group of soldiers affected by barodontalgia. The phenomenon of odontocrexis, also known as barometric tooth explosion, observed among aircrews, is an example of a specific form of dental trauma associated with barometric pressure changes, which often affects teeth with extensive fillings [21]. This highlights the complex relationship between ambient pressure and bodily responses, as well as the importance of using high quality preventive and therapeutic materials to minimise the risk of pressure-induced dental damage.

A case was described of a fighter pilot who experienced a tooth fracture in December 2009 while flying at an altitude of 3,600 metres, which manifested while descending to an altitude of approximately 900 metres [22]. Despite acute pain, the mission was not jeopardised due to short symptom duration. An intraoral examination revealed a V-shaped fracture in the right lower first molar. Various tests confirmed that the tooth was vital and had no previous pathology or treatment, which was also confirmed by X-rays. This case highlights the potential risks of working in extreme conditions and shows that even healthy teeth can be damaged as a result of pressure changes.

Gunepin et al. [23] conducted a study involving 60.6% of French military divers (1,317 fully completed questionnaires), and showed that 5.3% of divers developed barotrauma, which disrupted diving in 34.3% of cases. While the majority of divers were aware of the importance of oral health, as informed by military medical personnel, only some of them received specific dental advice and consultations related to diving or were warned against diving after certain oral procedures [23, 24]. These findings indicate the need to raise awareness about barodontalgia and to provide better dental care for individuals working in military environments. Since both military pilots and divers are at particular risk of barodontalgia and other oral health problems associated with pressure changes, military doctors and dentists should follow specific prevention and treatment protocols.

These issues demonstrate the importance of thorough dental surveillance to ensure the health and safety of military personnel. Regular screening and close collaboration between aviation and diving medicine and dentistry can help minimise the risk of barodontalgia and other complications arising from working in extreme conditions.

Laval-Meunier et al. [25] assessed the frequency of barodontalgia in French military and civilian aircrew in 2010. Using 1,184 detailed anonymous questionnaires from 15 medical centres for aircrew, the researchers collected data on barodontalgia. They found that 6.6% of respondents had experienced an in-flight barodontalgia at least once in their lifetime. The median pain intensity was rated at 5.5 out of 10, and the discomfort appeared most commonly during descent below 8,000 metres. Some pilots have expressed concerns about the impact of barodontalgia on in-flight safety. This research demonstrated the challenges associated with barodontalgia in pilots, despite advances in dentistry and technology. The authors recommended the use of preventive measures to reduce the prevalence of barodontalgia among flight crews, emphasising the importance of understanding and addressing underlying dental conditions that may exacerbate in-flight barodontalgia.

González-Santiago et al. [26] investigated the oral health and the prevalence of barodontalgia in 506 male military pilots between 1995 and 2000. Using specialised dental instruments and an X-ray machine, a detailed clinical examination was conducted and data on dental status were collected. Flight conditions were simulated in a hyperbaric chamber to assess the physiological effects of sudden pressure changes on the teeth. The analysis showed that barodontalgia was relatively rare (13 cases; 2.63%) and occurred more frequently during actual flights than during hyperbaric training. Most of these cases were associated with previously treated teeth, indicating a potential link between the quality of dental treatment and the risk of barodontalgia. The study highlighted the important role of oral health care and prophylaxis among flight crews to maintain flight safety.

Almadi and Al-Hajri [27] assessed the frequency of dental pain among military pilots and divers in Saudi Arabia and Kuwait. The study used 350 questionnaires, obtaining responses from 72.8% of pilots and 80% of divers, respectively. It was found that approximately 34% of respondents had experienced barodontalgia, with a significantly higher rate among pilots (49.6%) compared to divers (17.3%). Pain occurred at different heights and depths, depending on the type of activity. Recurrence of tooth pain after treatment was reported in 16.4% of pilots and 25% of divers, highlighting the problem of pain recurrence despite therapeutic interventions.

Zanotta et al. [28] focused on the general oral health problems of divers exposed to pressure changes in their study. The study group comprised 520 patients, of whom 15% reported dental problems and further 10.2% experienced dental pain. Dental injuries were reported in 6.3% of the study participants. Additionally, temporomandibular joint (TMJ) problems or mucosal irritation by a mouthpiece were reported by 11.3% of the subjects.

The results on the frequency of barodontalgia among soldiers are summarised in figures 1 and 2.

The results indicate the need for comprehensive oral examinations and avoidance of dental materials prone to air or fluid retention to reduce the risk of barodontalgia.

**Discussion**

The analysis of the cited articles allows to formulate a thesis that dental symptoms among military personnel, while not a primary concern, are still an important component of comfort during service. The cited studies indicate that PTSD and other mental disorders [4] may affect the stomatognathic system, leading to masticatory dysfunction and reduced salivary flow, which significantly contributes to the development of carious lesions, rampant caries in particular, and periodontitis, which may be linked to a compromised immune system.

Referring to the words by General Sikorski [1] and considering the current political situation in Eastern Europe,

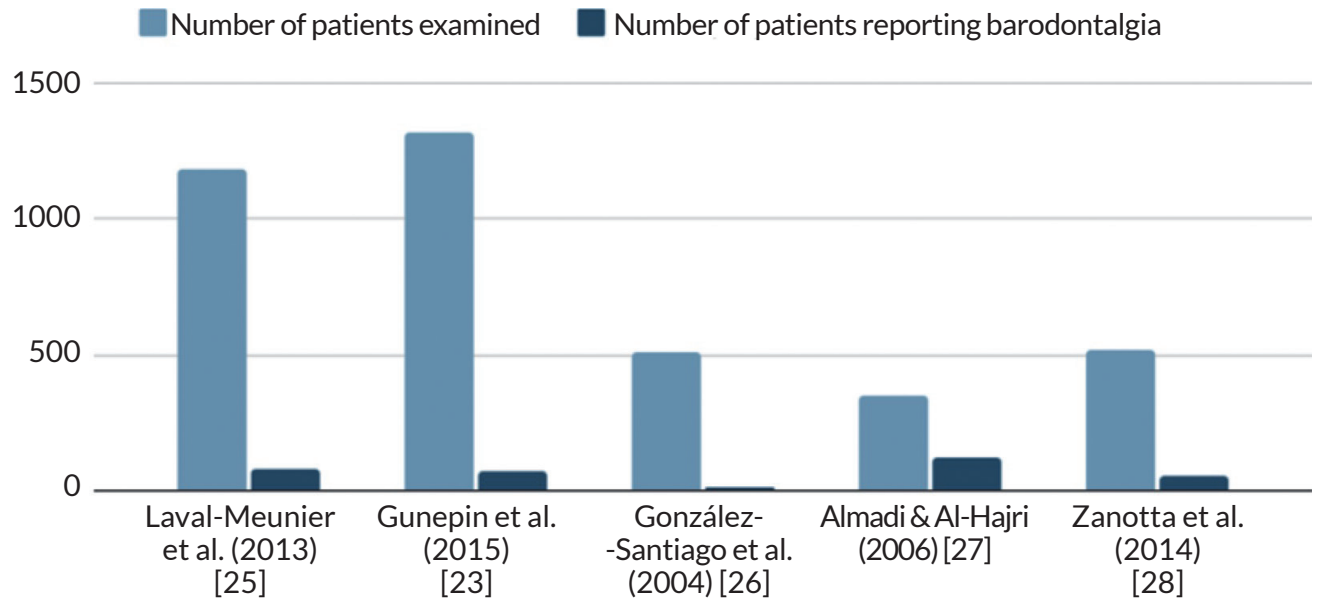


**Figure 1.** Overview of studies on the prevalence of barodontalgia among military personnel

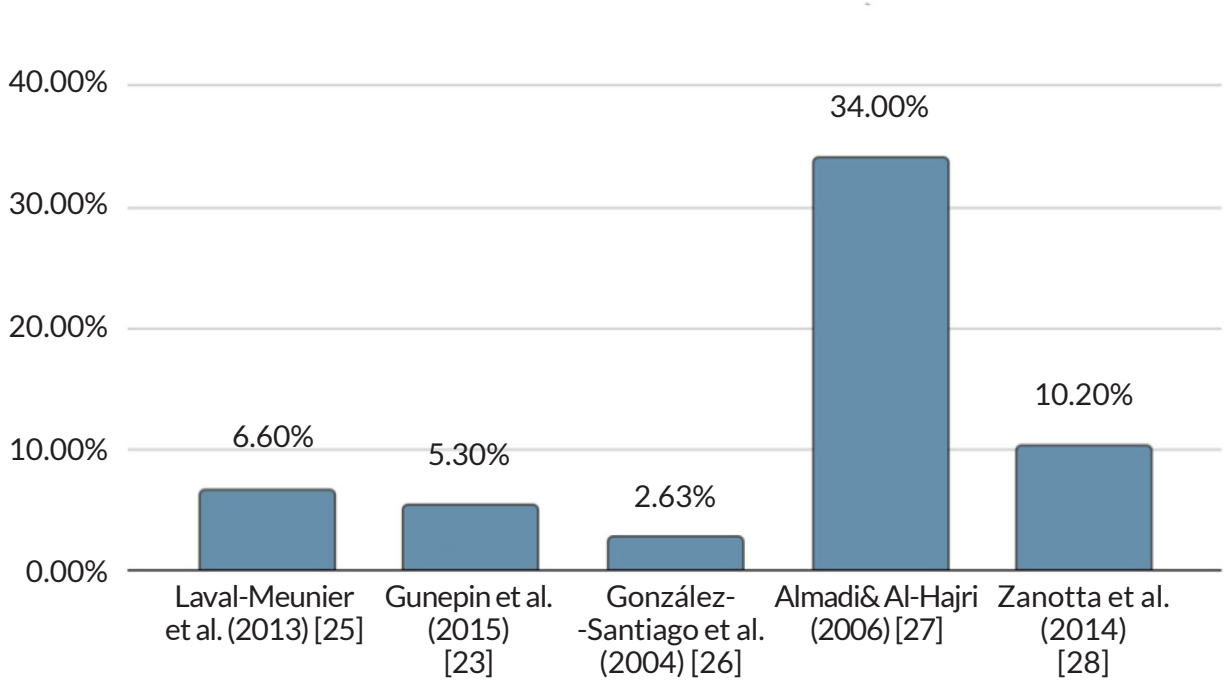


**Figure 2.** Percentage of soldiers reporting barodontalgia

it could be suggested that investigating dental problems among Ukrainian soldiers will deliver new data on barodontalgia. Lavrin et al. [11] suggested in their study that adopting NATO dental care standards and improving the existing care system could significantly enhance oral health and, consequently, the combat readiness of Ukrainian soldiers. Mobile dental clinics and improved oral hygiene practices, in line with NATO guidelines,

could be a solution to these common problems. Furthermore, the development of dental care in the military by incorporating comprehensive prevention and treatment models is of key importance in reducing caries intensity and ensuring effective oral health management among soldiers [11].

When considering the topic of dental problems in the military environment, many papers can be found highlighting the issue of barodontalgia, which is linked to a group of military personnel working in variable pressure conditions [20]. Since a certain proportion of those affected by barotrauma report a significant impact on their professional work, prevention and treatment of barodontalgia in these groups become a key direction for future research [25].

## Conclusions

Research shows that health problems ranging from PTSD to dental conditions, such as caries, periodontal disease and barodontalgia, significantly affect the effectiveness and combat readiness of military personnel, indicating the need for further research in military medicine and dentistry [4, 7–9]. The need for a holistic approach to soldiers' health, encompassing physical, mental and dental aspects, to improve their operational readiness and quality of life has been emphasised.

Dental challenges such as barodontalgia require regular check-ups and the use of specific treatment approaches and customised accessories (e.g. mouthpieces) for divers and pilots to minimise the risk of injury [10, 13, 15, 17, 20, 27]. Furthermore, there is a clear need for military-specific diagnostic and treatment protocols to improve dental care and reduce dental problems among soldiers, recognising oral health as an important component of combat readiness [23, 24, 26].

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# LIFE CAPSULES – THE EVACUATION OF THE FUTURE. AN UNMANNED AERIAL SYSTEMS TECHNOLOGY IN THE TRANSPORT OF WOUNDED SOLDIERS FROM THE BATTLEFIELD

## Kapsuły życia – ewakuacja przyszłości. Technologia bezzałogowych systemów powietrznych w procesie transportu rannych żołnierzy z pola walki

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**Abstract**

**Introduction and objective:** The authors present the use of new technologies to implement specially designed "life capsules" as part of a system for evacuating wounded soldiers from the battlefield. The article shows the possibilities of transporting "life capsules" by means of manned and unmanned aerial systems and introduces essential mathematical calculations regarding the reliability of operation of unmanned and manned transport of wounded soldiers. **Material and methods:** In addition, the principles of forecasting reliability processes over the expected operating periods have been taken into account. The analytical process also envisages the use of differentiated transportation in the areas of land, air and sea technology. The integration of new technologies – unmanned aerial systems – and humanism in the process of transporting wounded soldiers from the battlefield, represents the highest value in improving the process of saving human lives. **Results:** The article presented here covers the basic solutions for transporting wounded soldiers from the battlefield. Taking out wounded soldiers, in addition to moral considerations, is also important for restoring the combat capability of a fighting arm. **Conclusions:** The paper presents the fundamental conditions aimed at improving the transport processes of wounded soldiers on the battlefield. These conditions are the basis for undertaking work aimed at developing and implementing transport life capsules. The developed design solutions of transport life capsules, due to their special usefulness, should be adapted to diverse combat situations. In the process of transporting wounded soldiers from the battlefield, the transport infrastructure is of vital importance, which applies to varying degrees to all means of transport, especially airborne means. The paper provides an overview of the method and means of transporting wounded soldiers from the battlefield. Diverse methods and means of transport should be subjected to detailed studies. The whole process of transportation should be the basis for undertaking research and development and implementation work.

**Streszczenie**

**Wprowadzenie i cel:** Autorzy przedstawiają wykorzystanie nowych technologii do wdrożenia specjalnie zaprojektowanych „kapsuł życia" jako części systemu ewakuacji rannych żołnierzy z pola walki. W artykule omówiono możliwości transportu „kapsuł życia" za pomocą załogowych i bezzałogowych systemów powietrznych oraz wprowadzono zasadnicze obliczenia matematyczne dotyczące niezawodności funkcjonowania bezzałogowego i załogowego transportu rannych żołnierzy. **Materiał i metody:** W pracy uwzględniono dodatkowo zasady prognozowania procesów niezawodnościowych w przewidywanych okresach eksploatacji. W procesie analitycznym przewiduje się także wykorzystanie zróżnicowanego transportu w obszarze techniki lądowej, powietrznej i morskiej. Integracja nowych technologii – bezzałogowych systemów powietrznych – i humanizmu w procesie transportu rannych żołnierzy z pola walki stanowi najwyższą wartość w doskonaleniu procesu ratowaniu ludzkiego życia. **Wyniki:** W artykule zostały przedstawione podstawowe rozwiązania umożliwiające transport rannych żołnierzy z pola walki. Wyprowadzenie rannych żołnierzy, poza względami moralnymi, ma również znaczenie dla przywracania zdolności bojowej walczącego wojska. **Wnioski:** W pracy omówiono zasadnicze uwarunkowania zmierzające do usprawnienia procesów transportowych rannych żołnierzy na polu walki. Uwarunkowania te stanowią podstawę do podejmowania prac zmierzających do opracowania i wdrożenia transportowych kapsuł życia. Opracowane rozwiązania konstrukcyjne transportowych kapsuł życia, z uwagi na ich szczególną przydatność, powinny być dostosowane do zróżnicowanych sytuacji bojowych. W procesie transportowania rannych żołnierzy z pola walki istotne znaczenie ma infrastruktura transportowa, która dotyczy

w różnym stopniu wszystkich środków transportu, a w szczególności środków lotniczych. W pracy opisano ogólny zarys metody i sposoby transportu rannych żołnierzy z pola walki. Zróżnicowane metody i sposób transportowania powinny być poddane szczegółowym opracowaniom. Cały proces transportu powinien stanowić podstawę do podjęcia prac badawczo-rozwojowych i wdrożeniowych.

**Keywords:** drones, life capsules, evacuation, battlefield, unmanned aerial system, wounded soldier

**Słowa kluczowe:** drony, kapsuły życia, ewakuacja, pole walki, bezzałogowy system powietrzny, ranny żołnierz

**DOI** 10.53301/lw/176285

**Received:** 10.09.2023

**Accepted:** 04.12.2023

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## Introduction

Currently, there are approximately 50 armed conflicts globally, in which over 60 countries and 370 partisan groups are involved. Only in 2012, at least 100 thousand people were killed in armed conflicts. This number should be increased by civilian victims of humanitarian disasters that result from international conflicts, as well as civil wars and various "internal conflicts" that have been continuing for decades. Modern armed conflicts require providing a higher number of medical facilities that will allow to reduce the number of fatal victims thanks to the training of personnel and new technologies. Battlefield medicine is facing multiple challenges related to providing support in military operations, whose profile has been changing dynamically and will continue to change [1].

The participation of Poland in military peace missions that results from our membership in such organisations as the United Nations, NATO, or the EU, and the migration crisis related to the migrants from Ukraine lead to increasing threats to human life and health. As a result of these threats, the issues of injuries that result from the impact of battlefields are becoming the main area of scientific interest for the Military Institute of Medicine – National Research Institute, as a research institution. In the current situation of destabilisation and political and military threats in the international arena, one of the main subjects of interest is efficient, non-invasive, and quick evacuation of wounded soldiers from the battlefield. The analysis of the causes of death during armed conflicts revealed that a large part of deaths could be avoided, if alternative methods and measures were available. 90% of the deaths occur before the wounded reach the medical facilities [2]. According to the guidelines of Tactical Combat Casualty Care (TCCC), the care of people with injuries in the tactical environment has three main aims [2]:

- to provide aid to the injured person,
- to prevent additional casualties,
- to complete the mission.

Experts in military medicine and the academic circles agree that the out-of-hospital phase of care is the field in which the next "giant developmental leap" will be observed, mainly due to the continuous innovations in technology, training, and communications. The process of evacuating wounded soldiers from the battlefield may involve various means, which include [3]:

- manned and unmanned transport systems: unmanned aerial vehicles (UAV), "life capsules" carried by remotely controlled drones, or "rescue drones",
- manned transport systems – "life capsules" which will be an integral part of other methods of evacuating the wounded.

Traditional transport, with sue of a specially prepared stretcher and paramedics who are able to transport the wounded to a safe place or to a dressing station, is not very efficient. It is exposed to enemy fire and, apart from that, the prolonged time of transport to a specific point may have a negative influence on the health of the wounded soldiers. Moreover, lack of cover during evacuation may result in the transport being captured by the enemy, which, again, may threaten the safety of the wounded.

