The Polish Society of Family Medicine
The Association of Friends of Family Medicine & Family Doctors

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Editorial Office

Department of Family Medicine
Medical University of Wroclaw
Syrokomli 1, 51-141 Wrocław, Poland, Europe
Tel.: +48 71 325-51-26, tel./fax: +48 71 325-43-41
E-mail: fmpcr@familymedreview.org,
www.familymedreview.org

Contact persons: Bartosz J. Sapilak, MD, PhD, tel.: +48 501 148-503
E-mail: bartosz.sapilak@umed.wroc.pl

Marta Kowalewska, tel.: +48 71 326-68-78
E-mail: m.kowalewska@fundacjarodzinni.pl

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Editorial Office, subscription:
Continuo Publisher
Lelewela 4/325, 53-505 Wrocław, Poland, Europe
Tel./fax: + 48 71 791-20-30, +48 601 774-733
E-mail: biuro@continuo.pl, zamowienia@continuo.pl,
www.continuo.pl

Contact person: Jan Kuźma – Publishing Editor, tel. +48 71 791-20-30,
e-mail: wydawnictwo@continuo.pl

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CONTINUOUS MEDICAL EDUCATION (CME)

Preface

Colleagues, Readers,
Authors, Reviewers,
Members of the Scientific Committee,
Thematic Editors,
Members of the Editorial Board,

Issue 03/2018 of *Family Medicine & Primary Care Review*, which you are now reading, is the result of many months of work with authors and reviewers, and of the effort of the Thematic Editors, the Editorial Team, and our publisher, Continuo. You will notice a systematic increase in the scientific quality and international character of the articles in our quarterly. It is thus no accident that our Index Copernicus Value is higher than a year ago (ICV: 124.24). The work published in our recent issues also demonstrates that health research is essential in primary health care, and that the scientific evidence it generates can be implemented and used in everyday practice. Primary health care team members are becoming advocates, not only of their patients, but also of their patients' families (including informal caregivers), are modeling the local community, and are acting as stakeholders in current health policies. This is a modern image of family medicine that has a number of dimensions, regardless of the capacity of each European country, or of the world, to affect global decisions in the health care system as a whole. On account of the increasing awareness of the importance of proactively integrating patients into the processes of care, connecting to local communities, and emphasizing the need for care in nonclinical constituents, we are seeing changes in health care, in which patients and their families are now partners. This is reflected in the current issue of *Family Medicine & Primary Care Review*. Yet let us not forget that issues concerning the collection of data and evidence, as well as increased numbers of family doctors in the system, improves the outcomes for patients. I thank all our Authors, Reviewers, Thematic Editors, Members of the Editorial Committee and our publisher, Continuo, for their tremendous efforts and the time they have spent in recent months, resulting in this issue, which highlights the importance of interdisciplinarity and confirms that family medicine ought to be understood as the basis of the health care system, and should become an academic, scientific, and medical specialty with its own educational content, research, evidence-base, and clinical activity, targeted at primary health care.

In our original articles, we present the prevalence of allergy in children with adenoid hypertrophy and otitis media with effusion admitted to the Department of Pediatric Otolaryngology in Poznan; rhinoscopy assisted lacrimal probing – minimal invasive and effective therapeutic option for children with congenital nasolacrimal duct obstruction; orbital complications of acute rhinosinusitis in children: a retrospective review of 33 patients; acute mastoiditis, a severe complication of acute otitis media in children – prevalence, diagnosis and treatment; prevalence of selected mental disorders among graduation class adolescents: data from a screening study; assessment of anthropometric measurements in diagnosis and monitoring of excessive body weight in children; influenza vaccine efficacy in patients aged 60–75 years in the 2016/2017 season; satisfaction with life scale analyses among healthy people, people with noncommunicable diseases and people with disabilities; who do type 2 diabetics inform about their own illness; effect of whole body cryotherapy treatments on antioxidant enzyme activity and biochemical parameters in patients with multiple sclerosis; Polish e-cigarettes: users reasons to start vaping – a survey of 1142 Polish vapers; forced prolonged hospital stays as a manifestation of the dysfunction of the Polish long-term care system; the effect of modern medical technology on the availability and cost of cataract treatment in older patients; years of life lost due to colorectal cancer in Poland between 2000 and 2014 according to voivodeships.

Among the review papers in this issue, we included articles on systemic aspects of securing the health safety of the elderly and fostering digital literacy in the elderly as a means to secure their health needs and human rights in the reality of the twenty-first century.

I encourage you to familiarize yourself in the CME section with the recommendations of the Polish Society of Physiotherapy, Polish Society of Family Medicine and the College of Family Physicians in Poland in the scope of physiotherapy in the painful shoulder syndrome in primary healthcare and the article on the family doctor in the jurisprudence of medical disciplinary boards.

I encourage all our readers to submit your own research projects and to stay in touch with the Editorial Board of *FM&PCR*. Any of our Thematic Editors and Members of the Editorial Board will be happy to assist you in the stages of submitting publications through the *FM&PCR* Editorial System, as well as during the review process and revisions. I invite you to meet with members of the Editorial Board at the Polish Society of Family Medicine, which can be found at conferences and congresses, as well as at the stand of Continuo, which you will see during meetings throughout Poland. On behalf of the Editorial Committee, I welcome all participants of the 7th Congress of the Polish Society of Family Medicine to Wrocław (12–14 October 2018). I hope that the presentations and discussions at the Congress will inspire you to start work on articles for our quarterly. On the occasion of the new academic year, and on behalf of all at *Family Medicine & Primary Care Review*, I wish you the best

of luck with your scientific plans that will bring benefit to the field of family medicine, challenges that bring fulfillment, and success in realizing research projects involving real family medicine, the results of which will appear in the pages of *FM&PCR*.

Donata Kurpas, MD, PhD, Associate Professor
Wroclaw Medical University
Editor-in-Chief
Family Medicine & Primary Care Review

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ORIGINAL PAPERS

Prevalence of allergy in children with adenoid hypertrophy and otitis media with effusion admitted to the Department of Pediatric Otolaryngology in Poznan

PAULINA ADAMCZYK[A, B, D, E, F], BEATA PUCHER[A, B, E], MAGDALENA PRAUZIŃSKA[B], AGATA KAŁUŻNA-MŁYNARCZYK[A, B], MICHAŁ KOTOWSKI[B], JAROSŁAW SZYDŁOWSKI[A, D, E]

Pediatric Otolaryngology Department, Poznan University of Medical Sciences, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Allergic diseases are the most common chronic illnesses in children. It is said that patients with allergy more often suffer from adenoid hypertrophy and otitis media with effusion than non-allergic patients.

Objectives. To estabilish the prevalence of allergy in children with adenoid hypertrophy with or without otitis media with effusion (OME) admitted to the Department of Pediatric Otolaryngology in Poznan between 05.2017 and 05.2018 and to check if allergy affects the incidence of OME and adenoid hypertrophy.

Material and methods. Each patient admitted for adenoidecomy or tympanostomy tube placement or both was carefully interviewed to check if they suffered from allergic diseases. In every patient with OME, a preoperative tympanometry and pure tone audiogram or otoacoustic emission was performed. The data was analyzed statistically. The chi-square test was used, with a p value < 0.05.

Results. 153 patients aged 2 to 16 years (68 girls and 85 boys) were admitted to the Poznan Pediatric Otolaryngology Department between 05.2017 and 05.2018. The children were divided in to three age subgroups. 16.9% of children undergoing adenoidectomy and 17.4% of children undergoing adenoidectomy with tympanostomy tube placement suffered from allergic disease. Allergy did not affect the incidence of OME or adenoid hypertrophy, but this finding was not statistically significant. OME diagnosis and ear tube placement was statistically more often seen in boys (p = 0.02, chi^2 = 5.39).

Conclusions. Prevalence of allergy was higher in boys and they had more often ear tubes placement performed. That difference was statistically significant. Allergy in our study group did not influence the prevalence of OME, nor the adenoid hypertrophy.

Key words: hypersensitivity, adenoids, otitis media with effusion.

Adamczyk P, Pucher B, Prauzińska M, Kałużna-Młynarczyk A, Kotowski M, Szydłowski J. Prevalence of allergy in children with adenoid hypertrophy and otitis media with effusion admitted to the Department of Pediatric Otolaryngology in Poznan. *Fam Med Prim Care Rev* 2018; 20(3): 205–209, doi: https://doi.org/10.5114/fmpcr.2018.78252.

Background

Allergic diseases are the most common chronic condition in children in Poland. It is said that 11% of children and 17% of adolescents in the Polish population suffer from allergy [1]. It is estimated that children with allergy are more susceptible to either acute otitis media (AOM) or otitis media with effusion (OME) [2]. There are various factors contributing to this. Firstly, the Eustachian tube, the structure responsible for equalizing middle ear pressure, might become mechanically blocked by enlarged adenoid or swollen nasal mucosa. Such an obstruction may result in poor ear ventilation. In patients with allergic rhinitis (AR), the nasal mucosa is swollen, causing Eustachian tube dysfunction, which eventually leads to otitis media with effusion [2]. Adenoid hypertrophy may also cause Eustachian tube blockage and subsequently lead to the same condition. According to literature, children with allergic diseases more often suffer from adenoid hypertrophy than other children [3].

Another explanation for the connection between a higher rate of OME and adenoid hypertrophy in children with coexisting allergic diseases may lay in the pathophysiology of allergy.

It is said that the inflammation mediators found in ear exudates from allergic patients are similar to those found in the late phase of an allergic response. Moreover, the mucosa found in middle ear emerges from the same ectoderm as the rest of the mucosa of the respiratory system [4]. This means the middle ear is capable of an allergic response and may be treated as a compartment of the "united airway" [4, 5]. Summarizing, it behaves similarly to any other part of the respiratory tract in allergic patients, where the inflammatory response leads to swelling and obstruction [5].

OME is one of the most common conditions in the pediatric population, where non-purulent fluid is retained behind the tympanic membrane in the middle ear, causing conductive hearing loss. If such a condition persists, especially in younger children, this may lead to a delay in speech development [6]. OME might be called a silent disease, as it rarely presents visible symptoms, and due to this, it might be a challenge to diagnose. The symptoms vary depending on the child's age. This could be an impression of a full ear, tinnitus or autophony, but in younger children, the only sign of hearing impairment might be poor concentration or worsening of the child's behavior [7]. In Poland, the occurrence of temporary or permanent hearing loss of mild or moderate severity can be seen in 3.4% of children from primary school and 0.6% of middle school students [8]. The etiology of OME is multifactorial, and there are various factors influencing it, such as the male sex, craniofacial abnormalities, school attendance, exposure to tobacco smoke [9]. The allergy and its increased incidence in OME or adenoid hypertrophy remains disputed, and many studies are now being conducted to establish the relationship between these entities.

Objectives

Establishing the prevalence of allergic diseases in children with adenoid hypertrophy with or without otitis media with effusion admitted to the Department of Pediatric Otolaryngology in Poznan between 05.2017 and 05.2018. Checking if allergy affects the incidence of OME or adenoid hypertrophy and verifying weather allergy influences the incidence of OME and adenoid hypertrophy.

Material and methods

Study design, setting and participants

This research was a cross-sectional study concerning children with adenoid hypertrophy or OME or both. The study was conducted at the Pediatric Otolaryngology Department in Poznan, Poland, between 05.2017 and 05.2018. Each patient admitted to the hospital for adenoidectomy or tympanostomy tube placement was carefully interviewed for any history of allergic diseases. Patients were assigned to the allergic patient group only if asthma, allergic rhinitis or atopy was diagnosed and treated by an Allergist and the patient had either positive skin or blood test results or a copy of his/her history with diagnoses and treatment. At admission, at full ENT examination by a physician was conducted, and a hearing test was performed. Each patient with OME was examined using a portable tympanometer, was carried out/performed depending on the patient's age or cooperation level.

The research was carried out in accordance with the ethical principles of scientific research, the Declaration of Helsinki, as well as the Ethical Code of the Polish Academy of Science.

Statistical methods

The results obtained were analyzed statistically. The chi-square test was used, with a p value < 0.05.

Results

153 patients aged 2 to 16 years (68 girls and 85 boys) were admitted to the Pozan Pediatric Otolaryngology Department between 05.2017 and 05.2018. 62 children applied for adenoidectomy with tympanostomy tube placement, 83 only for adenoidectomy and 8 only for tympanostomy tube placement. The children under study were in pre-school or school age, from 2 to 17 years old (Me (Q25–Q75) = 6(5–8)). They were divided according to age into three subgroups: below 7 years = preschool children, n = 87 (37 girls, 50 boys); younger school children, aged 7 to 9 years, n = 52 (28 girls, 24 boys), and elder school children, aged 9 to 17 years, n = 14 (3 girls, 11 boys). No differences were found between the age groups concerning sex (chi-square test non-significant) (Table 1).

11 patients were referred only for an adenoidectomy, but the hearing test and the interview revealed hearing impairment, and they were eventually were diagnosed with otitis media with effusion and underwent tympanostomy tube placement.

8 patients were referred to tympanostomy tube placement with adenoidectomy but had good hearing test results upon admission, and in these patients, only an adenoidectomy was eventually performed. 25 patients had a history of allergic disease. From this group, 11 patients were referred to the hospital because of OME, and 14 only due to adenoid hypertrophy and frequent upper respiratory system infections. From these patients, 7 were female, and 18 were male (Figure 1).

Our data shows that 16.9% of children undergoing adenoidectomy and 17.4% of children undergoing adenoidectomy with tympanostomy tube placement suffered from allergic disease (Table 2, Figure 2).

Table 1. Differences in investigated clinical parameters according to the sex of children.
The chi-square test was used, $p < 0.05$

Parameter		Children with no allergy, n = 128	Children with allergy, n = 25	Statistical significance of the difference, chi-square test
Right ear pure tone audiogram	correct	37	9	ns
	incorrect	16	5	
Left ear pure tone audiogram	correct	33	7	ns
	incorrect	18	6	
Adenotomy	yes	123	22	ns
	no	5	3	
Confirmed OME diagnosis	yes	59	11	ns
	no	69	14	
Ear tube placement	yes	59	11	ns
	no	69	14	
Initial OME diagnosis	yes	65	14	ns
	no	63	11	

Table 2. Differences in investigated clinical parameters according to confirmed allergic conditions in the investigated children.
The chi-square test was used, $p < 0.05$

Parameter		Girls, n = 68	Boys, n = 85	Statistical significance of the difference, chi-square test
Allergy	yes	7	18	ns
	no	61	67	
Right ear pure tone audiometry	correct	19	27	ns
	incorrect	11	10	
Left ear pure tone audiometry	correct	18	22	ns
	incorrect	10	14	
Adenotomy	yes	66	79	ns
	no	2	6	
Confirmed OME diagnosis	yes	24	46	5.39; p = 0.020
	no	44	39	
Ear tube placement	yes	24	46	5.39; p = 0.020
	no	44	39	
Initial OME diagnosis	yes	29	50	3.96; p = 0.047
	no	39	35	

From 62 patients with an initial diagnosis of OME, 30 had type B tympanogram bilaterally, 6 had type C tympanogram bilaterally, and 4 had type A tympanogram bilaterally. 3 patients had type C tympanogram in one ear and type A in another, 5 patients had type B tympanogram in one ear and A in another, and 11 patients had type B tympanogram in one ear and type C tympanogram in another. 3 patients presented with their own hearing test results, and they were not eligible for this research (Figure 3).

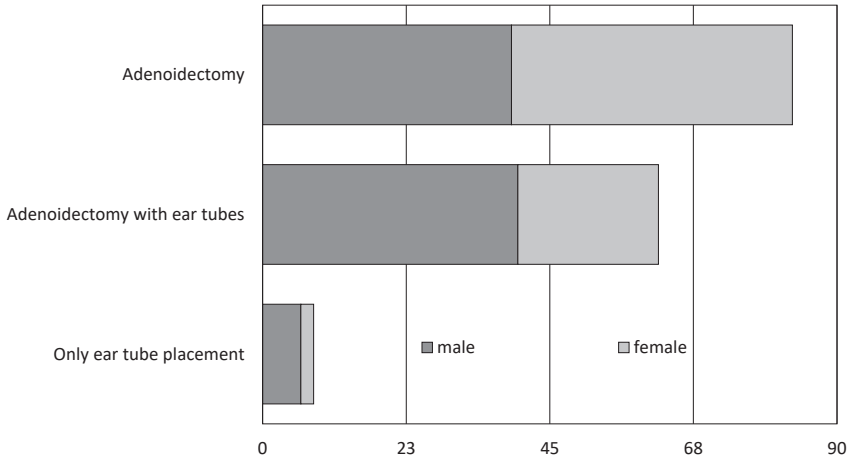

Figure 1. Children admitted for adenoidectomy with or without tympanostomy tube placement or only ear tube placement divided by sex

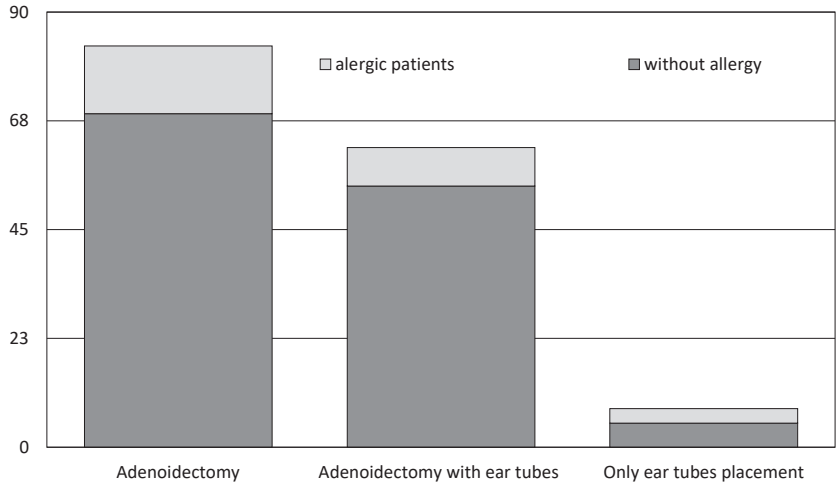

Figure 2. Allergic and non-allergic patients admitted for adenoidectomy with or without tympanostomy tube placement or only ear tube placement

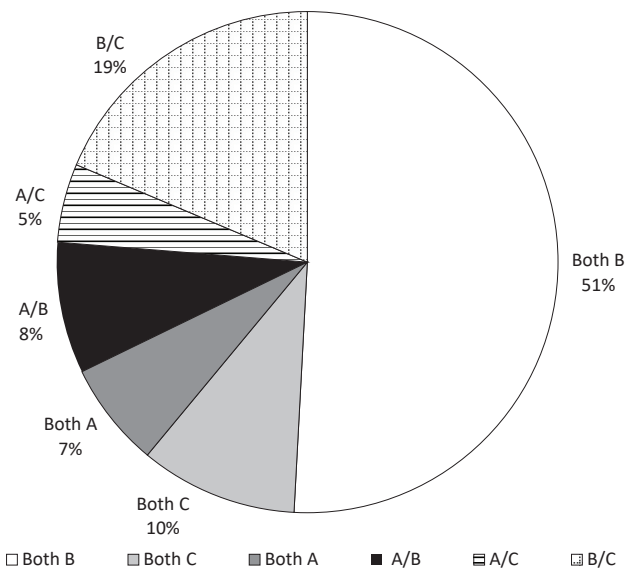

Figure 3. Diagram showing tympanometry results in children with otitis media with effusion and adenoid hypertrophy

Discussion

OME is defined as the accumulation of fluid behind the intact tympanic membrane, with no acute inflammation signs, leading to hearing impairment. Hearing deterioration, if persisting at a very young age, may eventually lead to a delay in speech development. OME is a very common condition in the pediatric population and a frequent cause of visits to the primary care unit. It is estimated that more than 50% of children in their first year of life will experience OME. Most of these children will recover spontaneously within 3 months and not require any medical treatment. However, in up to 10% of these children, the exudates will last for a year or even longer [10]. According to OME treatment guidelines, in such cases, ear grommet insertion is the only advised therapy [11]. Tympanostomy tubes are small canals inserted in the tympanic membrane that equalize middle ear pressure. However, in allergic patients or in those with an enlarged adenoid, ventilation tube insertion seems to be less effective than in non-allergic patients, and recurrences of OME are more often present [12].

There are many factors predisposing to OME, yet allergy is one of the most disputed. In many studies conducted over the last few years, the relationship between allergic diseases and increased susceptibility to OME was highlighted. Kwon et al. established that the incidence of OME is much higher in children with allergic rhinitis (31%) than in the control group (16%). They also stated that adenoid hypertrophy was greater in children with comorbid allergy [13].

Moreover, in Japan, Tomonaga et al. estimated that 50% of children with OME included in the study had allergic rhinitis, and 21% of patients with allergic rhinitis had OME [14].

The susceptibility to allergy seems to be even higher in Sicilian children. Martines et al. calculated that 62.9% of children with positive skin tests suffered from OME [15]. This finding might be very important when it comes to OME treatment: an adequately controlled inflammatory response with proper pharmacological therapy may result in exudate resolution [5]. In recently published guidelines for OME, Rosenfeld et al. permitted the use of topical intranasal steroid drops in OME treatment in patients with allergy, as they are said to reduce the inflammatory response in allergic patients [11].

According to Rosenfeld et al., pneumatic otoscopy is a basic diagnostic method for determining OME. In our Department, we tend to apply acoustic tympanometry in each patient as an alternative to pneumatic otoscopy. The tympanogram is a graphic version of the sound energy reflected back from the tympanic membrane, measured by a small microphone in the ear canal. This provides us with an objective view of the middle ear status. Basically, we can divide tympanometric curves into 3 main types: Type A – with a sharp peak – indicates that the possibility of exudate behind the tympanic membrane is low; Type B – flat – suggests a high chance of fluid behind the tympanic membrane; and Type C – peak and negative ear pressure in the middle ear – shows an intermediate likelihood of encountering effusion [11]. Tympanometry is said to be as sensitive as pneumatic otoscopy; however, it is less specific [11]. In our study group from 62 patients admitted for adenoidectomy with tympanostomy tube placement, 30 (51%) had type B tympanogram in both ears, so the sensitivity of this examination, in our case, was not satisfactory. To make the hearing test more reliable, we applied otoacoustic emission in children aged 1–5 and in patients who did not cooperate, and pure tone audiometry was applied in older children.

Our data seems to contradict studies conducted before and shows no correlation between allergy and the incidence of OME or adenoid hypertrophy. Unfortunately, these findings did not reach statistical significance and need further investigation. OME and ear tube placement were seen in boys more often than in girls, which was statistically significant. This finding is consistent with up-to-date literature [16]. Surprisingly, our findings show a lower percentage of children suffering from OME and allergy than the other studies mentioned above. In our study, 16.9% of children undergoing adenoidectomy and 17.4% of children undergoing adenoidectomy with tympanostomy tube placement suffered from allergic disease, which, in comparison with the Japanese group (50%) and Korean group (31%), is significantly lower. However, the percentage of allergic children and adolescents in Poland (11% and 17%, respectively) seems to be lower than in other countries. The National Health Interview Survey held in the US in 2014 revealed that 8.4% of children suffer from allergic rhinitis, 10% from respiratory allergies, 5.4% from food allergies and 11.6% from skin allergies. This means that more than 30% of American children suffer from allergy [17]. Unfortunately, an increasing trend for allergic diseases amongst US children, especially respiratory allergy, has been noticed over the last few years [18]. The same growing trend is visible amongst Polish children [19]. Further studies are planned to confirm the allergy rate amongst patients with OME and adenoid hypertrophy. Perhaps the prevalence of allergy will change in time as the tendency for allergic diseases grows in general.

Limitations of the study

The study was conducted in one pediatric tertiary center, and the authors are aware of this limitation. However, in the future, further studies to collect data concerning allergy in patients with OME and adenoid hypertrophy from other pediatric units are planned.

Conclusions

Although it is said allergic diseases influence the incidence of OME and adenoid hypertrophy in children, our study did not reveal such a finding. Allergy seemed not to affect the incidence of OME or adenoid hypertrophy in our study group. The only statistically significant result is the higher incidence of OME and adenoid hypertrophy in boys. The prevalence of allergy in patients with OME or adenoid hypertrophy in our study seems to be lower than in other studies conducted previously.

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Address for correspondence:
Paulina Adamczyk, MD
Klinika Otolaryngologii Dziecięcej
Katedra Otolaryngologii i Onkologii Laryngologicznej UM
ul. Szpitalna 27/33
60-572 Poznań
Polska
Tel.: +48 61 849-15-90
E-mail: paulina.adamczyk89@gmail.com

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ORIGINAL PAPERS

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Satisfaction with Life Scale analyses among healthy people, people with noncommunicable diseases and people with disabilities

ELENA BENDÍKOVÁ[1, A–G], DAGMAR NEMČEK[2, A–G], PETRA KURKOVÁ[3, B], WIOLETTA LUBKOWSKA[4, E, F], BOŻENA MROCZEK[5, E]

[1] Department of Physical Education and Sports, Faculty of Humanities, Matej Bel University in Banská Bystrica, Slovakia
[2] Department of Sport Educology and Sport Humanities, Faculty of Physical Education and Sports, Comenius University in Bratislava, Slovakia
[3] Department of Anthropology and Health Education, Faculty of Education, Palacký University Olomouc, Czech Republic
[4] Faculty of Physical Education and Health Promotion, University of Szczecin, Poland
[5] Department of Human Sciences in Medicine, Pomeranian Medical University in Szczecin, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** A satisfactory professional and social life of disabled and people with noncommunicable diseases depends on their life satisfaction (LS), which should be understood as a subjective assessment of their past and current life situation, as well as prospects for the future.
Objectives. The aim of this study was to analyze the LS status using SWLS among healthy people, people with noncommunicable diseases and people with disabilities and compare SWLS scores within three evaluated groups.
Material and methods. The study was conducted in 2015 and 2016 in Slovakia. It involved three population groups (n = 1144), which were recruited for the study: healthy people (HP; n = 313) people with noncommunicable diseases (PwNCDs; n = 351) and people with disabilities (PwDs; n = 480). The Satisfaction with Life Scale (SWLS) study was used.
Results. The overall SWLS score of the evaluated groups demonstrate that HP presented the highest LS (24.24), and PwDs the lowest LS (21.05). PwNCDs are significantly more satisfied with their life than PwDs ($p < 0.01$), and if PwNCDs could live their life over, they would change almost nothing ($p < 0.05$). The mean score of assessed LS statements pointed to a higher LS of PwNCDs, as they declared higher LS in all five statements, and the mean total score also showedg significantly higher LS in PwNCDs compared to PwDs (22.27 vs 21.05; $p < 0.01$).
Conclusions. Social relationships through appropriate physical activities and an active social life are extremely important for people with NCDs and disabilities, as they contribute to reducing their levels of social exclusion and isolation, which can lead to episodes of depression, stress, loneliness and consequent deterioration of health conditions.
Key words: noncommunicable diseases, disabled persons, adult, personal satisfaction, Satisfaction with Life Scale.

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Background

Many people with noncommunicable diseases and disabilities have poor general health, limited community participation and a low quality of life. The emerging pandemic of noncommunicable diseases (NCDs) is creating major health challenges globally. NCDs are currently the leading cause of mortality, causing 68% of all deaths globally. Cardiovascular diseases, cancer, chronic respiratory and diabetes mellitus have been identified by the World Health Organization as the four major NCDs occurring worldwide [1].

There are more than 1000 million people with a disability globally, i.e. about 15% of the world's population or one in seven people. Of this number, between 110 million and 190 million adults experience significant difficulties in functioning [2].

Life satisfaction (LS) is a generic term commonly referred to as a person's subjective contentment with life and may refer to one's life evaluation, social skills and engagement in life activities [3]. LS is often defined as a cognitive evaluation of one's current life situation compared to one's own unique set of criteria and is dependent on a person's adaptation process. In other words, LS reflects the degree to which individuals perceive that their own aspirations and achievements in life are met [4].

As LS is used as an overall goal in the management and rehabilitation of lifelong disabilities, it is important to determine the aspects of LS and factors that may influence it. One commonly used LS rating scale is the Satisfaction with Life Scale (SWLS). The SWLS offers a global measure of satisfaction with life and provides an overall summation of a person's life situation [4]. Some investigations have already been done to measure LS among people with NCDs and people with disabilities. Many of these studies indicated a lower LS in people with NCDs and people with disabilities compared to a healthy population.

Mudgal and Tiwari [5] measured the LS between participants diagnosed with HIV/AIDS and normal healthy persons with no reported chronic physical and/or mental health problems. They found a significantly lower level of LS compared to healthy par-

ticipants. The reasons for low LS in people with NCDs are many. People with NCDs may become more sensitive, making them more easily offended than those of normal health [6]. Morrison and Bennett [7] reported that the inability of patients with NCDs in expressing their complaints to others can make them feel upset and non-understandable. This condition can certainly cause discomfort and result in interpersonal conflicts. Psychologically, this can also lead the patients to feel depressed, anxious and hopeless in facing their diseases or their disabilities.

The results of Chen and Crewe [8] indicated that the psychological variables of hope and acceptance of a disability, as well as spiritual well-being, were the best predictors of LS in a group of 218 individuals with progressive disabilities, as well as that demographic and background variables were less powerful predictors. A few longitudinal studies that have examined the relationship between disability and LS [e.g. 9, 10]. The main aim of all these analyses was to study whether people can adapt to a disability over time after its onset in terms of LS. According to the set point model, individuals return to a baseline LS after painful (such as divorce, widowhood, unemployment, disability, etc.) or cheerful (e.g. marriage, the birth of a child, lottery winnings, etc.) life events.

Considering previous research findings, the aim of our research was to (1) analyze the LS status using SWLS among healthy people, people with noncommunicable diseases and people with disabilities, and (2) to compare SWLS scores (five SWLS statements and SWLS total scores) within three evaluated groups.

The following problems and research hypotheses were formulated:

1. What is the life satisfaction (LS) of people with noncommunicable diseases and people with disabilities in comparison to healthy people?
2. Do people with noncommunicable diseases have higher life satisfaction than people with disabilities?

H1: Life satisfaction (LS) is lower in people with noncommunicable diseases and people with disabilities in comparison to healthy individuals.

H2: People with disabilities have lower life satisfaction (LS) compared to people with noncommunicable diseases.

Material and methods

Participants and procedure

Three main population groups (n = 1144) were recruited for the study: healthy people (HP; n = 313), people with noncommunicable diseases (PwNCDs; n = 351) and people with disabilities (PwDs; n = 480). Intergroup variations were compared. The variables that differentiated the groups in the study were: noncommunicable disease, disability and health.

There were four main types of noncommunicable diseases in the research: cardiovascular diseases (e.g. heart attacks and stroke), cancer, chronic respiratory diseases (e.g. chronic obstructive pulmonary diseases and asthma) and diabetes mellitus.

Participants with NCDs and with disabilities were contacted through representatives of national organizations and schools all around Slovakia unifying people with different NCDs and with special needs. Some questionnaires were sent electronically by representatives of the organizations, and some were passed out at different meetings (e.g. general assembly, etc.) organized by national organizations. All data was collected over a two years period (2015–2016).

The study protocol was approved by the Ethics Committee of the Faculty of Physical Education and Sports, Comenius University in Bratislava, Slovakia.

The Satisfaction with Life Scale (SWLS)

The SWLS offers a global measure of satisfaction with life as an overall summation of a person's LS [4]. The SWLS consists of five items (statements) all tapping into global LS. In this study, a Slovak version of the SWLS was used [11].

Data analyses

Statistical analysis was undertaken using IBM SPSS version 23.0. Qualitative variables are presented as proportion and percentage. Quantitative variables are presented as a mean of standard deviation and range. Pearson's chi-square test was used to determine the differences between SWLS scores of healthy people, people with NCDs and people with disabilities. In the current study, only one measurement was made, and three main groups formed the study.

The level of statistical significance was set at $p < 0.05$.

Results

Participants

In the research, 27.4% of HP, 30.7% PwNCDs and 41.9% PwDs participated. The group of HP presented a higher num-

Table 1. Data of the 1,144 participants

		HP	PwNCDs *n* (%)	PwDs
Baseline characteristics of participants		313 (27.4)	351 (30.7)	480 (41.9)
Gender	Males	187 (59.7)	166 (47.3)	240 (50.0)
	Females	126 (40.3)	185 (52.7)	240 (50.0)
Age	Range 15–29 years	261 (83.4)	177 (50.4)	203 (42.3)
	Range 30 + years	52 (16.6)	174 (49.6)	277 (57.7)
Education level	Primary	22 (7.0)	72 (20.5)	135 (28.1)
	High school	225 (71.9)	192 (54.7)	275 (57.3)
	University	66 (21.1)	87 (24.8)	70 (14.6)
Marital status	Single	274 (87.5)	190 (54.1)	256 (53.3)
	Married	29 (9.3)	104 (29.6)	155 (32.3)
	Divorced	7 (2.2)	20 (5.8)	40 (8.3)
	Widow	3 (1.0)	37 (10.5)	29 (6.1)
Employment status	Employed	38 (12.1)	101 (28.8)	174 (36.3)
	Unemployed	9 (2.9)	11 (3.1)	52 (10.8)
	Student	251 (80.2)	163 (46.4)	140 (29.2)
	Pensioner	15 (4.8)	76 (21.7)	114 (23.8)

Table 2. Comparisons of SWLS among the evaluated groups of the population									
Statement	HP	PwNCDs	PwDs	HP vs PwNCDs		HP vs PwDs		PwNCDs vs PwDs	
No	mean			χ^2	*p*	χ^2	*p*	χ^2	*p*
1.	4.933	4.362	4.148	38.89	0.00**	68.21	0.00**	13.05	0.04*
2.	5.380	4.840	4.454	43.55	0.00**	92.54	0.00**	30.68	0.00**
3.	5.070	4.613	4.385	25.26	0.00**	57.95	0.00**	21.07	0.00**
4.	4.866	4.744	4.458	11.22	0.08	18.72	0.00**	25.08	0.00**
5.	3.994	3.715	3.600	12.01	0.06	16.69	0.01*	12.73	0.04*
Total score	**24.24**	**22.27**	**21.05**	**24.80**	**0.00****	**64.96**	**0.00****	**20.64**	**0.00****

(1) The possible statement score range is 1–7, and the possible total score range is 5–35; higher scores indicate better LS; (2)*level of statistical significance $p < 0.05$; **level of statistical significance $p < 0.01$.

ber of males (59.7%), mostly represented in the range of 15–29 years of age (83.4%). The HP population of our sample was mostly single (87.5%), still studying (80.2%) and had achieved a high school education level (71.9%). On the other hand, the group of PwNCDs was represented mostly by females (52.7%). Half of them were single (54.1%), up to 30 years of age (50.4%) and achieved a high school education level (54.7%). Nearly half the number of PwNCDs were still studying (46.4%), 28.8% had a full-time job, and 21.7% were elderly pensioners or people in disability retirement. The group of PwDs comprised 50% males and 50% females. This group included more people over 30 years of age (57.7%) than single people (53.3%) at a high school education level (57.3%). 36.3% of PwDs were regular employees, 29.2% were still studying, and 23.8% were elderly pensioners or people in disability retirement (Table 1).

The group of PwNCDs included individuals with problems of internal systems and musculoskeletal disorders. The sample of PwNCDs comprised 26.9% with musculoskeletal impairments, 19% with cardiovascular diseases, 18.7% with metabolic diseases, and 15.4% covered people with other impairments, such as hormonal system impairments, cancer, problems with bowel movements and gynecologic impairments.

The group of PwDs comprised 59.7% people with physical disabilities, 4.9% blind individuals and people with partial sight, and 35.4% people who are deaf or hard of hearing.

SWLS

The results of the study demonstrate significant differences between HP and PwNCDs in three evaluated LS statements and in the overall LS score (Table 2). In most ways, the life of HP is significantly closer to their ideal compared to PwNCDs ($p < 0.01$). The conditions of their life are significantly more excellent than the life conditions of PwNCDs ($p < 0.01$). HP are significantly more satisfied with their life than PwNCDs ($p < 0.01$). The mean score of assessed LS statements pointed to a higher LS of HP, as they declare higher LS in all five statements, as well as in the mean of total LS scores (24.24 vs 22.27; $p < 0.01$).

The results of the present study further demonstrate significant differences in LS between HP and PwDs in all evaluated LS statements as well as in the total LS score (Table 2). In most ways, the life of HP is significantly closer to their ideal compared to PwDs ($p < 0.01$). The conditions of their life are significantly more excellent than the life conditions of PwDs ($p < 0.01$). HP are significantly more satisfied with their life than PwDs ($p < 0.01$). HP more frequently received the significantly important things they wanted in life than PwDs ($p < 0.01$), and if HP could live their life over, they would change almost nothing ($p < 0.05$). The mean score of assessed LS statements pointed to a higher LS of HP, as they declare higher LS in all five statements, and the mean of total score also showed significantly higher LS in HP compared to PwD (24.24 vs 21.05; $p < 0.01$).

The results of the current study present significant differences in LS between PwNCDs and PwDs in all evaluated LS statements and in the overall LS score (Table 2).

The overall SWLS score of the evaluated groups demonstrate that HP presented the highest LS (24.24 of the point score), and PwDs the lowest LS (21.05 of the point score). HP, with a total SWLS score of 24.24 points, is the closest to a high score (range 25–29 points) from all assessed groups. On the other hand, PwDs, with a total SWLS score of 21.05 points, are closer to a score of 20 points, which represents the neutral point on the scale. This observed data generally showed that HP are the most satisfied with their life and PwDs are the most dissatisfied with their life when comparing all the assessed groups of the present study.

Discussion

In several studies, satisfaction with life has been associated with the health outcomes of people, in which LS plays an important role. People with chronic diseases and with disabilities are less likely to have access to health, rehabilitation, social support, income programs, education, leisure and employment, which increase the level of their well-being, and Piko [12] has found that younger individuals' psychosocial health should play an important role in the LS, particularly referring to psychosomatic symptoms, depressive disorders and health behaviors, such as food and tobacco consumption, which are factors that may impair the quality of life and health of the young adult population. The study by Clench-Aas et al. [13] explored the dimensionality and measurement invariance of SWLS across gender and age in a large ($n = 4.984$) Norwegian representative subsample of persons aged 15–79, including both male and female participants. Comparing the data of the current study, all evaluated groups of Slovak people achieved a much lower LS than the Norwegian groups of the population.

With increasing age, there is a higher appearance of chronic diseases, and later in life, many chronic diseases cause permanent disabilities. There is very strong evidence that participants with NCDs and disabilities participating in leisure time activities obtain and increase in physical and emotional health [14, 15]. Taking part in certain leisure activities can lead to different effects on the levels of LS according to the type of disability and disease. One very important leisure time activity that positively affects the level of LS is physical activity and sport.

The results of the study by Bendíková and Nemček [16] demonstrate no significant differences in LS between HP participating in sport leisure activities and HP with a sedentary behavior. On the other hand, the same study revealed significantly higher LS in actively PwNCDs compared to inactive people with NCDs. Tasiemski et al. [17] investigated LS domains in patients with spinal cord injury and whether or not participation in sports and physical recreation was associated with LS. The authors reported a higher level of LS in general in patients with spinal cord injury who were involved in sports and physical recreation. The study by Yazicioglu et al. [18] showed that people with physical disabilities who participated in adapted sports had significantly higher quality of life and LS scores compared to people with

physical disabilities not involved in any adapted sports. Another study by Kye and Park [19] also revealed that greater levels of happiness are associated with implementation of exercise.

Conclusion

Based on the aim of the current study, we found significantly higher LS in HP compared to PwNCDs and PwDs. Furthermore, we found significantly higher LS in PwNCDs compared to PwDs. According to the results and discussion of the present study, we need to emphasize the importance of having social relationships through appropriate physical activities and an active social life with, for example, friends, relatives, neighbors, teammates, at church, in civic associations, etc., which are extremely important for people with NCDs and disabilities, as they contribute to combating and reducing their levels of social exclusion and isolation, which can lead to episodes of depression, stress, loneliness and consequent deterioration of health conditions. General practitioners should, in particular, offer health counseling for people with disabilities and qualify them for special forms of residential and specialist care. In relation to people with noncommunicable diseases, general practitioners should recommend – in accordance with a general strategy to combat chronic noncommunicable diseases – physical activity and improved nutrition, which has a significant and often rapidly visible impact on public health.

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Conflict of interest: The authors declare no conflict of interests.

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Address for correspondence:
Doc. Paed Dr. Elena Bendíková, PhD
Matej Bel University, Faculty of Arts
Department of Physical Education and Sports
974 01 Banská Bystrica, Tajovského 40
Slovakia
Tel.: 00421 48 446 7556
E-mail: elena.bendikova@umb.sk

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ORIGINAL PAPERS

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Effect of whole body cryotherapy treatments on antioxidant enzyme activity and biochemical parameters in patients with multiple sclerosis

IWONA BRYCZKOWSKA[1, A–G], ALEKSANDRA RADECKA[1, B, E], ANNA KNYSZYŃSKA[1, B, E], JOANNA ŁUCZAK[2, B], ANNA LUBKOWSKA[1, A–F]

[1] Department of Functional Diagnostics and Physical Medicine, Faculty of Health Sciences, Pomeranian Medical University, Szczecin, Poland
[2] Faculty of Health Sciences, Warsaw College of Engineering and Health; Cardiac Rehabilitation Unit, Central Clinical Hospital of the Ministry of Interior and Administration, Warsaw, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Multiple sclerosis (MS), the most common cause of non-traumatic disability in adults, is a chronic, complex neurological disease with a variable clinical course and several pathophysiological mechanisms. Whole-body cryotherapy (WBC), due to its analgesic effects, is an increasingly popular form of rehabilitation for neurological patients, especially for those with MS.
Objectives. The following study attempted to evaluate the effect of 30 daily whole-body cryotherapy treatments (3 minutes at -130°C) on basic blood biochemical parameters and main antioxidant enzyme activity in the erythrocytes of MS patients.
Material and methods. Total protein, albumin, glucose and uric acid levels and lipid profile indicators: total cholesterol (TCh), HDL cholesterol and triacylglycerol (TAG) concentrations, were determined with the enzymatic colorimetric method. The activity of erythrocyte antioxidant enzymes: SOD1/CuZn-SOD (superoxide dismutase), CAT (catalase), GPx (glutathione peroxidase), R-GSSG (glutathione reductase), GST (glutathione transferase), was assessed using kinetic methods before and after 30 daily WBC treatment in 30 patients.
Results. Following a series of 30 WBC treatments, no significant changes in total protein, albumin, uric acid and glucose concentrations, total cholesterol and HDL- and LDL-fraction cholesterol levels and triacylglycerol concentration, as well as a significant increase in SOD1 activity coupled with a trend for increased GST activity, were observed in the group of patients.
Conclusions. The results confirm the possibility of modulating the effect of this form of rehabilitation on the systemic antioxidant potential in multiple sclerosis patients.
Key words: multiple sclerosis, cryotherapy, enzymes.

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Background

Multiple sclerosis (MS), the most common cause of non-traumatic disability in adults, is a chronic, complex neurological disease with a variable clinical course and several pathophysiological mechanisms, such as inflammation, demyelination, axonal/neuronal damage, gliosis, oligodendrocyte loss, re-myelination and repair mechanisms and oxidative stress [1, 2]. It is well known that inflammation might raise ROS levels, leading to oxidative stress (OS). One of the most abundant sources of ROS, apart from the electron-transport chain of mitochondria, is the respiratory burst system of activated microglia. ROS have been implicated as mediators of demyelination and axonal damage; moreover, the pathogenic role of oxygen and nitrogen free radicals is postulated in MS pathology. It is suggested that antioxidants might prevent free radical-mediated tissue destruction and inhibit some of the early pro-inflammatory events, such as T cell activation and cell trafficking into the CNS, which lead to inflammation and tissue destruction in MS [3, 4]. Free radical-mediated peroxidation of biological molecules, especially of lipids, is implicated in the pathogenesis of a number of neurological diseases, such as multiple sclerosis. A low concentration of antioxidant vitamins: beta carotene, retinol, alpha tocopherol and ascorbic acid, has been observed in the serum or cerebrospinal fluid of multiple sclerosis patients [5]. Genetic and environmental factors, such as IL-1 beta, IL-1 receptor, immunoglobulin Fc receptor genes, apolipoprotein E (APO-E) gene, as well as pathogens and chemicals, have been suggested to play a role in the pathogenesis of MS [3, 6–9].

Whole-body cryotherapy (WBC), due to its analgesic effects, is an increasingly popular form of rehabilitation for neurological patients, similarly in stationary rehabilitation centres. It has been demonstrated that this therapy has beneficial effects for patients with symptoms of depression and leads to regulation of muscle tone, which affects the effectiveness of kinesiotherapy being carried out. In MS patients, whole-body cryotherapy is commonly used in order to improve the overall functionality of the patient and to reduce the fatigue level. More importantly, patients tolerate this treatment very well [10, 11]. The previously described effects of cryotherapy, involving modification of the pro-oxidant/antioxidant status [12–14], have been confirmed in studies with MS patients. Miller et al. [15] showed changes in total antioxidant status and superoxide dismutase and catalase activities in the erythrocytes of MS patients with a secondary progressive disease course in response to a series of 10 WBC exposures.

Objectives

The increasing use of whole-body cryotherapy treatments in SM patients, as well as in the series of elongated effects, prompted us to undertake a study on the effect of 30 daily WBC treatments on basic blood biochemical parameters and antioxidant enzyme activity in the erythrocytes of MS patients.

Material and methods

Subjects and WBC protocol

The research involved 30 multiple sclerosis patients, women aged 45.6 ± 12.4 years (with normal distribution of results), who had never been subjected to any form of cryotherapy. The patients did not suffer from other diseases according to the physician's qualifications. Eligibility criteria for the subjects included diagnosis of multiple sclerosis according to McDonald diagnostic criteria (in accordance with 2010 amendments). An additional inclusion criterion was a level above of 6 in EDSS (Expanded Disability Status Scale). The exclusion criteria included the presence of contraindications for whole-body cryotherapy treatments and application of immunomodulators, immunostimulators, hormones, vitamins and supplements. Each participant provided their written consent before participation in the study, and the Local Ethical Committee of the Pomeranian Medical University (Decision KB-0012/36/13) issued a formal consent according to the Helsinki Declaration. Participants were exposed to a 30-day-long series of WBC at the Department of Therapeutic Rehabilitation at the Central Clinical Hospital of the Ministry of Interior and Administration in Warsaw, Poland. Each cryotherapy session lasted 3 minutes (-130°C), preceded by a 30-second period in the vestibule at a temperature of -60°C in a two-stage cryochamber of the Wrocław-type with a nitrogen-exchanger. After the cryotherapy session, each patient participated in the group kinesitherapy (general development carried out by a physiotherapist), which was the same for all patients and lasted 30 minutes after WBC.

Blood preparation

Venous blood samples were taken twice, before and after the series of 30 WBC treatments, between 8:00 and 9:00 a.m., while fasting, using a vacuum blood collection system (Sarstedt, Germany), in order to obtain erythrocytes and blood serum. The erythrocytes were separated by centrifugation (2,600 g, 10 min, 4°C), washed three times with 0.9% NaCl and chilled to 4°C.

Biochemical analysis

The activity of erythrocyte antioxidant enzymes: SOD1/CuZn-SOD; E.C.1.15.1.1 (superoxide dismutase), CAT; E.C.1.11.1.6 (catalase), GPx; E.C.1.11.1.9 (glutathione peroxidase), R-GSSG; E.C.1.8.1.7 (glutathione reductase), GST; E.C.2.5.1.18 (glutathione transferase), was assessed using kinetic methods. All reagents used were purchased from Sigma-Aldrich Sp. z o.o. (Poznan, Poland). The analysis of enzyme activity was performed using a UV/VIS Lambda 40 spectrophotometer (Perkin-Elmer). In all the mentioned cases, haemoglobin levels were assayed using Drabkin's method [16]. Enzyme activity was calculated per 1 g of RBC haemoglobin.

Sensitivity of the SOD assay (λ 320 nm; at 30°C) was 0.1 U/mL, specificity 97%, while the coefficient of variation was lower than 4% [17]. Sensitivity of the CAT assay (λ 240 nm; at 30°C) was 1.71 U/mL, specificity 89%, while the coefficient of variation was lower than 2% [18]. Sensitivity of the GPx assay (λ 340 nm; at 30°C) was 6 U/L, specificity 94%, while the coefficient of variation was lower than 4% [19]. Sensitivity of the GST assay (λ 340 nm; at 30°C) was 1.2 U/L, specificity 97%, while the coefficient of variation was lower than 2% [20]. The activity of erythrocyte GSSG-R was determined with the spectrophotometric method by Beutler and Yeh [21]; with sensitivity 0.14 U/L, specificity 94%, while the coefficient of variation was lower than 4%. Total protein, albumin, glucose and uric acid levels and lipid profile indicators: total cholesterol (TCh), HDL cholesterol and triacylglycerol (TAG) concentrations, were determined with the enzymatic colorimetric method (BioMaxima, Poland). The LDL-cholesterol fraction was calculated using the Friedewald formula:

LDL [mg/dl] = total cholesterol (TCh) - HDL cholesterol - (TAG/5) [22].

Statistical analysis

Statistical analysis was performed with STATISTICA software (ver. 12.5 PL). In addition to descriptive statistics (median, upper and lower quartiles), the normality of distribution of the analysed parameters was determined using the Shapiro–Wilk test. For values showing a distribution that deviated from the norm, the Wilcoxon matched-pairs signed-rank test was used. To carry out the above statistical analyses, a significance level of $p < 0.05$ was adopted.

Results

During the study, no deterioration of the condition on any of the patients being exposed to whole-body cryotherapy treatments was observed. For organisational and unforeseen reasons, one of the female patients could not participate in the full series of treatments, resulting in incomplete data, which was excluded from the final analysis.

Following a series of 30 WBC treatments, no significant changes in total protein, albumin, uric acid and glucose concentrations and lipid profile were observed in the subjects. The results for the level of biochemical parameters in response to successive weeks of whole-body cryostimulation are presented in Table 1.

Table 1. Values of selected blood biochemical parameters before and after WBC treatments

Biochemical parameters	T_0 – before the 1st WBC			T_1 – after the 30th WBC		
	M	Q25	Q75	M	Q25	Q75
Protein [g/L]	63.14	60.2	65.69	64.51	62.16	68.82
Albumin [g/L]	46.96	45.68	48.19	48.32	46.67	49.92
Uric acid [mmol/L]	0.33	0.3	0.34	0.32	0.3	0.36
Glucose [mmol/L]	3.74	3.44	4.43	3.93	3.34	4.48
TCh [mmol/L]	3.81	3.16	4.43	3.88	3.36	4.39
HDL [mmol/L]	1.31	1.26	1.34	1.33	1.25	1.37
LDL [mmol/L]	2.27	1.67	2.72	2.24	1.91	2.76
TG [mmol/L]	0.7	0.42	0.82	0.64	0.53	0.8

When analysing the activity of antioxidant enzymes, a significant increase in SOD1 activity, by 3.02% ($p = 0.049$), coupled with a trend for increased GST activity, can be observed. In the case of glutathione reductase, enzyme activity decreased by 35.9% ($p = 0.000915$) after a series of 30 daily WBC treatments. No significant changes were observed in CAT, GPx and R-GSSG activity. The results of enzyme activity in response to successive weeks of whole-body cryostimulation are presented in Table 2.

Table 2. Antioxidant enzyme activities before and after WBC treatments

Antioxidant enzymes	T_0 – before the 1st WBC			T_1 – after the 30th WBC		
	M	Q25	Q75	M	Q25	Q75
SOD1 [U/g Hb]	988.16	901.6	1119.89	1019.02 *T_0	950.23	1026.73
CAT [U/g Hb]	163.73	131.25	206.14	153.27	115.63	162.15
GPx [U/g Hb]	17.51	7.56	27.45	15.96	9.78	28.19
R-GSSG [U/g Hb]	0.39	0.36	0.47	0.25 ***T_0	0.2	0.36
GST [U/g Hb]	0.38	0.26	0.71	0.51	0.36	0.6

* $p < 0.05$; *** $p < 0.001$.

Discussion

Oxidative stress (OS) is a hallmark of neurodegenerative disorders, including MS symptomatology and complications of its negative symptoms. OS is caused by prolonged altered metabolism, exposure to exogenous oxidising agents or compounds and is associated with an inflammatory response [23, 24]. Erythrocytes may contribute to the pathophysiological mechanisms of MS through impaired antioxidant capacity and altered haemorheology, leading to increased oxidative stress in the periphery and potential ischaemic tissue damage, respectively [25]. Oxidative stress in the peripheral circulation of MS patients may further impede erythrocyte deformability through erythrocyte membrane lipid peroxidation [26, 27].

The possibility of supporting the mechanisms for maintaining the pro-oxidant/antioxidant balance that limit the severity of OS in the body seems to be of particular importance in long-term chronic diseases such as MS. It seems that whole-body cryotherapy, which is an especially common form of therapy and is, at the same time, very well tolerated by patients, has such a potential. In our experiment, we paid special attention to the activity of key antioxidant enzymes, such as SOD, CAT, GPx, R-GSSG and GST, in the erythrocytes of MS patients exposed to 30 daily WBC treatments. Antioxidants, whether endogenously synthesised or exogenously administered, act as reducing agents that neutralise the oxidative compounds (ROS) before they can cause any damage to different biomolecules [28, 29]. Acute cold temperature provided on a regular basis over a period of several months represents an obvious stress that could lead to certain adaptive mechanisms. It is postulated that prolonged WBC reduces oxidative stress by increasing the activity of antioxidant enzymes, especially in immunoactive disorders, although study results are still not clear. Miller [10] observed in their study on the effect of WBC on the antioxidant status in MS patients that exposing the MS patients to 10 WBC treatments induced a significant increase in total antioxidant status (TAS), whereas SOD and CAT activity in the erythrocytes of MS patients was not changed [30]. In another experiment by these authors, an increase was observed in the activity of SOD and CAT in the erythrocytes of MS patients after exposure to WBC accompanied by melatonin supplementation [31]. It should be noted that each time this was a series of 10 treatments. In this study, with the series of treatments increased to 30, a significant increase was observed in SOD1 activity and a small upward trend in GST activity, with no significant changes for other analysed enzymes, although, interestingly, the enzyme presenting a downward trend in its activity after a series of WBC treatments turned out to be catalase. Different mechanisms have been proposed to explain how low antioxidant levels or high ROS levels might specifically mediate CNS damage in MS. Lower levels of antioxidants may promote increased activity of lipoxygenase, an enzyme which triggers the production of leukotrienes, thereby increasing the immuno-inflammatory processes in brain tissue [17]. Earlier studies on the effect of WBC on the pro-oxidant/antioxidant status and lipid metabolism have shown that an important factor that determines its effect is the number of treatments in a series [12, 32]. In the case of healthy subjects, the first changes in the lipid profile were observed after 20 daily treatments [33], whereas in the study being described here, no changes in the lipid profile of MS patients were observed.

Conclusions

Multiple sclerosis, an inflammatory demyelinating disease of unknown origin, is neither genetically fully explained, nor are all the risk factors affecting its pathogenesis known. One of the patholomechanisms in multiple sclerosis may be prolonged oxidative stress. The changes observed in the activity of antioxidant enzymes following the use of whole-body cryotherapy with prolonged exposure confirm the possibility of the modulating effect of this form of rehabilitation on the systemic antioxidant potential, which can be one of the elements improving the functional status of chronically ill patients.

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Address for correspondence:
Anna Lubkowska, PhD, DSc, PUM Professor
Zakład Diagnostyki Funkcjonalnej i Medycyny Fizykalnej PUM
ul. Żołnierska 54
71-210 Szczecin
Polska
Tel.: +48 914 800-949
E-mail: annalubkowska@gmail.com

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ORIGINAL PAPERS

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Forced prolonged hospital stays as a manifestation of the dysfunction of the Polish long-term care system

JOANNA FURTAK-POBROTYN[1, A–F], PIOTR POBROTYN[2, A–F], ŁUKASZ RYPICZ[3, B–F], ROBERT SUSŁO[4, D–F], JAROSŁAW DROBNIK[4, A, D], IZABELA WITCZAK[3, B–F]

[1] "Citodent" Dental Care Center, Oława, Poland
[2] University Clinical Hospital in Wrocław, Poland
[3] Economics and Quality in Health Care Unit, Public Health Department, Health Sciences Faculty, Wrocław Medical University, Poland
[4] Gerontology Unit, Public Health Department, Health Sciences Faculty, Wrocław Medical University, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Long-term care (LTC) services involve long-lasting continuous supervision, care, nursing, therapy, and rehabilitation of patients who do not qualify for acute medical care. Demand for LTC services is on the rise, because of the aging of society and increasing number of dependent young and middle-aged people.

Objectives. The aim of the study was to examine the dysfunction of LTC services in Poland, taking the phenomenon of prolonged hospitalization as an example.

Material and methods. We examined data on patients at the University Clinical Hospital in Wroclaw, Poland, who were waiting for transfer from hospital to LTC facilities in the years 2012–2017. The statistical threshold of significance was $p < 0.05$.

Results. There were 1006 cases of hospital stays prolonged by waiting for transfer to LTC facilities; 77% of patients affected were 65 years or older. This age group saw a large increase in the total number of patients transferred from hospital to LTC facilities. Patients 65 years and older made up the majority of patients on transfer waiting lists, but their average waiting time was significantly shorter than that of younger patients (38.7 vs 69.6 days, respectively).

Conclusions. The demonstrated forced prolonged hospitalizations, which result from a lack of capacity on the part of LTC facilities to accept patients who have undergone hospital treatment, confirmed the dysfunction of the Polish LTC system. This results in a lack of adequate medical care continuity, increased total costs of medical care, and a shifting of expenses from the LTC facilities to the acute treatment facilities, which are most often hospitals.

Key words: long-term care, economics, hospital, patient care management, case management, hospitalization, delivery of health care.

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Background

Every human being is by nature entitled to benefit from the highest available level of physical and mental health care. The basic human right to health care consists of several complementary elements which entitle every person to benefit from the services, facilities, and conditions that are needed to achieve the highest available level of health perception, assuming that all of these needed elements are available in both physical and economic terms [1].

Demographic processes affect the demand for care and nursing services. The aging of society is commonly remarked on in this regard, but there is also an increasing problem of young and middle-aged people who are dependent on others because of congenital conditions, illness, trauma, or self-harm. From this point of view, long-term care (LTC) services are crucial; these involve long-lasting, sometimes continuous activities, such as supervision, care, nursing, therapy, and rehabilitation of patients who do not qualify to be treated in acute medical care facilities. Such activities require specialized staff capable of continuing on activities that may have been initiated during hospital treatment, and who are also able to introduce and sustain health promotion, often in close cooperation with primary care physicians [2].

According to the Polish national statistics office (*Główny Urząd Statystyczny*, GUS) [3], the number of inpatient LTC facilities increased in the years 2010–2016 (Figure 1); however, the demand for these services still exceeds the supply and patients

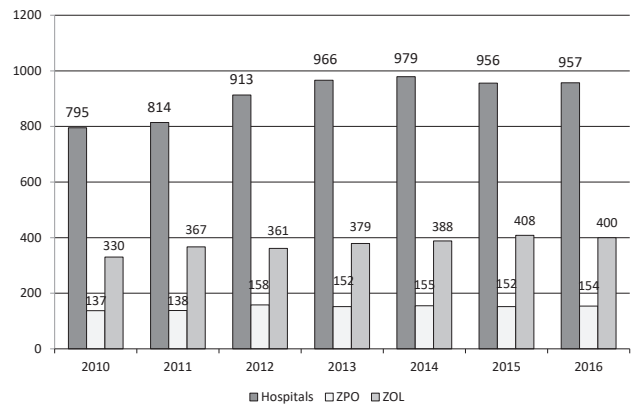

Figure 1. Number of hospitals, care and nursing facilities (ZPO), and care and treatment facilities (ZOL) in Poland in the years 2010–2016 [number of facilities]

Source of data: GUS [3].

usually have to wait for a place. In the Polish system, there are several LTC organizational types: inpatient facilities (hospices providing both care and treatment, called *Zakłady Opiekuńczo-Lecznicze*, ZOLs), facilities providing both nursing and care (*Zakłady Pielęgnacyjno-Opiekuńcze*, ZPOs); daytime facilities (specialized daytime palliative care); ambulatory facilities (palliative care ambulatories); and home care (community nurses and specialist teams). The most common of these are the inpatient care facilities [2]. Outside the health care system, there are also facilities that provide housing to socially incapable or otherwise dependent people (*Domy Pomocy Społecznej*, DPSs).

Since the thoroughgoing healthcare reform of 1997, funding of medical care in Poland has been neither adequate nor balanced [4], and care services have been slow to develop, not meeting increasing needs [5]. A significant number of patients who require these services therefore access them at their own expense at home, or else receive them from family members and other informal caregivers [6]. It is predicted that public spending in this area will rise dynamically, especially for care and nursing services, palliative, and hospice care. According to the Polish public health insurance fund (*Narodowy Fundusz Zdrowia*, NFZ), expenses for care and nursing services alone will have risen by over 30% by 2030, reaching 1.5 billion PLN (0.35 billion EUR) [7].

Medical services are financed by the NFZ and, since 2005, the LTC services covered have been specified in great detail [8]. The patient is entitled to receive palliative care when there is a medical indication for it, when the patient needs it, and when the patient or that patient's caregiver consents to receive it. The units used in palliative care service calculations are patient-days spent in inpatient hospice care facilities, palliative medicine wards, home hospices; and home hospices for children, plus number of home visits or consultations at home palliative medicine ambulatory facilities. The LTC services financed by the NFZ include basic services provided to patients with serious and chronic illnesses who do not require hospital care. These services are provided in palliative care wards, in chronic illness wards, at hospices, in home hospices, at palliative care ambulatories, at ZOLs, at ZPOs, at home as part of care for patients needing mechanical ventilation, and at home as long term nursing. However, the NFZ finances only ZOL and ZPO services for patients who score 0–40 points on the Barthel scale. The types of services financed by the NFZ are enumerated in detail, along with their codes and units of account ("points") [9]. A higher cost in patient-days is assigned to medical services provided by home hospices, ZPOs, and ZOLs for children.

In the years 2008–2015, the NFZ made numerous changes in the details of contracting and financing, beginning to require that contracted LTC services be fulfilled in certain way. This included the introduction of a patient-day correction factor in case of care and nursing services provided to patients who scored 0–5 points on the Barthel scale.

Objectives

The aim of this study was to examine the dysfunction of LTC services in Poland on the example of prolonged hospitalizations at the University Clinical Hospital in Wrocław, which resulted from the unavailability of post-hospitalization continuous care.

Figure 2. Number of cases of prolonged hospital stay in different wards of the University Clinical Hospital in Wroclaw, Poland in the years 2013–2017 caused by the need to wait for transfers to long-term care (LTC) facilities, by age: up to 65 years and 65 years and older [number of patients]

Source of data: University Clinical Hospital information systems.

Material and methods

Data was collected on patients of the University Clinical Hospital who had to wait to be transferred from the hospital to the LTC facilities in the years 2012–2017. These data were analyzed using the statistical software Statistica 13.1 PL; the statistical threshold of significance was taken as $p < 0.05$.

The study was approved by the Bioethics Committee of the Wroclaw Medical University, Poland (identification number of the opinion: KB.-608/2017).

Results

In the years 2012–2017, there were 1006 patients who were ready to be discharged from the study hospital, but whose hospital stay was prolonged due to the need to wait for places to become available in LTC facilities such as ZOLs, ZPOs, or DPSs. Of these patients, 771 (77%) were 65 years of age or older; this age group also accounts for the large increase (about 50% in the years 2013–2015) observed in the total number of patients transferred from hospital to LTC facilities. The prolonged hospital stays were mostly reported by the neurology ward; the internal and occupational diseases, hypertension, and oncology ward; the cardiology ward; and the neurosurgery ward. The least number of delays were reported by the otolaryngology ward; the head and neck surgery ward; and the neonatology ward (Figure 2).

Our analysis reveals that patients aged 65 or older make up the majority of patients on the waiting lists, but their average waiting time in the years 2013–2017 was significantly shorter than that of younger patients (38.7 vs 69.6 days, respectively). The longest waiting times for transfer to LTC facilities were reported by the urology and urologic oncology ward; the orthopedics and locomotive traumatology ward; and the anesthesiology and intensive care ward; all of these involved patients under 65 years (Figure 3).

Discussion

The results of this study point to a lack of LTC services in Poland. This situation not only generates additional costs in the health care system – as hospital stay is much more expensive than any form of LTC – but also locks up precious hospital resources, rendering them unavailable to the patients who actually need them. Unnecessary prolonged hospitalizations also can initiate a vicious circle, as they can result in complications, including hospital infections, that would not have occurred in timely transfer of the patient had been possible. These complications require treatment in hospital, so affected patients is not transferred to LTC when it is their turn; instead, they undergo treatment in hospital and then join the transfer waiting list again. These prolonged hospital stays disrupt the continuity of treatment, as acute medical care facilities are not suited to or staffed for the purposes of providing LTC services.

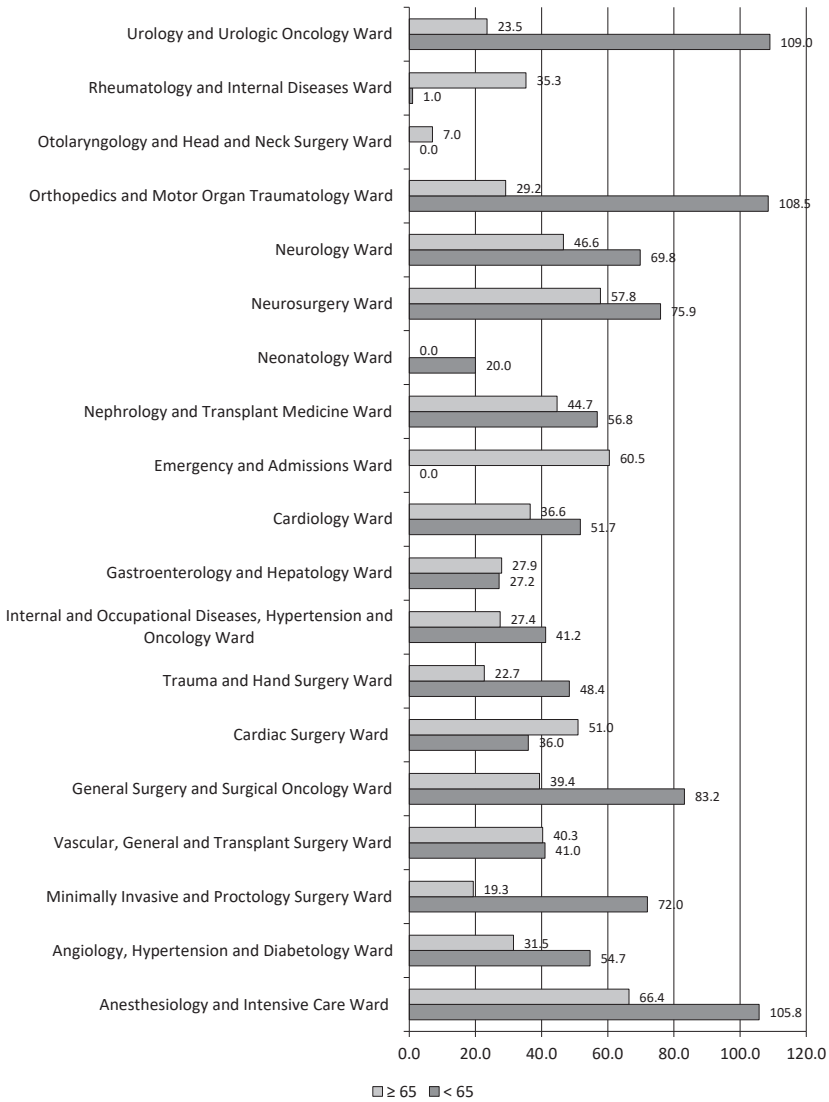

Figure 3. Average duration of prolonged hospital stay in different wards of the University Clinical Hospital in Wroclaw, Poland in the years 2013–2017 caused by the need to wait for transfers to long-term care (LTC) facilities, by age: up to 65 years and 65 years and older [days]

Source of data: University Clinical Hospital information system.

Patients below the age of 65 showed a longer average hospital–LTC transfer waiting time than those over 65, and this phenomenon needs to be investigated further. As many different predictions agree that Polish society will age rapidly in the decades to come, and since patients' need for care services increases steeply with age, it is clear that the deficit in LTC services will rapidly widen [10] so long as they remain both underfunded and underdeveloped in Poland [5]. According to a World Bank analysis, the total public expenditure on LTC in the years 2010–2013 in Poland were equal to about 0.8% of gross domestic product (GDP), one of the lowest such values in Europe [11]. The number of beds available in Polish facilities for long term care, whether medical or social, is too small; there is also a deficit of day care centers and other forms of support for dependent people at a time when, in other countries, fostering the deinstitutionalization of LTC, especially for the elderly, is becoming a priority [12, 13].

The Polish system of financing medical services does not make any significant differences in payment rates for LTC services, including palliative services and care and nursing that depend on the age of the beneficiaries. The payment received by the medical service provider depends primarily on the beneficiary's health state, which is estimated based on the level of illness advancement that made the beneficiary eligible to receive the given kind of service (assuming it is covered by public health insurance); however, no attention is paid to the general health and fitness status resulting from age-related processes of involution and degeneration, which gravely affect the level of care required and the costs associated with it.

Conclusions

By demonstrating the existence of the phenomenon of prolonged hospitalization – which results from the lack of capacity of LTC facilities to accept patients being transferred from hospital after treatment – this study has confirmed the insufficiency of LTC in Poland that has previously been described in the literature. This insufficiency results in a lack of adequate medical care continuity, an increased risk of in-hospital complications, elevated total costs of medical care, and the shifting of expenses from LTC facilities to acute treatment facilities, most often hospitals. It is to be expected that this problem will escalate in the years to come, as it currently mainly affects patients aged 65 years and older, and Polish society is aging rapidly. Until a systemic approach is found and successfully introduced to solve the problem of inadequate levels of LTC services in Poland, at least temporary relief could result from improving the coordination of different levels of medical and social care – including inpatient acute and chronic medical treatment facilities, specialist ambulatory medical services, and primary medical care.

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Address for correspondence:
Robert Susło, MD, PhD
Zakład Gerontologii
Katedra Zdrowia Publicznego UM
ul. Bartla 5
51-618 Wrocław
Polska
Tel.: +48 71 347-90-29
E-mail: robertsuslo@gmail.com

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ORIGINAL PAPERS

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The effect of modern medical technology on the availability and cost of cataract treatment in older patients

JOANNA FURTAK-POBROTYN[1, A–F], PIOTR POBROTYN[2, A–F], IZABELA WITCZAK[3, B–F], ŁUKASZ RYPICZ[3, B–F], ROBERT SUSŁO[4, D–F], RENATA JAŻDŻ-ZALESKA[5, D], JAROSŁAW DROBNIK[4, A, C, D]

[1] "Citodent" Dental Care Center, Oława, Poland
[2] University Clinical Hospital in Wrocław, Poland
[3] Economics and Quality in Health Care Unit, Public Health Department, Health Sciences Faculty, Wrocław Medical University, Poland
[4] Gerontology Unit, Public Health Department, Health Sciences Faculty, Wrocław Medical University, Poland
[5] Specjalistyczne Centrum Medyczne S.A., Polanica Zdrój, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** The average waiting time for cataract treatment in Poland is 441 days – the longest for any surgical procedures in the country.
Objectives. The aim of the study was to examine the availability of surgical cataract treatment among older Polish patients.
Material and methods. Using data from 25,970 hospitalizations at the Ophthalmology Ward of the University Clinical Hospital in Wrocław, Poland in years 2012–2017, we analyzed the demographic structure of the patients, the duration of hospital stay, and the average cost; the level of statistical significance was taken to be $p < 0.05$.
Results. Patients 65 years of age or older made up 78% of patients receiving surgical cataract treatment. This treatment required significantly shorter hospitalization time in 2017 than in 2012 (an average of 1.89 vs. 2.19 patient-days, respectively). The average hospital stay length among the older patients was significantly shorter than among younger patients (2.3 vs 3.2 patient-days, respectively) and the average hospitalization cost for patients aged 65 years or older was significantly lower (2105.63 PLN vs 2929.57 PLN, equivalent of 495.44 EUR vs 689.31 EUR, respectively).
Conclusions. The duration of the average hospital stay in the ophthalmology ward was shorter, and the average hospitalization cost was lower, for patients aged 65 years or older than for younger patients because older patients mostly undergo modern standardized less-invasive cataract treatment. As more ophthalmological medical staff, infrastructure, and financial assets are available for cataract treatment and have not yet been assigned or spent, Polish hospitals should introduce newer medical technology, process adjustments, and organizational innovations to fully utilize their potential and improve the availability of cataract treatment.
Key words: technology, economics, medical, patient care management, cataract, health services accessibility.

Furtak-Pobrotyn J, Pobrotyn P, Witczak I, Rypicz Ł, Susło R, Jażdż-Zaleska R, Drobnik J. The effect of modern medical technology on the availability and cost of cataract treatment in older patients *Fam Med Prim Care Rev* 2018; 20(3): 222–226, doi: https://doi.org/10.5114/fmpcr.2018.78255.

Background

The impairment and subsequent loss of vision are significant and increasing problems in old-age health care. The most common causes of vision loss in elderly patients include cataract, glaucoma, age-related degeneration of the macula, and diabetic retinopathy [1]. Acquired cataract is precipitated by aging-related or other metabolic disturbances in the lens. According to the World Health Organization, cataract is the leading cause of vision deterioration and loss around the world. It is estimated that around 17 million people suffer from reversible blindness, and this number continues to increase [2]. Age-related cataract is the most common form of acquired cataract, with pathological changes beginning as early as 40 years of age and clinically manifesting 10–20 years later [3]. The number of people suffering from cataract-related reversible blindness who can be treated surgically thus increases with the increasing average life-span. In order to keep up with this growing demand, it is crucial to develop and implement state-of-the-art technologies in ophthalmology [4]. Cataract surgery systems optimized for maximizing efficacy and lowering costs are currently being developed; they need to provide a reasonable level of safety to patients while securing acceptable levels of ophthalmology ward throughput [5]. Hospitals therefore need to implement modern methods of cataract treatment along with organizational innovations.

The average waiting time for surgical cataract treatment in Poland is 441 days, the longest of all the OECD countries (Figure 1); Estonia has the second-longest waiting time at 253 days [6]. It is also the longest waiting time for any surgical procedures in Poland, as this operation is underfunded by the Polish public health insurance fund (*Narodowy Fundusz Zdrowia*, NFZ), especially when the growing demand is considered. The costs resulting from these long waiting times are burdensome not only for patients and their caregivers, but also to society as a whole. Although the number of surgical cataract procedures carried out in Poland has risen significantly from 166,610 procedures in 2010 to 220,849 in 2014 [7], the number of patients on the waiting list has rapidly increased: in 2012–2016, this increase was observed both for urgent cases (18,848 vs 25,095 patients waiting, respectively) and for planned procedures (382,019 vs 518,845 patients waiting, respectively). Only in 2017 has the length of both these waiting lists shrunk slightly (to 23,125 and 471,929 patients, respectively) as the number of surgical cataract procedures carried out on Polish patients increased

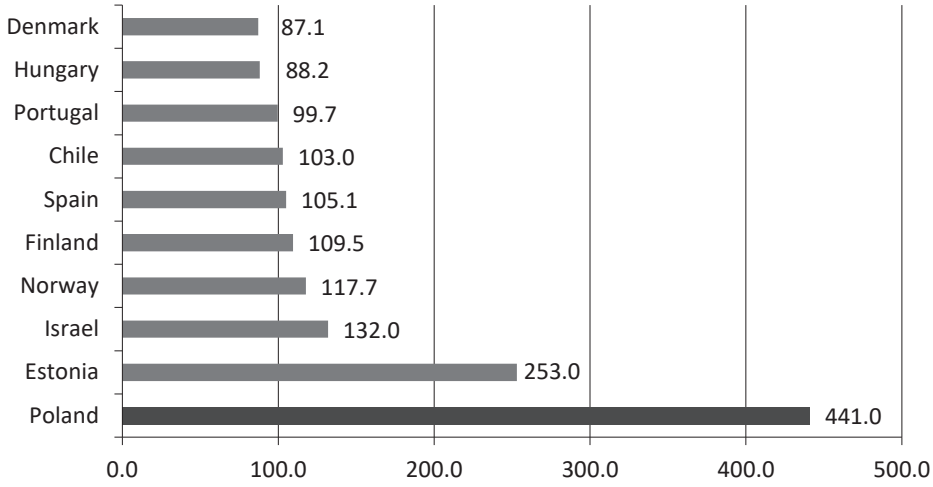

Figure 1. Average waiting time for surgical cataract treatment in selected OECD countries [days]

Source of data: [6].

– though this includes those who had the operation abroad. Even increased financial coverage of cataract treatment in Poland does not directly translate into better availability of the medical procedure: between January and November of the year 2016, the NFZ increased funding for cataract treatment by over 35 million PLN (around 8.2 million EUR), but in December of the same year, 23 medical facilities returned 2.6 million PLN (around 0.6 million EUR) they were incapable of spending [8]: they were unprepared to carry out all the procedures they had contracted to undertake, which resulted in the treatment being limited to patients who needed it. This situation forced waiting patients to use their right to be treated in other countries of the European Union. Directive 2011/24/EU on patients' rights in cross-border healthcare enables Polish patients to receive reimbursement of treatment costs from the NFZ. Around 92.3% of all reimbursement requests based on the Directive filed in 2017 with the NFZ related to the costs of surgical cataract treatment – which translates into a stunning total of 33,675,580.88 PLN (about 7.9 million EUR) [9].

According to data from the Polish national statistics office (*Główny Urząd Statystyczny*, GUS), in 2010–2016, the number of physicians specializing in ophthalmology increased in Poland (from 1753 to 2018, respectively), and the average number of ophthalmology per million people in Poland exceeds the average for the European Union generally (111 vs 82, respectively). Yet there are numerous unused hospital beds in ophthalmology wards in practically all regions of Poland: from 31% in Swiętokrzyskie Voivodeship to as much as 64% in the Lubelskie Voivodeship [10]. The aging of society in Poland is leading to an increase in the demand for cataract surgical treatment, which requires specific adjustments in hospital infrastructure. This triggered the increase in the number of ophthalmology wards observed in the period 2010–2016 (from 139 to 185, respectively), as reported by GUS.

Objectives

The aim of this study was to examine the problem of the availability of cataract surgical treatment in Poland on the basis of the records of the Ophthalmology Ward at the University Clinical Hospital in Wrocław, Poland.

Material and methods

Using data on 25,970 hospitalizations in the Ophthalmology Ward of the University Clinical Hospital in Wrocław, Poland in 2012–2017, we examined the demographic structure of the patients, the length of the hospital stay, and the average cost of hospitalization. Statistical analysis was performed in Statistica 13.1 PL. The data were tested for normal distribution (Lillefors test) and, as the hypothesis of normal data distribution was rejected, comparisons between groups were performed using the nonparametric Mann–Whitney U-test. Distributions of qualitative variables were analyzed by cross-tabulation and the chi-squared Pearson test. Statistical significance was taken as $p < 0.05$.

The study was approved by the Bioethics Committee of the Wrocław Medical University, Poland (identification number of the opinion: KB.-608/2017).

Results

In 2012–2017 in the Ophthalmology Ward at the University Clinical Hospital, there were total of 12,265 hospitalizations (48.6%) for surgical treatment of cataract and 13,345 hospitalizations (51.4%) for other reasons. In the examined period, among the group of patients admitted for surgical cataract treatment, the number of patients 65 years of age or older increased from 1449 to 1755 (Figure 2). These older patients made up 78% of all patients who underwent surgical cataract treatment in the period 2012–2017.

Patients undergoing cataract treatment needed shorter hospitalizations in 2017 (an average of 1.89 patient-days) than in 2012 (an average of 2.19 patient-days); also, the ratio of hospitalization time for surgical cataract treatment to hospitalization time for other reasons (Figure 3) decreased significantly (in 2012, this ratio was 2.19:3.07 = 0.71 and in 2017 it was 1.89:2.96 = 0.64).

Patients 65 years and older are admitted to the Ophthalmology Ward predominantly for surgical cataract treatment, which on average needs a shorter hospital stay (generally one day) than most other hospitalization reasons; these other reasons dominate among patients under 65. The average hospitalization time among the older patient group is thus significantly shorter than among younger patients (2.3 patient-days vs 3.2 patient-days, respectively).

Analysis of the hospital stay duration in terms of the cause of hospitalization showed that patients aged 65 years and older spend less time in hospital compared than younger patients, both in the case of surgical cataract treatment and other treatment causes (Figure 4).

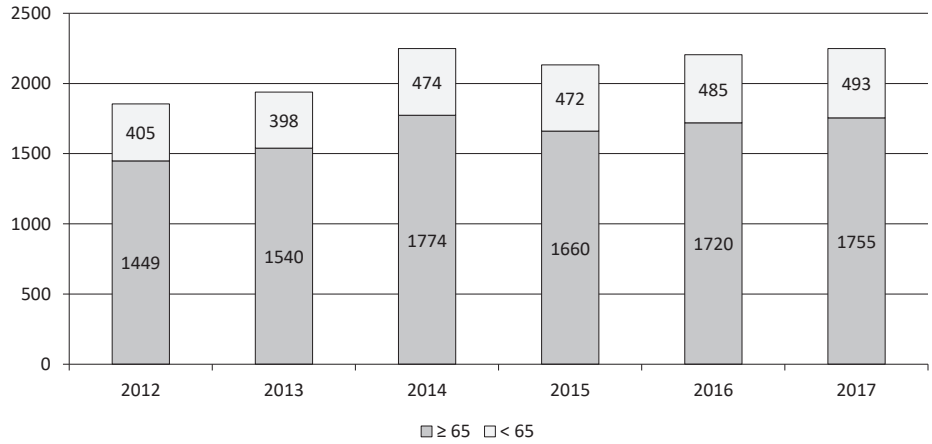

Figure 2. Number of patients treated for cataract in 2012–2017 in the Ophthalmology Ward of the University Clinical Hospital in Wroclaw, Poland, by age: 65 years and older and up to 65 years [number of patients]

Source of data: University Clinical Hospital information system.

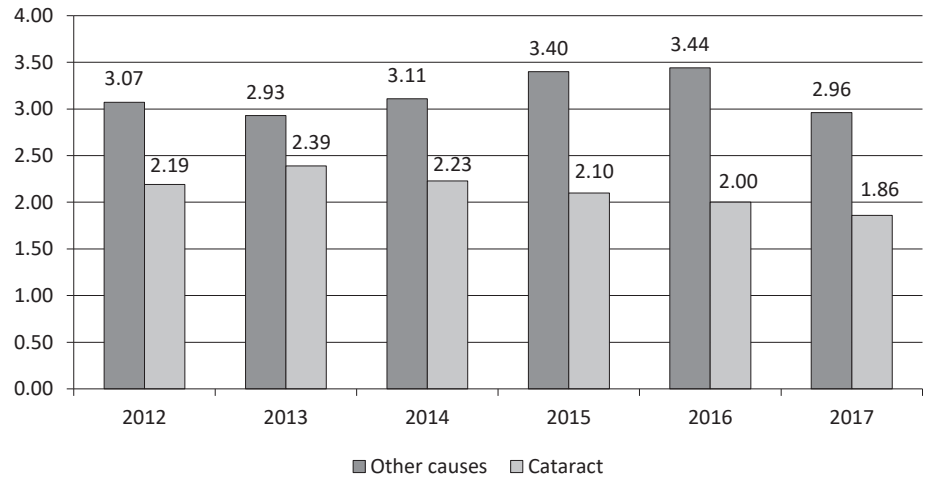

Figure 3. Average length of stay of patients treated for cataract and other causes in 2012–2017 in the Ophthalmology Ward of the University Clinical Hospital in Wroclaw, Poland [patient–days]

Source of data: University Clinical Hospital information system.

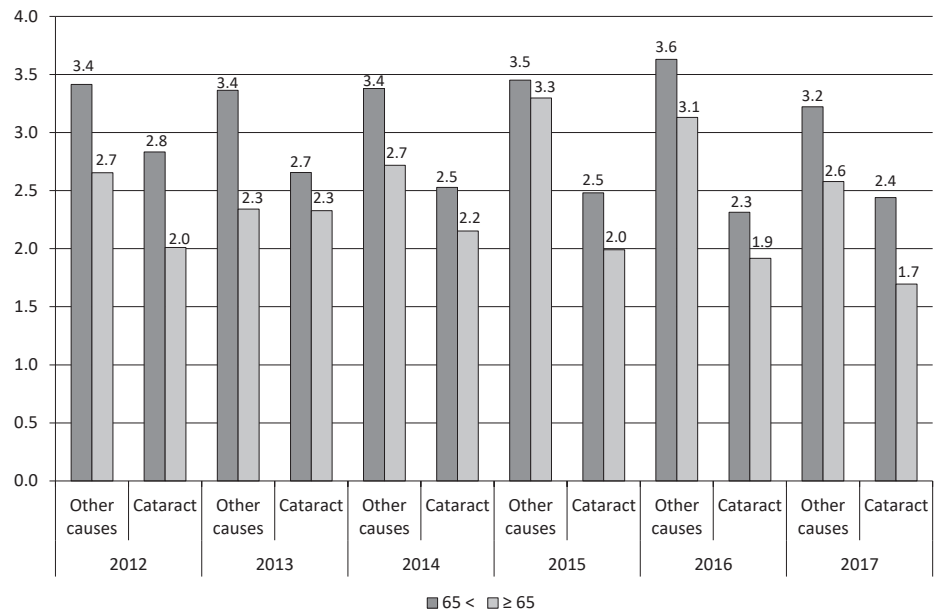

Figure 4. Average length of stay of patients treated for cataract and other causes in 2012–2017 in the Ophthalmology Ward of the University Clinical Hospital in Wroclaw, Poland, by age groups: 65 years and older and up to 65 years [patient–days]

Source of data: University Clinical Hospital information system.