## Using unmanned aerial vehicles as a method for evacuating the wounded

Drones carrying specially designed life capsules are a type of unmanned aerial vehicles that are able to fly without a pilot, carrying wounded soldiers on board or in life capsules. These aerial vehicles are remotely controlled by radio waves, or autonomously (on a predefined route). Unmanned aerial vehicles do not have a specified size or type of drive. They are very often equipped with devices for surveillance and monitoring, in form of optical electronic heads. One of the main properties of drones is the fact that they do not need any additional infrastructure to record and monitor the defined area or object in a quick way. Their main advantage is the extremely short time of response, i.e. launching and preparing the unit for take-off. Unmanned aerial vehicle systems are excellent devices which, thanks to their small dimensions and high agility, may fly between obstacles, buildings, and even enter premises through open gates, windows, or doors [4]. Models that are equipped with thermal and night-vision cameras (that use active infrared light or starlight reinforcement) may be used as searching devices in rescue activities, for everyday surveillance of the given area, and they may work all day long above forested areas. The image is transmitted in real time, which allows the competent services to react immediately in situations of threat [5–7].

**Figure 1.** The CityAirbus Generation
Source: www.airbus.com/en/newsroom/press-releases/2022-05-airbus-lays-the-foundations-for-future-urban-air-mobility-in

**Systems for evacuating wounded soldier from the battlefield with armoured means of transport**

Armoured means of transport include, among others, armoured personnel carriers, infantry fighting vehicles, and tanks. The aforementioned means of evacuation should be structurally prepared for the task, which is described by the reliability function in the following form:

$$FP(t) = Pst(t) \times Pk(t) \quad (1),$$

where Pst(t) is the reliability of the means of transport designated for transporting the wounded,

Pk(t) – reliability of the combat capsule for the transport of wounded soldiers.

These armoured means for transporting wounded soldiers should be structurally modified, adequately to the transport capsule used. Due to the structural limitations of means of transport, their design should allow for the installation or allocation of the capsule in specific means of transport. Life capsules should be appropriately equipped and adapted for such situations as injuries or accidents that do not require the application of special medical measures. Their main role is to smoothly evacuate the wounded soldier from the battlefield. Folded capsules should become a fixed element of the equipment or armoured means of transport. Individual capsules should have their own drives, which are started depending on the transport situation. Due to their high usability in battlefields, capsules should be characterised by a high level of functional reliability. This reliability is estimated with the use of the readiness index Wg(t) of the capsule to perform the tasks, in the following form:

$$Wg(t) = exp(-\Lambda(t)) \times t \quad (2),$$

where exp × (t) is the exponential function of the transport capsule,

t – time of use of the transport capsule.

The functional reliability of the transport capsule is essential for its users. This reliability is evaluated based on formula (2) and the value of damage intensity × (t). The intensity of damage to capsule elements is calculated from the formula:

$$\Lambda(t) = n(t) / t \quad (3),$$

where n(t) is the number of functional elements of the transport capsule,

t – value of the time of operation of the transport capsule until damage.

***Transporting wounded soldiers with a helicopter***

Wounded soldiers may also be evacuated from the battlefield with the use of helicopters. They may be transported in two ways:

- directly on board of the vehicle, or
- with the use of a transport capsule.

The second method is more efficient due to the transport capacity. In this case, the limitation is the lifting capacity of the helicopter. Therefore, the transport with a helicopter may be described by the following lifting capacity function:

$$U(l) = f(U(k) \times Ck \times Lr) \quad (4),$$

where U(k) is the structural lifting capacity of the helicopter,

Ck – weight of the transport capsule with a helicopter,

Lr – number of wounded soldiers.

Formula (4) demonstrates that elements of the transport capsule are characterised by different values of the readiness indices. Elements with the lowest values of the index (i.e. the number of damages) should be modernised or replaced when the value of the index is low. These operations will ensure the proper functioning of the transport capsule.

The listed elements of the transport system constitute an interconnected system according to a serial reliability structure. This means that the full functionality of the specific elements of the transport capsule is achieved, in particular, during the flight.

***Transporting wounded soldiers with an airplane***

The evacuation of wounded soldiers from the battlefield with the use of an airplane is similar to helicopter transport. The difference consists in the increased lifting capacity of the transport capsule. The parameters of the transportation process are described by the flight index Wl(t) in the following form:

$$Wl(t) = f(Us(f) \times Ck(f) \times Tl(t)) \quad (5),$$

where Us(t) is the value of the lifting capacity of the airplane,

Ck(t) – weight of the transport capsule with a airplane,

Tl(t) – distance of the flight.

These factors have a major influence on the processes of transporting wounded soldiers with an airplane. The mentioned transport capsule should take into consideration the lifting capacity of the airplane and the duration of the flight to the sanitary facility. Each of the listed factors in formula (5), apart from the distance of the flight, has a fixed value. The evacuation of wounded soldiers with a transport airplane cannot be optimised. Adjust-


**Figure 2.** Airbus Skyways that enables shore-to-ship deliveries
Source: www.airbus.com/en/newsroom/press-releases/2019-03-airbus-skyways-drone-trials-worlds-first-shore-to-ship-deliveries

**Figure 3.** Next generation of CityAirbus
Source: www.airbus.com/en/newsroom/press-releases/2021-09-airbus-reveals-the-next-generation-of-cityairbus

ments can be made by changing the weight properties of the capsule, in two variants:

- by reducing the number of transported wounded soldiers,
- by using an airplane with a higher lifting capacity.

The disadvantage of this type of transport is the relatively high cost of operating the airplane and its protection during transport.

In the process of preparing the transport of wounded soldiers, it is possible to evacuate the casualties with the use of a foldable capsule located inside the airplane. Similarly as in the case of transport with the use of a helicopter, it is necessary to use a capsule with a foldable structure.

***Transporting wounded soldiers on water bodies***

Water bodies, both inland and maritime ones, provide useful ways for transporting soldiers who were wounded in the battlefield. Maritime transport is used only in special conditions, due to large distances. Similarly as it is in case of other forms of transport, this method also requires capsules in folded and unfolded forms. Evacuation of wounded soldiers by waters often used as the costs are low and it is relatively easy to secure the transport. Soldiers may be evacuated with the use of transport capsules or directly on board of the "transport barge". The medical coast services should be notified about the transport process, so that they can provide appropriate medical care if necessary.

**Discussion**

Research conducted in 2022 in Ukraine revealed that high quality of training of the tactical and medical staff and the appropriate measures and methods of action significantly increase the survival chances of the wounded [8].The development of new materials, powerful engines (electrical or mechanical ones), strong batteries of high capacity or alternate sources of energy for mechanical or electrical engines (powered by electricity, gas, or solar power), as well as antennas with advanced GPS systems are the main areas of focus in the development of future methods of evacuation [9].

In 2018, a research project on the transport of blood for transfusions and diagnostic tests between hospitals in London conducted by the National Health Service demonstrated that the use of drones would allow the British economy to save 21 billion dollars annually [10]. In 2021, the 4D-TBO project by Airbus was launched. It focused on the analysis of real-time transmission of four-dimensional data concerning the flight trajectory (latitude, longitude, altitude, and time). Further tests on the use of drones in medicine for transporting chemotherapy drugs confirmed the development of this technology in the medical sector and proved that the technology has changed the meaning of the notion of transport forever [11].

The first known use of unmanned aerial vehicles (by Austrians) took place in August 1849. These were balloons, filled with explosive materials, which were used as bombs. One of the first creators of drones was Charles Kettering, who, in cooperation with Elmer Sperry, Orville Wright, and Robert Milikan, designed an airplane named "Kettering Bug" in 1959. In spite of its rather primitive design, this was an automated airplane that could determine its altitude, the covered distance, and position with the use of sensors.

Systems of unmanned aerial vehicles are excellent devices, for example, for monitoring large areas, i.e. protecting property or the state borders. Additionally, these units may also take aerial photographs that are used in geodesy.

First research on unmanned aerial vehicles was conducted in the USA, UK, Russia, Germany, and Israel. The forerunner of these aircraft was the "Predator" that was created in 1994. Three years later, it became a perma-

nent part of the American Air Force that was used in military operations. other tasks of unmanned aerial vehicles include the protection and monitoring of mass events as well as accidents or crisis situations that require intervention. UAVs may be use by the following public administration bodies: the fire brigades, the police, border guards, armed forces, as well as geodesic companies [12].

China and Japan are the pioneers in using drones during natural disasters, i.e. earthquakes and tsunamis. During the earthquake in Sichuan in 2008, in which 69 thousand people were killed and 18 thousand were missing, the drones proved that they were a valuable tool for assessing the actual damage. The use of drones by the Chinese government enabled to assess the state of motorways, buildings, schools, hospitals, power plants, bridges, and other facilities. In 2011 in Japan, unmanned aerial vehicles were used to assess the damages at the nuclear power plant Fukushima Daiichi. Another example that perfectly illustrates the influence of unmanned aerial vehicles on the assessment of the existing threats was the massive earthquake in Nepal in 2015 [9].

As far as natural disasters are concerned, three type of missions may be distinguished:
- Aerial monitoring, whose aim is to assess the size or area of damage. Stage 1 consists in using unmanned aerial vehicles equipped with high-resolution cameras. The main aim of this stage is to provide a preliminary assessment of the damages to infrastructure immediately after the natural disaster.
- Light load logistics, including supplying water, food, drugs, and equipment to remote areas that are affected by the consequences of a natural disaster.
- Assessment of the consequences of the natural disaster.

Each natural disaster requires building different shapes and structures of unmanned aerial vehicles, together with various strong engines and batteries.

The key element in the development of this segment is finding the perfect balance between the software (software and network) and the equipment (battery power, engine). Sample types of smart platforms, drones, and unmanned aerial vehicles are presented above [9].

The electronic system of control and communication with the unmanned aerial vehicle is responsible, among others, for: the drone's flight up and down, its rotation, responsiveness, and stability. Most control systems are equipped with the same set of sensors that differ only in terms of the rate of calculations and the algorithms used [13]. these include:
- flight controllers, which is responsible for steering the aircraft,
- Electronic Speed Control – unit responsible for the engine,
- power supply board that distributes the power supply to regulators,
- SIM module that enables transmission of telemetric data,
- proximity camera – an element of the anti-collision system,
- numerical keyboard for entering PIN codes.

The following documents should be drawn up for every means of transport:
- a concept design of the method of transporting wounded soldiers,
- technical transport capacity,
- technological design of transport,
- prototypes of the equipment and adaptation of the means of transport,
- documentation of the prototyping research with a description of test results,
- documentation of the state research with a description of test results,
- serial production of prototype solutions.

**Conclusion**

The paper presents the basic solutions that enable to evacuate wounded soldiers from the battlefield. Taking out wounded soldiers, in addition to moral considerations, is also important for restoring the combat capability of a fighting arm. The methods of transporting the wounded with the use of manned and unmanned vehicles are of a conceptual nature, so they still require preparing detailed designs, developing prototype solutions, and conducting the required laboratory and operational tests. The structural solutions used in the transport capsule, which is the fundamental element of the transport processes also require further, thorough design and research works. In the opinion of the authors, due to the fact that the capsule may be used in various means of transport, it should be adapted for evacuating wounded soldiers from the battlefield and thus have a foldable structure.

The essential factors in evacuating the wounded from the battlefield are the process of identifying wounded soldiers and the duration of their transport. Drones that are adequately prepared for such work may provide important support in this process. They should be equipped with the appropriate recording cameras and equipment that will transmit signal to dressing or sanitary stations. Drones used in battlefields should be capable of identifying the wounded and should be equipped with basic dressing materials.

**Conclusions**

The presented analysis of the transportation of wounded soldiers leads to the following conclusions:
- The conditions aimed at facilitating the processes of transporting wounded soldiers from the battlefield are the basis for taking actions with the aim to develop and implement transport life capsules.
- The developed structural solutions of life capsules, due to their high usefulness, should be adapted to various combat situations.
- Transport infrastructure is an important element of the process of evacuating wounded soldiers from the battlefield. This applies, to various extents, to all means of transport, in particular to aerial ones.
- The diversified methods and ways of transporting wounded soldiers should constitute the basis for taking further research, development, and implementation works.

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ORIGINAL ARTICLE

# PSYCHOLOGICAL RESOURCES FOR COPING WITH THE STRESS EXPERIENCED BY SOLDIERS PARTICIPATING IN MISSIONS

## Zasoby psychologiczne w radzeniu sobie ze stresem doświadczanym przez żołnierzy biorących udział w misjach

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**Abstract**

**Introduction and objective:** The aim of this study was to assess the level of the sense of coherence and stress coping strategies among the homecoming participants of foreign military missions. Due to the nature of peacekeeping and stabilising missions and the tasks performed by their participants, the ability to cope with a stressful situation in the face of danger is crucial, not only for the sake of their health, but most of all due to its significant impact on collective security. **Materials and methods:** Converted values of the scores obtained in the Polish adaptation of Coping Inventory for Stressful Situations by Szczepanik, Strelau and Wrześniewski were used as indicators for stress coping styles (a dependent variable). The results received in Antonovsky's Orientation to Life Questionnaire (Sense of Coherence Scale, SOC-29) were employed as indicators for the sense of coherence (an independent variable). **Results:** The stronger the sense of coherence, the more likely the respondent to choose the task-oriented coping style. Owing to cognitive transformations, a difficult situation is interpreted as a challenge that can be coped with by a given person, who then makes efforts to solve the problem. **Conclusions:** The research clearly shows that: (1) a strong sense of coherence significantly reduces the level of perceived stress and has a decisive impact on the choice of the preferred coping style; (2) the sense of coherence determines the choice of the preferred stress coping style; (3) individuals with a strong sense of coherence perceive stressors as challenges rather than threats; (4) individuals with a low sense of coherence tend to focus their energy on negative emotions and engage in activities of a definitely unhealthy nature (smoking, alcohol consumption).

**Streszczenie**

**Wstęp i cel:** Autorzy niniejszego badania postawili sobie za cel analizę poziomu poczucia koherencji i sposobów radzenia sobie ze stresem wśród powracających do kraju uczestników wojskowych misji zagranicznych. Ze względu na charakter misji pokojowych i stabilizacyjnych oraz charakter zadań realizowanych przez ich uczestników, umiejętność poradzenia sobie z sytuacją w obliczu zagrożenia jest kluczowa nie tylko ze względu na ich zdrowie, ale przede wszystkim ze względu na znaczący wpływ stresu na bezpieczeństwo. **Materiał i metody:** Wskaźnikami zmiennej zależnej stylu radzenia sobie ze stresem są przeliczone wartości wyników uzyskanych w Kwestionariuszu Radzenia Sobie w Sytuacjach Stresowych w polskiej adaptacji Szczepanika, Strelaua i Wrześniewskiego. Wskaźnikami zmiennej niezależnej poczucia koherencji są wyniki uzyskane w Kwestionariuszu Orientacji Życiowej Antonowsky'ego (Sense of Coherence Scale, SOC-29). **Wyniki:** Im wyższe poczucie koherencji, tym częściej respondent preferuje skoncentrowany na zadaniu styl radzenia sobie ze stresem. Dzięki przekształceniom poznawczym sytuacja trudna jest interpretowana jako wyzwanie, z którym jednostka jest w stanie sobie poradzić, a następnie podejmuje wysiłki w celu rozwiązania problemu. **Wnioski:** Przeprowadzone badania jednoznacznie wskazują, że: (1) wysokie poczucie koherencji znacząco obniża poziom odczuwanego stresu i ma decydujący wpływ na wybór preferowanego sposobu radzenia sobie ze stresem; (2) poczucie koherencji determinuje wybór preferowanego stylu radzenia sobie ze stresem; (3) stresory będą traktowane przez osoby o wysokim poczuciu koherencji jako wyzwania, którym należy sprostać, a nie zagrożenia; (4) osoby o niskim poczuciu koherencji będą raczej skupiać swoją energię na negatywnych emocjach i podejmować działania o zdecydowanie niezdrowym charakterze (palenie, spożywanie alkoholu).

**Keywords:** stress, soldiers, psychological resources, health

**Słowa kluczowe:** stres, żołnierze, zasoby psychologiczne, zdrowie

**DOI** 10.53301/lw/177197

**Received:** 12.10.2023

**Accepted:** 18.12.2023

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## Introduction

Stress arising from the potential for combat, or from combat itself, is an inherent component of foreign military expeditions. An analysis of factors underlying stress experienced during a military mission leads to the conclusion that exposure to the risk of death during warfare serves as a natural catalyst of stress, and that this is amplified by the technologically advanced nature of modern wars, their dynamics and unpredictability. Anthropogenic factors, being an inseparable element of conflicts and wars, remain in the background, regardless of the era in which they are set. Stress is stimulated by the awareness of the existing threats to health and life of an individual, built on the knowledge about conflicts and socio-cultural environment in which they occur. A lack of such knowledge contributes to the difficulty in coping with stress.

Therefore, the aim of this study was to determine the relationship between the personal resources of soldiers, such as sense of coherence and coping styles. Two concepts serve as the theoretical basis of the research: the transactional theory of stress by Richard Lazarus [1] and the salutogenic theory by Aaron Antonovsky [2].

The basic statement of Lazarus' transactional theory of stress, describing psychological stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" [3] is undoubtedly the most popular and most frequently cited theory of stress. It is a manifestation of a cognitive-phenomenological approach to the issue. This approach places special emphasis on the capacity to predict future events. It is assumed that stress is not generated by a given situation and its nature, but by the way it is perceived by the person. The relationship between an individual and environment can be classified as positive, neutral or stressful [4]. The process of assessing the situation is broken up by Lazarus into primary appraisal and secondary appraisal.

A theoretical foundation for research on stress coping styles has been proposed by Norman Endler and James Parker [5]. Their theory distinguishes between coping styles based on two criteria. These are confrontation and person-orientation. Based on these particular criteria, Endler and Parker distinguished four styles: confrontational task-oriented, confrontational person-oriented, evasive task-oriented and evasive emotion-oriented – typical of individuals who avoid making any decisions or taking any actions with regards to a stressful situation. This style may manifest itself in two ways: by engaging in substitute activities (watching TV, the Internet, overeating) or by seeking interactions with other people and undertaking other tasks to develop social contacts.

The ability of individual persons to cope with stress depends on multiple factors, such as intelligence, talents, knowledge, personality traits, temper, physical appearance, experience in coping with stressful situations, as well as the current condition of an individual (both mental and physical).

## Fundamental theses of Antonovsky's salutogenic theory

In contrast to the pathogenetic approach based on the dichotomic division into health and disease, the salutogenic approach developed by Aaron Antonovsky is based on perceiving health and disease as a continuum. This allows for not only treating health as a process, but also for determining its individual levels [6].

Antonovsky holds an opinion that when facing a stressful situation, an individual can not only protect their health, but also develop themselves and choose their actions. In such a case, a stressful situation is perceived as a disruption of the balance in the individual-environment system and only the efforts of the individual may restore the balance of this system [7]. Antonovsky's salutogenic model assumes that the type and level of stress, as well as the resistance resources and the sense of coherence of an individual are decisive in the process of coping with stress. The two latter factors are of particular importance in this theory.