Consistently, the average cost of hospitalization of patients aged 65 years and older in the Ophthalmology Ward of the University Clinical Hospital in 2012–2017 was significantly lower than in the case of younger patients (2105.63 PLN vs 2929.57 PLN, respectively; equivalent of 495.44 EUR vs 689.31 EUR, accepting the average PLN to EUR exchange rate 4.25 : 1).

Discussion

There are many possible causes for the limited availability of medical services. Current demographic phenomena–particularly the aging of society combined with prolonged life spans –are the direct causes of increased demand for medical services. On the other hand, the availability of these services can be limited by a lack of financial assets, a deficit of specialized medical staff, or patients' preference for medical services provided in a certain type of medical facilities [1]. The increasing expectations of quality of life among aging patients mean that modern medical technologies must be used to treat age-related vision impairment [11]. It is also necessary to introduce process adjustments and organizational innovations in hospitals [12] in order to lower the costs of medical services and improve their quality and availability.

Although both staff specialized in ophthalmology and the necessary medical infrastructure are available in Poland, and are comparable with the standards of other developed countries, surgical cataract treatment waiting times in Poland are among the longest in the entire OECD. This can be attributed in the first place to organizational faults in ophthalmology wards which make it impossible to utilize their full potential. Hospitals are the most complex facilities that providing medical services, in both economic and financial terms, and also on account of the wide variety of assets utilized and activities carried out. Efficient financial policy is needed for both every-day and long--term hospital functioning, so choosing the most appropriate tools is crucial if the positive effects are to be maximized [12]. The current limited availability of cataract treatment in Poland, together with the option of seeking medical help in other countries of the European Union made available to Polish patients by Directive 2011/24/EU [13], has led to an increased transfer of financial assets from the NFZ to medical service providers abroad. Undergoing surgical cataract treatment abroad seems to be attractive to patients in all parts of Poland [8], but in practice the vast majority (85%) of beneficiaries are inhabitants of the southern regions of Poland, namely the Dolnoslaskie, Slaskie, and Malopolskie voivodeships. Since the capacity does exist in Polish hospitals to provide more surgical cataract treatment procedures, organizational efforts should be made by the NFZ to apply more of its financial assets to medical services provided in Poland, rather than paying for them abroad.

The shorter duration of hospital stays among older patients seen in this study can be explained mainly by the difference in case characteristics in the different age groups: in the older patients, devolution- and degeneration-related conditions dominate; these need highly standardized approaches that take less time than the usually more atypical cases (often complicated by comorbidities) seen in younger patients; these require longer diagnostic processes and more complex treatment. The significantly lower hospitalization costs demonstrated in the study can be attributed to (among other causes) the shorter hospital stay duration among the older patients. This supports the thesis that the introduction of modern medical technologies into the diagnostics and therapy of cataract, the development of an appropriate infrastructure, the expansion of medical staff, and improving management make it possible to shorten the average hospital stay, especially in the standard cases that dominate in patients of 65 years and older, thus lowering hospitalization costs, as we observed in the study results. The resulting financial savings are significant not only to individual medical service providers, but also to the public medical insurance fund NFZ.

Conclusions

In the Ophthalmology Ward of the University Clinical Hospital in Wrocław, Poland, in 2012–2017, the average hospital stay was shorter and the average hospitalization cost was lower for patients 65 years of age or older than for younger patients. This can be attributed to the fact that the older patients are admitted primarily for surgical cataract treatment which, because it relies on recently introduced modern medical technology, is a highly standardized, relatively quick, and less-invasive procedure that needs only short introductory diagnostics and is often carried out as one-day-procedure. This demonstrates that the health needs of aging Polish society can be more effectively fulfilled using methods relying on modern medical technologies.

As Polish ophthalmological medical staff and infrastructure are comparable to OECD standards, and since there are financial assets reserved for the purposes of cataract treatment by the NFZ that have either not been used or could be redirected to be spent in Poland, Polish hospitals should not only introduce new medical technologies but also should undertake process adjustments and organizational innovations so that their potential is used to a greater extent, and the real availability of surgical cataract treatment to patients improves, shortening waiting lists.

Source of funding: This work was funded by the authors' resources.
Conflict of interest: The authors declare no conflict of interests.

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Address for correspondence:
Robert Susło, MD, PhD
Zakład Gerontologii
Katedra Zdrowia Publicznego UM
ul. Bartla 5
51-618 Wrocław
Polska
Tel.: +48 71 347-90-29
E-mail: robertsuslo@gmail.com

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ORIGINAL PAPERS

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Acute mastoiditis, a severe complication of acute otitis media in children – prevalence, diagnosis and treatment

AGATA KAŁUŻNA-MŁYNARCZYK[A–F], BEATA PUCHER[B, D, E], NEL NURCZYK[A–D], PAULINA ADAMCZYK[B], MAGDALENA PRAUZIŃSKA[B], MICHAŁ KOTOWSKI[B], JAROSŁAW SZYDŁOWSKI[A, D]

Pediatric Otolaryngology Department, Poznan University of Medical Sciences, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Acute otitis media in children is one of the most common causes of patients reporting to the family doctor and pediatrician. In rare cases, the inflammatory process spreads deeper into the temporal bone despite proper treatment, resulting in mastoiditis.

Objectives. The aim of this article is to present the most common complication of inflammation of the middle ear. This is mastoiditis. The authors describe mastoiditis by means of its characteristics, the most common symptoms, incidence and treatment.

Material and methods. Data about the patients hospitalized in the Pediatric Otolaryngology Department of the Poznan University of Medical Sciences from January 2017 to April 2018 was analyzed and subjected to a retrospective study. Statistical analysis of the results was performed.

Results. Based on the analyzed medical documentation, the incidence of mastoiditis was evaluated. In addition, the parameters characterizing the diagnostic procedure, along with the treatment methods and the effectiveness of the applied therapies in the hospital conditions, were assessed. The number of outpatient ambulatory visits and the frequency of necessary hospitalizations for patients with uncomplicated otitis media were additionally subjected to evaluation.

Conclusions. The number of cases of inflammation of the middle ear requiring hospitalization in the Pediatric Otolaryngology Department Poznan University of Medical Sciences is minimal, although the complications may present severe health consequences. Uncomplicated acute otitis media may be successfully treated in ambulatory conditions by family physicians and pediatricians. Early detection of the potential complication is essential in the practice of the family doctor.

Key words: mastoiditis, otitis media, child, ear diseases.

Kałużna-Młynarczyk A, Pucher B, Nurczyk N, Adamczyk P, Prauzińska M, Kotowski M, Szydłowski J. Acute mastoiditis, a severe complication of acute otitis media in children – prevalence, diagnosis and treatment. *Fam Med Prim Care Rev* 2018; 20(3): 227–231, doi: https://doi.org/10.5114/fmpcr.2018.78256.

Background

Acute otitis media in children is one of the most common causes of patients reporting to the family doctor and pediatrician, both of whom can successfully treat ear infections [1]. The basic mechanism for the development of acute otitis media (AOM) is dysfunction of the Eustachian tube and impaired ventilation of the tympanic cavity. The principle of conservative treatment is the restoration of Eustachian tube function and symptomatic treatment of earache and fever. In some cases, bacterial infection occurs and patients require systemic antibiotics. *Streptococcus pneumoniae* is the most frequent bacteria causing acute inflammation of the middle ear. The use of vaccinations against this pathogen reduces the risk of episodes of AOM in children.

In rare cases, the inflammatory process spreads deeper into the temporal bone despite proper treatment. Acute mastoiditis is the result of an acute inflammation of the middle ear that spreads to the pneumatic cells and the mastoid bone [2]. It often leads to periosteitis and osteomyelitis of the temporal bone. The most common cause of mastoiditis is a communication disorder between the tympanic cavity, the mastoid process and the Eustachian tube. The spreading inflammatory process may result in the formation of a subperiosteal abscess and osteolysis of the mastoid bone. Other, less frequent complications are divided into two groups: intratemporal (facial nerve paresis, labyrinthitis) and intracranial (sinus vein thrombosis, meningitis and cerebral abscesses). In addition, a subperiosteal abscess and a much less frequent abscess of Bezold (spreading to the deep neck tissues along the sternocleidomastoid muscle) may be formed. The primary treatment for complications is systemic antibiotic therapy in combination with surgical management. The basic surgical treatment is myringotomy (tympanic membrane incision, paracentesis). This treatment causes decompression of the tympanic cavity and improve access of air to the inside. The procedure can be extended with placement of a ventilation tube which maintains the patency of the incision and ventilation of the middle ear. In more severe cases, surgical treatment is external opening and drainage of the mastoid cavity – the procedure deemed antromasteidectomy.

Although the incidence of severe complications is low, otogenic complications may pose a serious threat to health and life of children [3–5]. Mastoiditis most often affects children up to 2 years old and occurs with a frequency of 1.2–6 per 100,000 cases [6].

Objectives

The aim of the present study was to determine the frequency of mastoiditis occurrence in children with acute otitis media

who were admitted to the Pediatric Otolaryngology Department during the last 16 months. Our study included all children treated for otitis media and mastoiditis.

Material and methods

Study design, setting and participants

A retrospective study was carried out on patients hospitalized from January 2017 to April 2018 at the Pediatric Otolaryngology Department of Poznan University of Medical Sciences (PUMS). A group of children who reported to the emergency room because of AOM in the same period of time was also analyzed. All patients subjected to the study are patients under 18 years of age. The approval from the Ethics Committee was not required for this research (retrospective analysis).

Data sources

The incidence of the most frequent otogenic complication was assessed, based on the analysis of the medical documentation of patients from the last 16 months. Moreover, the parameters characterizing the diagnostic procedure with the methods of treatment and the effectiveness of the applied therapies were subjected to evaluation.

Statistical methods

Statistical analysis of the results was performed. In the studied populations, normal distribution at $\alpha = 0.05$ was not proved by both the Shapiro–Wilk and Kolmogorov–Smirnov tests. Chi-squared test and Mann–Whitney U test were used in the study.

Results

The results of the retrospective study analysis concluded that for 1 520 patients diagnosed with AOM who reported to the emergency room (ER) of the hospital, only 58 patients (3.68%) required hospitalization in the Pediatric Otolaryngology Department (Figure 1).

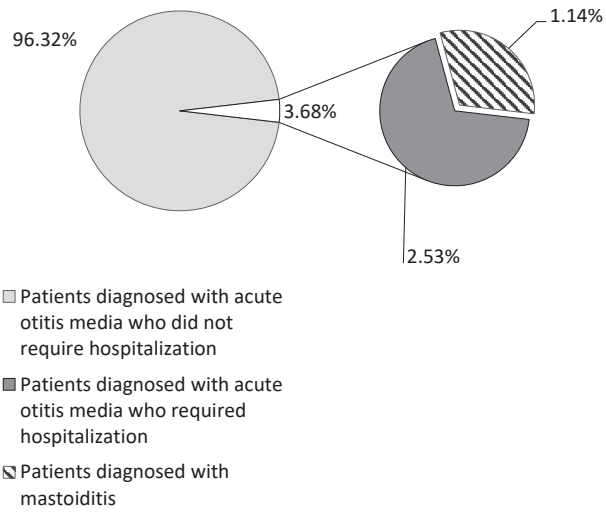

Figure 1. The percentage distribution of patients who reported to the emergency room of PUMS pediatric hospital

Among the hospitalized patients, 18 developed mastoiditis – a complication of AOM. Based on the age of the whole analyzed group of patients, children up to the age of 4 were the group which most frequently reported to the hospital ER because of acute otitis media (Figure 2). The frequency of patients reporting with this diagnosis decreased with increasing age of the children.

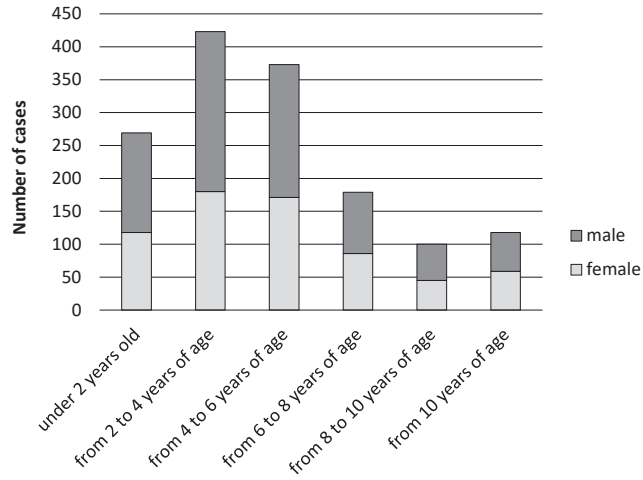

Figure 2. Numbers of patients reported to the ER of PUMS pediatric hospital grouped by their age and gender

Hospitalized patients who presented a higher incidence of complications in the form of mastoiditis were mainly children up to 4 years of age (Figure 3). In the time period from January 2017 to April 2018, there were no cases of mastoiditis in children over 8 years of age.

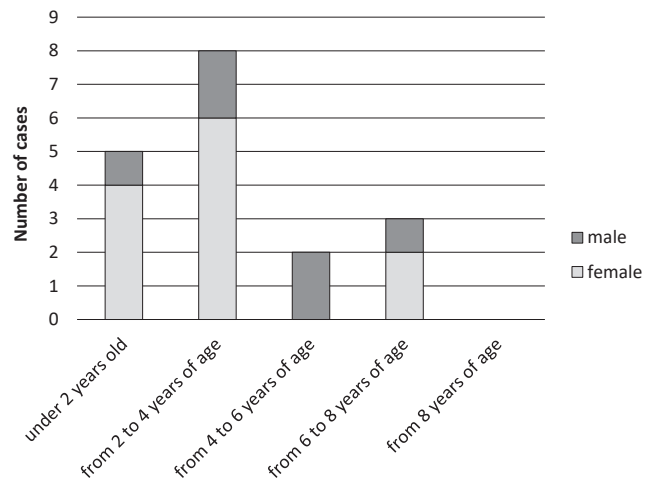

Figure 3. Occurrence of mastoiditis at PUMS pediatric hospital grouped by their age and gender

Chi-squared test was performed comparing the age and sex of the group of patients treated in the ER with the second group of patients hospitalized for mastoiditis. Test results showed that there is no significant difference between two groups of patients in this regard ($p = 0.68$ and $p = 0.20$, respectively). Mann–Whitney U test, which was also applied to this analysis, demonstrated there is no significant difference between the groups ($p = 0.20$ and $p = 0.18$, respectively).

Patients with mastoiditis hospitalized at the Pediatric Otolaryngology Department underwent inflammatory markers analyses. The results of the laboratory tests are characterized by a large range of values, with CRP values ranging from 0.44 mg/dL to 17.82 mg/dL (median value: 10.87 mg/dL) and WBC values from 7.26 × 10^3/μL to 25.99 × 10^3/μL (median value: 16.67 × 10^3/μL) (Table 1). Statistical analysis measuring the dependence of the level of inflammatory markers in relation to the used treatment and length of hospitalization could not be performed for the group of children with mastoiditis, as it was

a very small population and the large spread of results made it impossible to carry out a statistical analysis with a reliable confidence factor *α*. Further amounts of data are being collected to increase the population size and possibly enable it to find any correlations.

In the study, *Streptococcus pneumoniae* was the most frequently occurring pathogen in the secretion fluid collected from the middle ear of patients. Pathogens such as *Pseudomonas aeruginosa*, *Corynebacterium* sp., *Streptococcus pyogenes* and *Staphylococcus* sp. also appeared in the analyzed material. Part of the collected secretion was, according to microbiology assessment, a sterile purulent secretion. Such results may occur if the secretion collection was performed after the implementation of the antibiotic therapy. The basic treatment included intravenous antibiotic therapy. The most commonly utilized antibiotic was 3rd generation cephalosporin administered intravenously (Ceftriaxone, Cefotaxime), but drugs such as Amoxicillin with clavulanic acid, Cefuroxime, Metronidazole and Clindamycin or a combination of 2 or more of the above-mentioned antibiotics, were also administered. Additionally, Ciprofloxacin was sometimes added in the form of a topical formulation to the auditory canal.

Table 1. Summary of Pediatric Otolaryngology Department patients with mastoiditis – including therapy and laboratory values

No.	Age (y)	Side	Gender	CRP (mg/dL)	WBC (10 × 3/µL)	Pathogen	Antibiotic	Applied treatment
1	0.8	L	F	2.71	19.52	*Streptococcus pneumoniae*	Ceftriaxone iv Metronidazole iv	AM and myringotomy with VTP
2	1.2	L	F	15.69	25.99	*Streptococcus pneumoniae*	Ceftriaxone iv	AM and myringotomy with VTP
3	1.2	L	M	10.95	20.54	*Staphylococcus* sp.	Cefuroxime iv Clindamycin iv Ciprofloxacin (topical)	AM and myringotomy with VTP
4	1.7	R	F	12.03	13.06	*Streptococcus pneumoniae*	Ceftriaxone iv	Myringotomy with VTP
5	1.8	L	F	0.44	13.79	material was not taken	Cefuroxime iv Cefotaxime iv Clindamycin iv	AM and myringotomy with VTP
6	2.3	L	F	15.41	10.19	sterile	Cefuroxime iv Metronidazole iv Ciprofloxacin (topical)	AM and myringotomy with VTP
7	2.8	L	F	6.02	17.29	*Streptococcus pneumoniae*	Amoxicillin with clavulanic acid iv	AM and myringotomy with VTP
8	3.1	L	F	2.53	16.05	sterile	Ceftriaxone iv Metronidazole iv Amoxicillin with clavulanic acid iv Ciprofloxacin (topical)	Myringotomy with VTP
9	3.2	L	F	4.79	14.17	*Pseudomonas aeruginosa, Corynebacterium* sp.	Amoxicillin with clavulanic acid iv Ciprofloxacin (topical)	Myringotomy with VTP
10	3.4	L	F	16.88	14.69	*Streptococcus pneumoniae, Staphylococcus* sp.	Ceftriaxone iv Clindamycin iv	AM and myringotomy with VTP
11	3.4	R	M	17.74	20.42	*Streptococcus pneumoniae, Staphylococcus* sp.	Ceftriaxone iv	AM and myringotomy with VTP
12	3.8	L	M	10.99	21.01	*Staphylococcus* sp.	Ceftriaxone iv	AM and myringotomy with VTP
13	3.8	R	F	0.44	7.26	sterile	Ceftriaxone iv Amoxicillin with clavulanic acid iv	AM and myringotomy with VTP
14	4.9	R	M	17.82	18.48	sterile	Amoxicillin with clavulanic acid iv	AM and myringotomy with VTP
15	6.3	R	M	15.93	24.95	*Streptococcus pyogenes, Staphylococcus* sp.	Ceftriaxone iv	Myringotomy
16	6.3	L	F	2.35	9.6	sterile	Ceftriaxone iv Clindamycin iv	AM and myringotomy with VTP
17	6.5	L	F	10.79	15.16	*Streptococcus pneumoniae*	Ceftriaxone iv Clindamycin iv	AM and myringotomy with VTP
18	6.8	R	M	7.5	17.35	*Pseudomonas aeruginosa*	Ceftriaxone iv Ciprofloxacin (topical)	AM and myringotomy with VTP

Reference ranges – CRP: ≤ 0.5 mg/dL, WBC: 4.5 x 10 × 3/µL – 13.0 x 10 × 3/µL Shortcuts – L: left, R: right, F: female, M: male.

The primary surgical treatment of mastoiditis is myringotomy with or without a ventilation tube placement (VTP). Paracentesis improves the general condition of the child by draining the space of the middle ear affected by inflammation and thus allowing the outflow of accumulated fluid. This procedure in combination with VTP enables extended ventilation of the middle ear for several months. Paracentesis with the ventilation tube placement was performed in the vast majority of the children hospitalized with complication of AOM (94.44%). In the case of only one child, the therapeutic procedure was limited to the use of intravenous antibiotics therapy with myringotomy without ventilation tube placement. The general condition improved in some patients after the use of intravenous antibiotic therapy, however, 14 children required advanced surgical treatment – an antromastroidectomy (AM). The length of hospitalization of patients with a complication of otitis media ranged from 6 to 13 days (median 10). Each case of mastoiditis required hospitalization.

Discussion

The most common, but still rarely occurring complication of AOM is mastoiditis [7, 8]. The cause of mastoiditis is the spread of the inflammatory process in the temporal bone. Inflammation includes the tympanic cavity and air cells of the mastoid process because these spaces have a connection with each other [2, 3]. In some cases, bone destruction or the formation of inflammatory granules may also occur. Mastoiditis is usually manifested by symptoms of skin inflammation over the mastoid process (redness and/or swelling in the area behind the earlobe) and in the case of the formation of subperiosteal abscess, a protruding earlobe (Table 2). Symptoms of mastoiditis usually appear during or after the infection of the middle ear, so the observed symptoms may be earache and fever. Signs observed upon the otoscopic examination may include a convex tympanic membrane, perforation with leakage of purulent secretion fluid and, in rare cases, collapse of the upper and posterior wall of the external auditory canal [3, 4].

Table 2. Symptoms/signs that may occur in children with mastoiditis

• otalgia
• painfulness of the area behind the earlobe
• redness and/or swelling of the area behind the earlobe
• redness and/or convex tympanic membrane
• perforation of the tympanic membrane with purulent leakage from the ear
• collapse of the wall of the external auditory canal
• protruding earlobe

Factors that significantly contribute to the effectiveness of prevention and treatment of acute otitis media and mastoiditis include an increase in the availability of diagnostic tests, rationally applied antibiotic therapy, as well as the development of surgical techniques in the field of otosurgery. Computed tomography (CT) is an imaging method recommended in order to evaluate the state of inflammation in the mastoid. The pathological filling of pneumatic spaces of the mastoid and tympanic cavity can be observed in computed tomography imaging (Figure 4, 5).

In the advanced form of the disease, destruction of the bone and ossicles may be seen, as well as a fistula between the mastoid cavity and the subcutaneous tissue surrounding the ear mantle (in the case of the formation of a subperiosteal abscess) [8]. Currently, there is a tendency to perform imaging examinations limited to the (a) cases of patients suffering from neurological symptoms, (b) in suspicion of intracranial complications or (c) in the absence of improvement within 48 to 72 hours of treatment [6].

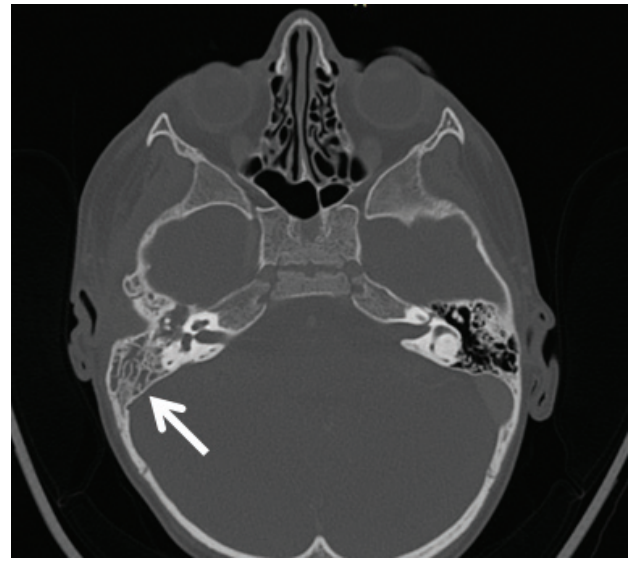

Figure 4. CT imaging of the mastoiditis – axial (own material)

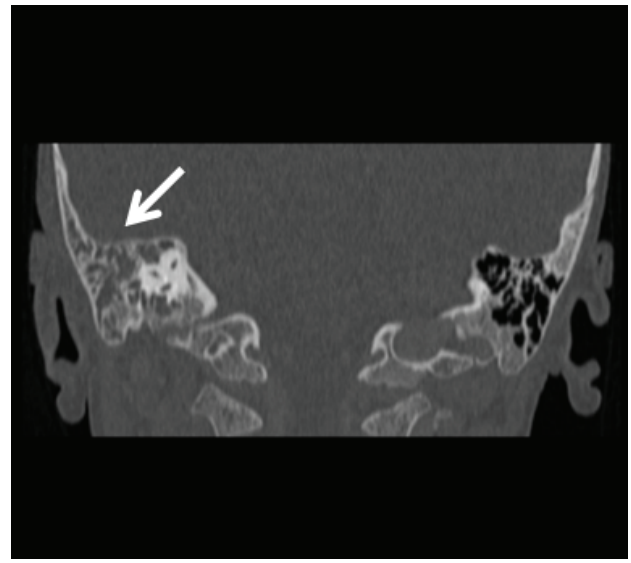

Figure 5. CT imaging of mastoiditis – frontal (own material)

Treatment of mastoiditis does not require antromasteidectomy in all cases. This is the final procedure for patients whose condition is not improving. In some patients, paracentesis combined with antibiotic therapy results in satisfactory outcome [5–7].

Conclusions

The number of cases of inflammation of the middle ear requiring hospitalization in Pediatric Otolaryngology Department Poznan University of Medical Sciences is minimal. Acute otitis media may be successfully treated in outpatient clinic by family physicians and pediatricians. In cases of suspicion of mastoiditis, the patient is required to be immediately directed to the otolaryngologist. In the practice of the family doctor, early detection of the potential complication is crucial.

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Address for correspondence:
Agata Kałużna-Młynarczyk, MD
Klinika Otolaryngologii Dziecięcej UM
ul. Szpitalna 27/33
60-572 Poznań
Polska
Tel.: +48 61 849-15-90
E-mail: mlynarczyk.agataa@gmail.com

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ORIGINAL PAPERS

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Polish e-cigarettes: users reasons to start vaping – a survey of 1142 Polish vapers

PAWEŁ LEWEK[1, A, B, D–G], BEATA WOŹNIAK[2, A, B], PAULINA MALUDZIŃSKA[3, A, B], JANUSZ ŚMIGIELSKI[4, C, D], PRZEMYSŁAW KARDAS[1, A, B, D, E, G]

[1] Department of Family Medicine, Medical University of Lodz, Poland
[2] Nowy Dwor Medical Centre, Nowy Dwor, Poland
[3] J. Babiński Psychiatric Hospital, Lodz, Poland
[4] Social and Technical Department, State Higher Vocational School, Konin, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** The electronic cigarette (EC) is a small device used as a potentially less harmful alternative to regular cigarettes. It is often advertised as a new tool for smoking cessation. After its introduction to the market in 2004, ECs became a global hit with few billion USD worth sales each year. Although it has global popularity, not much is known about the real reasons users choose them instead of other tobacco products.
Objectives. To understand the reasons why Polish vapers start using ECs.
Material and methods. This was a cross-sectional study based on an especially prepared questionnaire. This included the multiple choice question: "What made you start vaping e-cigarettes?". A link to a survey published on the Survey Monkey web platform was distributed among EC facebook groups and vaper forums.
Results. After collection of the results of the survey (run during in the last 6 months of 2016), 1142 responses were included into final analysis. The studied population included mainly men in the age group of 18–25 with secondary and higher education, living in urban areas. Three major reasons to start vaping were stated: lack of unpleasant odour (65.7%), belief in less harmfulness of ECs (64.6%) and better taste of ECs (58.8%) in comparison to regular cigarettes.
Conclusions. Perception of lesser harmfulness of e-cigarettes, lack of unpleasant odour and better taste of ECs as compared to regular cigarettes are important reasons for Polish vapers to start using ECs. Because many users switch to ECs from cigarettes and are convinced about their positive health effects, family physicians should inform them about lack of evidence on EC safety and encourage them to quit smoking no matter which nicotine delivery system they use.
Key words: e-cigarettes, Electronic Nicotine Delivery Systems, surveys and questionnaires, vaping, Poland.

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Background

Electronic cigarettes (EC), also called e-cigarettes, are hand-size devices designed to imitate cigarette smoking. Instead of tobacco combustion being used to produce smoke in regular cigarettes, electronic cigarettes vaporize (by heat) a liquid containing nicotine and other additives (e.g. propylene glycol, flavouring agents) producing vapour inhaled by user (referred to as vaping) [1]. Heath effects of e-cigarettes usage are still unclear. On one hand, heating instead of combustion should produce less cancerogenic substances and improve the health effect of e-cigarettes, but on the other hand, vaping has potential addictive effects, risk of other than nicotine substance usage, uncertainty about product engineering or quality of compounds and nicotine concentrations, possible harmful lung inflammation due to very small emitted particle size and increase of oxidative stress. The aforementioned brings about doubt about e-cigarettes having positive health effects [2].

In order to understand the usage of e-cigarettes better, it is important to understand the motivations of users behind the choice of electronic cigarettes. So far not many studies covered this topic. A Hungarian study by Pénzes et al. on 826 Hungarians found that smoking cessation, taste variety, perceived social norms and convenience when smoking is prohibited were the major motivators to vape. However, the study was done only on university students [3]. A Spanish study by Bunch et al. confirmed that reduction of tobacco-smoking and will to quit smoking or to use e-cigarettes in places where smoking is prohibited were the most important drivers to vape. Still, the study sample was relatively small (n = 600) [4]. In Poland, Brożek et al. concluded that leading motivators were quitting tobacco, a perceived less harmful impact on health and the price. This study was also conducted on students [5]. Other studies also dealt with the topic, but the subjects were mainly adolescents or students [6–8]. The lack of general population-based studies regarding motivation for vaping has lead us to design the following research.

Objectives

To identify the main reasons among Polish e-cigarettes users for taking up vaping.

Material and methods

This was an especially prepared cross-sectional online survey. Order of questions, sentence grammar, pilot study were designed by the authors on the basis of their previous experience [9, 10]. The survey included 38 questions, and was distributed on the Internet (electronic cigarette Facebook groups and Internet e-cigarette forums) by a web-based survey platform (Survey Monkey). Most questions were of single choice with a 5-point

Likert scale, a few questions were of multiple choice. Inclusion criteria were: no previous survey completion, age of participant between 13–70, at least one question more filled-in beyond the demographic questions, awareness of e-cigarettes. The survey was available online between July 1st, 2016 and January 1st 2017. All surveys filled-in by the end of the study were checked for meeting inclusion criteria. Acquired data was then verified for normality of distribution and equality of variances. The results of the quantitative variables are presented as a mean (± SD), median, minimum and maximum. In this paper, we present selected results of this survey, dealing with the question of the reasons for which electronic cigarettes users begin vaping. The survey was piloted in a group of 20 students in order to exclude typos and mistakes.

The approval from the Ethics Committee was not required for this research.

Results

A total number of 1288 questionnaires were collected. Respondents not satisfying inclusion criteria (16 duplicates, 86 questionnaires with no age provided, 6 with age out of inclusion range, 35 with only demographic pages filled, 2 with no answer to the question about knowledge of e-cigarettes and 1 with negative answer to that question) were removed. A total number of 1142 surveys were included in the final analysis. Participants were mainly Polish males younger than 26 years, with secondary or higher education, living in cities (Table 1). One out of ten (11.7%, *n* = 134) respondents were current cigarettes smokers, while 61.6% (*n* = 704) were former cigarette smokers (Table 1). In their responses, most participants chose lack of unpleasant odour as the reason which made them start vaping (65.7%). Almost the same percentage (64.6%) claimed that e-cigarettes were less harmful than cigarettes. Better taste was the third most common answer (58.8%) (Table 2).

Table 1. Baseline characteristics of study participants

		n (%)	Total *n* (%)
Age	< 18 18–25 26–45 > 45 min max mean (SD) median	134 (11.7) 603 (52.8) 312 (27.3) 93 (8.1) 13 69 25.9 (± 11.1) 21	1142 (100)
Gender	men women	978 (85.6) 164 (14.4)	1142 (100)
Education	higher secondary vocational primary	280 (24.5) 575 (50.3) 134 (11.7) 153 (13.4)	1142 (100)
Country of residence	Poland other	1121 (98.2) 21 (1.8)	1142 (100)
Place of residence	city over 1 mln inhabitants city over 500,000 to 1 mln inhabitants city over 100,000 to 500,000 inhabitants city over 10,000 to 100,000 inhabitants city up to 10.000 inhabitants rural areas	140 (12.3) 134 (11.7) 225 (19.7) 322 (28.2) 119 (10.4) 202 (17.7)	1142 (100)
Cigarettes smoking	current smokers former smokers never smokers no data	134 (11.7) 704 (61.6) 133 (11.7) 171 (15.0)	1142 (100)

Table 2. Reasons for starting vaping provided by the study participants in a response to the multiple choice question "What made you start vaping e-cigarettes?" *n* = 1142. Participant was asked to choose from one of proposed answers or type in one on his own in the field 'other'

Answer	*n* (%)
ECs does not leave unpleasant odour	750 (65.7)
I think ECs are less harmful than regular cigarettes	738 (64.6)
ECs have better taste than regular cigarettes	672 (58.8)
Vaping is cheaper than smoking	610 (53.4)
I tried to quit smoking	486 (42.5)
I was curious with regard to the taste of ECs	306 (26.8)
Vaping is allowed in places where smoking is forbidden	237 (20.7)
Need to decrease emotional tension/stress	204 (17.9)
Possibility of vaping other substances than nicotine liquids	112 (9.8)
ECs are more fashionable than regular cigarettes	80 (7.0)
Other answers	36 (3.1)
Hard to say	11 (1.0)

Discussion

WOBASZ and WOBASZ II – the two main Polish representative epidemiologic studies, found that between the years 2003––2005 and 2014–2015 (respectively), the prevalence of smoking decreased for men – from 39.0% to 29.9%, and for women – from 23.8% to 20.5% [11]. However, the number of smokers is still high, especially in the group of 45–54 years old where the percentage of smokers is the highest and equals 35.9% [11]. In our study, only 8.1% of participants were of that age, the majority (91.9%) were less than 45 years old, confirming that vaping was typical for young people. E-cigarette users younger than 26 constituted 64.5% of all participants (Table 1).

The most frequent reasons for smoking, as declared by WOBASZ study participants, were the force of habit, the calming effect of smoking and the "pleasure" of smoking [11]. These were not similar to motivators for vaping found in our research. Lack of unpleasant odour, lesser harmfulness and better taste of electronic cigarettes compared to regular cigarettes were identified in our study as the main reasons to start vaping among the study population. This is consistent with many other studies, which identified better smell as one of the advantages of e-cigarettes [12]. However, lack of unpleasant odour was not the most common reason for electronic cigarettes usage according to a systematic review of e-cigarettes studies by Glasser et al. [12]. This suggests that this finding may be specific to our population. The three most common reasons to vape listed by Glasser were: to address tobacco withdrawal symptoms, to evade smoke-free policies and because ECs are perceived as less harmful than regular cigarettes. It is interesting that smoking cessation in the studied group was not one of the most common reasons to use electronic cigarettes – it was ranked in 5th position. E-cigarettes were perceived by their users more as a device with a good smell than a tool to quit bad habit.

Lesser harmfulness was chosen as the second most common reason to start vaping by our study participants, however, there is not enough evidence to confirm that the harmfulness of electronic cigarettes is much lower than the one of traditional tobacco products [12]. It was also one of two main reasons for a change to e-cigarettes identified in a small Polish study on 69 subjects by Daniuk et al. [13]. The other main reason in that study was desire to use fashionable technological innovations, which was shared only by 7% of participants in our study. The third most common motivation to start vaping was the better taste of electronic cigarettes. This is mentioned in many studies,

especially in that of teenagers and students [14–16]. Such was an important reason to start vaping for 58.8% of our participants. A recent Eurobarometer study found that 12% of all Europeans started vaping because they liked e-cigarette flavours [17], which confirms that the taste of electronic cigarettes may attract new vapers and draw people to nicotine addiction. However, it was found that additives improving the taste of e-cigarettes, especially strawberry and cherry flavour, may increase electronic cigarettes toxicity [18, 19]. This underpins the need for providing proper information about possible side effects that should be targeted to future and present electronic cigarettes users.

Nearly 12% of our respondents were currently smoking cigarettes (Table 1). On comparing this figure with that of the 20.7% participants who claimed that they started vaping because it was allowed in places where smoking was forbidden (Table 2), it may be concluded that some vapers used e-cigarettes because of a strong nicotine addiction. Electronic cigarettes have been allowed in public places as a more acceptable way to inhale nicotine when regular cigarettes were not allowed, thus smokers with strong nicotine craving might use them to satisfy their habit. This tendency may be dangerous, because rather than encouraging smokers to quit, it makes nicotine inhalation more socially acceptable.

In a study on medical students and medical athletes by Shpakou et al., the youngest age of first attempt of smoking regular cigarettes was 12 years. Moreover, the traditional cigarette was listed as the first tobacco product to be smoked by a majority of participants (88.7%) [8]. The minimum age of participant in our study was 13, which confirms that the youngest teenagers are already experimenting with electronic cigarettes. This highlights the urgent need for regulations to ban e-cigarettes usage by the youngest.

The limitation of the study was the fact that it was not representative for the whole of the Polish population. Participants were limited to users of electronic cigarette facebook groups and internet forums. However, this approach made it possible to reach the targeted population – Polish ECs users. According to recent data, 81.9% of all Polish households have access to Internet, which makes online survey a reliable source of information and one of the best ways to conduct survey-based studies [20]. This approach enabled us to acquire over 1100 unique responses from e-cigarettes users, and, thus the results may be generalised to Polish electronic cigarettes users actively using the Internet. The studied population consisted mainly of men (85.6%) with secondary or higher education (74.8%) living in Poland (98.2%) and definitely speaking in Polish as this was language of the survey. Dominance of men in the vapers population is also seen in other studies [21]. In such population, these results may be true, however, they cannot be generalized to the Polish population as a whole.

Regarding our study, family physicians should be aware that smoking cessations is not the main reason for vapers to try e-cigarettes – a perceived lack of harm, a pleasant smell and taste are the most important factors to start vaping. Family physicians should inform their vaping patients that lack of harmfulness of electronic cigarettes is not truly confirmed and that e-cigarettes are currently undergoing studies to confirm their safety. Moreover, they may use the knowledge why electronic cigarette users reach for e-cigarettes, for their benefit. For example, in trying to encourage patients to quit smoking, they may start discussions about the unpleasant odour or the bad taste of cigarettes. In addition, instead of the reaching for ECs, the family physician may propose more evidence-based methods like varenicline or nicotine replacement therapy.

Conclusions

Although the health effects posed by electronic cigarettes are still unclear, vapers tend to perceive them as less harmful than regular cigarettes. According to our study, a perceived lack of harmfulness, a better smell and taste are important factors attracting Polish vapers to start vaping. Because of the aforementioned, more information about possible side effects of vaping should be aimed at their users. What is more, family physicians, being the first stage in the healthcare system to discuss smoking cessation with patients, should inform their patients that inhalation of any addictive substance is harmful no matter which delivery system is used (regular cigarette, e-cigarette, pipe, shisha etc.). They should also encourage them to quit smoking or vaping on each visit, assess and improve their motivation and advise evidence-based methods of smoking cessation in accordance with medical guidelines.

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Address for correspondence:
Paweł Lewek MD, PhD
Zakład Medycyny Rodzinnej UM
ul. Narutowicza 60
90-136 Łódź
Polska
Tel.: +48 42 678-72-10
E-mail: pawel.lewek@umed.lodz.pl

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ORIGINAL PAPERS

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Who do type 2 diabetics inform about their own illness

AGATA MATEJ-BUTRYM[1, A–G], MAREK BUTRYM[2, C–F], EWA RUDNICKA-DROŻAK[1, D, E], JOLANTA SZELIGA-KRÓL[1, D, E]

[1] Chair and Department of Family Medicine, Medical University of Lublin, Poland
[2] Department of Sociology, University of Warmia and Mazury in Olsztyn, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Type 2 diabetes is a chronic disease that can influence the relationship between patients and their social environment. Some diabetics are afraid of discrimination because of their illness.
Objectives. Understanding who of their social circle those afflicted with type 2 diabetes inform of the course of their disease.
Material and methods. 136 patients with type 2 diabetes, including 71 women and 65 men (age – median: 62.5, min–max: 40–84) were subjected to a survey study which included, firstly, questions on who they inform about their affliction, secondly, the degree to which they admit to the affliction as compared with selected carbohydrate metabolism parameters of their illness (HbA_{1c}, fasting glucose).
Results. Regarding their affliction, patients with type 2 diabetes most often inform their family members of their state of being, especially those who live with them (99.1%; 111), as well as those who do not live with them (86%; 117), then other people with diabetes (80.1%; 109), friends (72.8%; 99) and neighbours (63.2%; 86). In contrast, every second employed respondent did not inform their employer. The reason for admission to being type 2 diabetic was primarily motivated by a desire to prove that they can live a normal life while diabetic (60.3%; 86). There is a negative correlation between the level of HbA_{1c} and a willingness to reveal that the afflicted can live a normal life despite their diabetes ($p < 0,05$).
Conclusions. Our research shows that type 2 diabetics do not always inform certain people within their social environment about their illness. This may have negative consequences. The reasons for this behavior require further research.
Key words: diabetes mellitus type 2 , family, social distance, social environment.

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Background

In recent decades, the prevalence of diabetes has risen sharply around the world. According to estimates of the International Diabetes Federation, there are currently 451 million people with diabetes aged 18–99 in the world, and it is predicted that by 2045, this number will increase to 629 million [1]. Is this increasing number of people with diabetes getting more and more understanding and social support? Can any person suffering from diabetes always and everywhere admit to being diabetic?

In the literature, we encounter the problem of stigmatization and discrimination of people with diabetes. People who do not suffer from diabetes assume that diabetes is not a stigma [2]. In contrast, people with diabetes report that stigmatization is a serious problem for them – one which they experience in different areas of life, especially in the workplace or in relationships [2].

In the U.S., a study was carried out to measure the stigma of diabetes and the associated psychosocial effects within a large population of patients, using an online survey sent to 12,000 people with diabetes [3]. The results reveal that the majority of respondents with type 1 diabetes (76%) or type 2 diabetes (52%) reported that diabetes is associated with stigma [3].

The Second Diabetes Attitudes, Wishes and Needs (DAWN2) study, which covered over 8.500 adult diabetics from 17 countries, showed that 17.6% of all patients thought their affliction generated discrimination, intolerance and a lack of support from the communities in which they lived [4]. In Poland, the percentage of patients declaring similar experiences was higher and amounted to as much as 24% [4]. It is disturbing that even the very fact of becoming diabetic may cause shame in some people [5]. Such feelings of shame can prevent the afflicted from informing people within their social environment about the illness. This can have a negative impact on the course of diabetes therapy.