The concept of generalised resistance resources (GRR), the essence of which is effective prevention and eradication of stress, is understood as comprising the features and characteristics of both an individual and a group, along with cultural and environmental elements. These resources can be divided into different categories, such as material resources (GRR), such as money or physical strength; cognitive and emotional GRR (intellect, knowledge, or sense of identity); assessment and attitude resources (rationality, predicting and planning skills); interpersonal and relationship GRR (social support and commitment); as well as macro-socio-cultural resources, i.e. reactions which are determined for the individual by culture.

The sense of coherence is another concept that, according to Antonovsky, plays an extremely important role in explaining the mechanisms of coping with stress. He defines this concept as "(...) a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that 1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable, 2) the resources are available to one to meet the demands posed by these stimuli; and 3) these demands are challenges, worthy of investment and engagement" [8].

Based on this definition, three relatively autonomous components of the concept can be distinguished. Despite their independence, they still remain constructive constituent parts of the aforementioned sense of coherence. Antonovsky describes these components of the sense of coherence as comprehensibility, manageability, and meaningfulness.

On the other hand, according to Antonovsky, patterns of life experiences have the greatest impact on the formation and individual level of the sense of coherence of each individual, apart from generalised resistance resources.

Coherence is shaped by, and its level increases chiefly due to, socialisation. The formation and consolidation of

basic elements of the global sense of coherence are primarily due to three fundamental life experience patterns. According to Antonovsky, these are: consistency (stability), balance between overburdening and underburdening, and participation in decision making.

**The relationship between the sense of coherence and stress coping styles**

The fundamental claim of Antonovsky's salutogenic concept is the assumption that the state of dynamic heterostatic lack of balance is part of human nature. Regardless of whether the stressors will be internal or external by nature, a human being continually experiences stimuli during their life to which they are forced to react, even though they have neither a ready solution nor an adaptive response. In his concept, among the factors of effective coping with stress, Antonovsky names the sense of coherence, understood as a global, complex orientation of a human being which makes them perceive the surrounding world (both internal and external) as predictable, and the processes and events unfolding in it as conforming to their own expectations [9].

Individuals with a strong sense of coherence are distinctly more likely to perceive stressogenic factors as challenges which they can, in their own estimation, cope with, rather than as threats. They decide to undertake pro-health activities more readily, and are less likely to engage in harmful activities than those with low coherence.

The aim of this study was to assess the level of the sense of coherence (SOC) and stress coping strategies among the homecoming participants of foreign military missions. Due to the nature of peacekeeping and stabilising missions, and the tasks performed by their participants, the ability to cope with the situation in the face of danger is crucial, not only for the sake of their health, but most of all due to its significant impact on the collective security level [10]. Regions in which peacekeeping, stabilising and peace enforcement operations are conducted are frequently locations of intense hostilities, which is in turn associated with situations that pose a threat to mission participants and very often force them to make morally controversial decisions.

The aim of research was to demonstrate and describe the relationships between the sense of coherence exhibited by soldiers deployed on foreign missions and their preferred stress coping styles.

The fundamental research question posed by this study is: **What is level of the sense of coherence and what stress coping styles are used among soldiers deployed on missions**?

In order to ensure an in-depth and comprehensive analysis of the posed research question, the following more specific questions were isolated and formulated in the cognitive process:

- What is the relationship between the sense of coherence and stress coping styles in the personnel deployed on a military mission?
- What is the structure of a team deployed on a military mission? This question concerns the diversity among team members sent for peacekeeping missions in terms of the sense of coherence, i.e., whether the study subjects form a homogeneous group, or whether it is possible to distinguish subgroups differing in their level of the sense of coherence?

**Description of variables**

Given the aim of the study and the proposed research questions, the following dependent and independent variables were adopted.

Dependent variables: preferred stress coping styles among soldiers deployed on foreign missions.

Independent variables: the sense of coherence among soldiers deployed on military missions abroad, as well as secondary independent variables: age, marital status, children, education. Independent confounding variables: events that occurred during service on the mission.

**Methods**

A nomothetic approach was employed to verify the theoretical claims. It is based on the strategy of quantitative research in which survey results allow for identifying any emerging regularities, which can be projected onto a specific population. For this reason, in this case, the applied set of research and cognitive techniques, i.e. the research method, is quantitative in nature. Only such a method will ensure a fully objective response to the questions formulated in this study. The type of theoretical research undertaken here is of a verification nature, intended to confirm the relationship between the sense of coherence and stress management styles which the theory posits. The theoretical foundations and the aforementioned correlation were presented in the introduction to methodology. The nature of both the subject of research and the formulated questions required the use of the following cognitive techniques in the research process: the Orientation to Life Questionnaire (SOC-29), the Coping Inventory for Stressful Situations (CISS) Questionnaire.

The converted values of the scores obtained in the Polish adaptation of CISS by Szczepanik, Strelau and Wrześniewski were used as indicators for the dependent variable of stress coping style.

The scores obtained in Antonovsky's Orientation to Life Questionnaire (SOC-29) were used as indicators for the sense of coherence (independent variable). Interview data were utilised as indicators for secondary independent variables. The indicators for independent confounding variables are data items acquired from the interview.

**Description of the study group and the course of the survey**

The research was conducted between 2020 and 2022 on the premises of the General Tadeusz Kościuszko Military University of Land Forces in Wrocław, among the participants of the qualification, development and language courses conducted by the University. Participation in the study was voluntary. Every surveyed person received a set including the CISS and the Orientation to Life Ques-

tionnaire (SOC-29). The research session lasted about 20 minutes. A total of 182 soldiers who had participated in military missions at least once in their life took part in the study. All respondents were male. Soldiers of the Land Forces accounted for the majority of the study group (91%), while the members of Special Forces accounted for only a small percentage (9%).

The questionnaires were used to assess soldiers in individual corps of the Armed Forces of the Republic of Poland, including the corps of officers, non-commissioned officers, and career privates. This is the basic division into corps within the Polish Army, and consequently, there is a distinct recruitment and selection of persons for each corps. Since the military is still dominated by an autocratic leadership style, the tasks and duties of soldiers in individual corps also vary.

Non-commissioned officers prevailed among the respondents (44%), officers formed a smaller group (32%), followed by career privates (24%). Figure 1 shows a detailed breakdown of the respondents by military rank. The majority of respondents had higher education (59%), with the remaining soldiers having secondary education (41%). The age of the surveyed soldiers ranged from 26 to 43 years, with the mean age for the total group of 33.866 years.

Family situation was an important element in the description of the surveyed soldiers. This aspect is particularly important in the context of deployment on missions abroad, which is taken into consideration in this profession. When analysing the demographic data cards, the focus was placed on the marital status and the number of children. Over two-thirds of respondents (69%) had families and at least one child (37%).

A family left behind in home country can be a source of stress and a distraction for a soldier, preventing them from focusing their full attention on their assigned tasks. It is possible that a soldier on a mission abroad may receive information about problems or unfortunate events affecting their loved ones left behind in their country. For a soldier serving on a mission, the safety of their family is of paramount importance. Knowing that their family is safe positively contributes to their motivation to perform duties effectively and efficiently. A threat to this stability may pose a threat not only to the soldier themselves, but also to the members of their unit.

A statistical analysis of the questionnaire data was performed to answer the study questions. The calculations were performed using STATISTICA 13. Descriptive statistics were used to provide detailed descriptions of the variables. The analyses employed various statistical methods and tests, including: the Pearson correlation coefficient, Ward's method, histograms, the Shapiro-Wilk test, cluster analysis, the F-test, and the Student's t-test for independent samples. The analyses were performed at a statistical significance level of □ = 0.05.

The presentation of the research findings began with the preparation of descriptive statistics for each variable. Table 1 provides a description of the variables associated with coping styles.

The mean score for the task-oriented style (TOS) was 65.40. The minimum and maximum TOS score is 38 and 80, respectively. The standard deviation (SD) for TOS is 7.9. There was little variation in TOS among the respondents.

For the emotion-oriented style (EOS), the mean score was 34.62, with a standard deviation of 10.41. The minimum and maximum score was 16 and 67, respectively. A standard deviation of the mean >30% indicates a significant EOS variation.

The avoidance-oriented style (AOS) also significantly differentiated the soldiers surveyed. The mean score was 36.63; the minimum and maximum AOS score was 18 and 64, respectively, with SD of 10.43. The avoidance-oriented style is divided into two subscales: engaging in substitute activities (ESA) or seeking social contacts (SSC).

The first subscale is characterised by a large span between the minimum (8) and the maximum score (32). With an average of 14.82, the SD was 5.88, which is approximately 39% of the mean value. This result allows for a clear determination of the diversity among the respondents for this variable. In the case of SSC, the respondents also differed markedly in their use of this method to combat stress. The mean score was at the level of 14.24. The minimum and maximum scores obtained in the survey were 7 and 22, respectively (SD = 3.92).

The respondents showed no significant differences for the task-oriented style, which is not the case with regard to the other two coping styles. Particularly large diversity was evident for the ESA subscale.

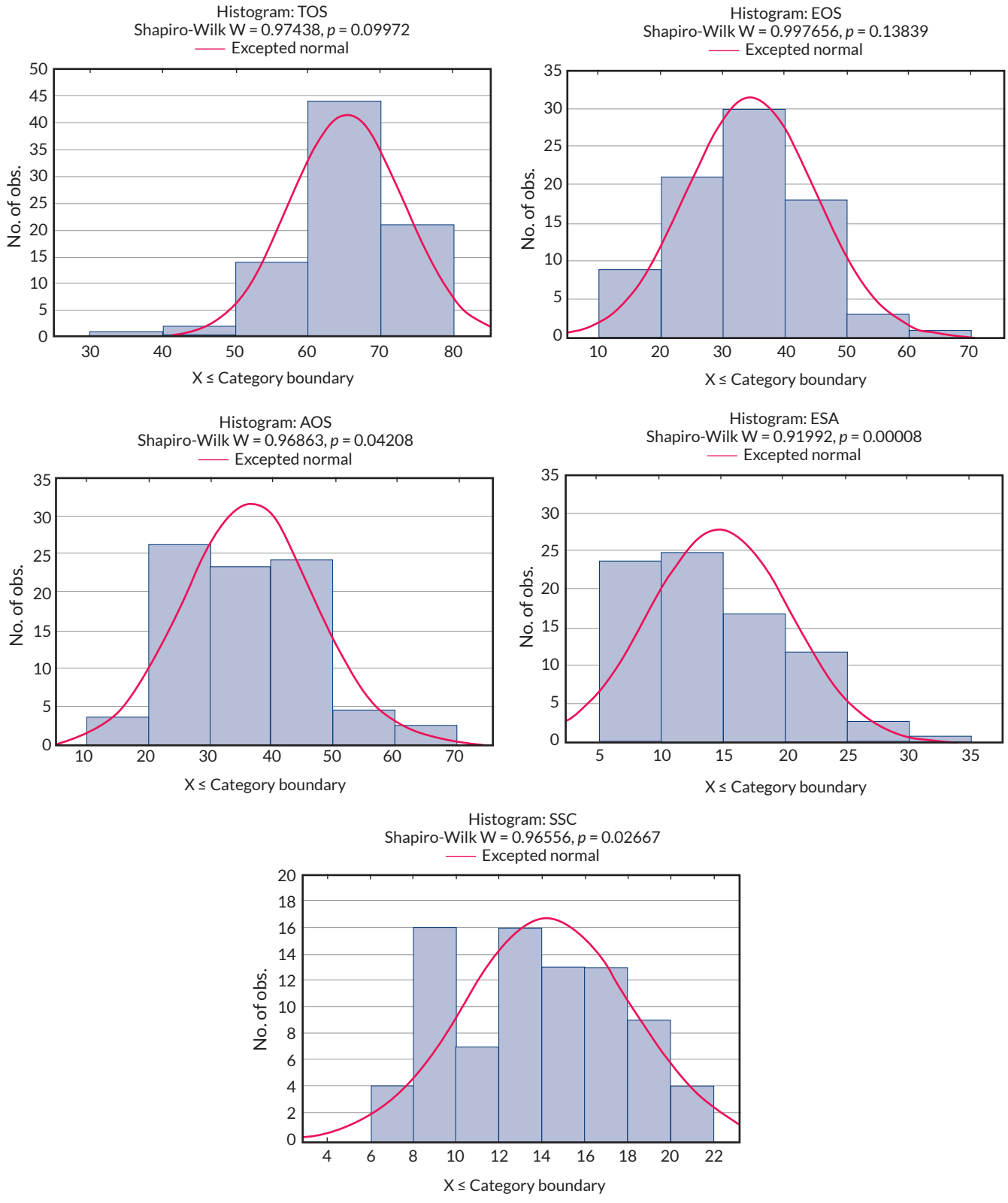
The same analysis was performed for variables related to the sense of coherence. Descriptive statistics for this variable are shown in table 2.

On the intelligibility scale, the maximum obtainable score is 77. For the respondents, the mean was 46.73 (SD = 13.58). The lowest and the highest score obtained by respondents was 24 and 71, respectively. This indicates significant diversity among the respondents.

The minimum and maximum scores for manageability were 23 and 68, respectively, out of a possible score of 70. The mean score was 48.62 (CD = 13.35). It exceeded 15% of the mean value, indicating that the results on the manageability scale varied significantly among the respondents.

The mean score obtained by soldiers in the meaningfulness scale was 41.89. The minimum and the maximum scores were 25 and 55, respectively. Considering the standard deviation at the level of 9.46, it can be concluded that the respondents differed in this sense of coherence subscale.

The mean score in the global level of the sense of coherence was 137.24, with the minimum of 76 and the maximum of 190. The ratio of the standard deviation (35.98) to the mean exceeded 21% of the mean value, indicating that the group was heterogeneous in terms of the global sense of coherence.




*Source: Statistica 13, the author's own the author's own research*

**Figure 1.** Histograms of individual scales of coping styles

To check the correlations between the level of the sense of coherence and coping styles, the r-Pearson correlation analysis included in table 3 was performed.

The analysis carried out at $p < 0.05$ showed statistically significant relationships between TOS and all components of the sense of coherence and the global sense of coherence among the surveyed soldiers. The coherence was in the range of 0.56 to 0.59. The strong link between these variables indicates a simultaneous increase in both aspects, i.e., individuals achieving high scores in the SOC-29 Orientation to Life Questionnaire, also have high scores on the TFS scale in the CISS Questionnaire. The higher the sense of coherence, the

**Table 1.** Statistical description of variables associated with coping styles used in stressful situations

| Variable | Descriptive statistics | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | N valid ones | Mean | CI −95.000% | CI 95.000% | Min | Max | SD | SE |
| TOS | 182 | 65.402439 | 63.6668746 | 67.1380035 | 38 | 80 | 7.89883529 | 0.872280435 |
| EOS | 182 | 34.6219512 | 32.3339115 | 36.9099909 | 16 | 67 | 10.4132397 | 1.14994995 |
| AOS | 182 | 36.6341463 | 34.3419757 | 38.926317 | 18 | 64 | 10.4320401 | 1.15202611 |
| ESA | 182 | 14.8170732 | 13.5242354 | 16.1099109 | 8 | 32 | 5.88391414 | 0.649769618 |
| SSC | 182 | 14.2439024 | 13.3824305 | 15.1053744 | 7 | 22 | 3.9206984 | 0.432968708 |

*Source: Statistica 13, the author's own research*
*SD – standard deviation; SE – standard error; Max – maximum; Min – minimum; CI – confidence interval*

**Table 2.** Descriptive statistics of the analysed variables for the sense of coherence

| Variable | Descriptive statistics | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | N valid ones | Mean | CI −95.000% | CI 95.000% | Min | Max | SD | SE |
| Comprehensibility | 182 | 46.7317073 | 43.7476175 | 49.7157972 | 24 | 71 | 13.5810769 | 1.49977904 |
| Manageability | 182 | 48.6219512 | 45.6876941 | 51.5562084 | 23 | 68 | 13.3542801 | 1.47473353 |
| Meaningfulness | 182 | 41.8902439 | 39.8109096 | 43.9695782 | 25 | 55 | 9.46338767 | 1.04505634 |
| Total | 182 | 137.243902 | 129.337787 | 145.150018 | 76 | 190 | 35.9820123 | 3.97354853 |

*Source: Statistica 13, the author's own research*
*SD – standard deviation; SE – standard error; Max – maximum; Min – minimum; CI – confidence interval*

**Table 3.** The r-Pearson correlation between the level of sense of coherence and coping styles

| Variable | Correlation<br>The determined correlation coefficients are significant with $p < 0.05000$<br>$N = 82$ | | | |
|---|---|---|---|---|
| | Comprehensibility | Manageability | Meaningfulness | TOTAL |
| TOS | 0.5888 | 0.5802 | 0.5621 | 0.5854 |
| | $p = 0.000$ | $p = 0.000$ | $p = 0.000$ | $p = 0.000$ |
| EOS | -0.6341 | -0.6527 | -0.6460 | -0.6515 |
| | $p = 0.000$ | $p = 0.000$ | $p = 0.000$ | $p = 0.000$ |
| AOS | -0.2386 | -0.2128 | -0.2156 | -0.2257 |
| | $p = 0.031$ | $p = 0.055$ | $p = 0.052$ | $p = 0.041$ |
| ESA | -0.3209 | -0.3134 | -0.3168 | -0.3207 |
| | $p = 0.003$ | $p = 0.004$ | $p = 0.004$ | $p = 0.003$ |
| SSC | -0.0556 | -0.0091 | -0.0149 | -0.0283 |
| | $p = 0.620$ | $p = 0.936$ | $p = 0.894$ | $p = 0.801$ |

*Source: Statistica 13, the author's own research*
*SD – standard deviation; SE – standard error; Max – maximum; Min – minimum; CI – confidence interval*

more likely the respondent to choose the task-oriented style. Cognitive transformations allow for interpreting a difficult situation as a challenge that can be coped with by an individual, who then makes efforts to solve the problem.

When looking at the emotion-oriented style, strong negative correlations may be observed between this variable and the global sense of coherence and its individual scales. These fell into a range from -0.63 to -0.65. The lower the sense of coherence in a given soldier, the more likely they are to focus on themselves, and the emotions experienced, using the emotion-oriented style. At the same time, they may often think wishfully, feel anger, irritability, guilt and constant tension.

A negative relationship between comprehensibility and the global sense of coherence and AOS could be also observed in the study group. A lower sense of coherence also occurs between the ESA subscale–and all components of the sense of coherence. This indicates that the lower the sense of coherence, the more likely the person to avoid a stressful situation, especially by engaging in other activities, most often destructive, such as any types of stimulant abuse and addictions.

In order to determine the structure of the group of soldiers and to check the homogeneity of the respondents in terms of their sense of coherence, the analysis of clustering using the k-means method was used. First, however, the scales were standardised for further analysis.

**Table 4.** Mean values of variables in isolated clusters

| Variable | Cluster 1 | Cluster 2 |
|---|---|---|
| **Comprehensibility** | -1.125747 | 0.7607275 |
| **Manageability** | -1.150876 | 0.772999 |
| **Meaningfulness** | -1.134825 | 0.7597756 |
| *Source: Statistica 13, the author's own research* | | |

**Table 5.** Analysis of variance in clusters

| Standardised variable | Between clusters | Df | Inside clusters | df | F | Significance P |
|---|---|---|---|---|---|---|
| **Comprehensibility** | 70.17754 | 1 | 12.806 | 80 | 438.4042 | 0.000000 |
| **Manageability** | 72.98775 | 1 | 10.00146 | 80 | 583.8165 | 0.000000 |
| **Meaningfulness** | 70.78344 | 1 | 12.16627 | 80 | 465.4406 | 0.000000 |
| *Source: Statistica 13, the author's own research* | | | | | | |

**Table 6.** Focus level vs. stress coping styles in the study group

| Variable | Focus level | Mean | Standard deviation | Z test result | Significance level |
|---|---|---|---|---|---|
| Task-oriented style (TOS) | Cluster 1 | 60.85 | 8.17 | 4.84 | <0.000 |
| | Cluster 2 | 68.47 | 6.08 | | |
| Emotion-oriented style (EOS) | Cluster 1 | 42.06 | 10.03 | 6.53 | <0.000 |
| | Cluster 2 | 29.61 | 7.23 | | |
| Avoidance-oriented style (AOS) | Cluster 1 | 37.76 | 10.50 | 0.80 | 0.427 |
| | Cluster 2 | 35.88 | 10.42 | | |
| *Source: Statistica 13, the author's own research* | | | | | |

A tree diagram (Ward's method) was used to determine the number of clusters. Individual cases were separated into two groups, hence the adoption of the twin-cluster solution. Then, clusters were isolated using the k-means method. Finally, two clusters were formed. There were 54 and 128 respondents in the first and the second group, respectively. The mean values of variables in the isolated clusters are presented in table 4.

Those scoring high in each dimension of the sense of coherence formed Cluster 2, while respondents with a low sense of coherence were included in Cluster 1. According to Antonovsky's theory, the sense of coherence is a relatively permanent disposition of an individual shaped in the course of experiences, and people belonging to individual clusters already have a fixed level of the sense of coherence.

It was also necessary to verify how well a given dimension determines clusters. For this purpose, an analysis of variance in each dimension was performed. The results are presented in table 5.

The analysis of variance indicated that all components of the sense of coherence differentiated the isolated groups in a similar manner. There were 182 study participants. Among the respondents, low scores on the scales of comprehensibility, manageability and meaningfulness (Cluster 1) were obtained by 54 respondents, while 128 respondents scored high in these scales (Cluster 2). In order to check the normal distribution for the coping scales, histograms were created and the Shapiro-Wilk test was performed.

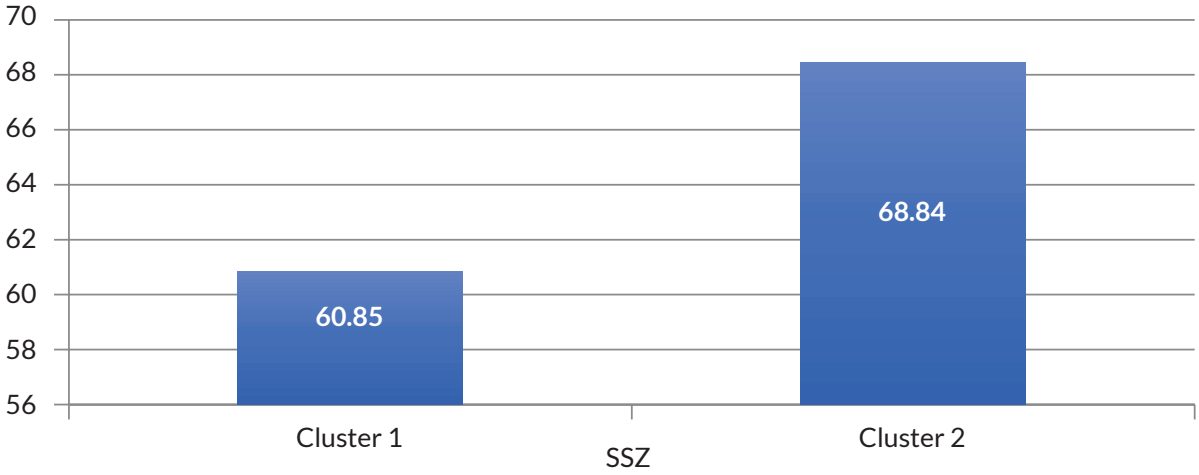
Shapiro-Wilk analysis and histograms indicated that the TOS, EOS and AOS variables had a normal distribution, which suggested the use of parametric tests.

In order to check whether those who scored low for comprehensibility, manageability and meaningfulness (Cluster 1) differed from respondents with high scores in the above-mentioned scales (Cluster 2) in terms of employed coping styles, the Student's t-test for independent trials was used. The results are shown in table 6.

The analysis with the Student's t-test for independent samples showed statistically significant differences in the frequency of using TOS and EOS. The mean results establishing differences between the isolated clusters due to given coping styles are presented in figure 2 (TOS) and figure 3 (EOS).

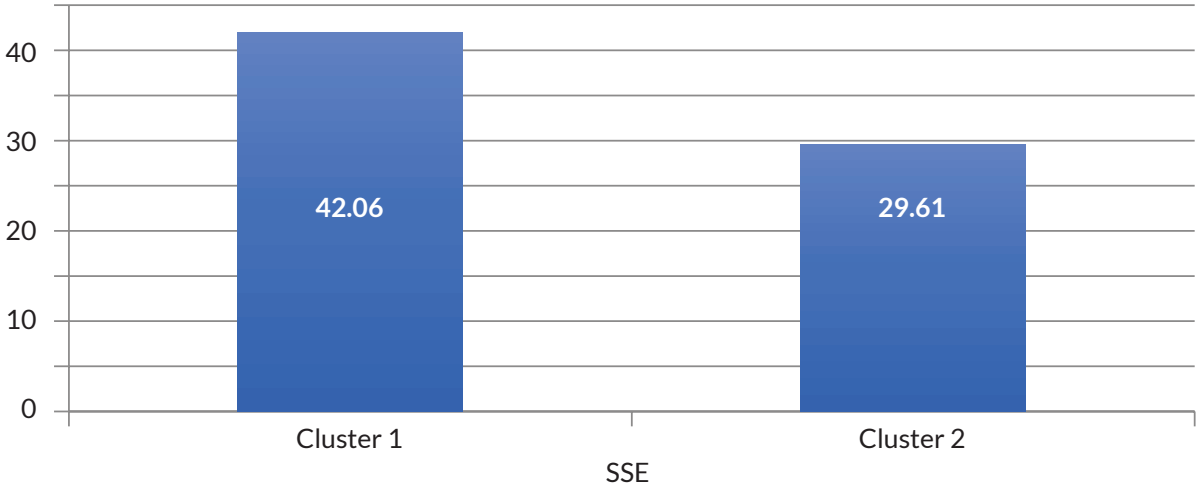
Such differences were not observed for the avoidance-oriented style. Respondents with a high sense of coherence were more likely to cope with a difficult situation using the task-oriented style, while those from Cluster 1 (with a low sense of coherence) preferred the emotion-oriented style.

When performing the Shapiro-Wilk test, it could be noticed that the variables of engaging in substitute activities and seeking social contacts did not have a normal distribution. Therefore, nonparametric tests were used. An analysis was performed using the Mann-Whitney U test to check whether persons with low scores for comprehensibility, resourcefulness and rationality (Cluster 1) differed from high-scoring individuals (Cluster 2) in terms




*Source: Statistica 13, the author's own the author's own research*

**Figure 2.** Average frequency of using task-focused style for isolated clusters




*Source: Statistica 13, the author's own the author's own research*

**Figure 3.** Average frequency of using task-focused style in the case of isolated clusters

of the frequency of AOS subscales, i.e., ESA and SSC. The results are shown in table 7.

The analysis with Mann-Whitney U test showed no statistically significant differences in the use of individual subscales of the avoidance style. Respondents from the isolated clusters did not differ in the frequency of engaging in substitute activities or seeking social contacts.

**Interpretation of results**

The empirical research presented here aimed at providing information on the level of sense of coherence and stress coping styles in soldiers deployed on missions abroad. The analysis of the results obtained with the questionnaire methods was intended to help provide answers to three research questions. The main question that was asked in developing the research methodology was: "What are the sense of coherence and stress coping styles of soldiers deployed on missions?". The need to perform an in-depth and comprehensive analysis of the research problem required the isolation and formulation of two specific issues in the cognitive process:

What is the relationship between the sense of coherence and coping strategy in soldiers deployed on a mission?

What is the structure of the team deployed on a foreign mission? This question concerned the diversity among team members sent on peacekeeping missions in terms of the sense of coherence, i.e., whether this was a homogeneous group or whether groups differing in the intensity of the sense of coherence could be distinguished.

After tests were carried out and the raw results were entered into the spreadsheet and then recalculated, descriptive statistics of variables were constructed. Then it was decided to determine to what extent the study group of soldiers was a homogeneous group due to the scale of the sense of coherence. For this purpose, two clusters with different levels of coherence were distinguished. The first cluster included respondents with low scores on all three scales of the sense of coherence. These respondents were

**Table 7.** Cluster level and stress coping styles in the study group

| Variable | Cluster level | Mean | Standard deviation | Z test result | Significance level |
|---|---|---|---|---|---|
| Engagement in substitute activities (ESA) | Cluster 1 | 13.90 | 5.60 | 1.74 | 0.085 |
| | Cluster 2 | 16.18 | 6.12 | | |
| Seeking social contacts (SSC) | Cluster 1 | 14.43 | 3.97 | 0.52 | 0.606 |
| | Cluster 2 | 13.97 | 3.88 | | |

*Source: Statistica 13, the author's own research*

then compared in terms of preferred stress coping styles with the second cluster, which included individuals with a high sense of coherence. Both external and internal factors are predictable, explainable and orderly for these individuals. They also have the means and resources that enable them to meet the requirements that these factors may set for them. They perceive these requirements as specific challenges, the overcoming of which, in their opinion, is worth their commitment and effort. The comparative analysis showed that only in the case of two coping styles, i.e. TOS and EOS, differences were found between respondents included in both clusters [11].

Respondents with a high level of coherence (the second cluster), were significantly more likely to use the task-oriented style than those with a low sense of coherence. Respondents from the second cluster were significantly more likely to take efforts and actions to solve a given problem or to change the stress-generating situation. Just as the task-oriented style turned out to be characteristic for those with a high level of sense of coherence, the emotion-oriented style dominated in the first cluster with a low sense of coherence. Therefore, it seems that individuals with a low sense of coherence are characterised by behaviours such as focusing on their own emotions; guilt and emotional tension; anger; tendency to fantasise; and wishful thinking.

## Conclusions

The research has clearly shown that a high sense of coherence significantly reduces the level of perceived stress and has a decisive impact on the choice of the preferred stress coping strategy. Furthermore, it strongly positively correlates with measures of mental health, while the correlation with somatic ailments is definitely negative. The research has also shown that there is a clear relationship between the level of sense of coherence and the choice of stress coping style.

Therefore, it can be concluded that the sense of coherence determines the choice of the preferred stress coping style. The research confirmed a measurable relationship between the level of sense of coherence and the choice of coping style. The more coherent a person is, the more likely they are to choose the task-oriented style as a way of coping with stress. On the other hand, as the level of sense of coherence decreases, the chance to focus on emotions as the preferred method of dealing with stress increases.

The results of the analyses have led to a conclusion that stressors will be treated by people with a high sense of coherence as challenges to be met rather than threats. The fact that the tension arising from potentially stress-inducing situations does not cause severe, chronic stress in these individuals, but rather motivates them to take intensive actions to solve the problem or change the stressful situation, probably results from their preferred task-oriented style. At the same time, the research shows beyond any doubt that individuals with a low sense of coherence will rather focus their energy on negative emotions and engage in activities of a definitely unhealthy nature (smoking, alcohol consumption). The focus on oneself and one's own negative experiences preferred by such people may lead to the consolidation of the tension they experience, and, as a consequence, long-term stress resulting in occupational burnout and physiological changes.

While the world may usually seem poorly understood and often meaningless for those who lack stress coping resources, which is determined by their far-reaching focus on efforts to eliminate only the negative consequences of events, individuals with a high sense of coherence focus primarily on the use of behavioural and cognitive strategies targeting a given problem.

A feature that seems to be common for all persons with a high sense of coherence is their effectiveness in taking action when facing challenges and problems. This encompasses not only the very process of coping with difficulties, but also the outcomes of these activities, and may include only one or many spheres of human activity. An example may be a person competent in social interactions, who will not necessarily be psychologically effective. Before starting a specific stress transaction, it seems logical to establish the baseline level of effectiveness. When assessing the coping styles among soldiers serving on missions abroad, an attempt should be made to determine the level of their effectiveness. At this point, it should be considered to what extent and in what specific situations soldiers serving on foreign missions could prove effective in action. The answer to this question could help determine to what extent a given coping style can be shaped and promoted. For example, soldiers of a motorised infantry brigade occupying the troop compartment of an armoured personnel carrier have neither the ability to operate the vehicle's onboard weapons (cannon) or control the vehicle. Therefore, they have no real impact on the movement of the vehicle, the use of evasion or its ability to fire heavy weapons. Therefore, it is difficult to speak of their ability to undertake meaningful and effective actions in the event of being attacked with anti-tank weapons or improvised explosive devices. The inability to take action in such cases will promote

the emotion-oriented style. Precise determination of the tasks and responsibilities of each crew member and what each of them can realistically do in such a situation may promote a more healthy coping style (TOS).

Based on the research by Pasikowski, it can be concluded that the level of the sense of coherence not only has a significant impact on the individual elements of the stress management process, but above all modifies the primary assessment [12]. At this stage, the significance of a given stress transaction is estimated. As part of the initial assessment, an individual considers a given situation in terms of harm (loss), threat (anticipation of future losses), or challenge. Preferring the task-oriented style, individuals with a higher sense of coherence will largely perceive stressful situations as challenges, which will significantly reduce their level of anxiety and negative emotions related to stress. Reducing the level of anxiety or its complete elimination will result in the belief of such individuals that they have free access to resources and means to cope with a given stressful situation.

It is extremely important that the person exposed to stressors is convinced that the situation in which they find themselves is cognitively manageable. This significantly reduces the risk of anxiety and depressive states. The research conducted by Pasikowski showed that success in action is influenced not so much by the number of strategies used as by their configuration. In these studies, active strategies, both cognitive and behavioural ones, were the most effective, and their opposite turned out to be avoidance actions, which only aimed to change the mood and well-being. The only way for emotion-oriented coping strategies to be effective is to skilfully integrate them into cognitive and behavioural activities.

Individuals characterised by a high level of the sense of coherence, by treating a stressful situation as a challenge, build their own dynamics of functioning under stress. This relationship has been confirmed in the present study. It has been demonstrated beyond any doubt that individuals who prefer the task-oriented style as a method of coping with stress show a high level of the sense of coherence [13].

The results of our cognitive study allowed for a closer look at the level of dependence between the level of coherence and preferred method of coping with stress. Due to the complexity of the issue being studied, the remaining elements of the stress transaction model were not investigated in this study. Therefore, this research can only be seen as a starting point for a deeper analysis of the specificity of soldiers' service on foreign missions and the associated stress.

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# ANALYSIS OF THE HEALTH NEEDS OF THE PAEDIATRIC IMMIGRANT POPULATION FROM UKRAINE WHO RECEIVED MEDICAL ASSISTANCE IN 2023 WITHIN THE FRAMEWORK OF THE CENTRE FOR MEDICAL SERVICES OF THE MILITARY INSTITUTE OF MEDICINE – NATIONAL RESEARCH INSTITUTE IN WARSAW

## Analiza potrzeb zdrowotnych populacji dziecięcej imigrantów z Ukrainy, którym udzielono pomocy medycznej w 2023 roku w ramach Centrum Pomocy Medycznej Wojskowego Instytutu Medycznego – Państwowego Instytutu Badawczego w Warszawie

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**Abstract**

**Introduction and objective:** The influx of Ukrainian refugees, caused by the armed conflict in Ukraine that began in 2022, necessitated the development of new standards of medical assistance in Poland. Therefore, the Centre for Medical Services for Refugees was established on the premises of the Military Institute of Medicine – National Research Institute. Based on the analysis of collected medical data, the main goal of the article was to define the health status and the most common health problems of the Ukrainian paediatric immigrant population. **Materials and methods:** Ukrainian children with refugee status seeking help at the Centre were included in the study. During the 56 days of the Centre's operation, medical assistance was provided to 130 paediatric patients as part of 211 medical consultations carried out from May to July 2023. Detailed analysis of the children's demographic data, epidemiological factors, current health issues, medical history and documentation was conducted. **Results:** The need for continuing the treatment for chronic diseases (30%, 64 visits) was the most common reason for appointment, while infections constituted the second most frequent reason (27%, 56 visits). Based on information collected by means of questionnaires, the majority of children (74%) were fully vaccinated, partially vaccinated and unvaccinated children accounted for 1% and 3%, respectively, whereas 22% of respondents refused to answer questions regarding vaccinations. According to the survey on infectious diseases, two cases of viral hepatitis and one case of tuberculosis were identified. There were no cases of HIV/AIDS. **Conclusions:** The general health status of paediatric Ukrainian refugees was good, not significantly different from the Polish population, and their health needs also did not differ from those of Polish patients. The patients did not present symptoms typical of a war migrant population. The results of the implemented programme confirm the usefulness of establishing the Centre for Medical Services for Refugees as a space for professional medical care and a great tool for public health data collection.

**Streszczenie**

**Wprowadzenie i cel:** Napływ ludności cywilnej (głównie kobiet i dzieci) pochodzenia ukraińskiego spowodowany konfliktem zbrojnym w Ukrainie, zapoczątkowany w lutym 2022 roku, spowodował konieczność opracowywania nowych standardów pomocy medycznej. W tym celu, korzystając z zasobów Wojskowego Instytutu Medycznego – Państwowego Instytutu Badawczego, utworzono Centrum Pomocy Medycznej, działające w okresie od maja do lipca 2023 roku. Na podstawie analizy zgromadzonych danych medycznych pacjentów zgłaszających się do Centrum podjęto próbę zdefiniowania najczęstszych problemów zdrowotnych populacji pediatrycznej imigrantów wojennych z Ukrainy. **Materiał i metody:** Badaniem objęto dzieci pochodzenia ukraińskiego, mające status uchodźcy wojennego. W ciągu 56 dni działania Centrum udzielono pomocy medycznej 130 pacjentom pediatrycznym, w ramach 211 przeprowa-

dzonych konsultacji lekarskich. Szczegółowej analizie poddano dane demograficzne i epidemiologiczne, bieżące problemy zdrowotne, wywiad chorobowy oraz dokumentację medyczną zgłaszających się dzieci. **Wyniki:** Najczęstszym powodem zgłoszenia się pacjentów była potrzeba kontynuacji świadczeń/leczenia z powodu przewlekłego problemu zdrowotnego (30%, 64 wizyty). Drugą co do częstości przyczynę zgłoszeń stanowiły infekcje (27%, 56 wizyt). Z wywiadu zebranego od opiekunów wynikało, iż większość (74%) dzieci była szczepiona zgodnie z ukraińskim kalendarzem szczepień, 1% stanowiły dzieci szczepione częściowo, 3% dzieci niezaszczepione, a w 22% przypadków odmówiono odpowiedzi na pytanie dotyczące szczepień. Na podstawie ankiety dotyczącej chorób zakaźnych stwierdzono dwa zachorowania na wirusowe zapalenie wątroby i jedno zachorowanie na gruźlicę. Nie odnotowano HIV/AIDS wśród badanych pacjentów pediatrycznych. **Wnioski:** Stan zdrowia przybyłych do Polski dzieci pochodzenia ukraińskiego był dobry, nieodbiegający znacząco od populacji polskiej, a ich potrzeby zdrowotne nie różniły się w większości od potrzeb pacjentów polskich. Pacjenci nie prezentowali objawów typowych dla populacji migrantów wojennych. Wyniki przeprowadzonego programu potwierdzają przydatność tworzenia centrów pomocy medycznej dla migrantów jako przestrzeni do fachowej opieki medycznej oraz gromadzenia danych z zakresu zdrowia publicznego.