In the literature devoted to the problem of informing about the disease, we find, first of all, issues concerning the manner in which medical personnel inform the afflicted about the course of their disease. The intent of the provided information is to compel the patient to adopt their doctor's recommendations, and, consequently, to ensure effectiveness of the therapy. It is also emphasized that information of this nature, regardless of what disease it concerns, creates a specific doctor–patient relationship and builds the patient's trust [6] and their willingness to care for their own health.

The problem of providing crucial information to the patient's family, is considerably less often taken [7]. When done correctly, doing so fulfils similar goals, because the patient expects understanding, support and acceptance from their family members. Indeed, the importance of the family has an additional dimension as the family has significance with regard to medical care and health protection, especially in chronic diseases, as it partners the health care system in performing traditional health-related tasks [8].

In everyday diabetological practice, however, we encounter situations wherein patients signal that they do not always admit to having diabetes. It is likely that in such scenarios, the

afflicted fear potential discrimination or stigmatization should they admit to being diabetic. Analyses of the information that the ill person communicates with their social environment are only occasionally performed/carried out. The only material available in the literature are individual studies on the concealment or disclosure of information about the disease by patients with diabetes, especially in the workplace [9–11]. Thus, there is a need to understand the social implications of being diabetic.

Objectives

The aim of the study is to understand why those afflicted with type 2 diabetes inform only certain individuals within their social circles, of the course of their disease. An attempt was also made to estimate the relationship between the fact of limiting admission of being diabetic and the values of the selected parameters of metabolic diabetes control.

Material and methods

Setting and participants

The study covered 136 patients with type 2 diabetes, including 71 women and 65 men (age – median 62.5, min–max 40––84) who reported to the Diabetological Outpatient Clinic of the Chair and Department of Family Medicine, Medical University of Lublin, for a medical appointment within a 6 month period, i.e. from September 2007 to February 2008.

The study used a previously developed original questionnaire assessing the socio-economic and family situation of patients with type 2 diabetes [12]. The respondents were asked to indicate people from their social environment (family members, friends, neighbours and others) who they inform about their illness. The respondents also gave reasons for telling others about their disease. The categories of causes included the expectation of greater emotional support, maintenance of dignity, as well as the health, social and professional safety of the patient. The metabolic control of diabetes was assessed based on the level of A1c glycated haemoglobin (HbA_{1c}) and fasting plasma glucose in the venous blood. Satisfactory values of fasting glucose was assumed to be ≤ 110 mg/dl and for HbA_{1c} ≤ 7%.

The study design received a positive opinion from the Bioethics Committee (KE-0254/116/2007).

Statistical methods

The statistical analysis was performed using the IBM SPSS program version 25. The Pearson χ^2 test was used in order to determine the statistical significance of the correlation between the variables. Values below 0.05 were assumed to be significant. The Kolmogorov–Smirnov test with the Lilliefors correction was used to ascertain normal distribution, herein, the confidence interval was set at the average of 95%. Age did not have normal distribution, but variables such as duration of diabetes, fasting glucose and HbA_{1c} had. Descriptives of the group are presented in Table 1.

Table 1. Descriptives of the group

Variable	Median	Min–max	Mean	SD	K–S Test Sig.
Age	62.50	40–84	62.65	8.865	0.199
Duration of diabetes	7.00	1–29	8.72	6.898	< 0.001
Fasting glucose	116.50	51–249	122.22	31.471	< 0.001
HbA_{1c}	6.50	3.6–9.8	6.60	6.599	< 0.001

Results

Participants and descriptive data

Persons aged < 65 years accounted for 55.9% (76) of the respondents, and those aged ≥ 65 years – 44.1% (60). The vast majority of the respondents lived in the city (75.7%; 103) and the remaining 24.3% (33) in the countryside. The percentage of the respondents living with at least one person in a household was 82.4% (112), and those living alone – 17.6% (24). Over 2/3 of the respondents (67.4%; 91) were married and the remaining 32.6% (44) were unmarried. The group characteristics are presented in Table 2.

Table 2. Characteristics of the group *n* = 136

Parameter		%	*n*
Age	< 65 years	55.9	76
	≥ 65 years	44.1	60
Sex	men	47.8	65
	women	52.2	71
Marital status	married	67.6	92
	unmarried	32.4	44
Place of residence	city	75.7	103
	country	24.3	33
Living in a household	with at least one person	82.4	112
	alone	17.6	24

People with vocational and secondary education dominated among the respondents (66.9%; 91), 18.4% (25) had primary and 14% (19) – higher education. Most of the respondents were professionally inactive (72.1%; 98). The people from the professionally active group were divided into employed (84.2%; 32) and self-employed (15.8%; 6). The mean duration of diabetes in the study group was 8.72 years (SD = 6.898).

The mean fasting blood glucose level in the study group was 122.22 mg/dl (SD = 31.471). In 61% (83) of the subjects, the fasting blood glucose level exceeded 110 mg/dl. The mean HbA_{1c} in the study group was 6.6 % (SD = 6.599). Satisfactory HbA_{1c} values (≤ 7%) were reported in 78.7% (107) of the subjects.

Main results

It appears that there are four groups of people who are most often informed by patients with type 2 diabetes with regard to their illness: 1) family members – both those who live with the patient (99.1%; 111) and those who do not live with the patient (86.0%; 117), 2) other people with diabetes (80.1%; 109), 3) friends (72.8%; 99) and 4) neighbours (63.2%; 86) (Figure 1). Persons at workplace are less frequently informed about the disease. Every second employed respondent (50%; 16) provided his/her employer with the information about the disease; a slightly larger percentage of patients (57.3%; 18) inform their workmates.

With regard to their disease, all persons living alone informed family members not living with them, whereas patients who lived with at least one person rarely inform family members not living with them about their illness (100% (24) and 83% (93), respectively, $p = 0.03$). People who are professionally inactive more often informed their friends about the disease than did those professionally active (77.6% (76) and 60.5% (23), respectively, $p = 0.045$).

Neighbours are an important category of people informed by patients about their illness. The variables which differentiate the frequency of informing neighbours include: 1) sex – more often women than men (71.8% (51) and 53.8% (35), respectively, $p = 0.03$), 2) age – more often older people aged ≥ 65 years than those younger (75% (45) and 53.9% (41), respectively, $p = 0.011$),

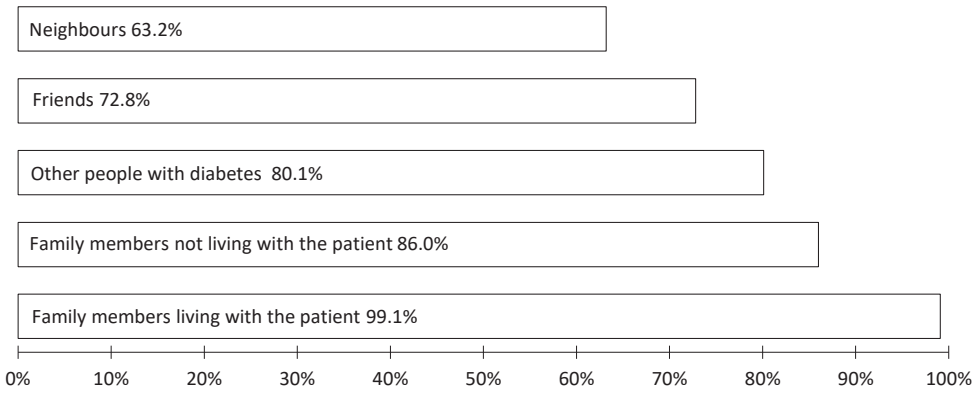

Figure 1. Persons most frequently informed by patients about their disease

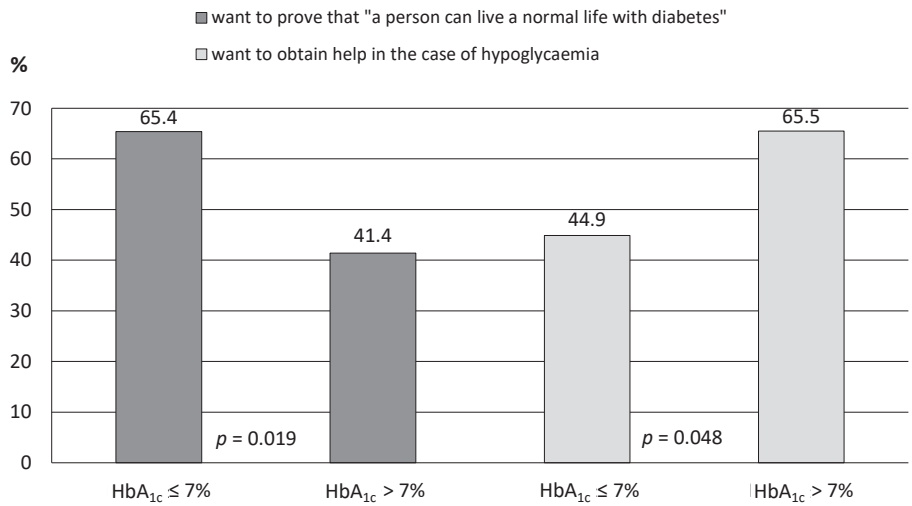

Figure 2. Percentage of subjects with normal and abnormal HbA_{1c} level depending on the motivation to inform about their own illness

3) marital status – more often unmarried than married people (77.8% (35) and 56% (51), respectively, $p = 0.013$) and 4) professional activity – the professionally inactive more often informed neighbours about their disease than did those who are professionally active (70.4% (69) and 44.7% (17), respectively, $p = 0.005$).

Informing about the disease was primarily motivated by a desire to prove that "a person with diabetes can live a normal life" (60.3%; 82), but also by the rule of reciprocity, "because others also told me about their illness" (54.4%; 74) as well as for safety reasons "so that others could help me in case of hypoglycaemia" (49.3%; 67). The concern about one's own safety and the course of therapy was also reflected in other reasons given by the respondents: "so that they would understand me" (47.8%; 65), "so that they would not hinder my compliance with medical recommendations" (47.8%; 65), "so that they would gain knowledge about diabetes" (46.3%; 63), "so that they could help me comply with medical recommendations" (31.6%; 43). Only a small percentage of respondents did so so as to obtain more kindness/friendliness (14.7%; 20) and care (9%; 12).

People with well-controlled diabetes ($HbA_{1c} \leq 7\%$) more often than those with poorly-controlled diabetes ($HbA_{1c} > 7\%$) are willing to prove that "a person can live a normal life with diabetes" (65.4% (70) and 41.4% (12), respectively, $p = 0.019$). On the other hand, patients with the level of $HbA_{1c} > 7\%$ more often than patients with $HbA_{1c} \leq 7\%$ inform about their disease for safety reasons, in order to obtain help in the case of hypoglycaemia (65.5% (19) and 44.9% (48), respectively, $p = 0.048$) (Figure 2).

Patients living in the countryside more often than people from the city inform about their illness based on the rule of reciprocity, because others also told them about the disease (69.7% (23) and 49.5% (51), respectively, $p = 0.043$). Men more often than women expect understanding of their situation (56.9% (37) and 39.4% (28), respectively, $p = 0.041$). Similarly, older patients (≥ 65 years) more frequently than younger mentioned the willingness to be understood by people they inform about the disease (60% (36) and 38.2% (29), respectively, $p = 0.011$). As for the needs related to diabetes therapy, the situation is similar. The older the person, the more willingly he/she speaks about his/her illness so that others would not hinder their compliance with medical recommendations (60% (36) and 38.2% (29), respectively, $p = 0.011$). Also more often, older patients who inform others about their disease expect help in compliance with medical recommendations (46.7% (28) and 19.7% (15), respectively, $p = 0.001$). People who are professionally inactive more frequently than those professionally active inform others about their health problem in the hope of receiving help in complying with medical recommendations (37.8% (37) and 15.8% (6), respectively, $p = 0.013$). People living in a household with at least one person, as opposed to those living alone, expected to be relived of some duties due to their affliction (15.2% (17) and 0% (0), respectively, $p = 0.041$).

No statistically significant relationship was demonstrated between the fact of informing about the disease and education, duration of diabetes and fasting glucose level.

Discussion

Key results and interpretation

The results of the study confirm literature data that the family is the most important source of support for diabetic patients

[13–15]. Ławska et al. also showed that the majority of diabetics expect help from their family [16]. The near family is considered the group of the greatest trust with regard to freely informing about the affliction without the expectation of negative reactions. Indeed, Stopford et al. concluded that the family support is most often associated with the reduction of HbA_{1c} level [14]. The study conducted by Mohebi et al. also revealed that patients with higher HbA_{1c} values felt less social support [17].

Another large group (80%) informed by patients about their disease are other people with diabetes. The analysis of reasons for informing such about diabetes has shown that more than half of patients shared the information about their illness with other patients based on the rule of reciprocity. The exchange of experience and mutual assistance between patients with diabetes may, on the one hand, improve patients' self-esteem, and on the other hand, expand their knowledge about treatment, self-care and coping strategies. It seems that this should be an indication for family doctors, diabetologists and other members of the therapeutic team that it is worth encouraging people suffering from diabetes to actively participate in various types of support groups and associations for diabetics.

It was also demonstrated that friends and neighbours are important social groups. Almost 2/3 of all patients with diabetes trust their neighbours and tell them about their illness. These are more often women, older people aged ≥ 65 years old, unmarried persons and those professionally inactive. It seems that with time, neighbourhood ties tighten and neighbours can be an important source of support for patients in the treatment of type 2 diabetes. On the other hand, unmarried persons more often than married inform neighbours about their illness hoping for support. Shaw et al. demonstrated that neighbours and neighbourhood resources seem to have a great impact "on adherence to diabetes self-care behaviours" [13].

The study found that the main reason why patients with type 2 diabetes informed others about their illness was a desire to prove that "you can live a normal life with diabetes". This belief is more common among patients with well-controlled diabetes ($HbA_{1c} \leq 7\%$) who set a good example, and, in this way, can convince other patients that diabetes can be overcome and that they enjoy all areas of life. It was also demonstrated that, on average, every second patient with diabetes informs others about their illness, expecting help in case of hypoglycaemia, understanding of the disease and non-hindrance in their compliance with medical recommendations or is motivated by a willingness to share experience and knowledge about diabetes.

Interestingly, patients with poor glycemic control ($HbA_{1c} > 7\%$) far more often than patients with good glycemic control ($HbA_{1c} \leq 7\%$) inform their social environment about their illness, expecting help in case of hypoglycaemia. This may be an important hint for doctors dealing with the therapy of diabetic patients that high HbA_{1c} levels in these patients may be due to fear of hypoglycaemia and to a deliberate maintenance of glycemia at a higher level. This is especially true for patients who have experienced a serious episode of hypoglycaemia and for fear of another episode, consciously reduce insulin doses or consume an additional meal [18]. On the other hand, unsatisfactory HbA_{1c} values may occur in patients with unstable diabetes, or with frequent episodes of hypoglycaemia and hyperglycaemia. Lipska et al. showed that severe hypoglycaemia was common in patients with type 2 diabetes at all levels of glycemic control, and the risk was usually higher in patients with almost normal glycemia or very poor glycemic control [19].

Physicians and other health care providers should encourage diabetic patients to wear identifiers with information that they suffer from diabetes, so that even a person accidentally met can give them first aid if needed. This is particularly important when an episode of hypoglycaemia occurs, the symptoms of which may mimic the state of alcohol intoxication [18]. Moreover, people who have different social relations with a patient suffering from diabetes, unaware of his illness and problems related to hypoglycaemia and diabetes therapy, may downplay the symptoms of hypoglycaemia, as well as fail to support the patient in compliance with medical recommendations, especially in the use of diet.

Our study showed that every second employed respondent does not inform his employer about the diagnosis of diabetes. Similar results were obtained by Hakkarainen et al. in a study conducted on Finnish workers with type 1 diabetes – only half of subjects disclosed their diabetes at work [10]. Olesen et al. in a study conducted among Danish workers with type 2 diabetes, stated that 23% did not disclose their illness to their employer [11]. Munir et al. examined in the United Kingdom workers treated for chronic disease (arthritis, musculoskeletal pain, diabetes, asthma, migraine, heart disease, irritable bowel syndrome, depression) and stated that "except for diabetes, chronic illness itself was not a significant predictor or barrier to self-disclosure" [20]. Failure to inform the employer or workmates about their illness by diabetic patients can have negative consequences, especially in the event of loss of consciousness due to hypoglycaemia, which may pose a serious threat to the health and even life of not only the patient, but also people in its environment [21]. This is especially true for workplaces where the fainting of a sick employee with diabetes (e.g. drivers) may endanger other people in a different way. Ruston et al. also showed that diabetic patients were reluctant to disclose their illness at work and reported the need for support if they were stigmatized or treated inappropriately, e.g. if symptoms of hypoglycaemia occur. He stated that diabetic employees strive to maintain glycemic values at a higher than recommended level to prevent hypoglycaemia or exposing oneself to the development of chronic diabetes complications [22].

Limitations of the study

The results of our study concern a group of patients with type 2 diabetes, characteristic of the older age category, in a large percentage of the professionally passive. This does not give a full orientation in the problems of informing about the disease by a larger group of patients with diabetes with more diversified demographic characteristics and professional and family situations. Future research should be extended to patients with type 1 diabetes, and in younger age categories, including a larger group of professionally active patients.

Conclusions

1. Patients with type 2 diabetes most often inform their family and people with diabetes of their situation, and the least frequently the employer.
2. The main reason for informing others about the illness is a desire to prove that "you can live a normal life with diabetes".
3. There is a negative correlation between the HbA_{1c} level and a willingness to prove that "you can live a normal life with diabetes".
4. There is a positive correlation between HbA_{1c} and the expectation of receiving help in case of hypoglycaemia.
5. Family physicians should encourage patients with diabetes to inform others about their illness, especially in workplaces, both for their own safety and for the safety of people in their environment.
6. Failure to inform the social environment about the diagnosis of diabetes can have negative consequences for the health and life of both the patient and people from the social environment. The reasons for this behavior require further research.

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Address for correspondence:
Agata Matej-Butrym, MD, PhD
Katedra i Zakład Medycyny Rodzinnej UM
ul. Langiewicza 6A
20-032 Lublin
Tel.: +48 81 524-78-56
E-mail: amatej@wp.pl

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ORIGINAL PAPERS

Prevalence of selected mental disorders among graduation class adolescents: data from a screening study

KATARZYNA NOWICKA-SAUER[1, A, D–F], BARTOSZ KARCZ[2, A, B, C, E], ALEKSANDRA DYMOWSKA[3, 4, B, D, F], JANUSZ SIEBERT[1, E]

[1] Department of Family Medicine, Medical University of Gdansk, Poland
[2] Institute of Human Development, SWPS – University of Social Sciences and Humanities, Sopot, Poland
[3] Institute of Social Pathology and Rehabilitation, University of Gdansk, Poland
[4] Center for Prevention and Addiction Therapy, Gdynia, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** An increase in the prevalence of mental disorders and suicidal attempts is being observed worldwide. This tendency is also being noted among adolescents. A consistent screening for mental disorders among adolescents can be helpful in early diagnosis.

Objectives. The aim of the study was to assess the prevalence of selected mental disorders among graduation class adolescents by means of a screening assessment.

Material and methods. The study sample consisted of 399 graduation class adolescents, including 221 (55.4%) women and 178 (44.6%) men. The median age was 18.0 years. The Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ) was used.

Results. 'Alcohol abuse' was preliminary diagnosed in 134 (33.6%) participants and was the most common disorder in the studied group. A preliminary diagnosis of 'major depression' was made in 21 (6.2%) adolescents. The same prevalence – 60 (15%) – of 'other depressive' and 'other anxiety disorders' was noted. In 10 participants (2.5%), 'panic syndrome' was preliminary diagnosed. Bulimia nervosa was suspected in 5 (1.3%) of the participants, and 'other eating disorders' in 34 (8.5%). 'Other depressive disorders' and 'other anxiety disorders' were more common in women than men ($p = 0.002$ and $p = 0.029$, respectively). 'Alcohol abuse' was significantly more prevalent among men ($p = 0.025$).

Conclusions. 1. Preliminary diagnosis of alcohol abuse was the most common in the studied adolescent group. This problem was especially frequent among men. 2. Psycho-educative intervention is of great importance among youngsters, especially among graduation adolescents. 3. Screening for mental disorders among graduation adolescents seems vital.

Key words: mental disorders, adolescent, public health.

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Background

Mental disorders include a wide range of problems with various symptoms involving a malfunction at the level of thoughts, emotions, behaviors and relationships with others. Examples of such disorders can be: anxiety disorders, depression, sleeping or eating disorders, substance abuse and addiction. There is a rapid increase in the incidence of mental disorders, both in Poland and other European countries [1–3].

According to data from EZOP (*Epidemiologia zaburzeń psychicznych i dostępność psychiatrycznej opieki zdrowotnej* EZOP – Polska) – a large Polish epidemiological study of a representative population sample of adults (aged 18–64) based on DSM-IV criteria – the most prevalent life-time mental disorders in Poland are alcohol abuse (10.9%), panic attacks (6.2%) and depression (3%). In the 18–29 age group, the most prevalent are: alcohol abuse (13%), panic disorder (2.9), specific phobia (2.9), substance abuse (2.3) and major depression (1.5%) [2]. Polish studies have also shown that about 11% of adolescents overuse alcohol, 6% suffer from panic attacks, and 3% suffer from depression.

The Saving and Empowering Young Lives in Europe (SEYLE), a randomized controlled trial conducted in 10 European countries (168 schools, 11.110 pupils) aimed at assessment of health and risky behaviors, mental disorders and suicide among adolescents (age 14–16 years), revealed that 13.4% of adolescents drink alcohol 2–3 times per week. The prevalence of depression was 10.5%, subthreshold depression – 32%, while the rate of anxiety disorders was 5.8% and subthreshold anxiety – 29.2%. These disorders were also significantly related to suicidal thoughts and behaviors [3].

Research also revealed that both adolescent girls and young women are at a higher risk of depression, anxiety disorders and suicidal thoughts, while alcohol use and abuse, as well as completed suicide rates, are significantly higher in adolescent boys and young men [2–4]. For example, according to data from the EZOP study published in 2015, lifetime depression is observed in 4% of women and 1.9% of men, panic attacks in 8.5% of women and 3.9% of men, and alcohol abuse in 18.6% of men and 3.3% of women [2].

The problem of mental disorders and suicidality among adolescents and young adults is significant, as a World Health Organization (WHO) report shows that suicide is the second most common cause of death among 15–29-year-olds [5], and this is proven to be related to depression and/or anxiety. A high rate of suicidal attempts among adolescents and young adults has also observed in Poland. In 2017, 5,276 persons (4,524 men and 751 women) committed suicide. Among them were 115 adolescents between 13–18 and 353 persons aged 19–24 [4].

One of the problems related to mental disorders in adolescents that emerged from a review of literature is the low rate of youngsters receiving appropriate care. Research has shown that only 50% of adolescents who suffer from severe impairment related to mental health problems is under specialist care [6].

It is emphasized that the first vital step in the treatment of mental disorders, as well as preventing suicide, is the identification of mental health problem, including subthreshold disorders, as well as risky behaviors [6, 7]. Hence, improvement of identification of mental health problems at their early stage is of great importance [7, 8]. Screening tests are helpful in identifying people at risk of mental disorders, as well as preliminary diagnosis of mental health problems, as well as the risk of suicide [3, 9]. Although one of the disadvantages of a screening test can be false positive results, it is emphasized that identification of subthreshold disorders is of great importance, since these may evolve into more severe disorders with comorbid psychiatric symptoms and increased suicidality [7].

As a review of literature revealed, the topic is very important, especially considering the developmental matriculation of high school graduates. There is no systematic assessment of the prevalence of mental disorders among high school graduates, and therefore a gap is formed for early diagnosis and directing accurate help for individuals at risk. It is suggested that a screening for mental disorders can and should be done by a primary care physician or school teachers [3, 9].

Objectives

The purpose of the present study was to assess the prevalence of select mental disorders among graduation class adolescents.

Material and methods

Study design

This is a report from a screening study.

Setting

The study was performed in the Pomerania region in Poland in cooperation with the high schools. The data was collected in 2016, and statistical analyses were made in 2017.

Participants

The study involved 399 graduation class adolescents, including 221 women (55.4%) and 178 (44.6%) men. Inclusion criteria were: age 18 years and above and agreement for participation in the study. The median age of the participants was 18.0 years (range: 18–21 years). The responses were collected anonymously.

Measures

The Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ) was used to assess selected mental disorders. PRIME-MD PHQ is a standardized test developed for the purpose of preliminary diagnosis of five common types of mental disorders among primary care patients: somatoform disorders, depression (major depression, 'other depressive disorders', anxiety ('panic syndrome', 'other anxiety disorders'), alcohol abuse and eating disorders ('bulimia nervosa' and 'other eating disorders'). The method was created on the basis of Diagnostic and Statistical Manual of Mental Disorders IVth Edition (DSM-IV) criteria and is recommended to be used as a screening test for preliminary diagnosis of mental disorders. The preliminary diagnosis of a particular disorder demands the presence of a specific number and duration of symptoms according to DSM-IV criteria included in the coding system [9, 10]. The assessment of somatoform disorders was excluded from the current analysis, since no objective data on medical health status was available. A request for information related to sex and age was included in the questionnaire.

The present study obtained the approval of the Independent Bioethics Commission for Research of Medical University in Gdańsk (permission number: NKBBN/190/2016).

Statistical methods

All statistical analyses were performed using SPSS 24 software. The Shapiro–Wilk test for normality was used. Categorical variables are presented as absolute values and percentage. Quantitative variable (age) is presented as median and minimum and maximum values. The chi-square test was performed to examine the significance of differences between sexes. A significance level of $p = 0.05$ was used.

Results

A preliminary diagnosis of 'major depression' was observed in 21 adolescents (6.2%), 14 women (7.9%) and 7 men (4.3%). 'Other depressive disorders' were preliminary diagnosed in 15% ($n = 60$), and this was significantly more frequent in women ($n = 44$; 19.9%) than men ($n = 16$; 9%). A preliminary diagnosis of 'other anxiety disorders' was made in 15% ($n = 60$). This type of anxiety was more common among women ($n = 41$; 18.6%) compared to men (19; 10.7%). In total, 134 youngsters (33.6%) gave responses indicating a preliminary diagnosis of 'alcohol abuse'. This problem was more frequently presented by men ($n = 70$; 39.3%) than by women ($n = 64$; 29%), with significant differences between sexes ($p = 0.025$). 'Panic syndrome' was preliminary diagnosed in 60 (15%), 'bulimia nervosa' in 5 (1.3%), and 'other eating disorders' in 34 (8.5%). No between-sex differences were found for these problems. The results are presented in Table 1.

Table 1. Prevalence of mental disorders preliminarily diagnosed among graduation class adolescents ($n = 399$)

Mental disorders*	Study sample *n* (%)	Women *n* (%)	Men *n* (%)	*p*
Major depression	21 (6.2)	14 (7.9)	7 (4.3)	0.171
Other depressive disorders	60 (15)	44 (19.9)	16 (9)	0.002**
Panic syndrome	10 (2.5)	8 (3.6)	2 (1.1)	0.113
Other anxiety disorders	60 (15)	41 (18.6)	19 (10.7)	0.029**
Alcohol abuse	134 (33.6)	64 (29)	70 (39.3)	0.025**
Bulimia nervosa	5 (1.3)	3 (1.4)	2 (1.1)	0.855
Other eating disorders	34 (8.5)	22 (10)	12 (6.7)	0.253

* According to PRIME-MD PHQ and DSM-IV; ** statistically significant; $p < 0.05$;

Discussion

The current study showed that a significant group of graduation class adolescents may suffer from various mental disorders. Taking into account the high risk of mental disorders and suicide rate in Poland [4, 11], the study seems to be of great importance. The noted prevalence of mental disorders was similar to those observed in previous studies [3, 12, 13], including a randomized control study conducted among teenagers in 10 European countries (SEYLE study) [3]. The most prevalent disorder

in the present study was alcohol abuse. The abovementioned SEYLE study revealed that about 13% of adolescents use alcohol [3]. Modrzejewska and Bomba [14] noted a high prevalence of alcohol use in Polish adolescents at age 17. It should be noted that the prevalence of alcohol abuse observed in our study – 33.6% – was higher than in other authors' studies. This result can be partially explained by the use of a screening test according to which any positive answer reflecting the presence of any of 5 symptoms related to alcohol overuse justified the preliminary diagnosis of 'alcohol abuse'. One should keep in mind that a false positive result may occur, and we would recommend treating this result with caution. Additionally, in every case, a preliminary diagnosis requires detailed assessment of symptoms by the clinician. Another explanation for declared overuse of alcohol in this group might be due to competition between youngsters and the interest of 'adult' behavior, which are proven factors related to alcohol use among children and adolescents [11]. It can also be assumed that in this specific study group of graduation adolescents, alcohol use can be seen as a method of self-healing to regulate the level of stress. Studies revealed that many factors, including biological, psychosocial, environmental (e.g. advertisements), as well as those related to personality traits and life-style, may influence child and adolescent alcohol use [15]. It seems that further research exploring factors related to alcohol abuse among the specific group of graduation class students is vital. Such exploration contributes to intervention planning. It should also be noted that 'alcohol abuse' is no longer separately mentioned in the DSM-V criteria. However, our study managed to point out an important problem demanding special attention, as it is emphasized that alcohol use *itself* among children and adolescents is an increasingly alarming problem globally [11, 15].

The observed higher prevalence of depressive and anxiety disorders among adolescent women is in accord with the general tendency of the more frequent occurrence of mental disorders in women [2, 3, 13, 14]. It seems that more targeted and individualized psycho-educational intervention could be undertaken for adolescent women and men.

In the current study, we attempted to show the importance of diagnosing mental disorders in late adolescence, in which the major stress trigger – the graduation exam – is linked to many stress factors [13]. The exam is called '*an exam of adulthood*', and it is taken very seriously in Poland, as it is perceived as one of the decisive factors of a youngsters' future. Approaching adulthood, a teenager faces many difficult tasks, and some of these can be overwhelming. In general, youth *itself* is considered a risk factor for mental problems [6, 8]. Additionally, studies revealed that the treatment rate among adolescents and young adults with mental health problems is especially low. It is estimated that 18–56% of young people with mental disorders receive specialist care. Moreover, this rate decreases along with the transition into adulthood. Thus, routine screening for mental disorder in these populations is highly recommended [6, 8]. It is emphasized that a teacher, psychologist, a school counselor or a primary care physician can undertake a screening assessment to identify the first signs or symptoms of mental health problems. Adequate reaction to the specific needs of the adolescents and tailored interventions are proven to be effective both in treatment of mental disorders and in suicide prevention [3, 6].

Limitations of the study

The limitations of the current study include the lack of randomization of participating schools. Due to the lack of medical data, preliminary diagnosis of somatization was impossible. The method used was created according to DSM-IV criteria, hence the prevalence of a preliminary diagnosis of alcohol abuse should be treated with caution. The possible bias of the current study may be related to the fact that we involved the sample of graduation class students which prevent from data generalization on the general population of adolescents. This fact should be taken into account when comparing our observations with the results of other studies.

Conclusions

1. Alcohol abuse was the most common disorder in the studied adolescent group. This problem is especially frequent among men.
2. Psycho-educative intervention is of great importance among youngsters, especially among graduation adolescents.
3. Screening for mental disorders among graduation adolescents seems vital.

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Address for correspondence:
Katarzyna Nowicka-Sauer, MA, PhD
Zakład Medycyny Rodzinnej GUMed
ul. Dębinki 2
80-211 Gdańsk
Polska
Tel.: +48 58 349-15-75
E-mail: kpsauer@gumed.edu.pl

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Years of life lost due to colorectal cancer in Poland between 2000 and 2014 according to voivodships

PAULINA PACIEJ-GOŁĘBIOWSKA[D, E, F], MAŁGORZATA PIKALA[A, B, C, G], IRENA MANIECKA-BRYŁA[A, F, G]

Department of Epidemiology and Biostatistics, Medical University of Lodz, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Colorectal cancers (CRCs) are among the most important oncological causes of death in Europe. Poland belongs to countries where the mortality rates due to this cause exceed the average values for EU-28.
Objectives. Comparison of the number of years of life lost (YLLs) due to CRC between 2000 and 2014 in Poland by voivodships.
Material and methods. The study was based on a dataset containing information from the death certificates of Poles who died in 2000 and 2014 (368,028 and 376,467 records, respectively). The data on deaths caused by CRC (C18–C21 according to ICD-10) was used for the analysis (8,517 deaths in 2000 and 11,411 deaths in 2014). SEYLL (Standard Expected Years of Life Lost) was implemented to assess YLLs.
Results. In 2000, the highest number of YLLs per 10,000 men was recorded in Zachodniopomorskie (55.7 years), and in 2014 – in Opolskie (77.5 years). The increasing tendency of this measure between 2000 and 2014 in the group of men was observed in all voivodships. In the group of women, in 2000 the highest number of YLLs per 10,000 was reported in Lodzkie (46 years), and in 2014 – in Warminsko-Mazurskie (49.6 years). In women, an $SEYLL_p$ decline over time was noted only in Lodzkie and Dolnoslaskie, and in other voivodships, its values increased.
Conclusions. Between 2000 and 2014, an upward tendency of YLLs due to CRC was observed in Poland, though with territorial differentiation. It is advisable to search for more effective methods of reducing existing inequalities between individual provinces of Poland.
Key words: colorectal neoplasms, social conditions, life expectancy, vital statistics.

Paciej-Gołębiowska P, Pikala M, Maniecka-Bryła I. Years of life lost due to colorectal cancer in Poland between 2000 and 2014 according to voivodships. *Fam Med Prim Care Rev* 2018; 20(3): 245–249, doi: https://doi.org/10.5114/fmpcr.2018.78260.

Background

Malignant neoplasms, along with cardiovascular diseases, are the most important causes of death among Europeans. It is estimated that more than every fourth death in the UE-28 countries is due to oncological causes – in 2014, they caused 26.4% of all deaths, and the dominant share included neoplasms of the lungs (20.1% of all cancer-related deaths), colorectum (11.3%), breast (6.9%) and prostate (5.5%) [1].

To improve the epidemiological situation regarding malignant neoplasms in Europe, in 2003, the Council of the European Union introduced recommendations on screening programs aimed at early detection of malignancies of the colon (fecal occult blood test performed in people aged 50–74 years), the breast (mammography performed in women between the age of 50–69 years) and the uterine cervix (cytological examination in women over 20–30 years of age) [2]. Unfortunately, these have not been widely translated into clinical practice as of yet. The results of the *European Health Interview Survey* (EHIS) from 2014 revealed that more than half of Europeans who qualified for screening for colorectal cancers (CRC) had never had a fecal occult blood test (including 81.7% of Poles), and just over 18% had this performed in the past 12 months before the survey (4.2% in Poland) [3]. In some countries, a colonoscopy is also included in the screening for CRC. In Poland, personal invitations to these examinations have been sent to people aged 55–64 from 2012; however, the percentage of applications does not exceed 20% annually (the highest response rate was noted in 2014 and was 17.4%) [4].

According to Eurostat, the values of the standardized mortality rate due to CRC for the EU-28 has slightly improved recently, but still in many European countries, an adverse trend of mortality for this reason is observed. In 2011, in the EU-28, the rate was on average 32.05 per 100,000 inhabitants, while in 2015, it was 30.40 per 100,000. At that time, the death rate for Poland was 35.77 and 37.83 per 100,000, respectively. In 2015, the highest values of this measure were recorded in Hungary (54.10 per 100,000), in Croatia (49.95 per 100,000) and in Slovakia (49.48 per 100,000); they were the lowest in Cyprus (19.31 per 100,000), in Finland (21.84 per 100,000) and in Greece (23.23 per 100,000) [1].

In many publications, attention is also drawn to differences in mortality for various reasons, not only between EU countries, but also between regions belonging to one country [5–10].

Currently, synthetic measures, such as DALY (*Disability-adjusted Life Years*) and its components YLL (*Years of Life Lost*) and YLD (*Years of Life with Disability*), are widely in use to assess the health status of a population [11]. YLL, in contrast to traditionally used mortality rates, takes into account not only the number of deaths, but also the age of the individuals at the moment of death. Therefore, it can be used to evaluate the socio-economic aspects of mortality due to different causes [12–14].

Objectives

The aim of this study was to compare YLLs due to CRC between 2000 and 2014 in Poland according to voivodships.

Material and methods

The study was based on a dataset containing information gathered from the death certificates of Poles who died in 2000 (n = 368,028) and 2014 (n = 376,467), provided by the Central

Statistical Office in Poland. Information on deaths caused by CRC was used for the analysis, i.e. covered by codes C18–C21 according to the *International Classification of Diseases and Related Health Problems, 10th Revision* (ICD-10).

The SEYLL (*Standard Expected Years of Life Lost*) measure was used to assess YLLs. Its value was calculated in accordance with the method developed by Murray and Lopez [15]:

$$SEYLL = \sum_{\chi=0}^{I} d_\chi \, e^*_\chi$$

where:
e^*_χ is the average life expectancy for a particular age determined based on standard population;
d_χ is the number of deaths at age χ;
χ is the age of death;
I is the oldest age in the population.

The expected lifespan for a given age was determined on the basis of the life table published by the *World Health Organization* (WHO) in 2012. According to this source, the life expectancy for both sexes at age 0 is 86.02 years [16].

We also implemented the $SEYLL_p$ measure (*Standard Expected Years of Life Lost per person*), which is a ratio of YLLs to the number of a population, in this study calculated per 10,000 inhabitants; and the $SEYLL_d$ measure (*Standard Expected Years of Life Lost per death*), which is a quotient of YLLs and the number of deaths caused by a particular disease.

The Bioethics Committee of the Medical University of Lodz gave consent for the study to be conducted (No. RNN/183/17KE of June 13, 2017).

Results

In 2000, CRCs were the cause of 8,517 deaths in the Polish population (2.3% of all deaths) – 4,373 deaths of men and 4,144 deaths of women, while in 2014, it was 11,411 deaths (3% of all deaths) – 6,423 deaths in the group of men and 4,988 in the group of women. Data on the number of deaths due to CRC according to voivodships is given in Table 1.

Table 1. Number of deaths from colorectal cancer in Poland in 2000 and 2014 according to voivodships

Voivodship	Men		Women	
	2000	2014	2000	2014
Dolnoslaskie	373	505	366	395
Kujawsko-pomorskie	242	382	235	287
Lubelskie	224	365	197	223
Lubuskie	118	170	91	111
Lodzkie	306	406	349	371
Malopolskie	345	528	321	389
Mazowieckie	598	829	603	691
Opolskie	125	198	117	137
Podkarpackie	201	271	157	209
Podlaskie	112	202	132	161
Pomorskie	248	370	222	305
Slaskie	583	842	515	663
Swietokrzyskie	138	213	124	167
Warminsko-mazurskie	132	209	125	202
Wielkopolskie	403	616	451	468
Zachodniopomorskie	225	317	139	209
Total	**4,373**	**6,423**	**4,144**	**4,988**

These deaths translated into a total of 162,365.5 YLLs in 2000 ($SEYLL_p$ = 42.4 years) – 88,250.1 YLLs in the group of men ($SEYLL_p$ = 47.6 years) and 74,115.4 YLLs in the group of women ($SEYLL_p$ = 37.6 years); while in 2014, they caused 202,208.5 YLLs ($SEYLL_p$ = 52.6 years) – 119,700.4 YLLs in men ($SEYLL_p$ = 64.3 years) and 82,508.1 YLLs in women ($SEYLL_p$ = 41.5 years). The value of $SEYLL_d$ in 2000 was on average 19.1 years – a man who died during that time due to CRC lost on average 20.2 years, and a woman lost 17.9 years; while in 2014, it was on average 17.7 years – 18.6 years in the group of men and 16.5 years in the group of women.

In 2000, the highest number of YLLs per 10,000 men was recorded in the voivodship of Zachodniopomorskie ($SEYLL_p$ = 55.7 years), while in 2014, it was the highest in the voivodship of Opolskie ($SEYLL_p$ = 77.5 years). An increase of the values of this measure between 2000 and 2014 was found in all voivodships (on average by 16.7 years), but in the voivodship of Opolskie, it was the highest (by 25.8 years). In 2000, the lowest number of YLLs was noted for inhabitants of the voivodship of Podlaskie ($SEYLL_p$ = 36.3 years), and in 2014, it was for the voivodship of Podkarpackie ($SEYLL_p$ = 48.3 years). The latter was reported to have the lowest increase in $SEYLL_p$ in the analyzed time (by 8.7 years) (Table 2).

Table 2. Years of life lost due to colorectal cancer in men in Poland in 2000 and 2014 according to voivodships

Voivodships	$SEYLL_p$		$SEYLL_d$	
	2000	2014	2000	2014
Dolnoslaskie	53.6	68.9	20.1	19.1
Kujawsko-pomorskie	50.0	71.4	20.6	18.9
Lubelskie	41.2	66.4	19.7	18.9
Lubuskie	54.1	67.1	22.5	19.6
Lodzkie	48.5	64.8	19.9	19.0
Malopolskie	44.6	57.0	20.3	17.6
Mazowieckie	45.9	59.2	18.9	18.2
Opolskie	51.7	77.5	21.5	18.9
Podkarpackie	39.6	48.3	20.3	18.6
Podlaskie	36.3	60.5	19.2	17.4
Pomorskie	46.0	59.3	19.6	18.0
Slaskie	53.4	69.4	21.1	18.2
Swietokrzyskie	45.3	63.9	20.9	18.5
Warminsko-mazurskie	38.1	60.1	20.1	20.3
Wielkopolskie	49.4	71.1	19.9	19.5
Zachodniopomorskie	55.7	71.1	20.5	18.7
Total	**47.6**	**64.3**	**20.2**	**18.6**

$SEYLL_p$ – Standard Expected Years of Life Lost per person (per 10.000); $SEYLL_d$ – Standard Expected Years of Life Lost per death.

In the group of women, in 2000, the highest number of YLLs per 10,000 was noted in the voivodship of Lodzkie ($SEYLL_p$ = 46.0 years), and in 2014, it was in the voivodship of Warminsko-Mazurskie ($SEYLL_p$ = 49.6 years). In the context of the whole of Poland, between 2000 and 2014, the $SEYLL_p$ value increased by 4.0 years, but the highest increase was recorded in female inhabitants of the voivodship of Warminsko-Mazurskie (by 18.0 years). On the contrary, in the voivodships of Lodzkie and Dolnoslaskie, the occurrence of a downward tendency of $SEYLL_p$ was revealed at the level of -2.6 and -2.4 years, respectively. In the analyzed time, the lowest $SEYLL_p$ values were noted in the voivodship of Podkarpackie (in 2000 – $SEYLL_p$ = 25.9 years; in 2014 – $SEYLL_p$ = 31.9 years) (Table 3).

The value of $SEYLL_d$ in the group of men who died in 2000 ranged between 18.9 years in the voivodship of Mazowieckie and 22.5 years in the voivodship of Lubuskie; while in 2014, it ranged between 17.4 years in the voivodship of Podlaskie and 20.3 years in the voivodship of Warminsko-Mazurskie. Only in

the voivodship of Warminsko-Mazurskie was there an upward tendency of $SEYLL_d$ over time (by 0.2 years).

Table 3. Years of life lost due to colorectal cancer in women in Poland in 2000 and 2014 according to voivodships

Voivodship	$SEYLL_p$		$SEYLL_d$	
	2000	2014	2000	2014
Dolnoslaskie	45.2	42.8	18.7	16.3
Kujawsko-pomorskie	40.2	43.3	18.3	16.2
Lubelskie	30.6	34.2	17.6	17.0
Lubuskie	33.9	34.5	19.3	16.3
Lodzkie	46.0	43.3	18.1	15.3
Malopolskie	34.7	37.3	18.0	16.6
Mazowieckie	39.3	39.9	17.3	16.1
Opolskie	40.1	43.1	18.8	16.2
Podkarpackie	25.9	31.9	17.7	16.6
Podlaskie	36.2	40.0	16.9	15.2
Pomorskie	33.5	43.0	16.8	16.6
Slaskie	38.0	47.9	18.1	17.1
Swietokrzyskie	34.4	43.9	18.5	17.0
Warminsko-mazurskie	31.7	49.6	18.5	18.1
Wielkopolskie	45.0	45.1	17.2	17.2
Zachodniopomorskie	30.0	39.2	18.8	16.5
Total	**37.6**	**41.5**	**17.9**	**16.5**

$SEYLL_p$ – Standard Expected Years of Life Lost per person (per 10.000); $SEYLL_d$ – Standard Expected Years of Life Lost per death.

In the group of women, the $SEYLL_d$ value was the lowest in the voivodship of Pomorskie – 16.8 years, and it was the highest in the voivodship of Lubuskie – 19.3 years. In 2014, it ranged between 15.2 years in the voivodship of Podlaskie and 18.1 years in the voivodship of Warminsko-Mazurskie. Between 2000 and 2014, the value of $SEYLL_d$ among women decreased in every voivodship.

Discussion

The results of the study confirmed the presence of an unfavorable epidemiological situation regarding CRC in Poland. Comparison of YLLs between 2000 and 2014 revealed an upward trend in both sexes, though with significant territorial differences. In 2000, $SEYLL_p$, both in men and in women, was above the national average in six of the sixteen voivodships, while in 2014, it concerned nine of them.

In comparison to other regions, the situation of women in the voivodship of Warminsko-Mazurskie seems to be particularly disadvantageous. In 2014, $SEYLL_p$ was in this voivodship the highest in Poland, and it amounted to 49.6 years. Additionally, the largest increase of $SEYLL_p$ over time was recorded here – in 2000, it was 18 years lower. In this voivodship, in 2014 in both sexes, the $SEYLL_d$ values were also among the highest, and what is more, it was the only voivodship in which an increase of this measure in the group of men was found over time.

On the contrary, a relatively good situation, compared to others, was reported in the voivodship of Podkarpackie – in 2014 in both sexes, the lowest $SEYLL_p$ values were recorded here, and in the group of women, this was also the case in 2000. Besides this, in the group of men, the $SEYLL_p$ increase over time in this voivodship was the lowest in Poland.

Available data indicates that in 2014, standardized mortality rates due to CRC were the lowest in the voivodship of Podkarpackie (17.3 per 100,000 inhabitants), while the worst situation was recorded in the voivodship of Wielkopolskie (23.9 per 100,000). Only an analysis of deaths rates in the age group 25––64 revealed results consistent with ours, i.e. the highest death rate among men was noted in the voivodship of Opolskie (21.1 per 100,000), and among women in the voivodship of Warminsko-Mazurskie (11.4 per 100,000) [17].

An important supplement to the analysis of prematurely lost years of life is the assessment of changes of $SEYLL_d$ over time. Virtually throughout Poland (except for the voivodship of Warmisko-Mazurskie in the group of men), a downward trend was recorded. This demonstrates the slow shifting of deaths from CRC to older age groups. This is mainly due to the increasing lifespan and aging of the Polish populations, and to a much lesser extent to the improvement of CRC treatment [18, 19].

A study conducted on the population of the voivodship of Lodzkie revealed that in 1990–2008 among men, CRCs were the second most important cause of YLLs in the group of oncological diseases, after malignant neoplasms of the trachea, bronchi and lungs, and in the group of women, CRCs were second after malignant neoplasms of the trachea, bronchi and lungs and malignant neoplasms of the breast [20]; while a study on the whole Polish population showed that in 2011, out of all disease entities, CRCs were the twelfth most important cause of YLLs among men (1.5% of all YLLs), and tenth in the group of women (2.2% of all YLLs) [21].

According to the *Global Burden of Disease* (GBD), in 2015, CRC caused a loss of approximately 54.2 years of life per 10,000 inhabitants of EU-28, while in Poland, it was 66.2 years per 10,000. The highest number of YLLs due to this cause were noted in Hungary – 97.8 years per 10,000, in Croatia – 85.9 years per 10,000, and in Slovakia – 73.4 years per 10,000 [22].

The recognized risk factors for CRC include: a diet rich in red meat and highly processed food, heat treatment of meat by its frying or grilling, obesity, excessive consumption of alcohol, cigarette smoking, sedentary lifestyle [23–25]. However, the causes of this unfavorable phenomena in the field of prematurely lost years of life due to CRC can be seen in the deterioration of the health attitudes of Poles and the gradual acceptance of a so-called "western lifestyle" [26–28].

In the WOBASZ study (Multi-Center National Population Health Survey), which was conducted in 2003–2005 in Poland, the existence of regional variations in an obedience of health habits was revealed. Analysis of the level of physical activity showed that the highest number of men performing physical activity within the recommended range resided the voivodships of Lubelskie (51%) and Opolskie (47%), while the lowest were in the voivodships of Podlaskie (26%) and Slaskie (32%). Similarly, the female residents of the voivodships of Lubelskie (50%) and Opolskie (46%) were most active, but in the voivodships of Pomorskie (25%) and Slaskie (25%), they were the least [29]. In terms of tobacco smoking status, the highest number of men currently smoking was noted in the voivodship of Podlaskie (48%), and smoking women were dominant in the voivodship of Warminsko-Mazurskie (34%) [30]. The highest number of obese men were recorded in the voivodship of Wielkopolskie (28.2%), and the lowest in the voivodship of Malopolskie (14.25); while the highest share of obese women was noted in the voivodship of Opolskie (24.0%), and the lowest in the voivodship of Podkarpackie (16.1%) [31]. The highest consumption of meat (in grams per day) was recorded in the voivodships of Podlaskie and Warminsko-Maurskie, while the lowest was in the voivodship of Podkarpackie [32]. Therefore, it seems that this last factor may play a leading role in diversifying the number of YLLs due to CRC in individual provinces.

Comparison of the WOBASZ survey results from 2003–2005 with its subsequent edition from 2013–2014 also revealed the occurrence of disturbing changes in time in the Polish population, such as the decrease in practicing regular physical activity from 37.4% to 27.3% in the group of men and from 32.7% to 28.3% in the group of women [27], or an increase in the percentage of people with abnormal body mass – from 61.6% to

69% in the group of men, and from 50.3% to 59% in the group of women [31].

Undeniably, excessive alcohol consumption is also an important cause of premature loss of life in Poland. According to the GBD, among all disease risk factors, alcohol is the sixth most significant cause of DALY in the Polish population, after elevated blood pressure, cigarette smoking, abnormal body weight, elevated total cholesterol and impaired fasting glucose [33]. As indicate WHO data, the amount of alcoholic beverages consumed by Poles is still increasing – between 2000 and 2014, the consumption of pure alcohol increased from 8.40 to 10.71 liters per capita [34]. This is reflected in the predominant contribution of alcoholic liver disease and fibrosis and cirrhosis of the liver in YLLs in the group of chronic diseases of the digestive system with a non-cancerous etiology in Poland [35, 36]. In addition, data from 2011 indicated that liver cirrhosis was the third, after car accidents and suicides, cause of YLLs per death ($SEYLL_d$) [21]. Limiting the consumption of alcohol by Poles could affect the reduction of YLLs, not only due to liver diseases associated with excessive alcohol use, but also due to CRC.

Conclusions

Over the years 2000 to 2014, an increase in the number of YLLs due to CRC in Poland was observed, and this phenomenon was characterized by territorial diversity. One of the reasons may be the deteriorating health habits of Poles. It is not possible to determine which risk factors affected the inequalities between voivodships to the greatest extent, but it seems that one of them may be the quantity and type of meat consumed.

It is advisable to continue research on territorial distribution of possible risk factors for CRC and to search for more effective methods of reducing existing inequalities between individual provinces of Poland.

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Address for correspondence:
Paulina Paciej-Gołębiowska, MD
Zakład Epidemiologii i Biostatystyki UM
pl. Hallera 1, budynek II
90-742 Łódź
Polska
Tel.: +48 609 915-997
E-mail: paulina.paciej@stud.umed.lodz.pl

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Assessment of anthropometric measurements in diagnosis and monitoring of excessive body weight in children

AGNIESZKA PAWELAK[1, 2, B, D–F], MACIEJ ORNAT[1, 2, A, C–E], KRZYSZTOF PACHOŁEK[2, B, E, F], AGNIESZKA WRÓBLEWSKA[1, 2, B, D–F], BARTOSZ JERCZAK[3, B, D–F], PAWEŁ BARSKI[1, B, E], ANGELIKA SAJ[1, B, E], IWONA PIROGOWICZ[3, A, B, F]

[1] Student Scientific Organization for Health Promotion and Disease Prevention at the Department and Clinic of Geriatrics, Wroclaw Medical University, Poland
[2] Student Scientific Society of Geriatrics and Gerontology at the Department of Geriatrics, Wroclaw Medical University, Poland
[3] Department and Clinic of Geriatrics, Wroclaw Medical University, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Obesity developing in the early years is one of the most important risk factors for cardiovascular diseases. This contributes to the need for the earliest possible diagnosis of overweight in children. There is a noticeable underdiagnosis of obesity, most often in children between 5 and 12 years of age, as well as in adolescents.
Objectives. The aim of the study was to estimate the correlation between anthropometric measurements that are most commonly used in the diagnosis of obesity.
Material and methods. The study involved 150 children, during their rehabilitation and wellness stay at CRR KRUS in Szklarska Poreba in 2017. The entire group performed basic anthropometric measurements – height, body weight, waist circumference and thickness of the deltoid skin fold. Body composition analysis was performed using the Tanita analyzer.
Results. A statistically significant correlation between the studied parameters was assumed ($p < 0.001$). The parameter showing the highest level of correlation with other measured parameters was the BMI percentile, BMI value and Cole index. Among the parameters not based on growth and weight in the boys' group, the most important was the percentile of the waist circumference ($r = 0.76$), while in the girls' group, the content of adipose tissue ($r = 0,74$).
Conclusions. The BMI and centile BMI results were the parameters of the highest value in the diagnosis and monitoring of excessive body weight in children. In addition, neither weight nor growth measurements should be used to determine the amount and location of adipose tissue.
Key words: obesity, Body Mass Index, body composition, pediatrics, anthropometry, waist circumference.

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Background

The awareness of the problem of obesity among children and teenagers is gradually increasing. Thanks to the widespread preventive activities and campaigns promoting a healthy lifestyle to the younger populations, numerous developed countries have succeeded in limiting the increase in the number of children with a confirmed diagnosis of obesity [1]. It has been observed that the percentage of younger populations with overweight is decreasing, which is also the case in Poland. According to data from the year 2010, 17.8% of Polish students suffered from overweight or obesity, whilst in the year 2014, only 14% [2]. Despite this positive trend, it should be noted that the average value of BMI between the years 1975 and 2016 gradually grew by 1 kg/m^2 in Middle Eastern Europe and that this rate was three times higher than among the world population [2]. The consequences of this dramatic rise may appear in the decades to come. It has been proven that obesity developing in early age bears a much higher risk of cardiovascular diseases than obesity developed in adulthood [3]. Moreover, children who are affected by obesity had reduced cognitive performance and presented changes in brain structures responsible for learning and memory compared to their non-obese peers [4]. This may obviously affect their school performance. Considering these facts, there is a necessity for the earliest possible diagnosis of increased body mass among children and teenagers. This may have a positive impact on the quality of their life in its further stages. For the time being, however, figures show that underdiagnosis of obesity predominantly concerns children between the age of 5 and 12. This is also frequent with teenagers, but comparatively less common among adults [5]. In the diagnostics of abnormal body mass in pediatric patients, doctors tend to adapt BMI with the reference to the applicable centile grids or using the Cole index, which is recommended by the IOTF (International Obesity Task Force). BMI cut-off values may differ between countries; in North America, obesity is diagnosed when BMI exceeds the 95th centile, but in some European countries, the threshold is marked at the 97th centile. Even though calculating BMI requires two basic parameters (weight and height), which should be obtained during every preventive outpatient visit, underdiagnosis of obesity is frequent. Patel et al. proved that only 18% of children matching the diagnostic criteria had a documented diagnosis of obesity [6]. WHO defines obesity as "a medical condition in which excess body fat accumulation can impact health negatively". As the definition shows, BMI is

an intermediary anthropometric index which does not convey any information about the accurate contents of fat tissue in the patient's body. Additionally, more and more attention is drawn to the problem of abdominal obesity, which seems to be more strongly corelated with the risk of cardiovascular factors than general obesity [7]. Epidemiological data shows that abdominal obesity may affect one out of ten children in Poland, and it is more common in boys, especially in older age groups, with eating habits and lack of physical activity being the most relevant risk factors [8]. In the assessment of abdominal obesity, the most frequently used parameters are WC (waist circumference) and WHR (waist height ratio). Another parameter associated with excess fat tissue is skinfold thickness, usually measured above the triceps muscle or in subscapular area. However, its accuracy may be biased by common errors made during measurement [9]. Interestingly, WC was proved to have a stronger correlation with insulin resistance than BMI or skinfold thickness [10]. There has been a growing trend towards the use of body composition analyzers based on bioimpedance, which allows precise estimation of FFM (fat free mass) and FM (fat mass). This low-cost method was validated in tests comparing its accuracy to reference imaging techniques [11]. The ability to adapt so many parameters in diagnosing obesity may facilitate the diagnosis and minimize the frequency of underdiagnosis.

Objectives

The purpose of this study was to test the correlation between anthropometric indicators predominantly applied in the diagnostics of obesity and body composition estimated by bioimpedance analysis (BIA).

Materials and methods

Study design and participants

The analysis of anthropometric parameters and body mass composition were a part of a rehabilitatory stay for children from rural areas held at the Granit Hotel in Szklarska Poreba (Poland). The research was carried out in July 2017. The camp was organized for children with upper respiratory tract disorders. Body mass composition analysis was carried out using the Tanita device.

Anthropometric measurements were the elements of a medical examination which was part of medical care during the rehabilitation treatment camp. Therefore, the authors did not request permission from the bioethical committee.

Data sources/measurement

We measured parameters such as: body weight, height, thickness of skin folds over the triceps brachii muscle, waist circumference and body composition (content of adipose tissue, muscle tissue, water and bone mass). Additionally, indicators such as BMI, WHtR and Cole index were calculated.

Statistical methods

Microsoft Excel 2017 was used to prepare the database, while statistical analysis was performed using the Statistica computer program (StatSoft Inc.). To evaluate the distribution curve, the Shapiro–Wilk test was used, while the correlation between the obtained parameters was estimated using the Spearman's rank correlation test. In all analyzed parameters, the value of $p < 0.05$ was assumed to be the statistical significance level. There wasn't any missing data, and all planned measurements were performed.

Results

The analysis of normal distribution revealed that none of the analyzed variables had a normal distribution; therefore, non-parametric tests were used in statistical analysis. We included all obtained data in the further analysis.

Participants and descriptive data

Table 1. Characteristics of the analyzed group of children. The results are presented as the median, maximum and minimum values (range)

Characteristics of the research group				
Gender		Girls	Boys	Summary
Population		82	68	150
Age [years]		12 (7–15)		
Illness	Bronchial asthma	28.1%	42.6%	34.7%
	Recurrent upper respiratory tract infections	75.6%	60.3%	68.7%
	Allergic rhinitis	14.6%	10.3%	12.7%
Weight [kg]		46.3 (19.1–98)	46.7 (21.3–82.4)	46.5 (19.1–98)
Height [cm]		154 (117–177)	152 (124–180)	153 (117–180)
BMI [kg/m^2]		19.5 (13.1–34.9)	19.3 (13–31.6)	19.4 (13–34.9)
FM [%]		26.6 (17.9–46.4)	22.4 (13–49.1)	24.8 (13–49.1)
Waist circumference [cm]		74 (52–103)	75 (54–110)	74 (52–110)
Skin fold [mm]		17 (7–40)	19 (5–40)	18 (5–40)
WHtR		48 (40–61)	49 (40–76)	49 (40–76)

Main results

Analysis without grouping

The mutual correlation between body mass, body weight percentile, BMI, BMI percentile, Cole index, body fat mass, waist circumference percentile, skinfold thickness percentile and WHtR index was, in all cases, statistically significant [Spearman's rank correlation, $p < 0.001$].

Analysis of the examined parameters depending on gender

Due to the small number of children aged 7 and 8 years, an analysis was not conducted in these age-groups. The analysis was carried out in groups of children 9–15 years of age.

An analysis of correlation values between the examined parameters revealed that the parameter showing the highest level of correlation with other measured parameters was found in the group of girls BMI percentile, the BMI value and Cole index. All these indicators analyze the body weight and height of the examined child. Among the parameters, which are independent of these variables, the content of adipose tissue and WHtR were the most useful. In the group of boys, the highest correlation value with other parameters was also shown by the BMI percentile, BMI and Cole index values. From parameters independent of these variables, the highest value was showed by the waist circumference percentile (Tables 2, 3).

In the group of children aged 9–12 and 14 years, the most useful parameters were: BMI, BMI percentile and Cole index. In the group of children 13 years of age, the body mass percentile along with the above-mentioned parameters were most helpful. In the age group of 15 years, BMI and BMI percentile did not show a sufficient correlation with other parameters, whereas the body mass percentile and Cole index were characterized by a high level of correlation with other parameters. From the group of the remaining elements – not based on body mass and height – the percentile of waist circumference was characterized by the highest level of correlation with other parameters (Table 4).

Table 2. Correlation values (*r*) between the analyzed parameters depending on gender. All correlations in the table are statistically significant with $p < 0.001$ [Spearman's correlation rank]

Sex	Girls								
Boys	Parameter	Body mass	Body mass percentile	BMI[1]	BMI percentile	Content of adipose tissue	Waist circumference[2]	Skin fold[3]	WHtR[4]	Cole index[5]
	Body mass	–	0.76	0.92	0.73	0.72	0.57	0.50	0.56	0.73
	Body mass percentile	0.71	–	0.87	0.95	0.73	0.74	0.56	0.74	0.97
	BMI	0.84	0.85	–	0.91	0.80	0.71	0.60	0.75	0.89
	BMI percentile	0.68	0.88	0.96	–	0.78	0.76	0.62	0.84	0.97
	Content of adipose tissue	0.42	0.68	0.63	0.68	–	0.60	0.74	0.79	0.76
	Waist circumference	0.65	0.75	0.73	0.70	0.78	–	0.49	0.82	0.78
	Skin fold	0.71	0.68	0.72	0.64	0.76	0.86	–	0.65	0.59
	WHtR	0.44	0.60	0.63	0.64	0.86	0.90	0.81	–	0.77
	Cole index	0.70	0.95	0.93	0.97	0.67	0.73	0.66	0.63	–

[1] BMI – Body Mass Index; [2] Waist circumference related to centile charts. Correlation depending on the percentile of waist circumference; [3] Skin fold – measured over the triceps brachii muscle, expressed in percentiles; [4] WHtR – waist-to-height ratio; [5] Cole index – [(measured body weight x proper height – 50th percentile)/(measured height x proper body mass – 50th percentile) x 100%].

Table 3. Averaged correlation value between analyzed parameters. All correlation values were statistically significant with $p < 0.001$.

Parameter	Average correlation coefficient relative to all other elements	
Sex	Girls	Boys
Body mass	0.69	0.64
Body mass percentile	0.79	0.78
BMI	0.81	0.79
BMI percentile	0.82	0.77
Content of adipose tissue	0.74	0.69
Waist circumference percentile	0.68	0.76
Skin fold percentile	0.59	0.73
WHtR	0.74	0.69
Cole index	0.81	0.78

Table 4. Averaged correlation values (r) between analyzed factors. Only statistically significant correlation values with $p < 0.05$ were taken into account

Parameter	Average correlation relative to all other elements						
Age	9	10	11	12	13	14	15
Body mass	0.8	0.86	0.9	0.86	0.73	0.81[3]	0.83[1]
Body mass percentile	0.82	0.85	0.9	0.86	0.82	0.76[3]	0.84[1]
BMI	0.87	0.89	0.93	0.86	0.78	0.81[3]	–
BMI percentile	0.87	0.89	0.94	0.86	0.78	0.81[3]	–
Content of adipose tissue	0.81	0.8	0.89	0.78	0.55	0.53	–
Waist circumference percentile	0.87	0.84	0.91	0.82	–*	0.64	0.53[2]
Skin fold percentile	0.77	0.82	0.76	0.74	–*	0.62[4]	–
WHtR	0.83	0.77	0.84	0.77	0.53	0.65	–
Cole index	0.89	0.88	0.92	0.86	0.81	0.79[3]	0.86

[1] No correlation with parameters: adipose tissue mass, percentile of skin fold thickness over the triceps brachii muscle, WHtR; [2] correlation with body mass, body mass percentile and Cole index; [3] no correlation with the percentile of skin fold thickness over the triceps brachii muscle; [4] correlation with adipose tissue mass, waist circumference percentile and WHtR.

Discussion

Key results

Based on the results obtained, it can be concluded that the BMI and BMI centile measurement had the highest correlation with other anthropometric measurements. Among the tested parameters not based directly on the value of body mass and growth, the waist circumference centile turned out to be the most useful. Adipose tissue content showed a positive correlation with overweight and obesity. Differences in the usefulness of this test depending on gender may be connected with

a higher content of muscle tissue in boys and the distribution of adipose tissue characteristic for the given gender [12]. The measurement of skin fold thickness belongs to the group of inexpensive, easily accessible and non-invasive methods of testing body composition [13]. According to Spanish researchers, skin fold thickness is also an appropriate indication of adipose tissue distribution in children and teenagers and has a positive correlation with general cardiovascular risk [14].

Limitations of the study

The largest disadvantage of using only the BMI measure is the inability to distinguish adipose tissue mass from lean mass [15]. For this reason, the BMI standards commonly used in adults should not be used to diagnose overweight and obesity in children. Therefore, the use of growth charts appropriate for gender and age is recommended, in which limit points are positioned, depending on the source, on centile 85 and 95 or 90 and 97, for overweight and obesity, respectively [16, 17].

In other analyses, the usefulness of waist circumference centile in pediatric offices was noted, which is supported by the simplicity of performance, evaluation and high effectiveness in prevention of excessive body weight. The test restrictions were underweight and overweight limits, common for a diverse testing group with respect to nationality [18]. The high sensitivity and specificity of this test was shown both in determination of adipose tissue content and predispositions to future occurrence of diseases of civilizations [19]. The changes taking place in the course of growth and puberty have a minor effect on this result [20]. Other authors, apart from the undeniable advantages of bioimpedance, such as simplicity of performance and price of the test, indicate frequent underestimation of measurements performed using this method. Furthermore, the measurement error for adipose tissue is proportional to BMI and waist circumference [21]. Fluctuations in the quantity of water in the organism depending on age were seen, especially among younger age groups. This may have an effect on the measurement error in the evaluation of adipose tissue content [22].

Unfortunately, measurement of skin fold thickness did not turn out to be the most precise in this study, and the reasons for such results can be due to both inaccuracy and the limited experience of the research persons, as well as in limitations of this method resulting from adipose tissue distribution. According to the authors of studies of anthropometric measurements, an experienced researcher can achieve repeatability of results with differences between individual results up to 5% [23]. The ratio of subcutaneous adipose tissue to total adipose tissue in the organism is not a constant value and may vary within the population. Additionally, the amount of subcutaneous adipose tissue may remain within the standard in persons with mild undernutrition [13].

Interpretation

It was proven that BMI has a high correlation with respect to parameters such as WHtR, waist circumference and skin fold, which was also confirmed by this research [8, 24]. However, for many, the degree of correlation is insufficiently high, which is why the use of BMI in clinical practice, in spite of its simplicity of measurement and calculation, is a disputable issue [25, 26].

Generalization

Many studies confirm that increased BMI for a given age is connected with a higher risk of cardiovascular disease. In addition, in nearly half of children with BMI above centile 97, at least one disorder occurs which is a part of the metabolic syndrome [8, 27]. In children, apart from the content of adipose tissue itself, its distribution in the organism is essential. In the case of the identical total content of adipose tissue in the tested children, its location will have an effect on the risk of cardiovascular diseases [28, 29].

Conclusions

In summary, it can be concluded that none of the discussed tests fulfils all the criteria for an ideal diagnostic test for obesity in children and predilection for the occurrence of metabolic syndrome and cardiovascular incidents in adulthood.

The parameters showing the highest value in the monitoring of children's body mass (which correlates in the highest degree with all other measured parameters) in almost all studied groups are: BMI value, BMI percentile and Cole index – all based on height and body mass.

Among the factors which are not based on body height and weight, the most useful indicator in the group of boys seems to be percentile of waist circumference, while among girls – the content of adipose tissue.

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Address for correspondence:
Iwona Pirogowicz, MD, PhD
Katedra i Klinika Geriatrii UM
ul. M. Skłodowskiej-Curie 66
50-369 Wrocław
Polska
Tel.: +48 71 784-25-21
E-mail: iwona.pirogowicz@umed.wroc.pl

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ORIGINAL PAPERS

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Rhinoscopy assisted lacrimal probing – minimal invasive and effective therapeutic option for children with congenital nasolacrimal duct obstruction

MAGDALENA PRAUZIŃSKA[A–F], BEATA PUCHER[B, D, E], AGATA KAŁUŻNA-MŁYNARCZYK[B, E], MICHAŁ KOTOWSKI[B], JAGODA KOLASIŃSKA-LIPIŃSKA[B], PAULINA MARIA ADAMCZYK[B], JAROSŁAW SZYDŁOWSKI[A, D]

Pediatric Otolaryngology Department, Poznan University of Medical Sciences, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Congenital nasolacrimal duct obstruction (CNLDO) is a common developmental anomaly, and in most cases, obstruction is located at the distal end of the nasolacrimal duct. The rate of spontaneous resolution of CNLDO is up to 96% during the first year of life, and, therefore, most authors advise only medical treatment in the first months of life. When obstruction persists, lacrimal probing is performed. Conventionally, the next steps in surgical treatment are lacrimal intubation and dacryocystorhinostomy. The intranasal approach was first proposed many years ago, but became possible only after the development of advanced endoscopic rhinosurgery. At present, it is widely used to treat CNLDO.

Objectives. To evaluate the effectiveness of rhinoscopy assisted lacrimal probing as a treatment for congenital nasolacrimal duct obstruction in children.

Material and methods. We enrolled 14 children with CNLDO to this case series study. All children underwent surgery between 01.03.2016 and 30.03.2018. Data about symptoms and previous treatment were first collected, surgery was then performed, and all patients were then reexamined postoperatively and data about results recorded.

Results. The age range was 6–152 months (median 30 months). Four (4) patients had no history of previous surgery, and ten (10) had undergone lacrimal probing before. The overall final success rate was 85.71% (12/14 patients, including 2 infants with dacryocystitis).

Conclusions. In our group of patients, endoscopy assisted lacrimal probing is an effective method of treatment for CNLDO. We suggest to use this method in cases of children older than 12 months with one or more unsuccessful probing, with infants with dacryocystitis, and always before considering dacryocystorhinostomy.

Key words: child, endoscopy, nasolacrimal duct.

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Background

Congenital nasolacrimal duct obstruction (CNLDO) is a common developmental anomaly and a cause of visits in pediatric primary care. It results from a failure of canalization of the nasolacrimal duct, and affects up to 20% of normal newborns [1–4]. The diagnosis is made in a vast majority of cases (approximately 90%) by a primary care physician, at a median age of 5 weeks without gender predilection. Premature birth has been shown be associated with the development of CNLDO. In most cases, it is caused by imperforated web at the level of Hasner's valve, which is located at the distal end of the nasolacrimal duct under the inferior nasal turbinate. Other reasons are narrowing of the inferior meatus, or, very uncommonly, bony obstruction of the nasolacrimal duct.

The nasolacrimal duct is not fully developed until the eighth month of gestation, and, therefore, infants born prematurely are less likely to have a fully patent duct [1, 4]. The symptoms usually start shortly after birth when the natural increase of tear production takes place. The main symptom is usually epiphora, which is overflow of the tears with mattering of the lashes in one or both eyes. Subsequent overgrowth of bacteria in the obstructed nasolacrimal duct will result in constant/intermittent purulent or mucopurulent discharge, crusting on the lashes and recurrent conjunctivitis [1, 4]. Besides an imperforated nasolacrimal duct, distally, there is also a valve-like obstruction proximally (at the junction of the common canaliculus and lacrimal sac), wherein a congenital dacryocystocele (congenital cyst of lacrimal sac) can develop. On occurrence, it is seen as a cystic mass of bluish coloration in the medial canthal region. In many cases, it might also have an intranasal extension. Due to the fact that infants are obligate nasal breathers, a bilateral nasolacrimal duct cyst can cause respiratory distress similar to that observed in children with bilateral choanal atresia. Dacryocystocele is prone to infection causing a form of infantile dacryocystitis [3].

The rate of spontaneous resolution of CNLDO is very high, up to 96% of all cases during the first year of life, and, therefore, most authors advise only medical treatment in first months of life [1, 5]. This includes mainly hydrostatic massage of the lacrimal sac (Crigler massage) and ophthalmic antibiotic or antibiotic and steroid drops in cases of infection. Massaging the nasolacrimal sac in a downward direction creates hydrostatic pressure which can rupture the membranous obstruction. Antibiotic drops ameliorate inflammatory symptoms while waiting for resolution [1, 2, 5].

When obstruction persists, lacrimal probing in local or general anesthesia is performed. Timing of this procedure re-

mains controversial. While some authors strongly advise waiting 12 months to avoid unnecessary surgery, others advocate earlier (6–9 months) intervention to decrease the duration of symptoms [1, 5]. The next step in surgical treatment according to ophthalmologist's therapeutic algorithms are lacrimal intubation and external dacryocystorhinostomy (DCR) [1, 5]. Since the blockage site is located within the nose in a vast majority of cases, intranasal surgery to correct distal lacrimal obstruction was first proposed many years ago, but has become possible only after the development of advanced instruments and effective pediatric endoscopic rhinosurgery techniques. At the present time it is widely used to treat CNLDO [3, 6–8].

Objectives

To evaluate the effectiveness of rhinoscopy assisted lacrimal probing in treating congenital nasolacrimal duct obstruction in children.

Material and methods

Study design

The study was designed as a part of an interventional case series. Due to the non-experimental character of the study, a Bioethical Committee agreement was not required.

Setting

The study took place in the Pediatric Otolaryngology Department of Poznan University of Medical Sciences.

Study size, participants and variables

We enrolled 14 children with various symptoms of CNLDO. Data about symptoms, course of disease and previous treatment were collected. All children underwent surgery between 01.03.2016 and 30.03.2018, and it was performed under general anesthesia with intubation. At the beginning of the procedure, rhinosurgical gauze pledgets soaked on 0,1% adrenaline solution were placed in the nasal cavities. Thereafter, gentle nontraumatic probing of the inferior and superior lacrimal canaliculus and diagnostic syringing was performed. The pledgets were removed and endoscopy of the nasal cavities with use of a rigid 0 and/or 30 degree 2,7 mm endoscope was performed to reveal any existing nasal pathology. This was followed by medialization (infracture) of the inferior turbinate and the placing of a pledget under it on the affected side/s for a couple of minutes. After this, the inferior nasal meatus was visualized with endoscope and simultaneous syringing was performed to check patency of nasolacrimal duct. If no free flow of saline was observed, the mucosa of the lateral wall was perforated with a sickle knife or a ball probe. If patency of the lacrimal system was achieved in this way, the excessive mucosa from the distal end of the nasolacrimal duct was removed with a small straight or angled biting forceps. Flow of saline to the nose during irrigation indicated successful surgery. After surgery, antibiotic ophthalmic drops were prescribed for 14 days and parents/caregivers were told to perform hydrostatic massage of the lacrimal sac 3–5 times a day. All patients were reexamined postoperatively in the office facilities of our clinic and data about results were collected. If symptoms disappeared completely or nearly completely (ex. tearing only in wind or discharge only present during upper respiratory tract infection), it was judged as success.

Results

Participants

The study consisted of 14 children (8 boys and 6 girls) who underwent rhinoscopy assisted lacrimal probing and syringing. The age of the children ranged from 6 to 152 months, with a median of 30 months. The initial symptoms were: tearing and recurrent purulent discharge (n = 4), constant purulent discharge (n = 6), purulent discharge and swelling of eyelids (n = 2), and dacryocystitis (n = 2). Symptoms of 12 children at the time of surgery were unilateral (left – 8, right – 4) and in two cases, bilateral. Of our patients, 4 had no history of previous surgery and 10 had undergone lacrimal probing before. In 4 of the latter, it was a single procedure and in 6, repeated (in 4–2 times, and 2–3 times).

Main results

In 12 children, surgery was successful (including all dacryocystitis cases), and in 2 unsuccessful (meaning not achieving patency of lacrimal system at the time of operation). During the examination that took place 1–3 months post-surgery, operation success was observed in 11/14 patients (78.57%). In 9 of them, resolution of symptoms was complete, and in 2, near complete. In 2 children, there was no improvement, and in 1, only small improvement was observed. In one of girls with successful surgery and no improvement on a visit 6 weeks post operation, the parents had been found to be applying the wrong massage technique. After correction, the symptoms resolved completely in one month, which enabled the post-surgery success rate to reach 85.71%. In all 7 children with successful surgery, a lack of symptoms was evident 1–3 months after surgery and as of observation time > 6 months. Herein, good results were maintained over the whole observation time (7–24 months).

Figure 1 shows a 4 1/2 year-old boy with symptoms of CNLDO on the left side (mainly constant purulent discharge). Figure 2 shows the same boy one year later (4 months post-operation) with complete resolution of symptoms.

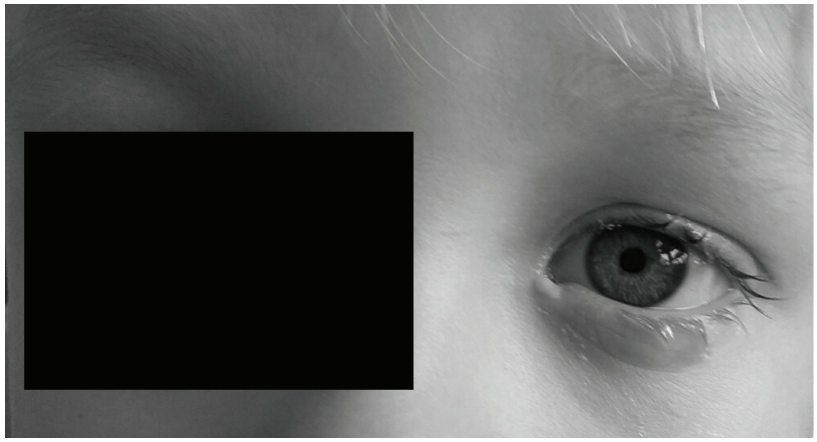

Figure 1. A 4,5 year boy with CNLDO on the left side after repeated (3 x) unsuccessful probing

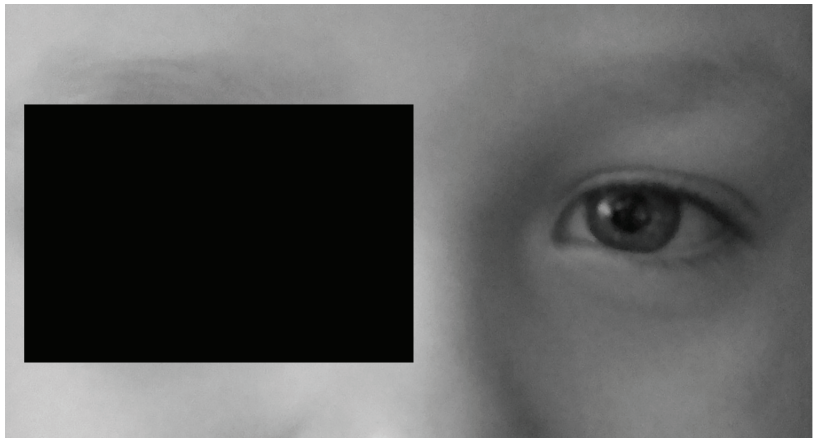

Figure 2. The same boy one year later 4 months after rhinoscopy assisted lacrimal probing

Discussion

Our group is relatively small, but our results (85.71% success) are similar to that reported by other authors. Levin et al. [6] and Ali et al. [7], for example, used nasal endoscopy to treat congenital lacrimal sac mucoceles, including dacryocystitis, achieving, respectively, 23 cures in 24 infants [6] and a success rate of 86.6% [7]. In our work, we observed complete resolution of symptoms in 2 infants (age 6 and 8 months) with dacryocystitis. A second study also showed that good results are maintained over a long period of time (9 months) [7]. A further example is that of Wallace et al., who treated 67 children with all forms of CNLDO. For the entire group, probing resulted in a successful resolution of symptoms in 89%. In opposition to our study, this one excluded patients who had had previous probings [8]. Moreover, Kouri et al., who used endoscopy assisted probing as a primary treatment in 40 children older than 12 months, saw an overall success rate 84.6% [9]. In addition, Galindo-Ferreiro et al., compared endoscopic assisted probing to conventional probing in children older than 48 months with 94.6% and 58.7% success rates in favor of endoscopic procedures. This study also included patients with a previous history of probing [10]. All the authors state that the use of an endoscope allows the identification of the site of obstruction and any coexisting intranasal anomaly. If one of these is a strongly lateralized, impacted, inferior turbinate, this alone can be a cause of CNLDO.

Conventional probing is a blind procedure, while endoscopy allows direct visualization of the distal end of the nasolacrimal duct. On of the most frequent reasons for unsuccessful probing is the so-called 'buried probe' or 'false probe passage'. This is a state wherein the probe does not perforate the mucosa of inferior meatus but remains in the submucosal layer of its lateral wall. In such cases, probing is unsuccessful despite a feeling of smooth passage even up to the floor of the nose. Conditions that may encourage false passage formation are anatomical variations of the nasolacrimal duct and thick nasal mucosa (which is typical for chronic inflammation). Gupta et al. determined the prevalence of buried probe in complex CNLDO and founded it to come about in 8% of all cases [11]. During endoscopy, in contrast, the buried probe is clearly visible and possible to correct. A further benefit that increases the success rate of endoscopy is the possibility to create a wide opening instead of the small perforation that is made during blind probing.

These advantages make endoscopy assisted lacrimal probing much more effective than a conventional ('blind') probing [3, 8–11]. Despite this, endoscopy assisted lacrimal probing is not a routine practice and is definitely much less commonly performed than conventional probing for many reasons. It requires general anesthesia and equipment such as pediatric endoscopic rhinosurgical instruments. What is more, the procedure has to be performed by a joint pediatric ENT/ophthalmology team or a surgeon who is familiar with both procedures.

After surgery, continuing massage of lacrimal sac is advised. This encourages a flow of tears through newly created opening. It is important, however, to make sure that parents/caregivers perform this in a proper (downward) fashion, because many are massaging in an upward direction, as it is easy to visibly empty the lacrimal sac this way. This happened with one of our patients, and we assume that it was a cause of lack of improvement on a first visit.

Conclusions

Endoscopy assisted lacrimal probing proved to be minimally invasive and effective in treating various types of congenital nasolacrimal duct obstruction in our group of patients. It has high success rates in children of all ages, whether as a primary treatment or after unsuccessful conventional probing. We suggest to use this method in cases of children older than 12 months with one or more unsuccessful probings, infants with dacryocystitis, and always before considering dacryocystorhinostomy. If symptoms like epiphora, recurrent conjunctivitis, constant purulent eye discharge, crusting in the line of eyelashes persist longer than 12 months or despite performed conventional probing, child should be referred for this type of treatment.

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Address for correspondence:
Jarosław Szydłowski, MD, PhD
Klinika Otolaryngologii Dziecięcej UM
ul. Szpitalna 27/33
60-572 Poznań
Polska
Tel.: +48 61 849-13-63
E-mail: szydlowski@ump.edu.pl

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Orbital complications of acute rhinosinusitis in children: a retrospective review of 33 patients

BEATA PUCHER[1, A–F], MAGDALENA PRAUZIŃSKA[1, A, B, D], MICHAŁ KOTOWSKI[1, A, B], AGATA KAŁUŻNA-MŁYNARCZYK[1, B, F], PAULINA ADAMCZYK[1, B, F], KATARZYNA JOŃCZYK-POTOCZNA[2, A, B, D], JAROSŁAW SZYDŁOWSKI[1, A, D]

[1] Pediatric Otolaryngology Department, Poznan University of Medical Sciences, Poland
[2] Department of Pediatric Radiology, Poznan University of Medical Sciences, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Acute rhinosinusitis occurs commonly in children. Orbital complications are reported in 5% to 7% of patients. Orbital involvement is reported to occur more often in children than in adults.
Objectives. To evaluate the prevalence of orbital complications in children with acute rhinosinusitis.
Material and methods. A retrospective study of 33 children referred to our department with orbital complications of acute rhinosinusitis between January 2016 and March 2018 was carried out. Patients' charts were investigated for the following data: gender and morbidity rate in the different age groups. Diagnostic imaging – CT scans and/or X-ray of the paranasal sinuses were analyzed. The incidence of the stages of orbital complications and their primary treatment (conservative or surgery) was evaluated.
Results. Group 1 (0–3 years of age) included 7 children. Group 2 (children aged 4–10 (*n* = 22) were affected most often. Group 3 (11–18 years of age) involved 4 patients. In a majority of patients, a CT scan was performed. An analysis of the stages of disease according to Chandler's classification revealed that stage I of orbital complications occurred most frequently, with a predominance in younger children.
Conclusions. The proper distinction between preseptal and orbital cellulitis, and subperiosteal abscess, is crucial in choosing the appropriate treatment strategy. Any delay may result in threatening vision complications.
Key words: sinusitis, orbital, child.