**Keywords:** children, epidemiology, vaccinations, migrants, war refugees

**Słowa kluczowe:** dzieci, epidemiologia, szczepienia, migranci, uchodźcy wojenni

**DOI** 10.53301/lw/188543

**Received:** 15.04.2024

**Accepted:** 10.05.2024

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## Introduction

Russia's invasion of Ukraine, which began on February 24, 2022, resulted in a massive influx of war refugees to Poland. In the first three days of invasion, 115,000 Ukrainians crossed the border of our country. This number rose to 2.3 million over the next five weeks. By July 2023, a total of 13.8 million war refugees had crossed the Ukrainian-Polish border, with women and children accounting for up to 97% [1]. According to the Office of the c.c. of Warsaw, more than 1.1 million refugees from Ukraine have passed through the capital in the year since the start of the military conflict [2].

According to official sources, there were more than 104,000 Ukrainians living in Warsaw in February 2023, of which 17,000 were under 18 years of age [2].

When crossing the Polish border, the immigrants were not familiar with the functioning of the Polish healthcare system, and their socioeconomic status mostly limited their ability to use private services. Additionally, the patients usually lacked medical records confirming information about their current health status, past hospital admissions, surgeries or medications taken, which made the diagnostic and therapeutic process challenging.

It was therefore necessary to determine in detail what resources should be used and what organisational modifications should be introduced in the health and social care system to meet the specific needs of migrants from Ukraine. A model of care based on Centres for Medical Services (CUM) for Refugees is one potential systemic solution to this problem. The idea behind CUM is to set up specialised medical units providing a wide range of medical services in the districts/voivodeships, with the services optimally adjusted to the specific needs of this population.

In line with this model of care, a CUM was established on the premises of the Military Institute of Medicine – National Research Institute in Warsaw (WIM-PIB). This project was conducted with the participation of WIM-PIB personnel and doctors of the Hashemite Kingdom of Jordan Armed Forces for a period of 2 months.

In this paper, we analyse the health problems of children presenting to CUM.

## Aim

The aim of this study was to perform a detailed analysis of the health status and define the most common health problems in the paediatric population of Ukrainian war immigrants presenting to CUM.

## Materials and methods

Information materials posted on television, in the press and on social media were used to recruit patients for the study. Ukrainian patients aged <18 years and with war refugee status, who presented to CUM were enrolled in the project. The CUM operated for 56 days (from mid-May to mid-July 2023). During this period, medical service was provided to 130 paediatric patients as part of 211 medical consultations. All children reporting to CUM were examined by a paediatrician, and a surgical consultation was also possible. Patients were assisted by an interpreter during each visit (after giving a consent). If other specialist consultations were needed, a referral was issued within the framework of general social insurance benefits. During medical appointment, the patient's caregiver was asked to complete a self-administered questionnaire in Ukrainian to collect data on infectious diseases or their risk factors. The questions enquired about past or present viral hepatitis, tuberculosis, parasitic infestations, psychoactive substance abuse and hav-

ing a tattoo. Demographic, epidemiological data, current health problems, medical history and medical records of children presenting to CUM were analysed in detail.

## Results

The age distribution of paediatric patients presenting to CUM is shown in table 1.

About 54% of children had a single visit to CUM and they did not require follow-up or further treatment. Several follow-up consultations were needed for 46% of patients (tab. 2).

The number of consultations provided in each month of the Centre's operation was comparable. A total of 67 (32%) consultations were given in May, 80 (38%) in June and 64 (30%) in July. The need for continuation of services/treatment for a chronic condition was reported for 64 visits (33% of all visits). Infections were the reason for 56 appointments (26.54%). The smallest number of appointments were for managing injuries (2 visits) and issuing referrals (2 visits) (fig. 1). More than half of the caregivers declared that their children did not suffer from chronic diseases (60.77%) and were not taking medication on a regular basis (84.62%).

Consultation by a specialist other than a paediatrician was indicated 67 times (31.75% of visits); 13 referrals to hospital (6.16% of visits) and 52 prescriptions were issued (24.64% of visits). Seven medical certificates on the health status were issued (3.32% of visits). During 76 consultations (36.02%), it was necessary to extend the diagnosis with laboratory or imaging tests (fig. 2).

According to medical history collected from the caregivers, most of the children had received mandatory vaccinations in Ukraine. A full and partial course of vaccinations was declared by 73.85% and 1% of respondents, respectively, whereas unvaccinated patients accounted for 3.08% of all admitted patients, and 22% of caregivers did not answer the question on vaccination (fig. 3).

It was found from the questionnaires on infectious diseases and their risk factors completed by caregivers that two children had current or past hepatitis and one child was diagnosed with tuberculosis. There was one case of a positive history of psychoactive substance use. There was no history of HIV/AIDS among children presenting to CUM (tab. 3).

## Discussion

The Centre for Medical Services for Refugees operating from May to July 2023 on the premises of WIM-PIB, was a pilot project aimed at developing an optimal organisational model and conditions for the use of the National

**Table 1.** Age characteristics of paediatric patients presenting to the Centre for Medical Services

| Age group (years) | Number of patients | Percentage |
|---|---|---|
| 0–3 | 14 | 10.77% |
| 4–6 | 19 | 14.62% |
| 7–10 | 30 | 23.08% |
| 11–14 | 37 | 28.46% |
| 15–18 | 30 | 23.08% |

**Table 2. Number of paediatric appointments at the Centre for Medical Services**

| Number of appointments | Number of patients | Percentage |
|---|---|---|
| 1 | 70 | 53.85% |
| 2 | 45 | 34.62% |
| 3 | 9 | 6.92% |
| 4 | 6 | 4.62% |

**Table 3.** Summary of survey results on the prevalence infectious diseases or risk factors for infectious diseases in children treated at CUM

| Illness/event | Number of patients with positive history | Percentage |
|---|---|---|
| HIV/AIDS | 0 | 0% |
| Viral hepatitis | 2 | 1.54% |
| Tuberculosis | 1 | 0.77% |
| Parasites | 9 | 6.92% |
| Psychoactive substance abuse | 1 | 0.77% |
| Tattoo | 0 | 0% |
| Missing data | 6 | 4.66% |

Healthcare System support unit under conditions of a mass influx of migrants. The CUM made it possible to assess in practice whether it was possible to provide effective emergency services in a crisis situation, using the resources of the Military Institute of Medicine – National Research Institute. The proposed organisational solution was a form of support for the health care system, implemented at the level of outpatient medical care within the already existing infrastructure.

This solution is intended to relieve the burden on the host country's health care system, ensuring that migrants maintain continuity of medical care to a degree adequate to their defined needs. Its aim is to counteract the effects of humanitarian crises and it mainly responds to the urgent, complex health needs of refugees.

When providing medical support for war refugees, it is important to bear in mind the specific health problems that affect this immigrant population, which are not usually observed in the host population. Compared to the native population, migrants have a higher risk of traumatic experiences and thus dissociative disorders or post-traumatic stress disorder (PTSD). Furthermore, by the very fact of migration, they are often in large concentrations, such as refugee camps, which makes them more vulnerable to infectious diseases. Additionally, chronic conditions or malignancies may be overlooked and diagnosed late due to the circumstances and the prioritisation of activities other than seeking medical attention by the refugee population. Medical professionals providing services to such patients need to be aware of these issues in order to offer the highest level of care and be able to select an appropriate management strategy [3].

With this in mind, we decided to conduct a detailed analysis of the medical records of paediatric patients attend-

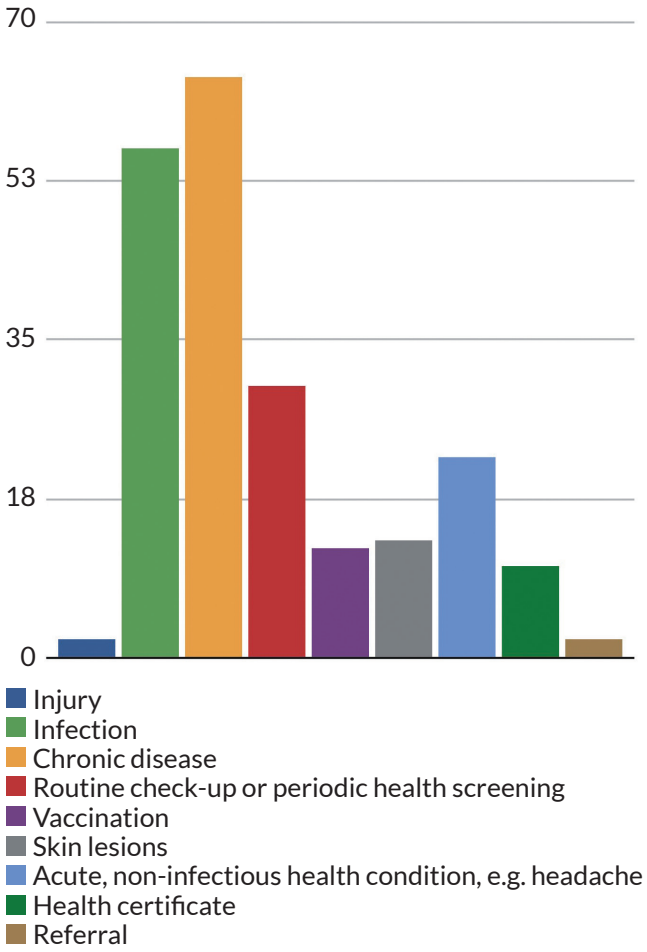


**Figure 1.** Overview of appointments at the Center of Medical Services among paediatric patients, including the reason for the visit

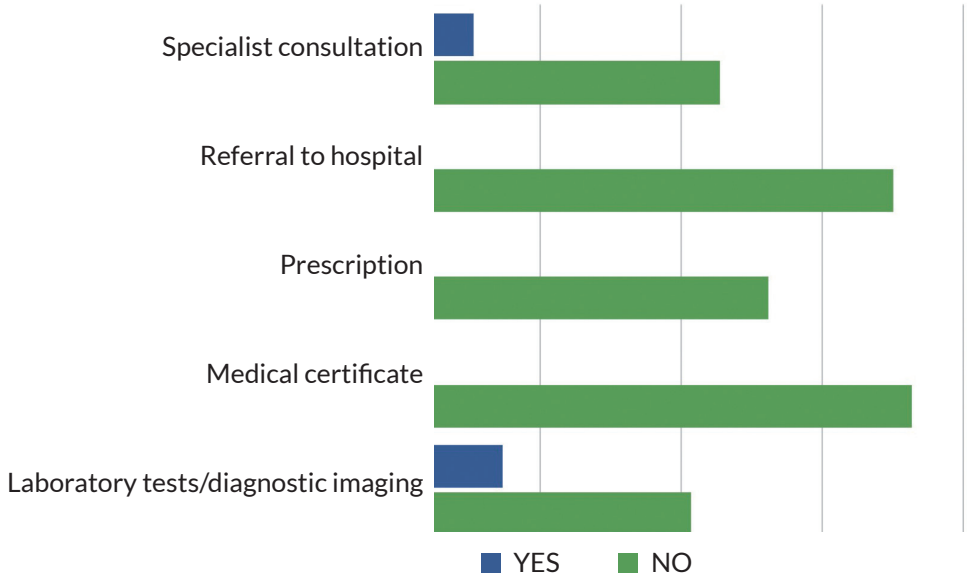


**Figure 2.** Type of medical services provided to paediatric patients at the Centre of Medical Services

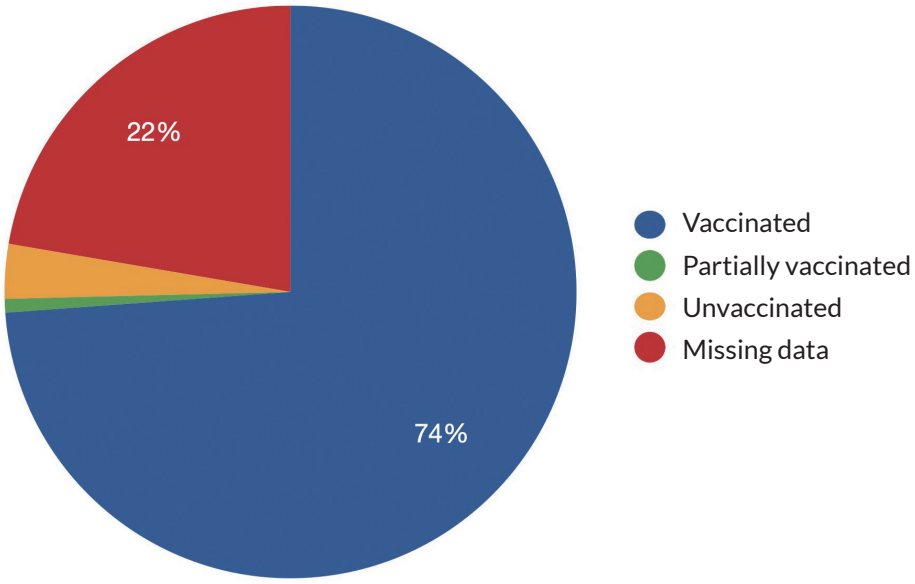


**Figure 3.** Vaccination status among paediatric patients reporting to the Centre of Medical Services

ing CUM to define their most common health problems and possibly optimise medical care.

Data obtained showed that the vast majority of paediatric patients examined at CUM did not report problems typical of the war migrant population. The patients did not present hygienic neglect, acute symptoms of infectious diseases or acute psychiatric disorders. Most children presented to the Centre due to an acute infection or to continue treatment of a chronic health problem.

Based on the collected data, it should be concluded that the health status of the Ukrainian refugee population arriving in Poland was good and did not differ significantly from the Polish population. It is also worth noting that the Centre did not introduce admission limits. Therefore, treatment of 130 patients within 211 visits over 56 days (an average of 3.8 visits/day) seems relatively modest.

All of the above indicates that the population described was probably already absorbed by the Polish public health care system. The Centre, on the other hand, mainly received patients with health problems that the system was unable to address immediately, e.g. due to distant appointments at specialist clinics or the inability to hold a paediatric consultation due to infectious symptoms on the day of the request.

The issue of the declared high vaccination coverage among patients managed at CUM requires detailed analysis. Epidemiological studies in the Ukrainian population have shown that the percentage of children vaccinated against diseases included in the Polish immunisation programme should be lower than that resulting from the declarations of caregivers at CUM. In 2016, only 20% of children in Ukraine were vaccinated for diphtheria, tetanus, and whooping cough, 40% for measles and tuberculosis and 50% for polio. In the following years, vaccination rates improved and in 2022, 78% of children were vaccinated against diphtheria, tetanus and pertussis, 69% for polio, 71% for tuberculosis and 69% for measles [4, 5]. It is worth noting at this point that the mandatory vaccination programme in Ukraine, compared to that in Poland, lacks compulsory vaccination against rotavirus and pneumococci [4, 5]. However, medical history collected from the caregivers of children at CUM showed that 73.85% of patients were vaccinated according to the immunisation schedule, with those unvaccinated accounting for only 3.08%. These data suggest that the vaccination rate among Ukrainian migrants to Poland is higher than the vaccination rate in the general Ukrainian population. However, it may be that patients presenting to the CUM provided incorrect data or refused to answer when completing their named questionnaires to avoid ostracism or for fear of being forced to vaccinate. This is confirmed by WHO data collected through anonymous questionnaires among Ukrainian refugees arriving in Poland in 2022. According to these data, only >70% of children aged 1–4 years who arrived in Poland had been vaccinated against childhood diseases [6].

Despite the relatively common reluctance of Ukrainians to vaccinate, the influx of war refugees from Ukraine does not seem to have had a significantly negative impact on the epidemiological situation in Poland. Although the high incidence of tuberculosis, including drug-resistant tuberculosis, measles or HIV infections in the population living in Ukraine is constantly highlighted, it should be noted there has been no sharp increase in the incidence of infectious diseases in Poland either at that time or at present. Mostly typical diseases endemic in Poland (e.g. chickenpox) and isolated outbreaks related to the stay of Ukrainian refugees in collective accommodation facilities were recorded. It should be noted that these were mainly outbreaks of food-borne infections, typical and common also in the Polish population, caused by pathogens such as rotavirus, norovirus, or outbreaks of respiratory-transmitted diseases, e.g. influenza-like illnesses. This phenomenon can be explained by the results of a study on the migration patterns of Ukrainians, con-

ducted by an interdisciplinary team of Ukrainian and Polish experts.

The results of the study and the analysis of recent data have shown that the vast majority of refugees from Ukraine who arrived in Poland after February 24, 2022 were middle-class people seeking shelter from the war and its negative consequences [7]. In a study by Professor Długosz, 97% of all respondents were women and only 3% were men (during the introduction of martial law in Ukraine, most men were banned

from leaving the country). The mean age of the survey participants was 36 years; 76% of respondents had higher education; 91% were urban residents before moving to Poland; and 52% described their socio-economic status as good or very good. In comparison, according to data from the Central Statistical Office, collected as part of the National Population and Housing Census 2021, 23.1% of the population in Poland have a higher education [8], and the middle class in our country accounts for 54% [9]. The above data show that Ukrainians arriving in Poland before the outbreak of war and leaving their country were at a similar socio-economic level as most Poles, which also influenced their gradual integration into Polish society.

Language barrier was the main non-medical problem encountered when providing services to the Ukrainian refugee population. It often had a negative impact on doctor-patient communication and caused difficulties both for the doctor (correct history collection), and for the patient (understanding the recommendations). At CUM, this problem was partly solved owing to the Ukrainian hospital staff members involved in the project, who had lived in Poland for many years and served as interpreters during medical appointments.

**Limitations**

Since the Ukrainian migrants participating in the study had most often already stayed in Poland for several months, the investigated population did not fully reflect the behaviour and health needs of the population at the time of the crisis-induced mass migration.

**Conclusions**

Acute infections or the need to continue treatment of a chronic illness were the main reasons for children's visits to the Centre for Medical Services. Patients did not present symptoms typical of the war migrant population. Based on the analysis, it should be concluded that the health status of the paediatric population of Ukrainian refugees who arrived in Poland was good and did not differ significantly from that of the Polish population.

This pilot programme has confirmed the feasibility of creating Centres for Medical Services for Refugees as a space for expert medical care and the collection of public health data.

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# ANOTHER FACE OF PREMATURE OVARIAN INSUFFICIENCY: *BLEPHAROPHIMOSIS, PTOSIS, EPICANTHUS INVERSUS* SYNDROME (BPES)

Kolejne oblicze przedwczesnego wygasania czynności jajników: zespół *blepharophimosis*, *ptosis*, *epicanthus inversus* (BPES)

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**Abstract**

Premature ovarian insufficiency occurs in 1 in 250 women by the age of 35 years. Exposition to radiation, certain medications, and genetic predispositions are the most common causes. In addition to the relatively common Turner syndrome or Fragile X premutation carriage, it can also be caused by less well-known defects, such as the very rare *blepharophimosis*, *ptosis*, *epicanthus inversus* syndrome. Type 1 of this syndrome is characterized by specific phenotypic traits, perimenopausal symptoms and infertility due to premature ovarian insufficiency. A 23 year-old patient presented to the Department with *oligomenorrhoea* and primary infertility. Gynaecological examination did not reveal any abnormalities, but dysmorphic features, such as narrowing of horizontal aperture of the eyelids, ptosis, a skin fold arising from the lower eyelid and telecanthus, were noted. In family history, a similar phenotype was present in patients' grandfather, father and three of four brothers. Hormonal blood tests revealed very low levels of anti-mullerian hormone (0.65 ng/mL), indicating diminished ovarian reserve. Due to the risk of premature ovarian insufficiency, the patient underwent molecular testing, which revealed a pathogenic *FOXL2* allele, which confirmed the diagnosis of *blepharophimosis*, *ptosis*, *epicanthus inversus* syndrome. The woman was referred for a consultation at an infertility treatment centre, where she was qualified for an in vitro fertilization with a donor egg. Premature ovarian insufficiency becomes a serious problem, especially for women planning pregnancy. Detailed diagnosis and taking into account also less common causes of premature ovarian insufficiency remain important domains for practitioners of all specialties. Advances in assisted reproductive technology techniques enable maternity not only for women facing infertility, but also for those with a genetic burden.

**Streszczenie**

Przedwczesne wygasanie czynności jajników (przed ukończeniem 35. roku życia) występuje u 1 na 250 kobiet. Oprócz ekspozycji na promieniowanie lub leki może rozwijać się na podłożu genetycznym. Poza stosunkowo często stwierdzanym zespołem Turnera czy nosicielstwem premutacji w zespole łamliwego chromosomu X, jego przyczyną mogą być także mniej znane defekty. Przykład stanowi niezwykle rzadki zespół *blepharophimosis*, *ptosis*, *epicanthus inversus*, którego typ 1, oprócz charakterystycznych cech fenotypowych, manifestuje się objawami wypadowymi i niepłodnością – związanymi z przedwczesnym wygasaniem czynności jajników. 23-letnia pacjentka zgłosiła się Kliniki Endokrynologii Ginekologicznej z powodu *oligomenorrhoea* oraz problemu niepłodności pierwotnej. W badaniu ginekologicznym nie wykazano odchyleń, natomiast uwagę zwracały cechy dysmorfii na twarzy pacjentki – horyzontalne zwężenie szpary powiekowej, ptoza, fałd skórny na dolnym brzegu powiek i telekantus. W wywiadzie rodzinnym podobny fenotyp występował u dziadka, ojca i trzech z czterech braci pacjentki. Badania hormonalne wykazały niskie stężenie hormonu antymullerowskiego (0,65 ng/ml), wskazujące na zmniejszoną rezerwę jajnikową. Z powodu zagrożenia przedwczesnego wygasania czynności jajników w przebiegu zespołu genetycznego zalecono pacjentce badania molekularne. Wynik wskazywał na patogenny wariant allelu genu *FOXL2*, co potwierdziło rozpoznanie dziedziczonego w sposób autosomalny dominujący zespołu *blepharophimosis*, *ptosis*, *epicanthus inversus*. Pacjentkę skierowano na konsultację w ośrodku leczenia niepłodności, gdzie została zakwalifikowana do procedury *in vitro* z komórką jajową dawczyni. Przedwczesne wygasanie czynności jajników stanowi istotny problem u pacjentek planujących macierzyństwo. Szczegółowa diagnostyka, z uwzględnieniem także rzadkich przyczyn zespołu, pozostaje ważnym zadaniem lekarzy różnych specjalizacji. Postęp w zakresie technik wspomaganego rozrodu umożliwia realizację planów reprodukcyjnych zarówno pacjentkom zmagającym się z problemem niepłodności, jak i obciążonym genetycznie.

**Keywords:** POI; premature ovarian insufficiency; BPES; *blepharophimosis*, *ptosis*, *epicanthus inversus* syndrome

**Słowa kluczowe:** POI; przedwczesne wygasanie czynności jajników; BPES; zespół *blepharophimosis*, *ptosis*, *epicanthus inversus*

**DOI** 10.53301/lw/175207

**Received:** 29.10.2023

**Accepted:** 14.11.2023

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## Introduction

Premature ovarian insufficiency (POI; formerly premature ovarian failure, POF) is a clinical entity diagnosed in young women, where both symptoms and laboratory findings resemble those seen during physiological menopause. The incidence of POI is approximately 1 in 250 by age 35 years and 1 in 100 by age 40 years [1]. The clinical picture of POI consists of hypergonadotropic hypogonadism associated with high levels of tropic hormones produced by the pituitary gland, follicle stimulating hormone (FSH) and luteinizing hormone (LH), with low levels of sex hormones produced by the ovaries, mainly oestrogens. All this leads to menstrual disorders, perimenopausal symptoms such as hot flashes, vaginal dryness, palpitations, excessive sweating or mood swings, as well as infertility. The longer the duration of ovarian insufficiency in terms of hormone production, the higher the risk of reduced bone mineral density and osteoporosis, and the higher the cardiovascular risk due to oestrogen deficiency. According to the European Society of Human Reproduction and Embryology (ESHRE), the diagnosis of POI is based on FSH levels >25 mIU/mL measured on two occasions at least 4 weeks apart in a patient with infrequent menstrual cycles or amenorrhea for at least four months [2].

The processes underlying the development of POI include accelerated loss of ovarian follicles or reduced production of sex steroids. POI differs from the physiological menopause in women over 40 years of age by the presence of a causative factor other than age itself. Although the aetiology of POI varies widely, the definite cause remains unknown in up to 70% of cases [3]. The most common causes of POI include genetic factors, associated with both chromosomal aberrations and abnormalities in the expression of particular genes. Turner syndrome (monosomy X) is the most common aetiology in the former group. The second group includes carriership of *FMR1* premutation alleles (fragile X syndrome), as well as mutations of many other genes involved in folliculogenesis, steroid hormone production, and receptor signal transduction (among others, *BMP-15*, *XIST*, *FSHR*) [4]. The genetic background is important, so much so that it is estimated that whole-genome sequencing of the coding genome could identify the cause of POI in 30–35% of patients [3]. Other causes of POI include autoimmune disorders (adrenal insufficiency, polyglandular autoimmune syndrome, Hashimoto's disease) and the toxic effects of pharmacotherapy, chemotherapy and radiotherapy in particular. POI can also be a consequence of viral infections and metabolic abnormalities [5].

*Blepharophimosis*, *ptosis*, and *epicanthus inversus* syndrome (BPES), which has a prevalence of 1 in 50,000 births, may also be an extremely rare cause of POI [6]. This autosomal dominant genetic syndrome includes a characteristic set of phenotypic features: narrowing of horizontal aperture of the eyelids, drooping of the eyelids and a skin fold arising from the lower eyelid, as well as an increased distance between the inner corners of the eyes. The classification distinguishes between two types of BPES. In type 1 BPES, the phenotypic features described above are accompanied by POI symptoms, while type two can be diagnosed in individuals with isolated eyelid abnormalities (structure and position). Approximately 64% of BPES cases occur in women [7]. Due to the ophthalmic manifestation of the syndrome, patients are offered corrective surgical procedures to achieve a cosmetic effect but also to prevent short sightedness and strabismus [7].

*FOXL2* mutation, located on the long arm of chromosome 3 (3q23), is responsible for BPES. Normal expression of the *FOXL2* gene product is responsible for eye and eyelid muscle development [8]. Additionally, it is involved in sex determination, regulates ovarian granulosa cell function and influences ovarian follicle development [9].

There are literature reports on the potential involvement of *FOXL2* overexpression in the pathogenesis of endometriosis and *FOXL2* mutation in the development of granulosa cell-derived ovarian cancer [10, 11]. In the case described below, the effect of the transcription factor SF-1, a product of *FOXL2* expression, on the production of antimullerian hormone (AMH) by ovarian granulosa cells appears to be most relevant [12].

## Case report

A 23-year-old patient presented to the Department of Gynaecological Endocrinology due to infrequent menstrual cycles and primary infertility. She additionally reported noticeable vaginal dryness. Gynaecological examination revealed no abnormalities, but dysmorphic features, such as narrowing of horizontal aperture of the eyelids, ptosis, a skin fold arising from the lower eyelid and telecanthus, were noted. Family history showed a similar phenotype in the patient's grandfather, father and three of her four brothers. Hormonal findings ob-

tained during the first phase of the cycle were as follows: oestradiol 42 pg/mL, FSH 4 mIU/mL and LH 6.54 mIU/mL. Hormone tests performed during phase 2 of the cycle showed progesterone levels below 0.1 ng/mL.

Of particular note was the low AMH level (0.65 ng/mL), indicating diminished ovarian reserve. Other laboratory findings, apart from a slightly elevated androstenedione level (3.27 ng/mL) and an abnormal fasting glucose (5.7 mmol/L), remained within normal limits. Transvaginal ultrasound showed a normal anteverted uterus measuring 42 × 27 mm, with 6.6 mm thick endometrium, and both ovaries with normal echostructure, typically located, measuring 31 × 21 mm (right) and 25 × 15 mm (left). Due to the risk of a syndromic POI, the patient was referred for molecular testing. Genetic findings from Sanger sequencing indicated a mutant *FOXL2*, which confirmed the diagnosis of autosomal dominant BPES. After consultation at the infertility centre, the patient was qualified for an in vitro fertilisation (IVF) with a donor egg. Six months after initiating the diagnosis, the patient attended an appointment during which an ultrasound of the uterine cavity showed a foetus corresponding to a gestational age of 8 weeks. Apart from type 1 gestational diabetes mellitus, the pregnancy progressed normally. The patient gave birth by vaginal delivery at term to a healthy newborn weighing 2,980 g.

## Discussion

Premature ovarian insufficiency should be seen as a spectrum including a range of clinical conditions. Biochemical POI with elevated FSH levels, reduced fertility and diminished ovarian reserve, but with regular menses, and overt POI with irregular or absent menstrual periods have been distinguished [13]. The described patient definitely did not present a typical picture of POI and did not meet the criteria for its diagnosis at the time of admission to the Department. However, due to the presence of a genetic syndrome in which POI can develop, in addition to the coexistence of diminished ovarian reserve and the lack of ovulatory cycles, a significant risk of POI in the near future was identified and measures were taken to enable the woman to achieve her desired pregnancy. Due to both infertility and a 50% risk of passing on the pathogenic gene variant to offspring, the woman was offered an IVF procedure with a donor egg.

Current guidelines emphasise the need to adequately address the patient's desire to preserve fertility. Although it is estimated that approximately 5–10% of women with POI have a chance of spontaneous pregnancy [14], assisted reproduction methods, IVF with a donor egg in particular, are considered the most appropriate option. Adoption of a child is the second option that the patient should be informed about. The indications for oocyte and ovarian tissue cryopreservation in women at risk of POI are increasingly reported in the literature [15]. This is particularly important given the alarming rise in the diagnosis of malignant tumours in increasingly younger women, resulting in an increasing incidence of POI as a result of ovarian tissue-destroying chemotherapy or radiotherapy. The extremely important role of oncofertility counselling in this group of patients is emphasised [16].

In the described case, the patient was also offered hormone replacement therapy to avoid the adverse effects of hormone imbalance. Underproduction of oestrogens increases the resorptive activity of osteoclasts and the loss of bone mineral density. This results in the development of osteopenia and osteoporosis, which can cause severe fractures [17]. The protective effect of female sex hormones on the cardiovascular system, proven in multiple studies, may also be lost in the course of POI. Patients will then be at an increased risk of endothelial dysfunction-related ischemic heart disease, as well as heart failure and myocardial infarction [18, 19]. According to current knowledge, hormone replacement therapy (HRT) is considered an appropriate approach to prevent both osteoporosis and cardiovascular incidents [20]. The supplementation also helps alleviate menopausal symptoms, while vaginal oestrogen is recommended in cases of increased urogenital atrophy.

It is also extremely important to consider POI in terms of its psychological impact, including psychosexual functioning of patients. Hormonal imbalance alone has an adverse effect on a woman's well-being (mood swings, depressive mood, reduced libido), and the diagnosis of POI in a very young patient with reproductive plans can significantly enhance this effect. In many cases, it will be reasonable to refer the patient for psychotherapeutic consultation [14].

## Conclusions

POI affects approximately 1% of women before the age of 40 years, which makes it a significant problem in clinical practice, not only due to the aspect related to bothersome symptoms and the limited possibility of family planning, but also because of the long-term consequences of hypoestrogenism and the psychosocial aspect. Therefore, there is a need to increase the vigilance of endocrinologists and gynaecologists, but also general practitioners, ophthalmologists and other specialists to identify the symptoms reported by patients in order to react quickly and take appropriate diagnostic and therapeutic measures to protect the patient's fertility and general health. Owing to the dynamic development of molecular techniques, physicians have an expanding array of diagnostic tools at their disposal to make an appropriate diagnosis and quickly implement therapy. A detailed diagnosis, also taking into account the less common causes of POI, such as the described *blepharophimosis*, *ptosis* and *epicanthus inversus* syndrome, therefore remains an important task not only for gynaecologists. Current advances in assisted reproduction techniques make it possible to plan a family for both women struggling with infertility problems and genetically burdened patients.

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# DIFFUSE LARGE B-CELL LYMPHOMA MIMICKING A POTT'S PUFFY TUMOUR – A RARE CASE OF NASAL AND FRONTAL SINUS TUMOUR

## Chłoniak rozlany z dużych limfocytów B imitujący guza Potta – rzadki przypadek nowotworu jam nosa oraz okolicy zatok czołowych

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**Abstract**

In this article, we present a case report of a 50 year-old patient with forehead oedema, who was admitted during emergency duty to Otorhinolaryngology Clinic. Based on clinical presentation and diagnostic imaging, he was initially diagnosed with Pott's puffy tumour. Conservative treatment was performed with slight improvement. The patient was qualified to remove the forehead lesion and to send tissue specimens from the right nasal cavity for histopathological examination. A diffuse large B-cell lymphoma was diagnosed based on histopathological findings, and therefore he was referred to further diagnosis and haematological treatment.

**Streszczenie**

W artykule opisujemy przypadek kliniczny 50-letniego mężczyzny, który został przyjęty w trybie ostrodyżurowym do Kliniki Otorynolaryngologii z powodu egzofitycznej zmiany w okolicy czołowej. Na podstawie objawów klinicznych oraz badań obrazowych wstępnie rozpoznano guz Potta. Wdrożono leczenie zachowawcze, uzyskując niewielką poprawę. Pacjenta zakwalifikowano do usunięcia zmiany z okolicy czołowej oraz pobrania wycinków z prawej jamy nosa w celu weryfikacji histopatologicznej. W badaniu histopatologicznym rozpoznano chłoniak rozlany z dużych limfocytów B, w związku z czym chory został skierowany do dalszej diagnostyki i leczenia hematologicznego.

**Keywords:** Pott's puffy tumour, DLBCL, sinusitis

**Słowa kluczowe:** guz Potta, DLBCL, *sinusitis*

**DOI** 10.53301/lw/175811

**Received:** 15.11.2023

**Accepted:** 24.11.2023

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### Introduction

Lesions located in the frontal sinus region may be caused by a number of factors, and their heterogeneous clinical picture poses a diagnostic challenge. A Pott's puffy tumour is defined as a swelling of the skin and soft tissues of the frontal region or a subperiosteal abscess associated with frontal bone osteomyelitis, which most commonly develops as a complication of acute or chronic frontal sinusitis, trauma to the frontal region, surgical interventions involving the forehead, dental infection or cocaine abuse [1–4]. Diffuse large B-cell lymphomas (DLBCLs) are rare, particularly those located in the nasal cavity and paranasal sinuses [5]. They give non-specific symptoms, which often results in a primary misdiagnosis and a delay in implementing appropriate treatment [6]. The paper presents a clinical case of an initially suspected Pott's puffy tumour in a patient diagnosed with DLBCL during further diagnosis.