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Background

Acute rhinosinusitis occurs commonly in children. Orbital complications are reported in 5% to 7% of patients. Orbital involvement is reported to occur more often in children than in adults. Ethmoid sinus is the most commonly reported sinus to be involved in children. This is attributed to the close relation between the orbit and ethmoidal sinus in children, with a thin line separating them. In adults, the development of the frontal sinus makes it a frequent cause of orbital involvement, along with maxillary sinus. Sphenoid sinus involvement is rare and may lead to optic nerve involvement [1, 2].

Sinus infection can spread to involve orbital and intracranial structures directly, by retrograde extension or, rarely, by hematogenous spread. The orbit is separated from the ethmoid cells and the maxillary sinus by thin bony plates, which have naturally congenital bony dehiscence [3]. The infection can also be secondary to spread through the valveless ophthalmic veins with retrograde flow, complicating venous drainage, which provide direct pathways from the paranasal sinuses to the orbit (most commonly ethmoid sinusitis), leading to a progression of phlebitis [4].

In 1970, Chandler et al. proposed a classification that places patients into five groups: grade I – inflammatory edema (preseptal cellulitis), grade II – orbital cellulitis, grade III – subperiosteal abscess, grade IV – orbital abscess, grade V – cavernous sinus thrombosis. In all classifications proposed, proptosis seems to be the finding that differentiates the most severe stages of the complication. Proptosis indicates the presence of postseptal sinusitis complication. Proptosis may also be used as a guide to help locate the abscess. If the proptosis is symmetrical, there is an even greater chance of orbit content involvement. However, if asymmetrical, the abscess may be located in the opposite orbitary quadrant. In general, the larger the proptosis, the more severe the inflammation or the abscess size is [2, 3].

In patients who develop orbital cellulitis, 10% have temporary visual loss in the affected eye. Other complications may occur less frequently and include meningitis, frontal osteomyelitis, intracranial abscess, etc. The treatment of these complications requires a team of different specialists: a pediatric ENT specialist taking care of the sinus infection, an ophthalmologist evaluating the visual complications, a pediatrician taking care of the clinical problems. Differential diagnosis of orbital swelling should include facial infections, trauma, iatrogenic causes, tumors and dacryocystitis. However, in the pediatric population, sinusitis is responsible for a least 75% of cases, and orbital complication may be the first and only present sign of sinusitis [3].

Objectives

The aim of the study was to present the most common orbital complications of acute rhinosinusitis in children.

Material and methods

A retrospective study of 33 children referred to our department with orbital complications of acute rhinosinusitis between January

2016 and March 2018 was carried out. The patients' charts were investigated for the following data: gender and morbidity rate in the different age groups (group 1 – aged 0–3 years, group 2 – aged 4–10 years, group 3 – aged 11–18 years). The ENT and ophthalmologic examination at admission (extraocular muscle motion, examination of periorbital adnexa and, when possible, visual acuity) were estimated in every case. The evaluated laboratory tests included white blood cell counts in the peripheral blood and level of CRP in blood serum. The results of swabs for microbiologic examinations taken either from the mucopus in the middle nasal meatus or from the pus obtained during drainage of subperiostal abscesses were also evaluated. Diagnostic imaging – CT (computed tomography) scans and/or X-ray of the paranasal sinuses – were analyzed. The incidence of the stages of orbital complications (according to Chandler's classification) and their primary treatment (conservative or surgery) was evaluated. The treatment protocol included intravenous broad-spectrum antibiotics, nasal decongestants and analgesics for patients with stage I and II of the disease. When no improvement was observed within the first 48 hours of treatment in stage II, endoscopic surgery preceded by CT imaging with contrast was performed. In stage III, surgical treatment was introduced within 24 hours of admission and included endoscopic surgery with abscess drainage. Antibiotic therapy was initiated for 10 to 14 days. In complicated acute rhinosinusitis, high-dose amoxicillin-clavulanate or cephalosporins are recommended. If they fail, ceftriaxone or cefotaxime are introduced. Adjunctive therapy also included saline nasal irrigation, systemic decongestants after surgical intervention and intranasal corticosteroids.

The paper presents a retrospective study, which does not require an opinion from the Ethics Committee.

Results

A total number of 33 patients were enrolled in the study (20 boys – 60.6% and 13 girls – 39.4%). Children aged 4–10 were affected most often (n = 22, 66.7%). Group 1 (0–3 years of age) included 7 children (21.2%), and group 3 (11–18 years of age) involved 4 patients (12.1%).

According to patients' history, orbital symptoms appeared after rhinitis a few days prior. There was no history of midface trauma, dental infection or conjunctivitis reported. Anterior rhinoscopy revealed the presence of mucopus in the middle nasal meatus in 26 children, and erythematous and congested turbinates in 7 patients. In children with preseptal cellulitis (n = 17), symptoms included unilateral (n = 11) or bilateral (n = 6) eyelid swelling, erythema and tenderness (Figure 1). Visual acuity, pupillary reaction and extraocular motility were normal. In children with stage II of the disease (n = 9), eyelid edema, erythema, mild proptosis and chemosis were present (Figure 2). Visual acuity, according to an ophthalmologist's examination, was not impaired. In cases with subperiosteal abscess (III stage of the disease, n = 7), the examination revealed unilateral eyelid edema, erythema, as well as larger proptosis and gaze restriction. There was no deterioration of visual acuity.

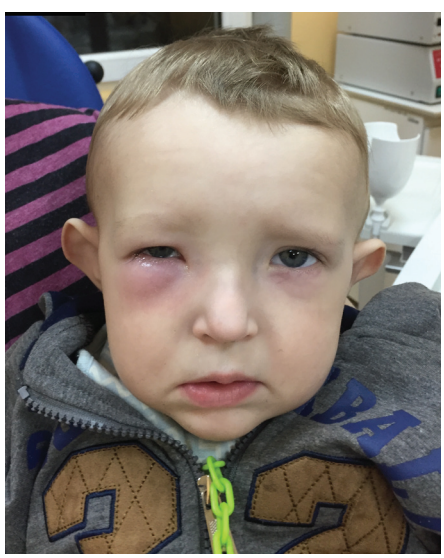

Figure 1. Preseptal cellulitis in 5-year-old boy (caregivers' written consent was obtained to publish the patient's photo)

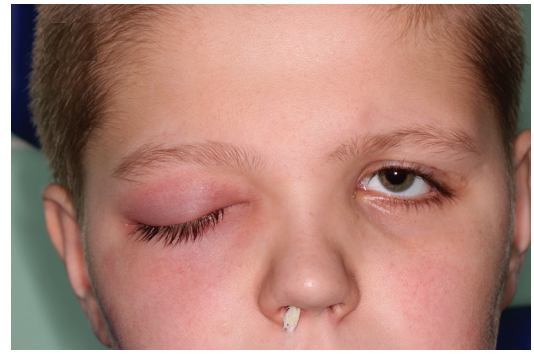

Figure 2. Eyelid swelling and ophtalmophlegia of the right eye in 6-year-old boy (caregivers' written consent was obtained to publish the patient's photo)

In laboratory findings, there was elevated CRP and leucocytosis in all children. Microbiology results (obtained in 30 patients) presented that *Streptococcus pneumoniae* was the most frequent bacteria cultured (n = 10), followed by *Haemophilus influenza* (n = 4), *Staphylococcus aureus* (n = 4) and *Corynebacteriae* (n = 1). In 4 children, polymicrobial cultures were identified, and in 7, the result was negative.

In a majority of patients, a CT was performed (n = 24, 72.7%), in 2 (6.1%) – an X-ray of the paranasal sinuses was made before referral to our department. A total of 7 (21.2%) received no imaging, as they had only eyelid swelling without other symptoms, which rapidly responded to antibiotic therapy. Every patient with whom surgery was necessary received CT imaging beforehand. The most common sinus involved was the ethmoid (n = 26, with radiologic imaging), and in 15 children, both the ethmoid and the maxillary sinus were involved. Analysis of the disease stages according to Chandler's classification revealed that stage I orbital complications occurred most frequently (n = 17, 51.58%), with a predominance in younger children (Table 1).

Table 1. Incidence of the orbital complications of the rhinosinusitis in children according to age

Stage of the disease (according to Chandler's classification)	Group 1 (n = 7)	Group 2 (n = 22)	Group 3 (n = 4)	Total (n = 33)
I: preseptal cellulitis	5 (71.4%)	12 (54.5%)	0 (0.00)	17 (51.5%)
II: orbital cellulitis	2 (28.6%)	4 (18.2%)	3 (75%)	9 (27.3%)
III: subperiosteal abscess	0 (0.00)	6 (27.3%)	1 (25%)	7 (21.2%)
IV: orbital abscess	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
V: cavernous sinus thrombosis	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)

A total of 17 patients (stage I) received conservative treatment, with the need of an antral puncture in 2 due to the fluid level in the maxillary sinus. In 5 children (out of 9 with stage II), surgical treatment was necessary, as they did not respond to conservative treatment. In 7 patients with stage III disease, surgical intervention was required within 24 hours after admission and was preceded by CT imaging, which revealed the presence of a subperiosteal abscess (Figure 3). The surgical procedure entailed functional endoscopic sinus surgery (FESS), which was performed in 5 children with stage II of the disease, and FESS with endoscopic subperiosteal abscess

drainage was undertaken in 7 patients with stage III. The postoperative course was not remarkable, and the mean hospital stay was 7.1 days (min. 1 day, max. 13 days). All children were followed-up in the outpatient clinic 2 and 6 weeks after discharge – there was no record of recurrence of the disease.

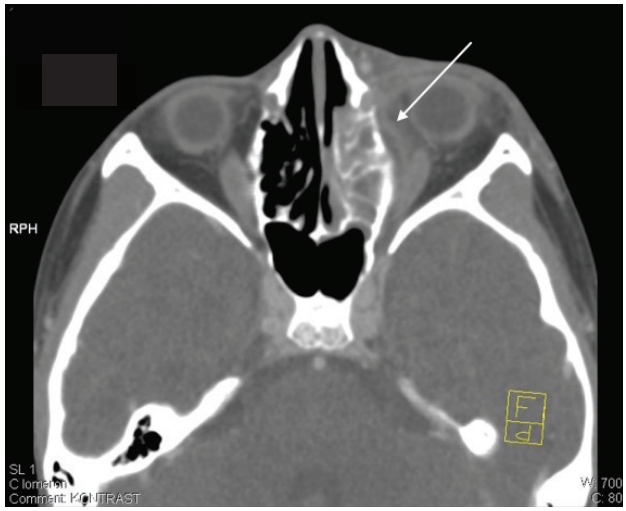

Figure 3. CT scan of subperiosteal abscess of the right orbit (indicated with an arrow)

Discussion

Orbital complications are observed more often in younger children, while intracranial complications typically occur in older children. The ethmoid sinuses are the most common source of infection in small children [4–9]. According to Watts, orbital cellulitis, secondary to sinusitis, is almost exclusively due to ethmoidal sinusitis in the first 5 years of life and is secondary to ethmoidal, maxillary and frontal sinusitis in children over 7 years of age [8].

According to Brook, the most common pathogens in cellulitis and abscesses are those seen in acute and chronic sinusitis, depending on the length and etiology of the infection. These are: *S. pneumoniae*, *H. influenzae*, *Staphylococcus aureus* and anaerobic bacteria [3]. A microbiological study was performed in our 30 cases of orbital complications, either by obtaining intraoperative samples of pus or with swabs of nasal secretions. Specific bacteria were identified in only 23 out of 30 cases, perhaps because some children received antibiotic therapy before referral to the ENT Dept.

The orbital complications include preseptal cellulitis, orbital cellulitis and abscess formation [1, 10]. Preseptal cellulitis is an infection of an eyelid and adjacent skin anterior to the orbital septum. This was the most common orbital complication in our study, and it predominantly affected children under 10 years of age (Figure 3). Treatment includes broad-spectrum antibiotics, which may be oral in mild cases providing that the follow-up is ensured. Admission for intravenous antibiotics is usually recommended in children under 3 years of age [11]. Orbital cellulitis develops when the infection spreads posterior to the orbital septum. This condition can lead to an abscess if not treated properly. The main symptoms include eyelid edema and erythema, mild proptosis and chemosis. Motility may be limited, but visual acuity remains normal. These patients require hospitalization and intravenous antibiotic therapy and an ophthalmology examination. A CT of the sinuses and orbits is required [11]. The progress of ophthalmological signs, such as proptosis, conjunctival injection and limitation of extraocular movements, is highly suggestive of an intraorbital process and requires radiological examination [10]. The investigation of choice is a contrast-enhanced sinus CT in order to verify the diagnosis and to assess the severity of the subperiosteal abscess [1, 6, 11]. Indications are a ring-enhanced lesion or presence of air-fluid level in the extraocular space, displacement and enlargement of the medial rectus muscle and proptosis. Treatment consists of immediate administration of intravenous antibiotics and surgical treatment, which includes transnasal endoscopy with ethmoidectomy, skeletonizing and penetrating the lamina papyracea in order to perform drainage, as was performed in 7 of our cases of a subperiosteal abscess [11]. Transnasal and external approaches are occassionally required for better exposure.

In stage IV of the disease, the infection exceeds the orbital periosteum, and an orbital abscess is formed. Symptoms include evident proptosis, chemosis, complete ophthalmoplegia and visual impairment. An orbital abscess is a risk for progression to irreversible blindness, and surgical intervention is mandatory. In stage V – the infection from the sinuses and the orbit can spread to the cavernous sinus through the free anastomosis, valveless vein system and the superior and inferior ophthalmic veins, causing cavernous sinus thrombosis. A sign of stage V of the disease is a progression of symptoms to the opposite eye. A physical examination reveals the rapid progress of chemosis and ophthalmoplegia. The patient's condition may worsen to loss of vision, meningitis and death [11]. Imaging studies include a CT scan and MRI with contrast. Treatment requires high doses of intravenous antibiotics that cross the blood-brain barrier for 6–8 weeks and surgical drainage of the affected sinuses. In our material, there were no cases with stage IV and V of the disease. Intracranial complications are less frequent than orbital and are seen more often in frontal or sphenoid sinusitis [11].

Conclusions

The most common orbital complication of acute rhinosinusitis in children is preseptal cellulitis. The ethmoid sinus is the main source of the complication, with a predominance in younger children.

The proper distinction between preseptal and orbital cellulitis, and subperiosteal abscess, is crucial in choosing the appropriate treatment strategy. Preseptal cellulitis responds to conservative treatment. An orbital abscess requires immediate surgical intervention involving decompression of the orbit, abscess drainage and opening of the affected sinuses [1, 10].

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Address for correspondence:
Beata Pucher, MD, PhD
Klinika Otolaryngologii Dziecięcej
Katedra Otolaryngologii i Onkologii Laryngologicznej UM
ul. Szpitalna 27/33
60-572 Poznań
Polska
Tel.: +48 618 491-363
E-mail: bpucher@poczta.onet.pl

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Influenza vaccine efficacy in patients aged 60–75 years in the 2016/2017 season

AGATA SŁAWIN[1, A–G], LIDIA B. BRYDAK[2, A D], ZBIGNIEW DONIEC[3, E, F], AGNIESZKA MASTALERZ-MIGAS[4, A–G]

[1] Family Doctor's Practise Slawin Ltd., Kielczow, Poland
[2] National Influenza Centre, National Institute of Public Health – National Institute of Hygiene (NIPH–NIH), Warsaw, Poland
[3] Department of Pneumonology, Institute of Tuberculosis and Lung Diseases, Rabka Branch, Rabka-Zdroj, Poland
[4] Department of Family Medicine, Wroclaw Medical University, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** From among the available and scientifically verified methods, vaccination every flu season is one of the most effective methods that aim at preventing flu, post-influenza complications and deaths. Its efficacy in preventing hospitalisation in patients over 65 years of age is 50–60%, and in preventing death from influenza and its complications, even up to 80%.
Objectives. The aim of the study was the assessment of influenza vaccine efficacy in patients aged 60–75 years in the 2016/2017 season.
Material and methods. The study included 96 patients aged 60–75 years. BMI, as well as the initial level of haemagglutinin H1, H3, HB antibodies, were determined for all patients. All subjects were vaccinated with trivalent seasonal vaccine (Vaxigrip). In the period of 4–5 weeks after vaccination, the level of haemagglutinin H1, H3, HB antibodies was measured again in all patients.
Results. GMTs for all anti-haemagglutinins before and after vaccination differ significantly ($p < 0.00001$). The protection rate is higher after the vaccination than before for all anti-haemagglutinins, and these differences are statistically significant ($p < 0.00001$). In respect of each anti-haemagglutinin, the protection rate significantly exceeds the 60% threshold. The study showed proper immunogenicity of the influenza vaccine in the group of elderly people.
Conclusions. The influenza vaccination induces a proper immune response in patients aged 60–75, and therefore, it should be recommended in such patients as a form of effective protection against influenza and its complications.
Key words: influenza, human, vaccination, aged, immunization.

Sławin A, Brydak LB, Doniec Z, Mastalerz-Migas A. Influenza vaccine efficacy in patients aged 60–75 years in the 2016/2017 season. *Fam Med Prim Care Rev* 2018; 20(3): 263–266, doi: https://doi.org/10.5114/fmpcr.2018.78271.

Background

Influenza is a contagious disease occurring seasonally, which is a global public health problem. The most effective preventive behaviour, both in the general population and in risk groups, is vaccination against influenza [1]. Recommendations indicate the elderly as a group which should, in particular, be covered by a preventive programme of vaccination against influenza. Age-related deterioration of the immune system results in a higher risk of complications, including death, in these patients than in the general population. In 2003 in the United States, Thompson et al. estimated that the mortality rate e.g. from flu or pneumonia in the years 1990–1999 was the largest in the population of people over the age of 65, and regardless of the strain of influenza virus, this amounted to 22.1/100 thousand people/year [2]. The rate of hospitalisation due to influenza is even higher in this group. Statistics strongly suggest the deterioration every subsequent 5 years of life and achieve up to 628.6/100 thousand people/year in people aged over 85. The number of days that older people spend in hospital due to complications caused by influenza also increases with age [3]. Importantly, the higher incidence of hospitalisation and mortality from flu in this group of patients does not result from a greater incidence of influenza and *influenza like illnesses* (ILIs). Age and related illnesses constitute the risk factor. Moreover, Barker et al. observed that the occurrence of influenza significantly deteriorates the overall functioning of the elderly in terms of such activities as mobility, getting dressing or taking a bath during 3–4 months after infection [4].

In accordance with the recommendations of the World Health Organization (WHO) and Advisory Committee on Immunization Practices (ACIP), the elderly are one of the risk groups due to age-related deterioration of the immune system, which makes the risk of complications, including death, much higher than in the general population. Moreover, the efficacy of vaccination in the elderly is estimated as only 17–53%, depending on the type of virus circulating in the given season, while in the younger group, the efficiency is 70% [5].

Epidemiological reports of the National Institute of Public Health – National Institute of Hygiene (NIPH–NIH) indicate a greater incidence of influenza and influenza-like illnesses: in the 2015/2016 and 2016/2017 seasons, more than 4 million cases of these diseases were observed. The number of hospitalisations due to influenza also increased by 16% [6].

Throughout the world, the influenza vaccination rate remains relatively high, although it is widely varied. The international study of the Vaccine European New Integrated Collaboration Effort (VENICE) showed that from 2% to 80% of people

aged over 65 were vaccinated in Europe in the 2006/2007 influenza season [7]. Traditionally, in the group of people aged over 65, the percentage of vaccinated people remains much higher than in younger age groups. Unfortunately, the efficacy of these vaccinations, resulting from a weaker immune response in the elderly, reduces the effect expected on the basis of favourable statistics [8].

The deterioration of the immune system equals a reduction of reactivity due to changes in the number and activity of individual cell populations: a reduction of about 30% of the total number of the main cells of a specific immune system is observed in persons aged over 60, in comparison to persons under 35 years of age, as well as weaker expression of the receptors and surface molecules regulating the immune response. Hence, the efficacy of the vaccine in the given season in terms of immune response in patients aged over 65 is only assessed as 30–40% [9]. Unfortunately, in Poland, the vaccination rate for the entire population has remained at a very low level for many years. In the 2016/2017 season, only 3.3% of Poles were vaccinated against influenza [6, 10]. Nevertheless, elderly patients are among the biggest beneficiaries of seasonal influenza vaccinations. Many years of research in this area and critical meta-analyses have provided solid evidence that the actual efficacy of vaccination is very high, namely in preventing hospitalisation in this group of patients. In general, it amounts to 50–60%, and in preventing death from influenza and its complications, up to 70–80% [9].

Objectives

The aim of the study was the assessment of influenza vaccine efficacy in patients aged 60–75 years in the 2016/2017 season.

Material and methods

The study protocol was approved by the Bioethics Committee of the Wroclaw Medical University. The study included 96 consecutive patients who came to the GP practice to see a general practitioner in the period from September to November 2016. Inclusion criteria included: age: 60–75 years of age and written consent to participate in the study. Exclusion criteria included: presence of malignant disease, autoimmune disease, contraindication to vaccination against influenza, or a situation requiring special caution (as recommended by ACIP) [11], severe renal or hepatic insufficiency, primary hyperparathyroidism. The average age in the study group was 66.67, and 63.5% of the respondents were female.

In the first stage of the study, a blood sample was taken from each patient in order to determine the starting haemagglutinin antibody titres.

All subjects were vaccinated against influenza with the trivalent vaccine (Vaxigrip®, Sanofi Pasteur), valid in the 2016/2017 season. A single dose of the vaccine (0.5 ml) contained: 15 µg of haemagglutinin from the strain of influenza virus A/H3N2/, /15 µg of haemagglutinin from the strain of influenza virus A/H1N1/, 15 µg of haemagglutinin from the strain of influenza B virus. After approx. 4 weeks after the vaccination, a 5 ml blood sample was taken from each patient in order to obtain serum for the determination of haemagglutinin antibody titres.

To evaluate the serological response to the vaccination, anti-haemagglutinin antibody titration (anti-HA) was carried out. This part of the study was conducted in the Department of Research on Influenza Virus – National Centre for Influenza (*Zakład Badania Wirusów Grypy – Krajowy Ośrodek ds. Grypy*) of the National Institute of Public Health – National Institute of Hygiene in Warsaw. Anti-HA antibody titration was conducted for the following antigens contained in the vaccine:

- H1: A/California/7/2009(A/H1N1/pdm09),
- H3: A/HongKong/4801/2014(A/H3N2/),
- HB: B/Brisbane/60/2008/.

The anti-HA titre was determined by means of the haemagglutination inhibition test. The anti-HA titre of the given strain of the virus is assumed to be the highest serum dilution in which haemagglutination inhibition occurred. The following parameters were analysed:

- Geometric Mean Titres (GMT) – before and after influenza vaccination.
- Mean Fold Increase (MFI) – after the influenza vaccination, calculated as the ratio of GMT before and after vaccination.
- Protection Rate (PROT) – the percentage of subjects with antibody titres ≥ 1:40 before and after vaccination against influenza.
- Response Rate (RESP) – the percentage of subjects who had at least a fourfold increase in antibody titres after vaccination.

According to the CPMP guidelines for the evaluation of the serological reaction to vaccination against influenza, the following values suggest an efficient response to vaccination in patients aged over 60 [1]:

- MFI ≥ 2.0,
- PROT ≥ 60%,
- RESP ≥ 30%.

Analyses were performed using the R statistical programme (version 3.1.3). All features, except for age, had distributions different than normal, which was proven with the use of the Shapiro–Wilk test of normality. In all tests, the level of statistical significance was $p < 0.05$.

Results

The immune response to vaccination was evaluated.

The data presented in Table 1 show that GMTs for all anti-haemagglutinins before and after vaccination differ significantly ($p < 0.00001$).

Table 2 shows that the protection rate is higher after vaccination than before vaccination for all anti-haemagglutinins, and these differences are statistically significant ($p < 0.00001$). In respect of each anti-haemagglutinin, the protection rate significantly exceeds the 60% threshold.

Table 1. Geometric mean titres (GMT) and mean fold increase (MFI) in the study group

	Variables	*n*	GMT	Mean	SD	Median	Min	Max	Shapiro–Wilk test *p*	MFI 95% CI	W test *p*
H1	H1 before vaccination	96	9.54	35.83	52.63	10.00	0.00	320.00	0	6.79 3.02; 9.12	0
	H1 after vaccination	96	64.78	176.50	209.81	80.00	0.00	640.00	0		
H3	H3 before vaccination	96	6.45	38.44	85.50	0.00	0.00	640.00	0	13.28 5.89; 18.01	0
	H3 after vaccination	96	85.65	244.90	244.95	160.00	0.00	640.00	0		
HB	HB before vaccination	96	16.83	23.02	14.15	20.00	0.00	80.00	0	5.51 3.81; 7.76	0
	HB after vaccination	96	92.67	162.29	188.71	80.00	0.00	640.00	0		

In the case of H1, the chance that the titre will have a value of at least 1:40 is 4.3 times higher after vaccination than before it. In the case of H3, the chance that the titre will have a value of at least 1:40 is 6.3 times higher after vaccination than before it. In the case of HB, the chance that the titre will have a value of at least 1:40 is 41 times higher after vaccination than before it.

Table 2. Protection rate (PR) in the study group

PR	Titres	Before vaccination		After vaccination		OR 95% CI	F test
		n	%	*n*	%		*p*
H1	< 1:40 ≥ 1:40	58 38	60.4 39.6	25 71	26.0 74.0	4.30 2.25; 8.39	0
H3	< 1:40 ≥ 1:40	65 31	67.7 32.3	23 73	24.0 76.0	6.58 3.37; 13.22	0
HB	< 1:40 ≥ 1:40	67 29	69.8 30.2	5 91	5.2 94.8	40.98 14.79; 142.77	0

As shown in Table 3, the response rate for each anti-haemagglutinin is higher than 30%. For H3 and HB anti-haemagglutinins, the response rate is significantly higher than 50%. The highest response rate is 64.6% for HB, and the lowest value is 56.2% for H1.

Table 3. Response rate (RR) in the study group

RR	Titres	*n*	%	95% CI for fractions	P test *p*
H1	< 4x ≥ 4x	42 54	43.8 56.2	47.3 100	0.13080
H3	< 4x ≥ 4x	35 61	36.5 63.5	54.7 100	0.00536
HB	< 4x ≥ 4x	34 62	35.4 64.6	55.7 100	0.00293

Obtaining the results exceeding the values of parameters for people aged over 60 suggests that the vaccination against influenza caused an immune response in the study group.

Discussion

The process of population ageing generates rising costs in the area of public health. The percentage of people aged over 60 is constantly growing. In 1950, it was calculated that this group of people constituted 8% of the population, whereas in 2000 – as much as 10%. It is estimated that in 2050, this will be as much as up to 21% of the population. The immune response to the influenza vaccination is weaker in the elderly than among younger people, and this is the group that is most vulnerable to severe influenza infections and their complications. The key to understanding the differences and lower efficiency of vaccines in the elderly resulting from these differences is *immunosenescence* – i.e. a gradual deterioration of the immune system caused by the ageing process [12, 13]. This includes both the ability of the organism to respond to infections and tumours, as well as the development of long-term immunological memory, in particular through the vaccination, which results in far-reaching implications for specific and non-specific immune responses. Some authors suggest that this phenomenon can be partly explained by the intensification of "antigenic stress" and chronic inflammation occurring in the ageing body [14]. Immune cells isolated from the elderly present higher levels of pro-inflammatory cytokines, which results from the abnormal regulation of *toll like receptors* (TLR). This leads to permanent subclinical inflammation in the ageing organism, which causes difficulties in identifying the real inflammation and in responding to the pathogen. Studies carried out on mice suggest that the result of the chronic inflammation can be increased susceptibility to infections and worse response to vaccines [15, 16].

The study assessed the immune response to the vaccine in a study group aged 60–75. As the analysis of the data obtained shows, GMTs before and after the vaccination differ significantly for all anti-haemagglutinins ($p < 0.00001$), which means that patients in the 60–75 age group respond to the influenza vaccination.

The presented conclusions of the study coincide with the results obtained by prof. Lidia B. Brydak et al. in 1999 on the basis of a study carried out on a group of 45 people aged 62–93 [17]. Equally good immunogenicity in the elderly was observed by Zhu et al., who assessed the safety and immunogenicity of two different TIVs in different age groups. The group of people aged over 60 consisted of 240 people [18]. On the other hand, researchers in France analysed the humoral immune response to the influenza vaccination in elderly residents of long-term care facilities for 9 consecutive years of having regular vaccinations against seasonal influenza, and they also observed a good response to the vaccination, as in this study [19].

Conclusions

The results suggest that people aged between 60 and 75 have a normal immune response to the influenza vaccine, and therefore, it should be advised to use the influenza vaccination in these patients as a form of effective protection against influenza and its complications.

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Address for correspondence:
Agnieszka Mastalerz-Migas, MD, PhD, Assoc. Prof.
Katedra i Zakład Medycyny Rodzinnej UM
ul. Syrokomli 1
51-141 Wrocław
Polska
Tel.: +48 71 326-68-70
E-mail: agnieszka.migas@gmail.com

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REVIEWS

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Systemic aspects of securing the health safety of the elderly

MATEUSZ PAPLICKI[1, A, B, D–F], ROBERT SUSŁO[2, A, B, D–F], KAROL DOPIERAŁA[1, B, D], JAROSŁAW DROBNIK[2, A, D]

[1] Developmental Age Traumatology and Emergency Medicine Unit, General Medicine Department, Wrocław Medical University, Poland
[2] Gerontology Unit, Public Health Department, Health Sciences Faculty, Wrocław Medical University, Poland

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Summary The rapid aging of Polish society brings increasing stress to bear on both informal and formal support systems. The article aims at discussing the scope of care-related challenges in ageing societies and both current and future status of systemic remedies in Poland. Formal support systems, including social and medical care, are underdeveloped, understaffed, underfinanced, desynchronized, and generally unready to confront the increasing demands of the increasing number of elderly people, who typically suffer from multiple chronic and degenerative diseases that require holistic geriatric care. Such care can only be delivered by teams of specialists that include a physician specializing in geriatrics, a nurse, a physiotherapist, a psychologist, and a social worker. Although demanding and seemingly expensive, this kind of approach actually cuts costs, as it not only improves health outcomes, but also prolongs the duration of functional independency of the elderly, allowing them to function in their home environment, delaying institutionalization, and lessening the pressure on long-term care facilities. As the resources of the formal support systems charged by Polish law with providing health safety to the elderly are scarce, the main burden of care rests, and will continue to rest, on informal caregivers – predominantly family members. Given the deficits of both physicians and of institutions specializing in geriatric care, primary care physicians and their offices are forced to fill the gap, especially for the comparably fit elderly people dwelling in the community. Consequently, family care physicians should include activities to expand their geriatric competences into their continuous professional development schedules.
Key words: primary health care, geriatrics, health care reform, aged, patient safety.

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Demands of care for the elderly

The aging of society, and especially the increase in the numbers of the "old old" (those 75–84 years old) and of the "oldest old" (85 and older), puts increasing strain on both the formal and informal systems of support, including social and medical care, support, and treatment. At the same time, the modern way of life with the increasing geographical mobility of people and the increasing popularity of the nuclear family over multigenerational families (resulting in significant numbers of widowed people living alone in their late adulthood) limits the availability of the informal care traditionally provided within households [1]. This makes it crucial to develop long-term care (LTC) services aiming at providing the elderly with holistic services, health, and support, both stationary and ambulatory, without time limitations and with the aim of improving functional independence and delaying institutionalization [2]. The article aims at defining the scope of care-related challenges created by ageing of societies and discussing the current and future status of systemic remedies in Poland, including limited access to specialized geriatric care and the resulting key role of primary care physicians in securing the health needs of the elderly.

The demand for assistance services in daily living depends not only on the extent of a person's functional limitations, but also on surrounding conditions [3], and especially on the social and formal environment [4]. In England, the deterioration of the activities of daily living proved to be the strongest determinant of the need for formal support. The main reason for men receiving informal support is a decline in physical health, while a decline in mental health is the more common reason for women to receive it [5]. The existence and progression of disabilities that limit activities of daily living are known predictors of institutionalization, but not all elderly people wish to be admitted to care institutions, meaning that they continue to dwell in the community [3] and often fail to utilize the institutional and even home care services that remain available [6]. The hidden gap between the met and unmet needs for assistance services can only be estimated crudely, but the deficit is typically twice as large in people who live alone as in those who live together with others. This translates into a difference in the number of hours of help received per week as high as 16 hours, resulting in serious adverse health effects, including increased numbers of cases of emaciation and dehydration, burns and falls [7, 8]. Because of psychomotoric and mental limitations, the elderly, especially when left without adequate support, are prone to accidents, especially traffic accidents [9], and are at increased risk of suffering from various kinds of crimes [10], often resulting in serious health disturbances or even death [11]; these can be difficult to differentiate from age-related and disease-related deaths [12]. Because of their limited mobility and generalized helplessness, even emergency room utilization may be lower in case of elderly who live alone [13]. Apart from living alone, other factors increasing the risk of needs being left unmet include multiple daily deficiencies in living activities and low income [14]. Even now, in societies that are not yet very aged, making up for the shortage in the number of hours of help required by all the partly or fully dependent elderly people would require enormous financial assets and workforces, which are not available and will not become available in the foreseeable future [7].

Care for the elderly is both demanding and expensive, as it requires a multidimensional approach and the coordination of multiple services delivered by various providers. In a patient who needs geriatric care, old age translates into complicated set of deficiencies in physical and mental functions, resulting in multiple organ insufficiency – the so-called frailty syndrome – which typically coexists with several chronic diseases, requiring fine-tuned therapy using many drugs [15]. Even from medicolegal point of view, care for the elderly often becomes formally complex, especially in cases patients become incapable of effectively expressing themselves [16], which may affect their giving or refusing consent to medical diagnostics and treatment, and cooperation of medical personnel with their legal guardians is needed [17].

Interdisciplinary geriatric care needs to be holistic, encompassing all the medical, physical, mental, and social problems of the patient. It thus needs to involve of a team of specialists including at least a physician specialized in geriatrics, a nurse, a physiotherapist, a psychologist, and a social worker [18]. Multiple standardized scales need to be used and periodically reused to objectively evaluate the patient's status and its subsequent changes [2]. The most widely used instruments for assessing functional deficiencies are the Barthel scale, the Activities of Daily Living scale (ADLs) scale, and the Instrumental Activities of Daily Living scale (IADLs) [19]. A common platform of medical information exchange and future action planning and coordination allows the use of assets to be optimized both for the patient and the health care system, allowing the main demands of geriatric care to be followed: equal access for all elderly people to geriatric services; high availability of geriatric services; continuous and time-unlimited nature of geriatric care; high quality of geriatric care; and holistic care provided by specialized geriatric teams [2]. Paradoxically, this complex approach not only increases the quality of care, but also saves costs, as it limits the expense of otherwise uncoordinated, repeated multiple specialist consultations and recurring hospitalizations, as well as the complications resulting from low patient compliance, polypharmacy, and iatrogenic complications [20]. The benefits of the complex geriatric care approach include lower risk of death (by 22%) during one year's observation; 47% lower likelihood of institutionalization; 12% fewer hospitalizations; and indicators of patients' independent functioning in their native environment being improved by 72% [2]. The geriatric approach can be effectively supported by modern medical technologies that address the health needs of community-dwelling elderly people [21]; they are not only effective means of health promotion and disease prevention, but also provide a multitude of solutions maximizing various aspects of health safety in old age, including remote supervision, emergency assistance, care, diagnostics, and treatment [22].

Geriatric care in Poland

Responsibility in Poland for ensuring protection of human life and at least a basic level of health safety lies with the state [23] acting directly through its organs or indirectly through local governments, nongovernmental organizations (NGO), and the private sector [24]; these duties also extend to the elderly and their specific health needs [25]. The aging of Polish society is progressing very rapidly thanks to increasing average lifespans and the decreasing number of children being born to the average women of reproductive age. Together these will decrease the Polish population if no opposing processes, such as immigration, occur. In the 1950s, merely 4% of people were aged 65 years or older was, while this is expected to reach 15% in the 2020s, and 30% in the 2050s [26]. In 1950, the number of Polish citizens who were 80 years or older was 522,000 while in the year 2013 these numbered 1,483,000. As early as 2009, 25% of all patients admitted to Polish hospitals were 65 years old or older, and the cost of their treatment consumed 33% of hospital budgets; at the same time, the cost of hospitalization for people aged 65 years and over was nearly double the average for all age groups; the cost of hospitalization of people 80 years and older was nearly three times greater than the average for all age groups. It is expected that, in the next decade, the proportion of elderly people in Polish hospital patients will reach 50%. As more than 40% of Polish elderly people suffer from health-related limitations in at least in one of the basic everyday activities [27], it must be stressed that, despite various formal and institutional forms of support, the main burden of care on the elderly in Poland rests on informal caregivers, who are in most cases family members [2].

Institutional care for the elderly is underdeveloped [28], and the financial assets assigned to social and medical care have been scarce and inadequately distributed for many decades [29]. The expected increase in demand for these services will add additional strain to the country's budget [30]. This problem is especially vivid for patients suffering from chronic debilitating health conditions that require constant supervision, care, or nursing, such as dementia, which is more common among the elderly than in younger people [31]. Health promotion and disease prevention have for many decades been invariably low-priority items in the distribution of financial assets, and the elderly in Poland thus suffer from potentially preventable illnesses. Vaccinations are one of the saddest examples of the failure of disease prevention, as even those required by law are being successfully avoided by an increasing proportion of the Polish population [32]. The low uptake of recommended vaccinations, including influenza vaccine, prevents the elderly from benefitting from the phenomenon of hoard immunity, which results from limitations in the spread of communicable diseases among populations with a sufficiently high proportion of people who are immune. Additionally, the elderly are rarely vaccinated themselves, although the benefits are unquestionable [33].

The main health problems among the elderly are multiple chronic and degenerative diseases, especially diseases of civilization; the current average duration of life in good health is well below 65 years of age, being 58.1 years for men and 62.1 years for women. This leaves a significant section of the Polish population not only unfit to work with full efficiency until retirement age (currently 65 for males and 60 for females). Moreover, for health related reasons, the elderly also become increasingly dependent on others' help during the last 15 years of life [34], as the average life expectancy is currently 72 years for men and 77 years for women. In Poland, around 40% of elderly people die at home and about 50% in hospitals. It is important to stress that the need for assistance and help does not increase linearly with age; instead, there is a steep rise during the last year leading to death, which in Poland is provided for the most part by informal caregivers, predominantly family members, who support the elderly in everyday living tasks, which most often include shopping, cooking, personal hygiene, getting dressed and undressed [26]. The Vulnerable Elders Survey, VES-13, allows identification of elderly patients who are at risk of suffering from a sudden drop in general health status or dying because of age-related causes within the next two years. It is estimated that around 25% of the elderly in Poland are at such a risk. Such patients should undergo the holistic geriatric evaluation (*Całościowa Ocena Geriatryczna*; COG), which is in fact only part-financed by the Polish national health insurance fund (*Narodowy Fundusz Zdrowia*; NFZ). As the funding covers only PLN 150 (EUR 35), which is several times smaller than the actual cost of this procedure. Because of serious underfunding, complex geriatric care is available to less than 1% of elderly people in Poland, evening though its introduction would save around 1400–1700 PLN (329–400 EUR) per patient per year over standard medical care [2]. Generally, the greater the risk of sudden deterioration of the health status of the patient, the greater the patient's benefits from access to complex geriatric care [18]. Currently,

the average Polish geriatric patient is 81 years old and has received five medical diagnoses, of which the most common are hypertension, depression, urinary incontinence, falls, dementia, diabetes, chronic heart insufficiency, gastric ulcers, emaciation, delirium, iatrogenic syndromes, chronic renal insufficiency, and neoplastic diseases. These require, on average, the concurrent use of at least seven drugs [2]. This complex pharmacotherapy is often poorly coordinated, which is associated with a high risk of iatrogenic complications, as the average elderly person in Poland is consulted and treated by multiple physicians specializing in every medical discipline except geriatrics: 76% of all treated older patients are treated, in order of decreasing frequency, by specialists in internal diseases, general surgery, cardiology, ophthalmology, orthopedics and motor system traumatology, neurology, urology, and rheumatology. In the year 2012, 77% of the patients in geriatric wards in Poland were being treated because of three main diagnoses: Alzheimer's disease; extrapyramidal and movement disorders; and other degenerative diseases of nervous system, not elsewhere classified (ICD-10 classes G30, G20–G26, and G31 respectively) [20].

Although in Poland responsibility for LTC tasks is divided between medical care and social care, with a significant participation from NGOs and the private sector, a significant proportion of the dependent elderly receive either no support or support inadequate to their needs; access to this care is difficult, limited by highly formalized and bureaucratic entry procedures. The coordination of actions of medical care and social care is difficult, and their efficacy is limited, as they are independent of each other in all important aspects: legal, formal, organizational, and financial. There is a gap in support services, including transitional care (providing patients who are leaving acute care facilities for transfer home or to LTC facilities with short stays at specialized wards or facilities specializing in treatment and rehabilitation) and respite care (allowing for time-limited relief care to prevent burn-out in informal caregivers [2] and possibly also limiting the scale of domestic violence against isolated elderly people, which is still underestimated, as even 75% of victims do not report it [35]).

The medical services delivered to elderly people by different kinds of providers – including hospitals, LTC facilities, outpatient and ambulatory specialist medical consultation offices, emergency medical care, and primary medical care – all need synchronization, especially as the role of family medicine as a medical specialty and its intended place in the Polish healthcare system needs further defining in the context of the demands of the aging society [36]. The exacerbating problems of social and health care in aging society call for urgent action, but even drastic financial and organizational changes will not solve the problem, given the limited availability of care and medical staff in the short term [37]. As the number of people 80 years and older is expected to rapidly rise in Polish population – reaching about 10% of the general population and around 25% of the population of the elderly by the year 2050 – it is clear that more geriatric and palliative care specialists are needed, as there are currently only around 300 physicians specializing in geriatrics in Poland, who practice mostly in urban areas. The actual demand for geriatric physicians is from 2.5 [2] to as much as 5 times higher [27]; the number of beds in specialized geriatric hospital wards is ten times less than the recommendation of the World Health Organization, given the size of the Polish population; the number of specialized geriatric ambulatory facilities should thus be increased by a factor of five [2]. Many Polish physicians specialized in geriatrics are not currently working as geriatricians on account of the lack of geriatric medical facilities that could employ them [18]. The training programs for the other medical staff who take care of the increasing number of patients in the 65–79 age group need ongoing adjustments to meet the emerging problems; this especially concerns physicians who take care of elderly patients on an everyday basis, such as those working in emergency medicine, internal medicine and, especially, family medicine specialists [38], who are practically "first-line geriatricians". It is estimated that currently each primary care physician practicing in Poland takes care of an average of 250 elderly patients [2]. The complex nature of geriatric care demands from primary care physicians rising levels of organization and management competences, including learning how to apply new coordination tools, like process mapping [39].

Guidelines for primary care physicians

Primary care physicians in Poland should take into the consideration the current demographic trends and include geriatric competences into their future continuous professional development schedules.