### Case report

A 50-year-old patient admitted as an emergency to the Department of Otorhinolaryngology due to a raised, hard exophytic lesion on the forehead. The lesion developed spontaneously about one month prior to admission, and was accompanied by purulent-mucous nasal discharge. Computed tomography (CT) of the head raised a suspicion of Pott's puffy tumour. The patient reported a history of sneezing and chronic watery rhinitis for one

year. He was treated with an intranasal corticosteroid by an internal medicine physician, achieving temporary improvement. After some time, however, he observed thick, purulent nasal discharge and was referred to an otolaryngologist with a suspicion of chronic sinusitis. Intranasal mupirocin was continued for 10 days with little improvement. During intranasal antibiotic therapy, a watery discharge appeared from the left nasal cavity on tilting the head, accompanied by a sensation of distension in the right and left frontal sinuses. A CT scan of the sinuses was performed, which, apart from the deviation of the nasal septum, was unremarkable. After two months, the patient observed foul-smelling discharge from the right nasal cavity. The ENT specialist started amoxicillin with clavulanic acid and fluconazole orally for 7 days, with temporary improvement. After one month, a swab was taken from the right nasal cavity due to symptom recurrence. *Escherichia coli* and *Staphylococcus aureus* were grown. Intranasal mupirocin and steroid were initiated, leading to improvement. Two months later, the patient noticed a sudden appearance of a growing nodule in the forehead. He was referred to a dermatologist, who ordered an ultrasound of the lesion. US findings were as follows: 'A hypoechoic area of 6 × 28 × 27 mm (AP × RL × SI), without evident blood flow, relatively well-delineated, is present in the midline, subperiosteally at the anterior lamina of the frontal bone. The image may correspond to a Pott's puffy tumour'. A repeat CT scan of the sinuses showed, among other things 'a soft-tissue lenticular focus is with a size of 27 × 9 mm (T × AP), vertical dimension about 25 mm, located in the frontal region in the midline. Mural mucosal thickening of up to 5 mm in the frontal sinuses. A 11 × 5 × 10 mm area of thinning of the bone structure, with significant thinning of the cortical layer of bone, within the anterior wall of the frontal sinuses – CT image corresponds to Pott's puffy tumour. The posterior wall of frontal sinus without features of bone destruction. Significant thickening/overgrowth of the right inferior nasal concha with significant narrowing of the inferior and middle nasal passages'. The patient presented with the above findings to the reference emergency department of otolaryngology at the Military Institute of Medicine – National Research Institute. On admission, endoscopic examination of the nasal cavities revealed a polypoid swelling of the middle and lower right concha, accompanied by a profuse purulent-mucous discharge, located behind the spike of the nasal septum. In the frontal region: a hard, raised, spherical, non-painful, non-movable exophytic lesion with unchanged colour. On admission, contrast-enhanced (fig. 1) and non-contrast-enhanced (fig. 2) CT scan of the paranasal sinuses was performed, showing: 'A solid focal lesion measuring 35 × 12 × 40 mm, undergoing slightly heterogeneous contrast enhancement, located medially at the outer lamina of the frontal bone at the level of the frontal sinus; at this level, thinning of the frontal bone with small defects of the cortical layer, without features of spreading infiltration to the anterior cranial fossa, a small thickening of the mucosa in the frontal sinuses and the maxillary sinus'. A culture was taken from the right nasal cavity. Empirical antibiotic therapy with ceftriaxone and metronidazole, intravenous corticosteroid and xylometazoline to both nasal cavities was initiated. Based on culture findings and the antibiogram (*Staphylococcus aureus* sensitive to cloxacillin), treatment with cloxacillin was initiated. A follow-up CT scan performed after one week of treatment showed a reduction of the exophytic lesion on the forehead. The patient was discharged home with the recommendation of intranasal corticosteroid. At a follow-up visit, the patient reported that the lesion had grown after treatment completion and was deformable under pressure. He was scheduled for surgery under general anaesthesia. An external ex-

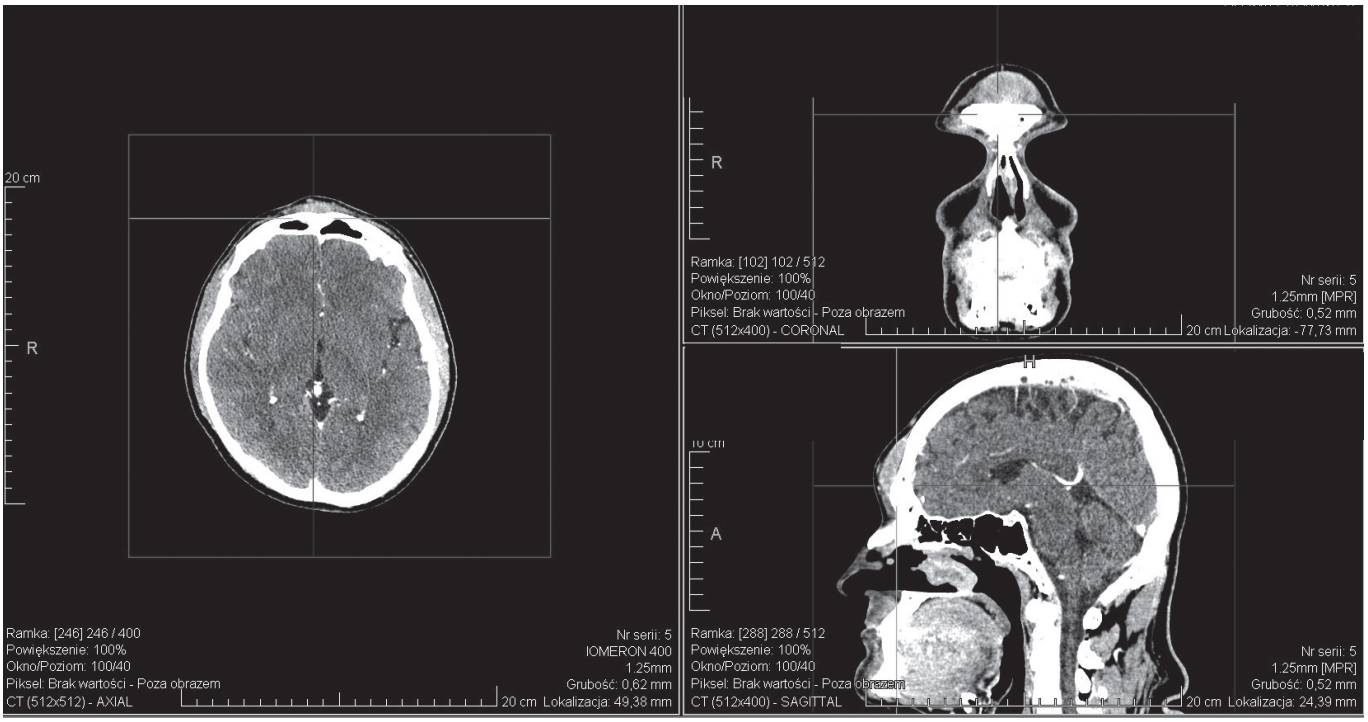


**Figure 1.** Contrast-enhanced CT of the paranasal sinuses on admission


**Figure 2.** Non-contrast-enhanced CT of the paranasal sinuses on admission

cess within the uninvolved tissues as used to remove the lesion from the frontal region. Specimens were collected from the right inferior nasal concha. Diffuse large B-cell lymphoma was diagnosed based on histopathological examination of the soft tissues of the forehead and the right inferior nasal concha. The patient was referred for further haematological treatment.

## Discussion

Pott's puffy tumour is described in the literature as a swelling of the skin and soft tissues of the frontal region or a subperiosteal abscess associated with frontal bone osteomyelitis [1, 2]. The most common causes of this pathology include a complication of acute or chronic frontal sinusitis, trauma to the frontal region, surgical interventions involving the forehead, dental infections, and cocaine abuse [1, 3, 4]. Additionally, patients with a history of allergy to penicillins or cephalosporins, a history of trauma to the frontal region and a low body mass index are more predisposed to Pott's puffy tumour [7].

Frontal oedema, fever, nasal discharge, periorbital swelling and, less commonly, neurological symptoms such as nausea, vomiting, skin fistulas, seizures, and altered mental status are the main symptoms [1, 8]. The disease affects mainly adolescents, but can occur in any age group [1, 2, 9]. The diagnosis is made on the basis of clinical symptoms and imaging findings, i.e., CT or magnetic resonance imaging (MRI) of the head with contrast enhancement.

We emphasise the importance of prompt diagnosis and treatment to avoid neurological complications. Surgical intervention, involving drainage of the frontal sinus from an external or intranasal access, combined with long-term antibiotic therapy based on culture and antibiogram, is the mainstay of treatment [1, 8, 9]. Similar cases to the one in our Department have been described in other reports, where the clinical picture implied Pott's puffy tumour, while the histopathological findings were suggestive of lymphoma [6]. Squamous cell carcinoma (SCC; 39.8%), mature B-cell lymphomas (17.5%), unspecified epithelial neoplasms (10.5%) and adenocarcinomas (ADC; 9.9%) are the most common histological types of frontal sinus tumours [6, 10, 11]. Lymphomas are classified as Hodgkin lymphomas (10% of all cases) and non-Hodgkin lymphomas (NHL; 90%), with DLBCL being the predominant type of NHL in the sinonasal tract [12].

DLBCL of the head and neck area mainly involves the Waldeyer ring (WR). However, involvement of the nasal cavity, paranasal sinuses, periorbital area, thyroid and salivary glands may also occur [5, 12]. The maxillary sinus (36.1%) and the nasal cavity (34.5%) are the most common locations of DLBCL within sinuses. Nasal cavity involvement is more common in the Asian and Pacific Islander populations (43.4%), whereas maxillary sinus involvement is more prevalent in Caucasians (36.3%) and African-Americans (42.1%) [5].

Sinonasal lymphoma may go undiagnosed for months or years and thus lead to treatment delays [6]. Diagnosis of the disease is based on clinical presentation and diagnostic imaging, followed by surgical intervention, involving early collection of pathological tissue specimens for histopathological examination. Systemic symptoms of lymphoma include fever without an apparent source, night sweats, unintended weight loss, non-painful lymphadenopathy and signs of bone marrow invasion, such as leucocytosis, leukopenia, anaemia, and thrombocytopaenia [13]. Symptoms associated with the presence of an extra-lymphatic tumour, in this case a tumour located in the paranasal sinuses, include nasal obstruction and

discharge, nasal bleeding, facial oedema or symptoms associated with cranial nerve compression, such as impaired vision or smell. Unfortunately, symptoms are often suggestive of inflammation and upper respiratory tract infections, including sinusitis, which delays correct diagnosis [12, 14, 15].

Kennedy et al. pointed to CT and MRI of the head as the imaging modalities of choice [14]. On T1-weighted MRI, lymphoma shows strong enhancement, as do acute sinus infections. On T2-weighted images, sinonasal lymphomas have a characteristic tendency to show a hyperintense T2 signal and less restricted diffusion, while the same image can be produced by squamous cell carcinoma. CT allows a better assessment of the extent of bone destruction compared to MRI. The ambiguous image of lymphoma on imaging gives rise to additional challenges in accurately identifying the underlying disease [14].

The presence of a suspicious mass requires collecting specimens for histopathological examination in the first place and then, depending on the result, implementing appropriate treatment [16]. The localisation of tumours in the frontal sinuses is generally associated with a very poor prognosis, irrespective of the histopathological result, due to the non-specific symptoms and the location posing a high risk of invading the orbit and anterior cranial fossa. Among frontal sinus tumours, mature B-cell non-Hodgkin lymphoma has the best prognosis, whereas adenocarcinoma has the worst [10, 17]. A higher stage in the modified Ann Arbour classification for staging primary lymphomas is associated with an unfavourable prognosis [5]. Varelas et al. indicate that surgical intervention has no significant impact on survival [5]. Surgery is indicated when the tumour invades critical blood vessels and nerves [15]. Radiochemotherapy, which allows for complete remission in 50% of cases, is the mainstay of treatment, while chemotherapy alone is recommended for patients with disseminated disease with a very poor prognosis [5, 18].

## Conclusions

The case described should remind clinicians that malignant lesions may initially produce non-specific symptoms of allergy or upper respiratory tract infection. Therefore, it is worth paying particular attention to the situation when the patient's condition improves only for a short time or does not improve at all despite conservative treatment used. Lymphomas are characterised by a good response to treatment and a high survival rate. Therefore early diagnosis and staging offer the possibility of good treatment outcomes.

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# COMBINED USE OF ACELLULAR DERMAL MATRIX AND SKIN GRAFTING IN THE TREATMENT OF POST BURN NECK CONTRACTURE

## Jednoczasowe zastosowanie bezkomórkowych matryc tkankowych i przeszczepów skóry pośredniej grubości w leczeniu przykurczów bliznowatych szyi u pacjentów oparzonych

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**Abstract**

Abnormal scarring and scar contractures are a serious clinical problem in the treatment of burn injuries. Scar contractures involving joints can limit their motion range, compromising the quality of life in post-burn patients. Hypertrophic and hyperpigmented scars are also a major aesthetic problem for these patients. W present a case report describing the potential combined use of acellular dermal matrix with skin grafting and surgical resection of the contracting scar in the treatment of a young healthy female diagnosed with post burn neck contracture. As a result of the therapeutic approach used, increased motion range and improved scar aesthetics were achieved. In conclusion, the presented method of scar contracture treatment provides a good functional and aesthetic outcome.

**Streszczenie**

Nieprawidłowe bliznowacenie i powstanie przykurczu bliznowatego w wyniku leczenia ran oparzeniowych jest poważnym problemem klinicznym. Przykurcz bliznowaty obejmujący staw powoduje ograniczenie jego ruchomości, co ma znaczący wpływ na jakość życia pacjentów. Przerośnięcie i hiperpigmentacja blizny stanowi także problem natury estetycznej. Prezentowany przypadek dotyczy pacjentki, u której w wyniku leczenia oparzenia termicznego doszło do powstania przykurczu bliznowatego w obrębie szyi. W leczeniu zdecydowano się na chirurgiczne wycięcie blizny z pokryciem ubytku tkanek przy pomocy matrycy tkankowej w połączeniu z wolnym przeszczepem skóry pośredniej grubości. Dzięki zastosowaniu tej metody osiągnięto znaczną poprawę w zakresie zwiększenia zakresu ruchomości stawu i ostatecznego wyglądu nowo powstałej blizny. Prezentowany przypadek wskazuje, że zastosowanie matrycy tkankowej w połączeniu z wolnym przeszczepem skóry pośredniej grubości może być skutecznym i bezpiecznym sposobem leczenia przykurczu bliznowatego.

**Keywords:** burn, neck, contracture, dermal matrix, ADM

**Słowa kluczowe:** oparzenie, szyja, przykurcz, matryca tkankowa, ADM

**DOI** 10.53301/lw/185906

**Received:** 31.01.2024

**Accepted:** 11.03.2024

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## Introduction

Thermal burns affect approximately 1% of the world's population each year [1]. Burns are estimated to cause approximately 180,000 deaths annually worldwide. In Poland, about 8,500 people are hospitalised for burns each year [2]. The prognosis and duration of hospital stay among burn patients depends on the severity of burns, which is in turn determined by the extent, depth, and location of the wounds, and the co-occurrence of airway injury. Age is also an important prognostic factor. The Baux score is a tool used to estimate the risk of death depending on the patient's age and burn extent [3].

Burn treatment carries the risk of complications. The most common of these include burn wound infections,

abnormal scarring and scar contractures. These latter significantly impair patient function and pose the greatest therapeutic challenge, especially when joints are involved [3]. Early rehabilitation, splinting of areas particularly prone to scar contractures and avoidance of prolonged immobilisation are used in the prevention of scar contractures [4]. The treatment of scar contractures involves non-invasive methods such as local scar mobilisation, physiotherapy, compression garments, and silicone dressings in the firs place, and, if these fail, minimally invasive methods, such as photo resurfacing (lasers, intense pulsed light [IPL]), platelet rich plasma (PRP) injections or fat grafting, as well as microneedling, are used. Surgical management is the final stage of treatment.

Precise excision of the scar tissue including the contracture, release of tissue adhesions and then closure of the resulting tissue defects with skin grafts or transposition flaps is the treatment of choice in local reconstruction of scar contractures.

In recent years, acellular dermal matrix (ADM) has been increasingly used in the treatment of burn contractures. ADM is a type of skin substitute used for repairing skin and subcutaneous tissue defects in cases where the use of autogenous skin grafts is not possible due to exposure of vessels, nerves or tendons. In cases of extensive, deep defects, the combination of ADM and autogenous skin graft has shown promising results in reducing wound closure time, limiting contractures, as well as improving elasticity and aesthetic outcomes [5, 6].

**Case report**

The procedure was performed in a 46-year-old clinically healthy patient diagnosed with a neck scar contracture resulting from a mixed-degree (II/III) thermal burn with a total body surface area (TBSA) of 40% according to the Lund and Browder (LB) chart, involving the neck, shoulder girdle, chest, back, both upper limbs and perineum. The primary treatment of the burn included three necrectomies, with coverage of the resulting tissue defects with free intermediate split-thickness skin grafts (STSGs). The STSG achieved 95% healing. Pressure garment therapy (PGT) and intensive rehabilitation were recommended during outpatient treatment. Despite preventive measures, the patient was diagnosed with a neck scar contracture, significantly limiting her functioning (fig. 1). For this reason, the woman was qualified for urgent surgical treatment. On admission, the scar received a Vancouver Scar Scale (VSS) score of 11 [7]. Restricted range of cervical spine motion in flexion, extension and left-right rotation was noted. The boundaries of the scar were considered to be the region of the cervical notch of the sternum on the lower side, the bony margin of the mandible on the upper side and the region of the mastoid processes of both temporal bones laterally to 60% of the anterior circumference of the neck. The surgical procedure involved a suprafascial excision of scar tissue, sparing all relevant anatomical structures to the extent that full mobility could be restored in the cervical spine. The resulting tissue defect was covered entirely with MatriDerm® matrix, cut to fit the size of the defect. The matrix was covered with STSG meshed at 1:1.5 and fixed to the wound edges using skin staplers. The dressing was made of Bactigras® mesh and sterile gauze soaked in Microdacyn®. Temporary immobilisation of the cervical spine in maximum flexion was also applied. A rigid orthopaedic collar (Camp) was used for this purpose. The immobilisation made it possible to dispense with negative pressure wound therapy (NPWT) dressing typically used for simultaneous ADM and STSG healing. Due to the significant risk of perioperative graft and matrix damage, it was decided to keep the patient under analgosedation for the next 48 hours, until the first dressing change. The dressing was changed every 48 hours.

The following changes in the surgical site and general condition were observed during the healing process:

- transient whitening of the grafts, which was thought to be related to the presence of tissue matrix under the grafts (fig. 2), on postoperative days 2 and 4;
- a short-term increase in laboratory inflammatory markers accompanied by a rise in body temperature to 37.5°C, observed on postoperative day 4;
- spots of graft lysis in the mid-part of the wound, at the site of greatest tissue tension, spontaneously healed by granulation (fig. 3);
- completely integrated ADM and healed STSG - confirmed on postoperative day 29 (fig. 4);
- residual wounds representing <10% of the surface area of the repaired tissue defect.

Perioperative fluoroquinolone antibiotic therapy at typical doses was administered during hospital stay. The patient did not require transfusion of blood products. Inpatient treatment was concluded on postoperative day 9, and full local wound healing was achieved on day 30. Immobilisation with a cervical collar was maintained throughout local treatment. Healing of 85% of the surface area of the applied skin grafts was achieved. The newly formed scar received a VSS score of 3, which was an improvement of 8 over the original scar. Increased range of motion in the cervical spine in flexion, extension, right and left lateral flexion and right-left rotation was achieved.

The patient was referred for further treatment at the Day Rehabilitation Unit at the Burns Centre.

Figures 5 and 6 show the final appearance of the scar 7 months postoperatively.

**Discussion**

In the case presented here, a therapeutic approach using ADM and STSG was chosen due to the good long-term outcomes in patients with similar contractures reported in the literature. The primary goal of treatment in this case was to achieve the greatest possible range of motion in the cervical spine and to prevent re-contraction of the resulting scar.

The literature provides sufficient evidence for the efficacy of this method in avoiding abnormal wound scarring. In 2011, Cervelli et al. demonstrated the superiority of MatriDerm® combined with STSG over STSG alone in the treatment of traumatic wounds.