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Address for correspondence:
Robert Susło, MD, PhD
Zakład Gerontologii
Katedra Zdrowia Publicznego UM
ul. Bartla 5
51-618 Wrocław
Polska
Tel.: +48 71 347-90-29
E-mail: robertsuslo@gmail.com

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REVIEWS

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Fostering digital literacy in the elderly as a means to secure their health needs and human rights in the reality of the twenty-first century

ROBERT SUSŁO[1, A, B, D–F], MATEUSZ PAPLICKI[2, B, D], KAROL DOPIERAŁA[2, B, D], JAROSŁAW DROBNIK[1, A, D]

[1] Gerontology Unit, Public Health Department, Health Sciences Faculty, Wrocław Medical University, Poland
[2] Developmental Age Traumatology and Emergency Medicine Unit, General Medicine Department, Wrocław Medical University, Poland

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Summary The rights to life and health are basic human rights but, as life spans increase and societies age, these rights become increasingly difficult to secure. The number of people needing care, nursing, and medical treatment increases – and their expectations of quality of life rise – faster than the available financial assets and workforce. The article aims at defining the influence of digital literacy of patients and digital-based medical services availability on perspectives of fulfilling health-related needs specific for ageing societies. A variety of information and communication technologies (ICT) solutions can deliver at least temporary relief to countries suffering from these problems, assuming that the potential beneficiaries are able and willing to use such methods. It is thus worthwhile to foster digital literacy, especially among middle-aged and older people. ICT-based solutions include a variety of more or less technologically advanced, sophisticated, and easy-to-use services, many of which have been in operation and common use for decades, and are thus ripe for medical application. Such technologies can create a highly complex system of interconnected electronic tools and information systems operating on sensitive medical data that must remain confidential. These systems aim to increase patients' medical safety and maximize their quality of life, but they also pose serious threats to their privacy. Confidential data are protected by legal regulations, including the recently introduced European General Data Protection Regulation (GDPR), but primary care physicians should not be discouraged by this from implementing ICT-based solutions into their practices, as they may significantly lessen their everyday workload.
Key words: biomedical technology, primary health care, aging, data anonymization.

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The human right to health

Article 25 of the 1948 Universal Declaration of Human Rights states that every person has the right to a standard of living adequate for health and well-being, including food, clothing, housing, medical care, and necessary social services, and the right to security in the event of sickness, disability, old age, or lack of livelihood in circumstances beyond his or her control. Motherhood and childhood are entitled to special care and assistance [1]. The 1950 European Convention on Human Rights does not directly refer to health, but article 2 enforces protection of the human right to life [2]; however, the European Court of Human Rights has pointed out in several rulings that this article can be violated by a systemic or structure-based lack of access to health care of reasonable quality to individuals [3]. The European Union's Charter of Fundamental Rights, which was published in 2000 and came into force in 2009, provides safeguards for both the right to life (article 2) and guarantees for health, encompassing the right to access preventive health care and the right to benefit from medical treatment under the conditions established by national laws and practices (article 35), as well as the right to work under conditions that respect the health, safety, and dignity of both adult workers (article 31) and younger working people (article 32) [4]. The article aims at defining the influence of digital literacy of patients and digital-based medical services availability on perspectives of fulfilling health-related needs specific for ageing societies.

Health needs in aging societies

According to the Constitution of World Health Organization (WHO) "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" while "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition" [5]. Unmet health needs are often matched with patients' strong desire for their fulfillment, especially in dependent old patients [6]. The number of older community-dwelling individuals is on the rise in developed countries, and an increasing number of these are housebound because of functional impairments that preventing them from leaving their homes; some are partly housebound and are capable of leaving home only with assistance. In the United States in 2011, it has been estimated that 5.6% of the elderly population fall into this category [7], which corresponds to 3.6 million people

who need home-based care, as they suffer from multiple coexisting illnesses of both medical and psychiatric nature more often than the general elderly population. These conditions typically include metabolic, cardiovascular, cerebrovascular, and musculoskeletal diseases, cognitive impairment, dementia, and depression [8]. This group has special needs resulting from its sociodemographic characteristics, living environment barriers, and coexisting chronic diseases, which translates into an increased use of health care and social services [9], and a greater burden on informal caregivers [10]. The generally accepted solution to this is to develop various forms of home respite services to alleviate the load and stress on informal caregivers [11], although the objective evidence for the positive effects of such services is considered limited and weak by some studies [12]. Informal caregivers generally appreciate any form of support and respite care, especially that which provides them with some time off, but they also seek communication with other informal caregivers and information from professional caregivers. However, the scope of the desired support varies widely, and depends on the individual caregiver and care recipient, on the specifics of the caregiving situation, and on the formal or institutional environment [13]. The need to increase the quantity, quality, and flexibility of support and respite services is stressed by informal caregivers [14]. The true extent of the demand for support and respite services is hidden, as many informal caregivers do not readily ask for these, despite the fact that they objectively need them [15].

The other side of the coin is that attitudes are changing towards aging processes, old-age lifestyles, and the behaviors presented by comparably healthy retired people of both sexes, even in the oldest age groups – including the changing demand for medical services [16]. The desire to stay healthy, even towards the end of life, without giving up on plans, is consistent with increasing life expectancies [17]. As both the chance of reaching old age and health in old age are largely predetermined by genetic predispositions and modifiable factors, such as environment and lifestyle, with proper public health policy, the onset of age-related physical and intellectual deterioration can be significantly delayed and managed – a feat which will in the coming decades seriously involve the activities of primary care physicians [18]. Japan presents a good example of the changes expected to arrive in Europe with increased average lifespan and declining birth rates. Population aging in Japan has reached an extent unknown in any other society: by 2013, 25% of the population were 65 years or older, and 12% were 75 years or older; Japanese society continues to age and by 2060, these percentages are expected to reach 40% and 27%, respectively [19].

Digital literacy

Electronic medical services are being more widely introduced in developed countries. Interaction with information systems can be difficult for many older people, many of whom lack digital literacy, which is defined as possessing the general competences that allow interaction with information systems. On the other hand, medical literacy refers to a background level of basic medical knowledge allowing the use of medical resources in a meaningful and effective way. Such resources now include not only printed materials but increasingly websites, e-mails, electronic messages, computer files in different formats on different media or online, electronic medical records (EMR), and other remote databases [20]. A person's level of digital literacy is inversely linked with their level of anxiety around tools and services based on information technologies [21]. There is a direct link between the frequency of contact with information and communication technology (ICT) and positive attitudes towards ICT, including decreasing anxiety, though this has been clearly demonstrated only in men [22]. Elderly people's attitudes towards ICT also seem to be modifiable, although they are commonly believed to have more negative attitudes toward ICT than younger people: they feel on average less comfort, efficacy, and control over ICT tools and services, but their attitudes toward technology improve with experience, as in others [23], even after two weeks of training [24]. However, this does not change the general observation that, on average with increasing age of ICT users, response time becomes longer, the number of errors rises, and the subjective perception of fatigue and of the difficulty of the tasks increases [25]. Other user-independent phenomena, such as the unexpected crashes and slowdowns which are common with ICT tools and services, often cause significant additional burden to elderly users [26]. It was confirmed that also in Poland, on average, the older the person the less likely he or she is to search the Internet for medical knowledge [27].

As health literacy and digital literacy are increasing closely linked in modern societies, a lack of digital literacy should be considered an important factor discriminating against access to medical services in the modern world; interestingly, this can work both ways, as elderly people with low health literacy are generally less likely to use and benefit from electronic medical resources [20]. To make decisions concerning health, people now need increasing amounts of information and, as access to health information is provided largely through various ICT systems, especially internet-based services, they thus require skills such as the ability to search, evaluate, and employ information acquired online [28]. Medical education is increasingly provided in the form of multimedia, which has been demonstrated to be more effective not only than no education at all, but also than the standard clinical care education provided by health professionals, as medical personnel members tend to be overloaded with work and often lack the time for the prolonged interaction with patients needed for proper education [29].

Digital-based medical services

With the aging of society, medical services are supposed to be adjusted and the paradigm of health care provision is expected to change from hospital-centered medical care oriented towards healing to community-rooted medical care aiming at both healing and support [19]. Providing care to an increasingly large dependent aged population increases the societal burden, calling for new solutions to avoid structural and systemic collapse as a result of increased lifespans [30]. Modern technologies can be used to a wide variety of ends, including the delivery of education and shaping behavioral skills, and these ends can be achieved by enhancing communication between patients and health professionals; maximizing patients' motivation, individual self-management, efficacy, organization, and adherence in intervention-demanded activities, especially by using reminders and providing feedback on progress; facilitating the management and self-monitoring of health condition and disease by the patient; providing the patient with education on the condition or disease, its prevention, monitoring, and treatment; supporting adherence to medical procedures, particularly by using reminders; providing the patient with the opportunity to communicate with other patients with similar conditions, especially via electronic discussion boards or peer-to-peer networks; supporting the process of proper informed decision making for both patients and their caregivers; and collecting or capturing data originating from both the patients and their caregivers [31].

Modern technologies allow for the delivery of medical interventions in many ways, particularly using older mobile phones; software-enhanced and internet-enabled smartphones; other internet accessing devices such as personal computers (PC), portable computers, and tablets [31]. Some technologies seem to be more easily introducible than others: for example, mobile phones have been in wide use for over two decades, and their Short Message Service (SMS) and Multimedia Message Service (MMS) facilities do not require high levels of digital literacy; they

are thus generally well-accepted by patients as a means of communications with both medical professionals and healthcare institutions. Those services are cheaper than the alternatives, such as postal reminders and phone calls [32], and more convenient for medical staff, as they allow a significant level of automation of the process of both sending and receiving messages, thus proving effective both for health promotion and prevention [33] and in the management of long-term health-related conditions and illnesses, such as obesity, diabetes, hypertension, and asthma. SMS and MMS have proved to be more efficient than e-mail prompts in ensuring patient compliance, for example in the regular use of prescribed drugs, sending results of tests, or attending scheduled visits [34].

Smartphones present some difficulties for older people with vision impairments and psychomotor limitations, as they require more accurate pointing with the fingers and their small size can be difficult to operate. However, they are still very promising tools, as they are internet-connected and software--enabled, which makes them flexible and allows them to be used as a single means for communication, education, reminders, and feedback, leading to better control of chronic diseases and resulting in better health outcomes [35]. Smartphones and other wireless internet-enabled wearable electronic tools, such as smartwatches and specialized trackers are equipped with Global Positioning System (GPS) receivers, allowing their location to be tracked; this can serve as a feasible assistive technology for caregivers of patients with mental disturbances, including the elderly suffering from dementia [36]. At present, the distinction between larger smartphones and smaller tablets is becoming blurred, it can be expected that the uses of tablets will also prove to be numerous, not only as they can serve as a means of connection to medical information sources and medical professionals, but also because they can help overcome old-age physiological limitations, such as improving the reading performance of low-vision patients. Unlike classic tools, the positive effects improve significantly with the users' growing experience with them [37]. Previously employed technical solutions to the low-vision problem have included handheld or static magnifying lenses, systems based on closed-circuit television (CCTV), and head-mounted video magnifiers (low-vision enhancement system, LVES), but as these operated on the basis of the object's view, rather than on the viewed object itself, they had numerous limitations, including a restricted range of magnification [38]. These limitations are absent in the case of electronically generated images on tablets.

There are many portable, wearable, and even implantable medical hardware and software solutions, with varying ranges of ease of use, which have been developed to fulfill one or more functions such as reminding; remote supervision; monitoring; alarming; emergency contact; storing, aggregating, and sharing medical data locally or in the cloud; tracking and emergency location; medical advice and consulting; automated diagnosis support; remote diagnosis; intervention guidance and remote treatment; and documenting [39].

Medical data security

The recently introduced European General Data Protection Regulation (GDPR) [40] requires that providers of care and medical services implement strict data privacy protection and patient consent procedures; that they use means of control for collecting, accessing, and sharing data; and that they ensure broad acceptance of the privacy and security culture by all staff of medical facilities. At the same time, securing elderly patients' health needs increasingly relies on a multidimensional approach that combines multiple services, engaging more medical, care, support, and technical staff from different facilities, and employing more data-dependent technical devices and information systems; all this demands the rapid acquisition, exchange, integration, and sharing of the medical data of larger numbers of patients, which means it becomes a complex, demanding task to adequately preserve patients' privacy and autonomy [41].

Although many modern medical technological solutions foster elderly patients' independence and self-reliance, there is always a trade-off in the case of privacy and security. If modern technology-supported care is to extend to cover an increasing number of older people, it needs to continue to seek the optimal point of dynamic balance [42]. It needs to be stressed that the actually achieved level of medical data security depends not only on the built-in safeguards of the ICT systems but also on the medical personnel and their steady efforts while operating those systems [43].

Guidelines for primary care physicians

Both the assets and resources of health care systems are limited in an aging society. In order to utilize them optimally in primary care practice, it is useful to actively seek new medical ICT solutions and incorporate them into existing systems in medical facilities. It is also crucial to advise middle-aged and elderly patients, as well as their caretakers, of existing ICT-based opportunities, to direct and encourage them to gain experience in using ICT services as early as possible in their lives, so as to foster and sustain positive attitudes towards such services. It is important to start with technologies that are well accepted by patients, and then proceed to more advanced ones. In introducing any new ICT solution, the primary care physician needs to follow the applicable legal regulations on medical data security and information confidentiality, and especially the newly introduced GDPR.

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Address for correspondence:
Robert Susło, MD, PhD
Zakład Gerontologii
Katedra Zdrowia Publicznego UM
ul. Bartla 5
51-618 Wrocław
Polska
Tel.: +48 71 347-90-29
E-mail: robertsuslo@gmail.com

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Recommendations of the Polish Society of Physiotherapy, Polish Society of Family Medicine and College of Family Physicians in Poland in the scope of physiotherapy in painful shoulder syndrome in primary healthcare

KRZYSZTOF KASSOLIK[1, 2, D–F], ELŻBIETA RAJKOWSKA-LABON[1, 3, D–F], TOMASZ TOMASIK[4, 5, D–F], KRZYSZTOF GIEREMEK[1, 6, D–F], ANNA DOBRZYCKA[3, D–F], WALDEMAR ANDRZEJEWSKI[1, 2, D–F], MAREK KILJAŃSKI[1, 7, D–F], DONATA KURPAS[8, 9, D–F]

[1] Polish Society of Physiotherapy, Poland
[2] Department of Physiotherapy, Academy of Physical Education in Wroclaw, Poland
[3] Department of Physiotherapy, Medical University of Gdansk, Poland
[4] College of Family Physicians in Poland
[5] Department of Family Medicine, Chair of Internal Diseases and Gerontology, Jagiellonian University Medical College in Krakow, Poland
[6] Academy of Physical Education in Katowice, Poland
[7] University of Computer Science and Skills, Lodz, Poland
[8] Polish Society of Family Medicine, Poland
[9] Department of Family Medicine, Wroclaw Medical University, Poland

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Summary The objective of these guidelines in the scope of physiotherapy in primary healthcare is to suggest simple, uncomplicated and more cost-effective physiotherapeutic activities in patients experiencing pain due to painful shoulder syndrome. A general practitioner should decide whether the treatment undertaken within primary healthcare, including the process of physiotherapy, is effective and sufficient, or whether it requires more advanced activities, such as advanced diagnostics and further specialist treatment. The authors of the recommendations, apart from massage, also include procedures in the scope of kinesiotherapy, physiotherapy and orthopedic equipment. According to the authors, the aim of recovering the correct spatial system, called structural homeostasis, in the shoulder girdle, is, first of all, normalization of muscle tension and then inclusion in a rehabilitation program covering the methods to recover and consolidate the correct models of motor activity. The starting point for determining a rehabilitation program should be the ability to prepare a simple assessment of the patient's condition. This may result from a palpation examination to determine the incorrect distribution of resting tension in the area of the muscles and tendons engaged in the pathology and causing pain. The authors believe that such a solution contains the key to reducing the costs of treatment, providing access to physical therapists and quick assistance in the scope of improvement of a patient's clinical condition. At the same time, they emphasize the need to correct the previous healthcare model, so that it becomes a more effective tool in maintaining health.

Key words: general practitioners, shoulder pain, rotator cuff, shoulder injuries, shoulder impingement syndrome.

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Background

Pain associated with the musculoskeletal system is one of the most frequent causes of consultation in primary healthcare and usually affects more than one area of the body [1–3]. The third most frequent type of pain [4, 5], after back and hip pain, is painful shoulder syndrome, which constitutes a common problem in adults and has a negative effect on the ability to work, to perform everyday activities (driving, getting dressed, combing one's hair, preparing meals, eating), on sleeping and on the general quality of life [2, 6–9]. According to observations, the pains associated with painful shoulder syndrome are often chronic and recurring, and 40–50% of patients report persistent symptoms after 6 to 12 months, while 14% of patients continue treatment after 2 years [9].

Furthermore, it has been recorded that 10% of all referrals to physical therapists are associated with pain in the area of the shoulders [7]. With an ageing society and the relationship between more shoulder pain and age, according to estimates, more and more people with this diagnosis are going to report to their general practitioners [10].

As follows from a data analysis conducted in New Zealand, shoulder pain causes 14.7 persons per 1000 patients [11] to seek medical attention from family physicians, while in the Netherlands – 34 per 1000 [4].

Chester et al. indicate that the period of 2011–2012 was the first in Great Britain to record more cases of upper limb pain than cases of pain of the lumbosacral area [12].

In the Netherlands, clinical guidelines for general practitioners in the scope of treating patients with shoulder pain and recom-

mendations issued by the Dutch Society for Physical Therapy for patients with suspected pain in the subacromial area are applicable. Physicians jointly determined a classification of patients with non-specific shoulder pain into three subgroups: the first subgroup is patients with pain during abduction (located in the subacromial space), the second one – patients with passive movement limitation (pain of the shoulder joint), and the third one – patients with pain during abduction and passive movement limitation (instability, pain of the acromioclavicular joint or neck) [4].

A tendency for chronic shoulder pain lasting over 6 months has been observed in working people [3]. Half of the patients reporting this problem to their general practitioners manage to recover in half a year, and just 60% – in a year [13]. The results of the lengthiness and poor effectiveness of treatment of painful shoulder syndrome are long periods of absence from work, and even cases of losing one's job, as well as rising costs of treatment [1, 14, 15]. The costs associated with treating and diagnosing shoulder pain in primary healthcare are not known in detail. According to estimates (based on Swiss and Swedish data), 47–87% of the costs of treatment are associated with absence from work. It has also been observed that patients with direct access to physical therapists incurred lower costs related to healthcare [12]. In 2000, in the United States, the annual cost of treating patients with shoulder pain amounted to USD 7 billion [16]. The outcome of the therapy is affected by the period between the first incident of pain and the introduction of treatment, as painful shoulder syndrome is associated with pain in the area of the neck, and if lasting too long, it results in unsatisfactory results of primary care treatment [17]. Similar conclusions were included in a systematic review of 2013, which indicated that working patients aged 45–54 with chronic shoulder pain of significant intensity demonstrated worse results in the scope of physical therapy [12].

In the USA, ca. 4.5 million patients a year report to their physician, usually because of shoulder pain and incapacity resulting from rotator cuff impingement syndrome [16].

Shoulder pain, in particular the pain associated with rotator cuff impingement syndrome, is a common pain reported to a general practitioner. It follows from the research available that the general success ratio of conservative treatment is ca. 75% [18]. Research conducted on cadavers and radiological analyses demonstrated rotator cuff impingement syndrome in at least 10% of people aged 60 in the USA [19]. The estimated number of surgeries in this country resulting from rotator cuff impingement syndrome every year is between 75,000 and 250,000 patients. This number indicates that less than 5% of the patients in the USA with this type of damage were treated surgically [20].

On the basis of available literature, the authors noted that the key aspect of treating patients complaining about pain of the musculoskeletal system is cooperation between general practitioners and physical therapists [8, 9, 21–23]. The application of specialist diagnostic tests (MRI, ultrasound, arthrography, MRA) [24] should be proposed only at a later stage of treatment if physical therapy is not effective and if surgery is taken into account. [8]. As a result, it seems necessary to introduce systemic changes in diagnosing and treating patients with painful shoulder syndrome at the level of general practitioners. The recommendations include simple solutions, taking into account acting at the stage of first contact between patients and physicians. The authors present diagnostics of painful shoulder syndrome with diagrams supplemented with physiotherapy procedures, including massage, physical therapy, kinesiotherapy and orthopedic equipment, as well as emphasize the role of education and self-therapy.

Objectives

The objective of these guidelines in the scope of physiotherapy in primary healthcare is to suggest simple, uncomplicated and more cost-effective physiotherapeutic activities in patients experiencing pain due to painful shoulder syndrome.

Methods

Experts from the Polish Society of Physiotherapy, Polish Society of Family Medicine and College of Family Physicians in Poland conducted a detailed review of published scientific evidence associated with application of physiotherapy in painful shoulder syndrome in the years 1998–2018, published in the following databases: Pub Med, Cochrane Library. The search for articles was based on the following keywords: shoulder pain, pain, rotator cuff impingement syndrome, epidemiology, etiology, risk factors, guidelines. Of the articles found, the authors selected those that are comparable with the Polish primary healthcare system. A model of physical therapy procedure in patients with pain in the area of the shoulder was presented.

Definitions

As diagnostics of painful shoulder syndrome are complex, literature lists several conditions associated with pain in the shoulder joint, and the classification is mainly based on Codman's publication "The Shoulder". The following were differentiated:

- rotator cuff impingement syndrome,
- tendinopathy musculus biceps brachii,
- disorders in the area of the acromioclavicular joint,
- adhesive capsulitis (frozen shoulder),
- injuries of the shoulder joint (dislocations, fractures),
- non-specific shoulder pain [23, 25, 26].

Below can be found definitions useful in diagnosing pathologies connected with painful shoulder syndrome:

a) rotator cuff impingement syndrome (RCIS). Lädermann et al. considers rotator cuff impingement syndrome to be a condition in which at least two tendons are completely torn. Apart from torn tendons, at least one of the two tendons must be located behind the apex of the head of the humerus bone [27]. The clinical advancement in this diagnosis is determined by the number of injuries of the shoulder joint rotator tendons. Collin et al. classified impingements of the apex into 5 categories, A–E, depending on the location and number of damaged tendons. In turn, Cofield based his clinical classification on the size of damage. He listed: small (up to 1 cm), medium (1–3 cm), large (3–5 cm) and massive (over 5 cm) impingements of the tendon [27].

b) tendinopathy musculus biceps brachii. The most typical symptom is pain in the intertubercular groove of the arm, intensifying during compression [28]. Singajaru et al. claim that the main cause of pain in the anterior part of the shoulder is pathology of the LHBT (long head of the biceps tendon) [29].

c) subacromial impingement syndrome (SIS), commonly referred to as subacromial conflict. Pains are defined as pain in the shoulder joint radiating to the area between the neck and the elbow. A gradual deterioration of the motion range and intensification of pain during movements of the upper limb over the head is observed [25].

d) frozen shoulder syndrome (FSS). The current definition used by American surgeons, specialists in pathology of the shoulder and elbow joints, associated with adhesive capsulitis is as follows: "a condition of uncertain etiology, characterized by significant limitation of the active and passive movements of the shoulder, appearing in the absence of a known unequivocal internal dysfunction of the shoulder-blade" [30]. Le et al. define frozen shoulder syndrome as a pathological process caused by inflammation of the joint capsule and its arthrofibrosis caused by excessive scar tissue or adhesion in the area of the whole shoulder joint, leading to rigidity, pain and dysfunction [31].

Epidemiology

Painful shoulder syndrome appears in 18–31% of the total population [7]. According to estimates, in Great Britain, this

affects 14% of the British population [23]. In Europe, shoulder pain appears in 19% of the total population [32]. Of all the reported complaints of this area, SIS is the most frequent disorder and appears in 89% of all the reports submitted to general practitioners and physical therapists [33].

Complaints of the arm, neck or shoulder constitute a large proportion of work-related musculoskeletal disorders. It follows from research conducted on the Dutch population that after 12 months, 58% (n = 404) of persons suffering from chronic pains used the assistance of a general practitioner, specialist or physical therapist [34]. Medical advice associated with chronic CANS was provided to females more often than males (7.0% and 4.1%, respectively). What is more, the rate of using medical assistance by persons with chronic CANS is higher in the working population than among the unemployed [34]. It should be emphasized that CANS results from multiple factors. Predispositions include: psychosocial properties, personal and environmental factors. The significance of every element in causing pain is different and depends on the character of work [25, 34].

A review of literature indicates a significant correlation between pain of the musculoskeletal system and the type of work (work-related musculoskeletal disorders) [35, 36]. The high-risk group includes persons working with computers and manual workers. According to studies conducted on 513 office workers, 50.5% of them reported shoulder pain [37]. In this group of patients, the pain correlates to age and work experience [38]. It should be noted that, in most cases, their pain was non-specific [26]. Painful shoulder syndrome also often appears in healthcare professionals. The most exposed groups are nurses, physical therapists and dentists, of whom 23.5% report shouldered pain [39]. According to other reports, the above problem appears in 40% of nurses, midwives and physical therapists [40] and 18% of dentists [41]. It follows from the latest research that 52.39% of nurses above the age of 26 experience shoulder pain, mainly resulting from working over 40 hours a week [42]. Of those operating ultrasound equipment, 66.1% reported the above-mentioned issue on the left side of their body [43]. It follows from research into location of the pain in the musculoskeletal system and analyzing its occurrence in terms of frequency and prevalence that the percentage of patients with painful shoulder syndrome changed between 38% and 58% in the examined population, depending on the source [44]. Under the 2018 meta-analysis, the issue related to rotator cuff impingement appeared in 18% (300 of 1,513) of surgeons. The researchers emphasized the lack of awareness of the risks and the need for promoting knowledge of work ergonomics [45].

3–5% of the population is diagnosed with "frozen shoulder syndrome", usually people with diabetes and hyperthyroidism aged 40–59 [31, 46]. The pains may appear suddenly and progress gradually.

Shoulder pain may also be associated with certain sports disciplines. Of 340 athletes, this was experienced by 43.5% of people, of whom the highest ratio was people training at handball and judo [47]. It follows from other research that 40% of female volleyball players experienced non-traumatic shoulder pain, but only 33% of them took a break from training to treat it [48]. Other athletes exposed to shoulder joint injuries are tennis players [49] and disabled athletes in wheelchairs (16–76%) [50].

Etiopathogenesis

Due to the complexity of the causes of shoulder pain, the process of diagnosing them sometimes requires detailed diagnostics. Pain in this area may appear in the course of: diseases of blood vessels, nerve diseases and injuries, internal diseases, developmental disorders [28].

Painful shoulder syndrome constitutes a complex diagnostic issue for general practitioners. When determining treatment, structural lesions are noticed only in some cases, and if they are not – they result in further progression of the dysfunction (rotator cuff impingement) [51]. Chronic, non-specific shoulder pain is a more and more frequent problem requiring medical advice [52]. The causes include psychosocial factors, such as stress at work, relationships with colleagues, somatization, anxiety, depression or depressive disorders [3, 26, 53]. Attention is paid to the relationship between the incidence of painful shoulder syndrome with an uncomfortable body position, a high degree of motor monotypy associated with the upper limb and excessive physical exertion of the upper limbs combined with lifting heavy items or lifting items above the head [51, 54, 55]. Other causes include: age, female gender, obesity, marital status, smoking, hypercholesterolemia, fibromyalgia, rheumatoid arthritis, multiple sclerosis, genetic factors and vibrations resulting from work-related requirements [10, 14, 26, 56].

Shoulder pain should be examined not only in terms of the shoulder joint itself, but of the whole shoulder girdle. The pathology may refer to anatomic joint connections (acromioscapular joint, sternoclavicular joint, acromioclavicular joint), functional connections (scapulothoracic joint, subacromial joint), as well as muscles, tendons, nerves and vessels. Due to the degree of complexity of the above-mentioned structures that are interdependent in biomechanical, anatomic and functional terms, diagnostics and differentiation between pains may sometimes prove unsuccessful or prolonged [2, 57].

Due to the extent of the pathomechanisms causing dysfunctions in the area of the shoulder girdle and the associated limitations, the authors of these recommendations emphasize certain pains of the shoulder caused by orthopedic pathologies and agree that, apart from physical therapy, in justified cases, more technologically advanced diagnostics and specialist treatment should also be used, e.g. in the scope of neurology, internal diseases, neurosurgery, vascular surgery, orthopedics. However, they emphasize that, regardless of the more or less complex causes or pathomechanisms of the shoulder, the clinical joint symptoms appearing even at the initial stage of development of painful shoulder syndrome, include pain, disrupted the distribution of resting tension in the soft tissues, limited functionality. A general practitioner should decide whether the treatment undertaken within primary healthcare, including the process of physiotherapy, is effective and sufficient, or whether it requires more advanced activities, such as advanced diagnostics and further specialist treatment. The authors believe that such a solution contains the key to reducing the costs of treatment, providing access to physical therapists and quick assistance in the scope of improvement of a patient's clinical condition. Below we refer to the most frequent clinical diagnoses leading to shoulder pain.

Rotator cuff impingement syndrome (RCIS) refers to the following muscles: supraspinous, subspinous, subscapular and teres minor muscles. Structural lesions are usually observed in people in their 50s and are associated with ageing. The pathology usually appears in the tendon of the supraspinous muscle. Imbalance in muscle tension in the area of the rotator cuff not only results in inflammation of their attachments, but also in instability of the shoulder joint. Rotator tendons may be damaged as a result of: degenerative lesions, recurring microinjuries or significant injuries (falling on a stretched arm, pushing or pulling of the limb with significant power, displacement of the shoulder resulting from excessive movements), atraumatic irritations (e.g. repetitive movements) and secondary dysfunctions [58].

Effects may include inflammation of the musculus biceps brachii. The cause of inflammation in that area may also be a past injury or excessive strain [26, 59, 60]. Physicians recommend an MRI to diagnose the causes of rotator cuff disorders. It follows from observations that 40% of persons without symptoms after the age of 50 demonstrate irregularities in such an image [58].

Tendinopathy musculus biceps brachii. This diagnosis rarely occurs as an individual clinical problem. The pain is often re-

lated to dysfunction of the supraspinous muscle [60, 61]. The joint occurrence of lesions is especially justified, as the research conducted by Braun et al. confirms the anatomic and functional relationships between the listed structures [62]. Tendons of the above-mentioned muscles are engaged in stabilization of the head of the humeral bone, and damage to one tendon may affect the functionality of the other [60]. The most frequent causes of LHBT tendinopathy include inflammatory, traumatic and degenerative factors [60].

Subacromial impingement syndrome. A lot of factors are associated with potential development of SIS, including: anatomic irregularities in the coracohumeral arch or the head of the humeral bone, ischemia associated with tension overload, recurrent eccentric overloads, incorrect kinematic patterns caused by debilitation of rotator cuff muscles and dysfunction of the scapula stabilizer muscles and body posture disorders [63]. It has been demonstrated that four independent risk factors are related to SIS [64]. The first one is cigarette smoking (7 times higher risk of development of SIS in comparison with non-smokers). Cause: debilitated vascularization and extended healing time caused by consumption of nicotine. The second one is sleeping position (sleeping on the side was demonstrated as causing a 3.7 times higher risk of development of SIS than sleeping in the supine position). The third one is the shape of the acromion (the risk of development of SIS increases 6.3 times in the case of the hook shape in comparison with the flatter shape). The fourth one is profession, sports and daily activities which may increase the risk of development of SIS (in particular movements of the limb that are repetitive, uncomfortable, overburdening or leading to improper posture) [65]. The dysfunction usually causes pain of the anterio-lateral part of the shoulder joint. Other authors believe the cause of pain is pathological overloading and microinjuries of the supraspinous muscle. Another etiology is balance disruption during activity of the deltoid muscle and rotator cuff muscles, leading to destabilization of the connection between the head of the humeral bone and the joint socket. In the advanced stage of the disease, the rotator cuff is partly or completely damaged, and joint arthritis appears. [66]. In 50% of patients with acute symptoms of SIS, after medical intervention by a general practitioner, the pain sometimes disappears after 6 months, and in 40% – after 1 year. These results suggest that the condition in 10% of patients suffering from acute pain will not improve satisfactorily. Furthermore, 50% of patients with SIS and chronic pain may expect a relapse after 10, 12 or 18 months of the occurrence of the first symptoms [14].

Frozen shoulder syndrome. The etiology is usually idiopathic, and symptoms appear without a recognized cause [31]. The symptoms that accompany pain include: debilitation, rigidity, crepitation, edema, fear of movement, sometimes imbalance [2]. The predisposing diseases include hyperthyroidism, diabetes, hyperlipidemia and cerebrovascular diseases. Trigger factors include: immobilization, emotional experiences, mental strain [31, 66]. The incidence frequency is also higher in patients with Dupuytren's disease and Peyronie's disease and in patients after surgery of the heart or of the cervical spine [67]. It usually appears in females aged 40–60 and affects the dominant hand [66]. Other researchers record higher predilection in white patients, patients with a positive family history and with a positive HLA-B27 antigen [68]. The course of the disease may be acute (< 6 weeks), subacute (6–12 weeks) or chronic (> 6 months). There are 3 stages of the disease: freezing, frozen and thawing [2, 67]. Some researchers indicate four phases in the course of adhesive capsulitis. The first phase may last between 3 and 6 months and is characterized by acute pain, usually while resting. In the next phase, the pain subsides, but the result of the first phase is stiffness and further limitation of movement in all directions. The third phase is characterized by limitation of passive and active movements in every plane. In the last part of the course of the disease, there is observed a smaller level of pain and stiffness and gradual recovery of lost functionality, but as many as 50% of the patients never regain full mobility as was before the disease [26].

In their publication, Georgiannos et al. refer to formal diagnostic criteria, which include: 1. pain and progressive stiffness of the shoulder joint for at least 4 weeks; 2. strong shoulder pain making daily activities or work difficult; 3. night pain; 4. painful limitation of the range of shoulder movements, both during passive and active operation (height < 100°, limitation of external rotation by 50%); 5. untypical radiological image [69].

Clinical picture

Shoulder pain may significantly affect the functioning of the whole upper limb. The initial pain comes from the tissues supporting the structure of the shoulder joint [2]. They usually appear in the superior-lateral part of the shoulder, which may radiate to the neck and elbow. It appears in the shoulder joint during passive and active movements and may appear at night [14].

a) Interview

During the interview with the patient, attention is paid to such information as: course of the disease, history of injuries, dominant side, pain location, direction of movement that provokes pain, character of pain, type of work, effect of pain on sleep, co-existing diseases [23].

b) Functional assessment and clinical tests

The most frequent tool for assessing pain is the visual analog scale (VAS) concerning general feeling, during active movement and while sleeping. The active range of movement is then measured (flexure, extension, abduction, adduction, internal and external rotation) using a goniometer or tape measure [52]. Functional assessment usually consists of a Constant-Murley Score (CMS) questionnaire and a Shoulder Pain and Disability Index (SPADI) [70, 71]. Another useful test for identification of rotator cuff damage is a scapula stability test and a test of passive abduction in the patient's shoulder joint. Pain during movement means the result of the test is positive [72]. Damage to the tendon of the biceps brachii muscle is demonstrated in difficulty with flexure while lifting items to the height of the chest and pain in the anterior part of the shoulder [73]. Adhesive capsulitis is characterized by pain during passive external rotation movement of the shoulder [31, 74]. Detailed diagnostics associated with choosing a specific test for examining shoulder joint dysfunctions and the methods of performing them exceed the main purpose of this study.

c) Palpitation examination

During palpation examination of patients with shoulder pain, it is important to understand the anatomical connections and relationships in the discussed area. The basic anatomic structures include: proximal part of the humerus, the clavicle, scapula and ribs, the cortical and thoracic areas of the spine, as well as the muscles, tendons and ligaments surrounding and stabilizing these structures [2]. Assuming that the basic therapeutic objective of a general practitioner is reduction of pain in the shoulder, recovering the range of movements and improving functionality, it is necessary to conduct a palpation examination in order to obtain information on which muscles demonstrate intensified tension and tenderness and which limit movements. This may be conducted by checking the pressure sensitivity in the areas of their attachment, as presented in Table 1 [75–77].

Table 1. Palpation examination of pressure sensitivity of muscles and tendons – painful shoulder syndrome [76–81]

Muscle/tendon/nerves	Examination area	Commentary
longissimus muscle levatores costarum muscles 1–5	transverse processes of the thoracic vertebra $Th_{1–4}$	in order to exclude irritation of the top five intercostal nerves: additional palpation examination on costal cartilage 1–5 in the area of the sternum (if pressure sensitivity appears in this place, it may indicate irritation of intercostal nerves and thus increased sensitivity of the top five ribs with the muscles attached to them: serratus anterior muscle, pectoralis minor and major muscles, intercostal muscles; this is why it is accompanied by painfulness on the upper part of the scapula, coracoid process of the scapula and the greater tubercle of the humerus. In this case, we should start by normalizing the resting tension of the levatores costarum muscles and by eliminating pressure tenderness in costal cartilage 1–5
serratus anterior muscle levator scapulae muscle rhomboid minor muscle supraspinatus muscle	superior angle of the scapula	the examined muscles are attached in this spot; pain of the posterior part of the shoulder
pectoralis minor muscle coracobrachialis muscle biceps muscle – short head	coracoid process of the scapula	pain in the superior-anterior area of the chest and problem with lifting and abducting the upper limb
supraspinatus muscle infraspinatus muscle teres minor muscle	greater tubercle of the humerus	point in the anterior area of the shoulder and problem with abducting and lifting the upper limb
scalene muscles	transverse processes of cervical vertebra $C_{3–6}$	possibility of occurrence of irritation of the brachial plexus (between scalene muscles), which may be demonstrated by disruption in feeling in the whole hand
teres minor muscle	lateral side of the scapula in 1/3 of its central part	increased tone of the teres minor muscle may cause reduction of the quadrangular space housing the axillary nerve and the posterior circumflex artery of the arm, thus disrupting the functionality of the deltoid muscle
pectoralis major muscle	crest of the greater tubercle of the humerus	point in the anterior area of the shoulder and problem with horizontal abduction of the upper limb
latissimus dorsi muscle	lateral area of the spinous processes $Th_{5–7}$. External lip of the iliac ala at its highest point	spot pain between the scapulae at the height of $Th_{5–7}$ and difficulty with lifting the upper limb
trapezius dorsi muscle: ascending part transverse part descending part	triangular beginning of the scapula spine; upper border of the scapula spine; upper border of the shoulder end of the clavicle	difficulty with lifting the upper limb, pain between the scapulae, pain in the temporal area of the head caused by increased tension of the temporal fascia being in structural contact with the galea of the head and with the descending part of the trapezius dorsi muscle
deltoid muscle: anterior part central part posterior part	upper arm protuberance of the humerus	difficulty with abducting and lifting the upper limb

Table 2. Physiotherapy in painful shoulder syndrome [31, 33, 57, 63, 69, 70, 87–93, 96–100, 103–109, 113]

Muscles/ligaments/ /fasciae	Automassage	Massage	Auto-physiotherapy	Physiotherapy	Auto-kinesiotherapy	Kinesiotherapy	Orthotic equipment
longissimus muscle, levatores costarum muscles 1–5	rubbing in the area of the intermediate line of the sacral bone at the attachment of the lateral side of the longissimus muscle and on the nuchal line of the lower occipital bone – at the place of attachment of the longissimus muscle	flexor halluces longus, tibalis posterior (spot rubbing on terminal attachments), semitendinosus and semimembranosus muscle, gluteus maximus, longissimus capitis, levatores costarum muscles 1–5 until disappearance of pressure pain on the cartilaginous elements of the ribs (1–5)	hot or cold compresses (depending on patient's condition – acute, subacute or chronic condition, and on tolerance of thermal stimuli), application of painkilling ointments or creams or non-steroid anti-inflammatory drugs after warming the place of application up, Biopron lamp or led therapy or IR, TENS currents using small battery-powered devices, – an outstanding supplement is brine baths with mud extracts and baths with special inserts that generate water pearling or even ozone, – as a preventive or autotherapeutic element – also use of the sauna or bathhouse, many patients have access to magnetic mattresses, on which they can only sleep or take treatments twice a day	the objective of treatments using physical stimuli is to fight pain, to increase muscle flexibility and movement range, to improve trophy, to recover functionality and to generally improve life quality, after eliminating the contraindications, the physical therapist will act using its equipment (the same effects may be achieved through different procedures), the application may be local or based on the distribution of segmental innervation or peripheral nerves; one may combine physical stimuli from various groups (electrotherapy, light therapy, low-frequency pulsed magnetic field, UD, high-frequency electromagnetic field) in order to make the stimuli complementary and adequate to the reported symptoms and objectives of therapy	program of exercises to be performed at home (autotherapy), muscle tension normalization using simple techniques: TEM, stretching, re-learning correct posture	– special exercises: deep stabilization of cervical spine, – exercises improving correct alignment in the shoulder joint, – immobilization in some cases, – exercises increasing flexibility of the shoulder girdle muscles, spine muscles, upper limb, – exercises supporting rotator cuff muscles, – exercises in activating assisted movement (active with support, passive exercises, active exercises with support and with resistance), – exercises aimed at improving the range of movements (ROM) of the shoulder girdle (active exercises, active exercises with resistance), – mobilization techniques (TEM), – home exercise programs, – dynamic scapula stabilization exercises (using closed and open kinematic chains for the shoulder girdle), – exercise the ability to position and recreate the correct movement patterns – motor control exercises (kinetic control)	– braces for the shoulder joint for early intervention in preventive treatment and physical therapy of the shoulder, – flexible stabilization brace, incomplete support, short, – regulated stabilization brace, incomplete support, short, – flexible stabilization brace, incomplete support, long, – rigid stabilization brace with capacity for movements, incomplete support, – full support brace of the character of a sling
m. serratus anterior muscle levator scapulae muscle rhomboid minor muscle supraspinatus muscle	displacement and rubbing of the thoracolumbar fascia, middle part of the deltoid muscle	displacement and rubbing of the thoracolumbar fascia, middle part of the deltoid muscle, supraspinatus muscle, rhomboid muscle, levator scapulae muscle					
biceps muscle – short head coracobrachialis muscle pectoralis minor muscle	displacement and longitudinal kneading of the biceps muscle, rubbing of the coracobrachialis muscle	stroking of the biceps muscle, of the coracobrachialis muscle and at the end of the pectoralis minor muscle					
supraspinatus muscle infraspinatus muscle teres minor muscle	kneading and rubbing on the lateral edge of the scapula	stroking of the supra- and infraspinatus muscle and of the teres minor muscle, stroking of the lateral quadrangular space in order to normalize the functioning of the axillary nerve and posterior circumflex artery of the arm					

Table 2. Physiotherapy in painful shoulder syndrome [31, 33, 57, 63, 69, 70, 87–93, 96–100, 103–109, 113]

Muscles/ligaments/ /fasciae	Automassage	Massage	Auto-physiotherapy	Physiotherapy	Auto-kinesiotherapy	Kinesiotherapy	Orthotic equipment
scalene muscles	rubbing on the dorsal surface of the sacral bone, stroking and displacement of the neck fascia	gluteus maximus, biceps femoris, semitendinosus, semimembranosus muscle, erector spinae muscle, neck fascia, scalene muscles					
teres minor muscle	rubbing on the lateral edge of the scapula until disappearance of pain	stroking of the supra- and infraspinatus muscle and of the teres minor muscle, stroking of the lateral quadrangular space in order to normalize the functioning of the axillary nerve and posterior circumflex artery of the arm					
pectoralis major muscle	displacement on the scalenus anterior muscle in order to recover correct functionality of the internal thoracic artery, displacement on the anterior-inferior part of the chest, kneading of the pectoralis major muscle	stroking of the scalenus anterior muscle, stroking of the thoracic fascia in the inferior-anterior part of the chest, and then of the pectoralis major muscle					
latissimus dorsi muscle	no access	stroking of the latissimus dorsi muscle					
trapezius dorsi muscle	access only to the transverse and descending parts; rubbing and displacement of the muscle using the opposite hand	stroking of the trapezius dorsi muscle					
deltoid muscle	rubbing and displacement of the deltoid muscle in a sitting position, with the forearm resting on a table or a desk, so that the shoulder is slightly away from the body and decompressed	before stroking the anterior part of the deltoid muscle, in order to increase effectiveness of the massage, one may first stroke the descending part of the trapezius dorsi muscle; as for the posterior part of the deltoid muscle, one may stroke the transverse part of the trapezius muscle					

Physical therapy strategy

The main objective of physical therapy within primary healthcare is to use it in patients that most frequently use that form of treatment and to deal with so-called low-risk patients. This approach is proactive and aims to increase patients' responsibility for the process of therapy for current pains and prevention of relapse. The main emphasis is placed on preventive physical therapy, i.e. forms of broadly-understood education, access to finished studies and understandable selection of physical therapy activities that may be performed by the patient on his/her own at home, as well as preparation of descriptions of exercises and automassage, drawings, recordings, advice. Another important element should be education in ergonomic principles in everyday life and in protection against excessive overloading during regular everyday activities, thus eliminating the factors that maintain the risk of relapse of pain and developing useful motor strategies. Therapy should concentrate on the following tasks:

1) normalization of resting tension of muscles and fasciae (massage and poisometric muscle relaxation);
2) recovery of correct trophy in the tissues and organs of the motor system (inflow of arterial blood and effective discharge of venous blood and lymph), which provides conditions for correct regeneration or repair processes (in the case of tissue damage – past trauma or inflammation);
3) withholding of atrophy processes in muscles and connective tissue elements (ligaments, tendons, fasciae) – recovery of their structure and thus capacity (massage, physiotherapy, kinesiotherapy);
4) re-learning of correct movement patterns through targeted motor exercises of various degrees of complexity (kinesiotherapy), individualization of the rehabilitation program;
5) application of proper orthotic equipment and technical aides, as needed.

a) Massage

Available literature usually lacks details on the power of the respective stimuli used during various massage techniques, on frequency parameters, duration and depth of penetration and location of the massaged structures. The above reservations constitute a serious obstacle to comparing the results of own studies with the publications of other researchers [81]. A review of twelve studies of high methodological quality demonstrates the short-term effectiveness of massage in reducing pain of the shoulder, lack of significant functional improvement of the upper limbs or of a long-term painkilling effect [85]. As painful shoulder syndrome affects multiple structures, and previous studies were based on local work, the recommendations are going to include massage based on the principles of tension shifting in the areas of groups of muscles and fasciae in structural contact with each other, taking into account vessel and nerve connections [86]. Therefore, the structures in distant body parts, with structural relationships with the muscles and fasciae of the area of the shoulder, are also going to be massaged. As a result, it will be possible to recover correct innervation of the shoulder area, mainly from intercostal nerves, the brachial plexus and axillary nerve, as well as normalization of blood circulation from the anterior and posterior circumflex humeral artery and from the internal thoracic artery.

b) Physiotherapy

The selection of physical stimuli in skeletomuscular dysfunctions is based on symptoms. In painful shoulder syndrome, the main objective of physical treatments is to fight pain, to increase muscle flexibility and movement range, to recover functionality and to generally improve quality of life [70].

Based on a literature review by Page et al., it is known that using low-level laser therapy (LLLT), high-intensity laser therapy (HILT), therapeutic ultrasound, transcutaneous electrical nerve stimulation (TENS) and pulsed electromagnetic field therapy (PEMF) require further placebo-based research in order to confirm their clinical effectiveness [70].

In turn, the team of White et al. claim that other non-conventional methods of pain treatment are losing out in light of opiate epidemics and concentration by the medical community on pharmacotherapy. They indicate clinical trials describing the advantages of using electrotherapy and laser therapy as adjuvant treatment in treatment of both acute and chronic pain. According to the FDA, "non-pharmacological attitudes to pain treatment have been considered an urgent priority" [87]. It follows from the prepared literature review that TENS demonstrates poor evidence for effectiveness of pain relief in patients with fibromyalgia and is much less effective than electroanalgesia in the form of electro-acupuncture (EA) or percutaneous electrical nerve stimulation (PENS) [87]. As regards laser light therapy, what has been indicated has been a higher effectiveness in elimination of pain through the use of HILT in comparison with LLLT in the treatment of rotator cuff pain (pain and disability minimization, improvement of movement range) [87, 88] and in muscle and fascia pain of the trapezius dorsi muscle [89]. A short-term painkilling effect using HILT was confirmed in patients treated for subacromial conflict, frozen shoulder or inflammation of the lateral epicondyle of the humerus. However, the authors emphasize that it is necessary to conduct research on a greater scale in order to verify the advantages of HILT in comparison to LLLT and electrotherapy in reducing acute and chronic pain, as well as observations of the long-term effects of therapy [87]. It follows from the observations by other authors, however, that LLLT is more effective than a placebo or ultrasound in subacromial conflict syndrome, just like shockwave therapy is more effective than placebo therapy in the case of persistent shoulder tendonitis [90].

It follows from a literature review prepared by the team of Page et al. that 80% (16/20) of participants reported success in treatment of frozen shoulder using LLLT in comparison with 10% (2/20) of participants from the placebo group. Similar observations were made for pulsed electromagnetic field therapy (PEMF). Due to poor quality, evidence for the effectiveness of this therapy is uncertain. However, after a two-week cycle of treatments, a more effective improvement was observed, in terms of pain and functionality, than in the placebo subgroup. 75% (15/20) of participants reported a decrease in pain by 30% in comparison to 0% (0/12) from the placebo group [91].

The authors studying the impact of physical procedures (low-level laser therapy and ultrasound) on reducing myofascial pain syndrome (MPS) observed that laser therapy is the preferred type of therapy in reducing the myofascial pain of that area [92].

In another article, the authors reported the effectiveness of application of UD in the treatment of calcerous shoulder tendonitis, but they emphasized that there is little evidence for the significant clinical effectiveness of this method [93]. The positive effects of treatment of calcerous shoulder tendonitis using shockwaves were discussed in an article by the Yu team. At the same time, the authors emphasized that a review of literature demonstrated a lack of unequivocal evidence for the effectiveness of shockwave treatment in SIS [90].

In a randomized clinical trial, the team of Gomes et al. studied the impact of interference currents on pain related to SIS. It follows from analyzing the obtained data that adding interference currents to the subgroup with exercises and manual therapy, despite reducing pain, did not significantly improve the result in the NRS (Numeric Pain Rating Scale) [94].

It follows from another study (evidence level 1b) conducted by Rabini et al. that in patients with rotator cuff tendinopathy, the impact of local microwave diathermy on disability, arm functionality and pain was equivalent to the effects caused by subacromial injections of corticosteroids [95].

c) Kinesiotherapy

Shoulder pain is a frequent problem, in particular among adults. What is most important in making the decision on which therapy to choose is a diagnostic conclusion based on a systematic (subjective, objective taking into account functional tests) study that allows one to find and specify the actual causes of pain [96].

However, regardless of the etiology of pain, therapy based on pain control and rehabilitation using therapeutic exercises are applied in almost all of the above-mentioned clinical trials, as well as physical procedures and elements of manual therapy. The complexity of causes of shoulder dysfunctions results in continuous discussions as to the manner of pain control and functional recovery of movement range [97]. The obvious aim of the proposed therapies is fast recovery achieved through regained mobility (proper flexibility of soft tissues), muscle strength, pain elimination and recovery of lost or limited functionality in the shoulder joint. In the case of lack of unequivocal causes of pain, some shoulder-related problems may result from incorrect posture and disrupted distribution of muscle tension in the upper and lower parts of the back and neck, and this should be taken into consideration in therapy planning [98].

Work-related skeletomuscular disorders of the upper limbs and neck are some of the most frequent work-related disorders in the world. It follows from the randomized research conducted by Zebis et al. that high-intensity strength training, based on the principles of progressive loads, may be implemented among employees (working in static positions with a curved neck) and result in a clinically significant reduction in neck and shoulder pain in this group. Employee training included dynamic high-intensity muscle work with gradual load progression [99].

Other authors, before planning therapy procedures, analyzed in detail both the range and course of movements. Analysis of the scapulohumeral rhythm allowed one to assess shoulder joint alignment and quality of scapula movement (direction and range) and to follow the irregularities resulting from disruption of motor control of the muscles (in particular the trapezius dorsi muscle and the serratus anterior muscle) [101].

Rotator cuff conflict

The treatment plan in rotator cuff impingement in primary healthcare depends on several critical variables. The following factors should be taken into account in therapy planning: age, profession, pain level, initial functional capability and co-existing diseases. Proper pain control is important for motivating patients to participate in rehabilitation [18].

According to numerous authors, the exercises improving movement of the shoulder joint and girdle (in the scope of flexion, abduction, external and internal rotation) and recovering shoulder girdle flexibility and muscle strength include: posture exercises, pendulum exercises using the upper limbs, slow active exercises (e.g. raising shoulders), active exercises with support (suspension), active exercises with support and resistance, exercises with a prop (e.g. a cane) to support active movement, exercises with flexible resistance (TheraBand) or dumb-bells. During therapeutic sessions, isotonic exercises, as well as static loads and isometric muscle work, were used. Furthermore, an important element of the kinesiotherapeutic program of rehabilitation is exercises stabilizing the scapula, performed in a lying position with and without load, with control of the scapula activity model [33, 97, 101, 103].

Kuhn suggests, in order to maintain shoulder fitness, reinforcing the therapy effects by applying, in home therapy, daily exercises improving muscle flexibility and range of movement in the joint and to use muscle strengthening exercises 3 times a week [97]. In order to improve flexibility of pectoral muscles and external rotators of the shoulder joint, it is recommended that autotherapy include stretching [103, 104].

In earlier publications, the authors emphasized that so far there is no convincing evidence for the effectiveness of physiotherapy in long-term improvement or in preventing a relapse of shoulder pain. It also follows from randomized controlled trials that there are no premises for applying physical procedures and various combinations thereof. Although motor therapy is considered to be the "cornerstone" of physical therapy, there has only appeared limited evidence for its effectiveness, which requires further research [105].

LHBT tendinopathy

It follows from the observation of a small group of patients (n = 10) by McDevitt et al. that exercises of an eccentric-concentric character applied in patients with chronic LHBT tendinopathy may be useful in fighting pain, but this requires further observation [106].

SIS

In the case of shoulder pain caused by SIS, physical therapy is often the first choice for therapy. However, the therapeutic effectiveness of the applied methods is not always confirmed in literature. For this reason, people continue to look for new solutions [101].

The results obtained by Worsley et al. suggest that 1 week of exercises, including motor control training for the scapula, strengthening of the trapezius dorsi muscle and serratus anterior muscles, manual techniques recovering the flexibility of shortened muscles (e.g. stretch, trigger point therapy), may improve functionality and reduce pain in younger people with signs of subacromial conflict [100]. However, according to the authors, the research should be repeated on a larger population, with randomization.

Another randomized trial conducted by the Scandinavian team of Engebretsen et al. compared the effectiveness of supervised exercises to shockwave in patients experiencing pain in the subacromial area. After 18 weeks, 64% of patients (32 persons) in the exercising group experienced reduced shoulder pain and improvement of disability in comparison with 36% (18 persons) in the subgroup treated with shockwaves. It was demonstrated that a significantly higher percentage rate of patients in the subgroup with supervised exercises experienced an improvement (odds ratio 3.2, 95% confidence interval = 1.3 to 7.8). In the exercising subgroup, significantly more patients returned to work (p = 0.016) [107]. Similar results were demonstrated by the above-mentioned research group in a publication from 2011. 29 (60%) participants in the SE (supervised exercises) subgroup supervised by a physical therapist, in comparison with 24 (52%) participants in the rESWT (radial extracorporeal shockwave therapy), demonstrated clinical improvement. Fewer patients in the SE subgroup required additional treatment in the period between 18 weeks and 1 year [107].

In the rehabilitation program proposed by other authors, in the first period, the objective of therapy was to relax the tense muscle, and then start manual and flexible resistance for the muscles cooperating with the scapula, thus improving joint movement. The therapy included the rehabilitation program used in the trials of other authors [101, 102].

In their research, Moezy et al. assumed that the potential cause of subacromial conflict may be dysfunction in the biokinematic chain caused by debilitation of the scapula stabilizers (levator scapulae muscle, rhomboid muscles, serratus anterior muscle, trapezius dorsi muscle). Lack of synergy among muscles, disrupted timing, a decrease in nerve-muscle coordination, debilitation, changed activity result in untypical loads, thus leading to subacromial compression [63]. In the proposed therapy, a team of researchers compared the impact of the applied therapy on improvement of movement range, the painkilling effect and scapula movement control in two subgroups. The first

subgroup (ET – Exercises Therapy) underwent a 6-week cycle of supervised exercises, and the other subgroup (PT – Physical Therapy) underwent 6 weeks of physical procedures (Solux lamp, TENS, UD) together with exercises. The resultant analysis indicated that despite reduction in the level of pain on the VAS scale, no significant statistical differences were achieved. However, the ET subgroup demonstrated considerable different mobility of the shoulder joint. The authors believe that effect is a result of exercises reducing the tension of the shoulder joint capsule and the recovering flexibility of the pectoralis major muscle. Therefore, in SIS, inclusion of scapula rehabilitation exercises in the program seems to be justified [64]. The Swedish authors who presented the algorithm for physical therapy in treating shoulder pain agreed with these conclusions. An expert panel consisting of physical therapists agreed on the main principles of using motor therapy in shoulder pain (limited number of exercises, performed with proper scapular-humeral coordination, alignment of the humeral joint, gradual introduction of exercises without causing shoulder pain). The algorithm emphasizes that decisions regarding physiotherapy should be based on the results of clinical assessment and not on structural pathology. Furthermore, it was confirmed that the main physiotherapeutic intervention in treatment of shoulder pain and dysfunction is associated with active motor therapy. Available data suggests that a supervised program of exercises brings about clinical benefits in short- and long-term observation in comparison to no treatment or a placebo. Despite the growing evidence for the significance of physiotherapy (in particular motor therapy) in the treatment of shoulder pain, there is no consensus regarding the most effective exercise strategy [5].

The results demonstrated by the team of Aytar et al. indicate that a rehabilitation program with scapula mobilization did not significantly affect functional improvement, increased range of movement, reduced pain or satisfaction of patients with SIS syndrome [57].

The article by Gebremariam et al. was equally skeptical regarding the effectiveness of physiotherapeutic methods in subacromial impingement syndrome. Although the authors argue that some methods, despite moderate evidence of their effectiveness, seem promising in the treatment of SIS. At the same time, they emphasize that further research based on a higher class of evidence is required [65].

It follows from the research conducted by the team of Abdulla et al. that the effectiveness of supervised exercises, conducted independently or in combination with exercises performed in home conditions, is similar to invasive surgery in subacromial conflict syndrome [108]. It follows from a systematic review of literature prepared by other authors that there is little repeatable evidence to confirm the effectiveness of corticosteroid injections in treating rotator cuff subacromial conflict [109].

Frozen shoulder

Le et al. emphasize that treatment of frozen shoulder continues to be an unresolved clinical problem. So far, no universal conservative treatment algorithm has been developed; therefore, therapy should be adapted to the patient [31]. Adhesive capsulitis is often considered a self-limiting disease that subsides between the 1st and 3rd year of existence. However, various research has demonstrated that 20–50% of patients may develop chronic symptoms [31]. Three types of methods are possible in frozen shoulder treatment: conservative, pharmacological and surgical treatment in lack of progress from non-invasive treatment.

As for physiotherapy, there is no consensus as to the type, frequency or intensity of exercises. It follows from analyzing the research results published in the Cochrane Collaboration of Systematic Reviews that the effects of manual therapy and physical exercises are comparable to the therapeutic results of glucocorticosteroid injections and arthroscopic subacromial decompression, but these conclusions are based on evidence of poor quality [70].

The selection of the approach to treatment depends on the patient's functional status at the time of clinical examination. Principally, some researchers believe that conservative therapy should be continued for 6 months, with the level of pain monitored over this period [69].

Conservative treatment includes oral pharmacotherapy with nonsteroidal anti-inflammatory drugs (NSAID), intraarticular injections of hyaluronic acid and corticosteroids, as well as physical therapy.

However, Calis et al., in a comparative study, demonstrated that intraarticular injections of hyaluronic acid were less effective than intraarticular injections of corticosteroids or physical therapy in the treatment of frozen shoulder [110].

In turn, in an RCT, Hsieh et al. demonstrated that adding injections of hyaluronic acid to conventional physical therapy did not result in significant benefits in the treatment of patients with FS, and thus such injections may unnecessarily generate additional costs of treatment [111]. It also follows from analyzing the studies published in the Cochrane Library that the effects of annual therapy and exercises may be comparable to injections of glucocorticosteroids and invasive surgical intervention, but this conclusion is based on evidence of poor quality [112].

Although physical therapy is included in FS therapy, there are no unequivocal guidelines for the selection of therapeutic methods. Selection of the most effective option will be determined by the clinical condition for the patient and by observation of progress in pain elimination and functional improvement. In a study by Diercks et al., what was noted was the impact of exercise intensity on the outcome of therapy in patients with FS. The results of two subgroups of patients were compared: undergoing therapy of high and low intensity (including passive stretching and mobilization above the pain threshold vs. actively supported exercises within pain limits). After two years, only 63% of people from the first subgroup and 89% from the second subgroup achieved satisfactory functionality of the shoulder joint [113]. In literature, there is still no consensus as to which therapeutic option is better, mainly due to the absence of high-quality evidence. However, it should be emphasized that, regardless of the stage of disease, the most important objectives are eliminating pain, removing joint stiffness, maintaining correct movement range and recovering functionality [69].

Orthopedic equipment and work ergonomics

In chronic inflammatory conditions of the shoulder, in the cases of light damage to soft tissues of the shoulder joint and in the cases of mechanical overloading and degenerative lesions, flexible stabilization braces (bands) are often used. They cover the acromioclavicular joint, the shoulder joint and the shoulder. They are made of soft and/or flexible materials and are equipped with additional belts bringing the shoulder closer to the chest, and some cover the opposite part of the chest. These types of bands are effective in supporting the shoulder in muscle debilitation conditions and reduce joint loads with various types of pains, improve joint compactness after injuries of capsules and, additionally, stabilize the scapula. Band-type braces work well in early therapeutic interventions and perfectly supplement physical therapy. In inflammatory conditions of the soft tissues surrounding the shoulder, when it is not always necessary to limit mobility, more advanced structures are applied which, in the SICAMMP classification, are called stabilization rigid braces with possibility of movement. We should also take into consideration various other types of braces, such as slings, which are very useful in the therapy of patients with increased muscle tone while resting, in order to consolidate the therapeutic effects after a massage normalizing muscle tone [82, 83].

Summary

The authors of the recommendations note that, apart from an injury-related dysfunction, each of the above-mentioned pains demonstrate a similar mechanism of development. Incorrect distribution of muscle tone in the shoulder area causes disturbance in innervation and blood supply, which manifests in a feeling of disruption, tingling, local feeling of cold, debilitation of muscle strength and, in the long run, structural lesions, thus translating to more or less abrupt lesion dynamics resulting in gradual loss of local mobility. According to the authors, the aims of recovering the correct spatial system, called structural homeostasis, in the shoulder girdle, is, first of all, normalization of muscle tension (regardless of the etiopathogenesis of the pain) and then inclusion in a rehabilitation program covering the methods of recovering and consolidating the correct models of motor activity.

As a result, the authors suggest starting with a massage for the purpose of recovering proper resting muscle and fascia tone as the foundation for further recovery of disrupted functionality of the shoulder complex. According to the authors, while looking for effective and cost-effective solutions for patients with painful shoulder syndrome, massage should be supplemented with the procedures in the scope of kinesiotherapy, physiotherapy and orthopedic equipment, while emphasizing the significance of patient education and autotherapy after instruction. The basis for deliberations in the search for the most effective model for treating patients with shoulder pain is the guidelines included in the article entitled: "Consensus for physiotherapy for shoulder pain". The authors of this publication emphasize the significance of clinical assessment in determination of the cases of functional deficit. Authors of the publication emphasize the importance of clinical evaluation in diagnostics causes of functional deficits. The more so that the analysis of imaging studies sometimes indicates the presence of structural changes in the shoulder in people without clinical symptoms, and sometimes shows a weak relationship between the level of shoulder pain and disability and the level of structural deficit detected during imaging. These observations challenge the validity of imaging procedures for the purposes of determining the source of symptoms in the shoulder and emphasize the significance of a detailed clinical assessment as the foundation for determining the aims of treatment [5]. It follows from a review of literature that researchers continue to search for the most effective solutions, supported with evidence, for treating painful shoulder syndrome.

The remarks included in the above-mentioned article, as well as the recommendations for treatment of pain in the spine, hip and now also shoulder in primary care, provide an opinion in the discussion associated with looking for the best practices in treatment of this type of dysfunction on the basis of cooperation between family physicians and physical therapists.

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Address for correspondence:
Krzysztof Kassolik, MD, PhD, Assoc. Prof.
Wydział Fizjoterapii AWF
Al. I.J. Paderewskiego 35
51-612 Wrocław
Polska
Tel.: +48 71 347-30-89
E-mail: krzysztof.kassolik@awf.wroc.pl;
krzysztof.kassolik@gmail.com

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CONTINUOUS MEDICAL EDUCATION (CME)

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The family doctor in the jurisprudence of medical disciplinary boards. Analysis of select cases

IWONA WRZEŚNIEWSKA-WAL[A–G]

Department of Law, Economics and Management of the Public Health Care School of the Centre for Postgraduate Medical Education, Warsaw, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary The increase in the number of malpractice actions for damages before civil courts is linked not only to patients' increasing awareness of their rights, but also to the rapid development of medical science and new technologies, as well as the associated risk. At present, besides expert medical knowledge, a medical practitioner must have basic knowledge of the law. This article outlines, on the basis of the jurisprudence of medical disciplinary boards, the rules for medical practice that are grounded not only in the provisions of the law, but also in professional deontology. The essential rule that a practitioner may never forget at any stage of professional activity is the principle of due diligence. Examples from medical disciplinary boards cited below show that, in practice, this principle, being so fundamental to the medical profession, is violated in more than 60% of the cases at hand. These include cases involving family doctors and those practising in primary care. Medical disciplinary proceedings are brought by the disciplinary prosecutor (*Rzecznik Odpowiedzialności Zawodowej*), who, if convinced that professional misconduct has occurred, requests the medical disciplinary board for punishment. In regulating the disciplinary proceedings, the lawmaker provided for two instances: regional medical disciplinary board (*Okręgowy Sąd Lekarski*) rules in the first instance, and the Chief Medical Disciplinary Board (*Naczelny Sąd Lekarski*) hears the appeals. At present, one can also challenge the latter's rulings with an appeal-in-cassation to the Supreme Court, where professional judges decide upon the case.

Key words: physicians, primary care, eligibility determination.

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Background

A medical practitioner's activities relate to such values as human life and health. Violating practice rules may lead to criminal, civil or professional (disciplinary) liability. For the purposes of professional responsibility, the practitioner is bound by two normative systems: (medical) ethics and law. The definition of professional misconduct in Article 53(1) of the Act on Medical Chambers [1] shows that every doctor, as a member of a medical chamber, has the obligation to observe medical ethical principles and comply with the legal provisions relating to medical practice, under the pain of professional responsibility. The provision on professional misconduct must be read in conjunction with Article 8(1) of the Act on Medical Chambers, which provides for the obligations of the members of the medical self-government. In accordance with this provision, members of a medical chamber have a duty to observe and comply with: 1) the rules of medical ethics; 2) legal provisions relating to the practice of the medical profession; 3) resolutions of the bodies of medical chambers. This means that on the one hand, the professional responsibility of doctors will have a narrower personal scope (being applicable solely to the members of the medical self-government), but on the other hand, broader material scope (imposing additional obligations on the members). The latter finds its rationale in the specificity of the medical profession, the nature of the tasks and the responsibility involved. The significant feature here is that the provisions on professional responsibility do not, as is the case with criminal liability, contain definitions of the various offences. The statutory concept of professional misconduct has intentionally been left vague, due to the objective impossibility of creating a list of behaviours that pose a threat to the due performance of professional obligations and to the upholding of the dignity of the medical profession [2].

One of the most important rules of professional practice for a doctor at any stage of contact with a patient is the principle of due diligence. In keeping with this principle, the practitioner should carry out all diagnostics, therapy and prevention with diligence, devoting to the patients the necessary time. Diligence, in its colloquial understanding, means conscientiousness, reliability and care for the well-being of another [3]. For a doctor, this includes the conscientious preparation of diagnosis, therapy and treatment. Conscientiousness and a sense of duty constitutes an important element in the work of any good doctor. A lack of this in the exercise of professional duties may cause, and often does cause, irretrievable harm to patients [4] and, consequently, entails legal responsibility. It is worth emphasizing that in the professional responsibility of medical practitioners, it is precisely Article 8 of the Code of Medical Ethics [5] in concurrence with Article 4 of the Act on the Professions of Physician and Dentist [6], containing the term 'due diligence', which supply the legal basis for the requests for punishment brought about by medical disciplinary prosecutors.

Objectives

The purpose of this work is to discuss select cases that were decided upon by regional medical disciplinary boards (OSL), wherein charges were pressed against family doctors and doctors practising in primary care. Particular emphasis was placed on the doctor–patient relationship in the light of legal provisions and professional ethics. The analysis of these solu-

tions is intended to show young doctors the risks associated with the practice of medicine in POZ and, at the same time, provide useful tips for professional practice. The cases being discussed in this article illustrate the core duties of a doctor in both diagnostics and therapy. The diagnostic and therapeutic process is, in essence, a sequence of decisions leading to the resolution of the health problem of a patient requesting the doctor's assistance [7]. The gathering of information about the patient includes: 1) interview, 2) physical examination, 3) additional examinations (e.g. imaging, laboratory tests, histopathology). All these principles ought to be followed in the daily practice of family medicine or primary care. The reality, however, shows otherwise. The cases from regional disciplinary boards cited herein demonstrate that these fundamental professional principles are repeatedly violated. The typical ailments patients complain about to family and primary-care doctors include: stomach ache, symptoms of upper-limb fracture or a sudden life-threatening event with a child that have not been diagnosed in time, leading to a delay in the implementation of the correct treatment. In this connection, it becomes necessary to discuss the above violations for educational purposes, with a view towards broader inclusion of such issues in the teaching curricula for family and primary-care doctors.

Material and methods

To showcase this specificity of the medical profession, the author of this work has analysed select decisions of regional medical disciplinary boards (OSLs) for violations of legal provisions and of the Code of Medical Ethics. The author has analysed the jurisprudence of medical disciplinary boards on the basis of the case files of the OSLs in Lodz (2016), Poznan (2015–2016); Warsaw (2016) and Wroclaw, using anonymized files and decisions (years: 2012, 2013 and 2014). In this way, the author obtained a cross-section of cases from various different locations in a comparable period of time. In principle, these were closed cases and final decisions. However, due to the recent status of such OSL rulings (e.g. 2016 and 2017), they include non-final rulings (several in each OSL).

The author analysed the frequency with which the failure of due diligence was imputed to doctors. As analysed by the author, out of 55 cases before the Warsaw OSL in 2016, failure of due diligence was charged in 39 (71%) cases. During the same year, out of 33 cases before the Lodz OSL, doctors faced a charge in 23 cases (69.7%), and before the Poznan OSL, which heard 9 cases, 2 (22%) faced charges. The year before, in the Poznan OSL, the author analysed 29 cases heard, out of which 12 (41.4%) referred to Article 8 of the Code of Medical Ethics in conjunction with Article 4 of the Act on the Medical Profession. In the Wroclaw OSL, the author analysed 37 cases from 2014, with a failure of due diligence in the diagnostic and therapeutic process ruled in 23% (62.2%) cases; out of 35 cases analysed for 2013, the charge provided the basis for a request for punishment in 19 (54.3%) of the cases, and in 2012, out of 57 cases analysed, failure of due diligence was involved in 37 (64.9%) cases. Out of all these cases selected by author for discussion the board decisions relating to family doctors and those practising in primary care.

Select Cases

1. Upper-Limb Fracture

A primary-care doctor was brought before the disciplinary board in Wroclaw on charges of professional misconduct in the period from January to March in the form of failure to observe due diligence in the care of a patient, whom despite her complaints of pain in the right he did not order an X-ray or refer her to a specialist in orthopaedic clinic, thus delaying correct diagnosis, i.e. dislocated right humeral head and fractured greater tubercle of the right humerus, in violation of Article 8 of the Code of Medical Ethics. In January, the patient fell on the pavement and suffered injury to the right upper limb. After two days, due to intensifying pain, she reported herself to the Primary Care Clinic of the Medical Diagnostic Centre, where the defendant doctor received her. The doctor interviewed the patient and obtained information about the injury. The patient also mentioned intensifying pain in and swelling of the shoulder. The doctor conducted a physical examination, in which he found a bump on the forehead and right shoulder bruising without finding any shoulder deformation. He recommended compresses for the right upper limb, pain medication and continued monitoring of the hand. Due to the recommended treatment not bringing about any expected improvement, the patient paid another visit to the defendant doctor, but the doctor once again only recommended pain medication and prescribed sedatives. With time, the pain was joined by fever, tremors and headache, resulting in yet another visit with the primary-care doctor. The defendant identified those ailments as symptoms of an infection and implemented the according treatment. The patient visited him once again in March, complaining about limb ailments preventing her ability to function normally. This was when the doctor, during a physical, found a shoulder deformation and referred the patient to the Surgical Clinic for consultation. On the same day, the patient, with a diagnosis of dislocation of the acromioclavicular joint, was sent to the Orthopaedic Department for attempted repositioning of the inveterate dislocation of the right humeral head with fractured humeral tubercle. The following day, under general anaesthesia, despite repeated attempts, it was not possible to reduce the dislocated right humeral head. Due to the good passive flexion range of the patient's shoulder, surgery for open repositioning of the dislocation was abandoned. Two weeks later, the patient was readmitted to the same health-care unit for attempted surgical treatment of inveterate dislocation of the right humeral head with fractured humeral head. Following the necessary preparation, the surgery was completed. The X-ray after the surgery found a repositioned dislocation of the right humeral head and splinters from the broken greater tubercle of the right humerus in the correct position.

Based on the evidence gathered, the OSL took the position that the patient, during the first visit, provided the defendant doctor with all information about the injury suffered and the accompanying complaints, which, together with the results of the physical examination, supplied the absolute indication for imaging diagnostics of the location of the injury and for providing the patient with specialist, i.e. orthopaedic, care in the Orthopaedic Injury Clinic. The defendant doctor failed to extend the diagnostics to an X-ray and receive specialist consultation, recommending monitoring of the limb and treatment of symptoms instead. Appropriate action was not taken with the patient when she visited the doctor for the second time, either, as clearly shows from extracts taken from the patient's files at the Primary Care Clinic. The situation was similar during the February visit, which is when systemic reactions joined in, which the defendant doctors identified exclusively as infection-related ailments. Only during the final visit, which is when the patient once again reported pain preventing her from everyday functioning, did the doctor recommend surgical consultation. In summary, the OSL took the position that the defendant doctor's conduct in respect to the assistance provided to the patient was not adequate and found the doctor guilty of professional misconduct. In the board's view, a quicker diagnosis and implementation of the correct treatment, which was therefore delayed by several months, would have prevented the patient's suffering in connection with the injury sustained and with the omission of suitable diagnostics and therapy. The severity of the penalty was mitigated by the defendant doctor's attitude during the proceedings, where he showed a significant degree of criticism toward the event, as well as contrition. The explanation he

provided was the great number of patients he was receiving due to the prevailing flu infection at the time. He noted that he had inspected the patient's hand twice and seen nothing suspicious, and only during the later visits did the patient complain about swelling. He admitted his guilt of professional misconduct and advised that he had settled with the patient for an apology and financial compensation [8].

2. Emergencies

The medical board in Warsaw considered the case of a family doctor who, while on duty for after-hours assistance, did not auscultate a patient less than 3 years old. The parents brought the child because of a cough, a temperature of 39.7°C (the boy did not react to antipyretic medicines) and acute vomiting for several hours. They mentioned the child had shown similar symptoms recently with pneumonia. The defendant doctor, after the interview and without conducting a physical examination, recommended antipyretic medicines and micro-elements. In response to the mother's inquiry as to why he would not auscultate the child, he emphasized the boy's organism was strong, and the boy would manage even if it were pneumonia. After several hours of deteriorating condition, the mother brought the child to A&E. When received, the boy was pale, with high fever and rapid breath and was vomiting. The doctor on duty at A&E, after an interview, as well as physical and routine laboratory examinations, diagnosed septicaemia. It must be emphasized that such examinations could also have been conducted by the defendant doctor in after-hours assistance. At the hearing, the defendant doctor admitted to the charges and showed contrition. In his explanation, he admitted that during the holiday period, there were approximately 150 patients daily, often children, and he lacked experience with children, as his patients at the clinic tended to be older than 50 years of age. In the board's opinion, insufficient collection of data from the interview and omission of an examination due to lack of time was reprehensible [9]. Thus, the defendant's instruction as to the possibility of approaching A&E for assistance did not justify his decision, as his own assessment of the patient's condition had not excluded the necessity of hospitalization.

3. Stomach aches

The regional disciplinary prosecutor charged the primary-care doctor with failure to observe due diligence with regard to her patient, resulting in the omission to order examinations to find the cause of iron deficiency and omission of a physical examination of, especially, the abdominal cavity, i.e. professional misconduct consisting in a violation of Article 4 of the Act on the Professions of Physician and Dentist and Article 8 of the Code of Medical Ethics.

The patient had been treated by a primary-care doctor for several years. Due to her complaints about weakness, dyspnoea, malaise, dizziness and swelling in the left part of the body, upon the defendant doctor's orders, the patient underwent a morphology test showing a 6.5 g/dL haemoglobin level (with the norm being 12–16) and iron in the serum at 16 µg/dl (with the norm being 50–150). Based on the above results, the doctor diagnosed 'iron-deficiency anaemia', and due to the patient's low tolerance of oral medication, as was found from the interview, she decided for intramuscular iron injection, 10 injections total, every other day. Subsequently, a follow-up examination in July showed: 9 g/dL haemoglobin and 65 µg/dl iron in the serum. During the visit, the patient reported feeling better. The defendant doctor included treatment with an oral iron preparation, Sorbifer Durules. A follow-up examination in September showed: 11.5 g/dL haemoglobin and 47 µg/dl iron in the serum. Stomach aches started, and a different doctor referred the patient to the hospital, where an ultrasound showed, among others, free fluid in the abdominal cavity. Moreover, the patient received gynaecological consultation, which found no irregularities. In December, she once again visited the defendant doctor with complaints about stomach ache and diarrhoea. The doctor examined the patient, including palpation of the abdomen, finding: soft abdomen, tenderness in the lower abdomen, no pathological resistance; Goldflam and Chełmoński symptoms were negative. The defendant doctor ordered medication with Ircolon, which is used, among others, in the treatment of symptoms of digestion disorders manifesting in a sensation of fullness, flatulence, nausea and stomach aches, as well as stress-induced disorders of the digestive system (diarrhoea, constipation, stomach ache). Several days later, the patient once again came to the Primary-Care Clinic with acute stomach aches. After a physical, a different doctor found: 'stomach ache in the right quadrant, distended abdomen, palpable tumour in the right quadrant'. The doctor decided to refer the patient to the hospital. On the same day, the patient reported to the hospital and was admitted to the General Gastroenterology and Oncology Department. The CT examination of the abdominal cavity showed ileocaecal intestinal infiltration. Due to symptoms of intestinal obstruction, the defendant went into surgery for right haemicolectomy. The histopathology showed G2 adenocarcinoma. The expert's opinion emphasized the irregularities in the defendant's conduct. She had not ordered examinations to find the causes of the anaemia. According to the expert, the defendant failed to conduct a correct physical examination, as, besides the patient's December visit, she had not performed any for a half a year.

The disciplinary board found the doctor guilty of professional misconduct and imposed a penalty. In the OSL's view, the patient's condition could only have been assessed after a personally conducted interview and physical examination. The mere finding of anaemia and recommendation of iron supplements could not be regarded as correct medical procedure. All the more so considering that the patient's tests for morphology and iron in the serum did not show clear improvement of her condition. The patient's medical files in the previous years did not contain blood-test results showing anaemia or iron deficiency. If the defendant suspected chronic anaemia in the patient, it was necessary to exclude all sources of chronic blood loss. First of all, the defendant had a duty to complete a physical, including abdomen palpation, and order diagnostics to exclude gastrointestinal haemorrhage [10].

Discussion

1. Upper-Limb Fracture

Diagnosis is the first and most important step in the therapeutic process. In principle, the physician commences treatment following diagnosis. The second stage that follows after diagnosis in medical procedure is treatment. The diagnostic potential of modern medicine is enormous. Diagnostic standards have been introduced in some medical fields and are of great assistance to numerous practitioners. In this connection, literature notes that a doctor who fails to conduct specialist examinations and make the correct diagnosis commits a medical error [12]. Basic diagnostics were missing from the discussed case of the family doctor who failed to order an X-ray in a patient with an injury causing intensifying pain.

2. Emergencies

In the practice of family doctors and primary-care doctors, diagnosis is based mainly on the knowledge of which symptoms and diseases are the most frequent. Often, frequent symptoms in patients reporting to clinics are: stomach ache, back ache, pain in the chest, headache, cough and catarrhal symptoms [13]. However, a distinction must be drawn between such obvious diagnoses and emergencies requiring a hospital referral. This is the role of the duty doctor in e.g. after-hours assistance.

After-hours assistance provides limited diagnostic opportunities; thus, the doctor arrives at an accurate diagnosis only through a diligent interview and meticulous physical examination. Due diligence in the examination of the examination of the small child was patient was lacking in the case at hand, where the doctor only conducted an interview, but not a physical examination, and moreover did not auscultate the child, knowing him to have recently been hospitalized with pneumonia. In an unknown disease, the doctor makes the preliminary diagnosis on the basis of the interview and the physical examination. Additional examinations make it possible to select the most accurate diagnosis. Advising the parents that A&E can be of assistance if the child's condition should deteriorate does not justify the lack of diagnostics.

3. Stomach aches

In the physical examination, the doctor should first conduct a general examination and then detailed examination (of specific organs). In the former case, the doctor is to assess the patient's general condition, including without limitation the degree of consciousness, awareness, signs of suffering, posture, walk and physical activity. Detailed examination starts from those parts of the body that may show the largest deviation from the norm as a result of the interview and general examination. The physical examination should be by visual inspection, palpation, percussion, auscultation and measurement [14]. The examination is a relatively simply activity of great significance to the correctness of the doctor's subsequent course of action [15]. Failure to conduct a physical examination constitutes a lack of due diligence. In the OSL's view, there ought to have been a meticulous diagnosis of the patient's anaemia. Firstly, all possible sources of haemorrhage must be excluded, especially within the limits of the abdominal cavity. Apart from ordering basic laboratory tests (e.g. faecal occult blood test), the doctor has a duty to conduct a physical examination of the patient during any visit.

Summary and Conclusions

Presently, health is becoming an increasingly important and broadly discussed subject. Biological and sociological conditions of life are changing, resulting in new threats to human health [16] and new challenges for medical practitioners. In this connection, medical studies stress the importance of equipping future doctors with the necessary professional competence, i.e. the knowledge and intellectual and practical skills necessary in the profession [17]. Due diligence in medical practice is more than professionalism, however. It is beyond any doubt that medical practice, apart from suitable substantive preparation, also requires a specific ethical attitude. This attitude should manifest itself in traits and conduct of the highest moral calibre, worthy and deserving of public esteem. Here, it is necessary to consider the special role played in the functioning of the medical profession by medical disciplinary boards, which, apart from professional competence, also flesh out professional ethical principles. Władysław Biegański's observation remains relevant: 'Should anyone ask me today what virtues I found the most important to a doctor, I would reply without hesitation: humanity, conscientiousness and resolve' [18]. The author continues to investigate, for educational purposes, the rulings of medical courts. When analysing data from the District Medical Court in Warsaw for 2017, it should be noted that in comparison with the previous year, there was a slight decrease in the number of cases in which a lack of due diligence was identified. The author examined 52 cases, of which in 34 (65.4%) physicians were charged with failure to exercise due diligence in the diagnostic and therapeutic process. There are also cases concerning family doctors and POZ doctors. However, it is too early to draw final conclusions, as some of these verdicts are not legally binding. *De lege ferenda*, it is necessary to recommend the inclusion of legal issues in both postgraduate and undergraduate curricula to illustrate the medical practitioner's problems and options before a disciplinary board.

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Address for correspondence:
Iwona Wrześniewska-Wal, MD, PhD
Szkoła Zdrowia Publicznego CMKP
ul. Kleczewska 61/63
01-826 Warszawa
Tel.: +48 22 560-11-41
E-mail: iwona.wrzesniewska-wal@cmkp.edu.pl;
idrwal@yahoo.com

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- Christensen S, Oppacher F. *An analysis of Koza's computational effort statistic for genetic programming*. In: Foster JA, Lutton E, Miller J, Ryan C, Tettamanzi AG, eds. *Genetic programming*. EuroGP 2002: Proceedings of the 5th European Conference on Genetic Programming; 2002 Apr 3–5; Kinsdale, Ireland. Berlin: Springer; 2002: 182–191.

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FAMILY MEDICINE & PRIMARY CARE REVIEW
Bartosz J. Sapilak, MD, PhD
Katedra i Zakład Medycyny Rodzinnej
Uniwersytet Medyczny we Wrocławiu
ul. Syrokomli 1
51-141 Wrocław
Poland, Europe
Tel.: +48 71 326-68-72
Tel./fax: +48 71 325-43-41
E-mail: bartosz.sapilak@umed.wroc.pl