**Figure 1.** Postoperative range of cervical mobility in a patient with neck scar contracture

The study showed faster re-establishment of the epidermal layer, reduced contracture scar formation, and greater flexibility of the resulting scar tissue in matrix-treated wounds [8]. Similar observations were made by Puchała et al., who used a different type of matrix (Integra®) for post-traumatic skin defects [9]. In 2023, early vascularisation of grafts achieved already within the first 2 weeks of healing and full re-establishment of epidermis within 2 months of MatriDerm® application were demonstrated in reconstructive surgery in thermal burn patients [10]. In the same year, a study was also published comparing the use of STSG in combination with MatriDerm® vs. alone in the treatment of tissue defects of the lower extremity. This

**Figure 2.** Local status of the operated area on day 4 postoperatively

**Figure 3.** Spots of impaired healing in the operated area

**Figure 4.** Complete integration of tissue matrix and skin grafts in the operated site on postoperative day 29

time, it was shown that ADM combined with STSG can be successfully used to cover deep tissue defects, without negatively affecting the final cosmetic outcome [5]. Promising results were also obtained in a study by Ryssel et al., who compared the healing outcomes for STSG combined with ADM in the treatment of burn wounds subject to early necrectomy. The study found no effect of ADM on poor skin autograft survival and showed significantly higher tissue elasticity, as assessed with VSS, in patients treated with ADM [11].

Bearing in mind that, according to the literature, proper healing of a graft on a tissue matrix ranges from 35–96% and has an increased risk of complications in the form of haematoma and infection [11, 12], it was essential to ensure optimal conditions for proper healing, especially during change of wound dressing, in the presented case. To this end, emphasis was placed on maintaining adequate intraoperative haemostasis and absolute aseptic and antiseptic rigour was used when changing wound dressing. Additional immobilisation of the body part covered with STSG for a period of several days is recommended in the literature and was also used in the presented case [13].

Appropriate management of the healing scar is an important aspect of post-operative care for STSG-treated patients. There are three key elements in the prevention of abnormal skin scarring: minimising skin tension in the wound area, ensuring adequate hydration and scar occlusion, and using scar compression therapy (PGT) [14]. In the presented case, skin tension in the wound area was negligible and did not increase as a result of the chosen method of tissue defect repair.

In further postoperative care, moisturisers in the form of a gel or silicone dressing, which, according to literature, reduce discomfort such as pruritus, pain, and hypersensitivity [14, 15], and promote the restoration of the stratum corneum water barrier through hydration and occlusion [16], were used once the wound was fully healed. It has been repeatedly demonstrated in the literature that ultraviolet radiation has a negative effect on pigmentation and scar structure [17, 18] and, therefore, patients are educated on the need for daily use of cosmetics with a high degree of UV protection (SPF50), with a preference for mineral over chemical filters.

**Figure 5.** Total range of motion of the operated site after 7 months - side view

**Figure 6.** Total range of motion of the operated site after 7 months - front view

All of the above-mentioned elements of perioperative management produced a favourable effect on the final outcome of postoperative wound healing, and the treatment resulted in a soft, elastic scar with normal colour and appearance acceptable for the patient, which did not restrict the range of cervical movement.

## Conclusion

Contracture scars resulting from the treatment of burn wounds represent a major clinical challenge. The use of tissue matrices in combination with STSG in the surgical treatment of contracture scars yields very good functional and aesthetic outcomes, even in difficult body regions such as the joint area, as evidenced by the presented case.

The discussed approach involving a simultaneous application of ADM and STSG makes it possible to speed up graft revascularisation and, consequently, shorten hospital stay and accelerate rehabilitation, which may reduce both treatment costs for hospital burn units and the percentage of surgical interventions due to recurrence of contracture scars in patients with extensive tissue defects.

The use of an orthopaedic collar to stabilise the matrix and grafts in maximum cervical spine flexion in the first postoperative days minimises the risk of inadvertent damage to the skin grafts during cervical movement and prevents early contractures, which has a beneficial effect on the healing process. This technique may be a good alternative to the negative pressure wound therapy (NPWT) typically used in cases of simultaneous ADM and STSG healing, especially in defects involving problematic body regions, such as the joint area or the cervical spine.

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# REPORT FROM THE SCIENTIFIC CONFERENCE "THE ROLE OF PSYCHIATRY IN NEONATAL AND EARLY CHILDHOOD DISORDERS"

Sprawozdanie z konferencji naukowej pt. „Rola psychiatrii w zaburzeniach okresu noworodkowego i wczesnego dzieciństwa"

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**Abstract**

On March 15, 2024, a conference devoted to psychological and paediatric problems of mother and child in the neonatal and infancy period, entitled "The role of psychiatry in neonatal and early childhood disorders" was held at the headquarters of the Military Institute of Medicine – National Research Institute in Warsaw.

**Streszczenie**

W dniu 15 marca 2024 roku w siedzibie Wojskowego Instytutu Medycznego – Państwowego Instytutu Badawczego w Warszawie odbyła się konferencja poświęcona problemom psychologiczno-pediatrycznym matki i dziecka w okresie noworodkowym i niemowlęcym pt. „Rola psychiatrii w zaburzeniach okresu noworodkowego i wczesnego dzieciństwa".

**Keywords:** conference, paediatric care, child psychiatry, neonatology

**Słowa kluczowe:** konferencja, opieka pediatryczna, psychiatria dziecięca, neonatologia

**DOI** 10.53301/lw/176198

**Received:** 17.04.2024

**Accepted:** 17.04.2024

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On 15 March 2024, a conference on psychological and paediatric problems of mother and child in the neonatal and infant period entitled 'The role of psychiatry in neonatal and early childhood disorders' was held at the headquarters of the Military Institute of Medicine – National Research Institute in Warsaw. Paediatricians, child psychiatrists and psychologists were the target audience. The event enjoyed high attendance.

The conference was held under the patronage of the Director of the of the Military Institute of Medicine –National Research Institute in Warsaw, the Ombudsman for Children, the national consultant in child and adolescent psychiatry, as well as provincial consultants in paediatrics and child psychiatry. The event was organised in cooperation with the personnel of the paediatric, neonatology and psychiatry departments. The organisers were:

- Prof. Bolesław Kalicki, MD, PhD, Head of the Department of Paediatrics, Nephrology and Paediatric Allergology, Military Institute of Medicine – National Research Institute in Warsaw;
- Prof. Bożena Kociszewska-Najman, MD, PhD, Head of the Department of Neonatology and Rare Diseases, Medical University of Warsaw;
- Aleksandra Lewandowska, MD, PhD, Head of the Child Psychiatric Ward, Child Psychiatry Ward, Child and Adolescents Psychiatry Day Ward, Head of the Coordinated Care Program for children with holistic developmental disorders (KO-CZR) at the J. Babiński Specialist Psychiatric Healthcare Complex in Łódź;
- Lidia Popek, MD, PhD, Head of the Department of Paediatric Psychiatry in Józefów, Masovian Centre for Neuropsychiatry.

Due to the diversity of topics, the presentations were arranged in three sessions: paediatric, neonatological and psychiatric.

The conference was officially opened by Professor Bolesław Kalicki, MD, PhD, who read out a letter from the Ombudsman for Children, the official patron of the event. He then outlined the subject matter and objectives of the conference and delivered the first lecture of the day, entitled 'Breast milk - is it just food?'. During the lecture, he discussed the benefits of breastfeeding, including the nutritive and non-nutritive properties of breast milk. He drew particular attention to the presence of immune cells in breast milk, pointing out the potential

for their use in medicine. The presence of HAMLET (human alpha-lactalbumin made lethal to tumour cells) in breast milk, which could potentially be used, for example, in patients with bladder cancer, was an extremely interesting issue raised by the speaker.

Continuing the above topic, Agata Tomaszewska, MD, PhD, who also represented the Department of Paediatrics at the Military Institute of Medicine – National Research Institute, discussed the latest scientific reports on the issue of breastfeeding in her lecture entitled 'Variability in breastmilk composition depending on the child's health'. She pointed out factors that may have an impact on the composition of breast milk, such as the maturity of the newborn, the time of the end of labour, the time of day or the time of feeding. The speaker pointed out possible maternal and infant-related factors that may influence the phenotype of white blood cells present in breast milk. In concluding the presentation, she presented the results of her own study on the immunomodulation of breast milk composition during infant infection.

The paediatric session closed with a lecture 'A mother with postpartum anxiety and depression' by Joanna Kalicka from the Department of Psychiatry and Combat Stress at the Military Institute of Medicine – National Research Institute, holding a master's degree in psychology.

The second part of the conference was devoted to the extremely important topic of the mother- child relationship. The speakers placed particular emphasis on the issue of building a mother-child bond from the earliest moments. This panel was opened by a lecture entitled 'The importance of the parent-child relationship in the perinatal period', by Grażyna Kmita, an associate professor of the Faculty of Psychology at the University of Warsaw and the Early Psychological Intervention Department (Institute of Mother and Child), holding a PhD in social sciences.

In his presentation entitled 'The role of skin-to-skin contact in building the mother-child bond', Professor Milan Stanojevic, MD, PhD, representing the Department of Neonatology and Rare Diseases at the University Clinical Centre of the Medical University of Warsaw, drew attention to the great importance of physical closeness between mother and her newborn, referring to the most up-to-date scientific reports on the subject.

The second part of the conference was closed by Teresa Jadczak-Szumiło, holding a PhD in social sciences and representing the same institution, who held a lecture with the title 'The mother-newborn bond as a foundation of health', in which she highlighted the role of the nature and quality of mother-child contact.

The final and, at the same time, the most extensive session, was devoted to mental health problems in infancy and early childhood. The first of four lectures, by Aleksandra Lewandowska, MD, PhD, entitled 'Risk factors for mental disorders in children', introduced the audience to the issues of epidemiology and difficulties in implementing mental health programmes in the paediatric population.

The role of unipolar affective disorders in the prenatal period was discussed in a presentation entitled 'The impact of prenatal depression on the mental health of adult offspring' by Professor Piotr Galecki, MD, PhD, the Head of the Department of Adult Psychiatry at the Medical University of Łódź.

The question 'Can an infant have mental health problems?' was discussed together with the conference audience by Julia Szelągowska, MD and Magda Warczyńska, MD from the Department of Child Psychiatry in the Mazovian Neuropsychiatric Centre. The speakers emphasised the specificity of mental health disorders in the early phase of human development, i.e. the infancy.

The final lecture of the conference, 'The role of psychiatry in neonatal and early childhood disorders', was given by Lidia Popek, MD, the Head of the Department of Child Psychiatry in the Mazovian Neuropsychiatric Centre. In her presentation 'A bond that gives security. Psychotherapy for parents and infants', she discussed the fundamentals of psychoanalytic parent-infant psychotherapy (PPIP), its goals and scope, basic therapeutic tools and techniques, as well as the effects of parental attitudes towards the youngest children.

After the final official lecture, the conference was closed by Professor Bolesław Kalicki. Summing up and appreciating the lectures, he expressed his hope for further cooperation and participation in future events devoted to psychological and paediatric issues of children and their mothers.

# HOSPITAL PRACTICE VERSUS WORK ON THE FRONT LINE. ABOUT ANNA WACŁAWIK'S BOOK "LEKARZE. WALKA O ŻYCIE"

## Praktyka szpitalna a praca na linii frontu. O książce Anny Wacławik „Lekarze. Walka o życie"

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**Abstract**

A book by Anna Wacławik entitled "Doctors. Fight for Life" is an important document worth recommending, showing the wartime work of Polish civilian doctors on the front line in Ukraine. A series of interviews with doctors shows how the skills of specialists, previously acquired in Polish hospitals, must be quickly supplemented with elements imposed by war, such as the ability to work without access to modern equipment, under direct life threat.

**Streszczenie**

Książka Anny Wacławik jest ważnym, wartym polecenia dokumentem pokazującym wojenną odsłonę pracy polskich cywilnych lekarzy na linii frontu w Ukrainie. Seria wywiadów z lekarzami pokazuje, jak umiejętności specjalistów, wcześniej zdobyte w warunkach polskich szpitali, na ukraińskim froncie muszą być szybko uzupełnione o elementy, jakie narzuca wojna: umiejętność działania bez nowoczesnego sprzętu, w warunkach bezpośredniego zagrożenia życia.

**Keywords:** PTSD, war, hospital practice

**Słowa kluczowe:** PTSD, wojna, praktyka szpitalna

**DOI** 10.53301/lw/188535

**Received:** 16.04.2024

**Accepted:** 10.05.2024

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### Introduction

The book by Anna Wacławik entitled "Doctors. Fight for Life" (original Polish title: Lekarze. Walka o życie") [1] was published in October 2023 and is a record of interviews conducted by the author among doctors and paramedics who volunteered to rescue and treat the victims of warfare in Ukraine. The documentary shows the service of Polish doctors on the frontline, their work in field conditions, without access to modern diagnostic equipment, under fire, among wounded soldiers and civilians.

Although Poland is a country where, according to the recent OECD report, the availability of medical services and expenditures on the broadly understood healthcare are relatively low [2], there is an ongoing debate on the need to improve the situation, and hospitals are constantly applying for more financing and additional equipment [3–5], working conditions for doctors in war zones pose an enormous challenge.

This is how Anna Waclawik writes about her idea to collect interviews among Polish medical professionals serving in Ukraine: 'I wanted to see what MEDEVAC (medical evacuation) looks like in a country involved in a military conflict, where snipers shoot at doctors, invaders murder women and children, leaving grenades in kitchen cupboards as they depart' (p. 8).

### Working conditions

The working conditions of doctors in war zones often extremely deviate from the comfort of their previous work in hospitals.

Justyna Jaszczuk, who treated those wounded at a stabilisation point and participated in transporting soldiers to such points, describes the available equipment: "In Ukraine, I was working in an ambulance with everything flying around on the rough terrain and limited supplies of medications at my disposal, which had to suffice for a long

time... I mean, it's possible. And when I go back to the hospital in Poland, I find problems like 'hand me a different laryngoscope blade because this one is the wrong size'" comical (p. 113).

Piotr Wolak, a surgeon from Krakow, describes the equipment available to the doctors at the stabilisation points in Donbass in the following way: "a primitive ultrasound machine, our hands and a stethoscope – these were the three diagnostic tools at our disposal. We made clinical decisions on this basis. We did not have access to modern imaging tools, such as CT or MRI, which are available on the spot in most emergency departments. [...] As for surgical equipment, it allowed for performing abdominal and thoracic procedures, life-saving surgeries for soldiers and to stabilise their condition" (p. 176).

**Types of injuries among those wounded**

Wounds on the battlefield differ from those that doctors typically encounter in Polish hospitals. Although gunshot wounds also occur in peacetime conditions, they are relatively rare [6]. 'Combat injuries are a completely different type of trauma than gunshot wounds sustained under civilian conditions', says Piotr Wolak. – 'It is multifaceted. Firstly, apart from a few exceptions, gunshots from handguns or gunpowder weapons can be encountered in Poland, whereas shrapnel wounds predominate in the conditions of war in Ukraine. They develop when an explosive charge, which is used to 'fight a living force', in military jargon, breaks into several hundred small pieces after an explosion. [...] Shrapnel of this kind, however, is powerful enough to penetrate body cavities, such as the chest or abdomen. Such injuries usually do not kill immediately, but cause damage to internal organs, and the injured person must be transported to hospital within a certain timeframe to stand a chance of survival' (pp. 179–180).

Under war conditions, the majority of patients suffer combat wounds, most often shrapnel wounds, and these become an everyday occurrence. For some Polish doctors, the scenes at stabilisation points and hospitals remind of the World War II films they used to watch. "Those heavily wounded are placed on stretchers, bloody, torn uniforms, someone is unconscious [...] a piece of flesh is torn out somewhere at the back of the thigh. Everything is happening very fast here. [...] Many soldiers are victims of barotrauma, resulting from the force and the noise from the impact of a missile. They have paralysed tympanic membranes, impaired hearing, and neurological injuries caused by the force of the recoil' (pp. 64–65).

When rescuing the injured, even experienced doctors are forced to master new skills, treating injuries they have never encountered before during their daily practice in civilian hospitals.

This is how Justyna Jaszczuk, a paediatric anaesthetist, describes what she had to learn: "Faster assessment of patients and their general condition. I gained experience in other activities, I performed procedures that I do not normally perform in Warsaw, such as applying haemostatic dressings to gunshot wounds and chest-penetrating wounds, or removing shrapnels. I also learned how to perform plexus blocks. From my professional perspective, this was a new and useful experience' (p. 94).

**Working under fire**

Under wartime conditions, doctors also work under fire. When asked by Anna Waclawik what it is like to work when shelling is heard, Justyna Jaszczuk replies: "[There was shelling] close to the frontline. It's like the sound of a thunderstorm, to which you stop reacting after a while' (p. 128). 'In the evenings, hell began,' recalls Piotr Wolak, 'This was the situation on the frontline in Donbass [...] then the shelling would start with the coming of dusk' (p. 190).

Doctors also speak openly about targeted attacks on medical facilities and personnel. "Doctors are as important targets for the Russians as HIMARS (M142 High Mobility Artillery Rocket System), as recounted by Wolak. According to Conventions [7, 8], medical personnel may under no circumstances be attacked. During war, however, conventions can be put between fairy tales. [...] Eliminating medics from the battlefield means that many wounded soldiers cannot be helped, and have no chance of survival (p. 196).

**Stress and PTSD**

The circumstances under which doctors work during shelling, so unlike civilian conditions, gave rise to enormous stress. Despite being aware of the threat to their own life and health, many doctors still performed surgeries, pushing away thoughts of danger. However, the consequences of exposure to such stress persist for a long time.

Piotr Wolak talks about recurring images of powerlessness in his dreams at night, caused by helplessness, lack of time and conditions to save those wounded, the pressure to choose whom to rescue first, giving up on hopeless cases. "Engaging in their rescue was pointless under conditions of limited equipment and personnel resources. If one believes in hell, it looked exactly like this: screams, suffering, darkness, begging for help, blood, sweat, tears, mud and hopelessness' (p. 187).

When asked by Anna Wacławik whether they were suffering from PTSD (post-traumatic stress disorder), the doctors confirmed that they developed the symptoms, although usually not immediately after returning from Ukraine, but with a delay, even after several months. Situations such as noises from a construction site reminiscent of anti-aircraft artillery or a siren from a nearby fire station that evoked memories of air alerts in Ukraine were the cause of "discomfort, unpleasant anxiety, agitation, nervousness". "This siren triggered the most intense somatic reaction in my body, with palpitations, shortness of breath. And I even caught myself crouching against the wall in the same way I did in the shelter" (p. 204), describes Piotr Wolak, who additionally admitted having sought psychological help to cope with PTSD.

Confronting both the immediate threat and the enormity of human suffering, including the deaths of civilians and children, under wartime conditions requires not only si-

gnificant mental resilience, but also the ability to cope with images that persist in one's memory, and to distance oneself from the realities of war.

## Conclusions

The book by Anna Wacławik is an important highly recommendable document showing the wartime aspects of the work of civilian doctors. It shows how the specialist skills acquired in Polish hospitals, although essential and highly useful, had to be rapidly expanded to account for the harsh realities imposed by war, such as working without access to modern equipment, working under direct threat to life, or resistance to mental trauma.

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