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1. Manuscripts should be prepared using the MS Word text editor and sent by e-mail or by post on a 3.5" floppy disk or a CD.

2. The number of pages of the manuscript (including tables, figures and references) cannot exceed 30 pages for original articles, 30 for review articles, 20 for reports, 30 for articles on the history of medicine and 15 for rationalization articles. Reports on meetings and conferences should be concise (up to 5 pages) and discuss only significant issues.

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6. Each article should include the following:

1) On the first page: main title in Polish and English, Author's or Authors' (max. 10 people) first and last names, including academic degrees, full name of affiliated institute (institutes), head of the institute (academic degree, first and last name), below an abstract (up to 15 lines) with keywords in Polish and another abstract with keywords in English, corresponding author, his/her postal address with postal code, telephone (fax) and e-mail address.

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Original articles should be prepared according to the following structure: introduction, aim, material and methods, results, discussion, conclusions, references; case reports: introduction, case description, discussion, summary (conclusions), and references.

Abbreviations and acronyms should be defined when first mentioned in the text and consequently used in the paper.

3) References should be presented according to the order they appear in the text. If the article has no more than four authors, please provide all their names; if there are more authors, a maximum of three names should be provided, followed by the words "et al.". References should be numbered using the keyboard, please do not use automatic numbering. Examples of citations:

Journal articles:

Calpin C, Macarthur C, Stephens D., et al. Effectiveness of prophylactic inhaled steroids in childhood asthma: a systemic review of the literature. J Allergy Clin Immunol, 1997; 114 (100): 452-457

Books:

Rudzki E.: Alergia na leki: z uwzględnieniem odczynów anafilaktycznych i idiosynkrazji. Lublin, Wydawnictwo Czelej, 2002: 338-340

Chapter of a book:

Wantz GE Groin hernia. In: Cameron JJ, ed. Current surgical therapy. St Louis: Mosby, 1998: 557-561

The list of references should include only those publications that were used by the Author and should be reduced to 20. All references should be cited in the text and the numbers of references should be put in square brackets. In order to avoid errors, titles should be copied from medical databases.

7. The paper should be accompanied by: a) author's request to publish the paper with a declaration that the article has not been published before and not simultaneously submitted to any other journal; b) approval of the head of the clinic, head of the department or head of the institute in which the research has been conducted, and in the case of a study carried out in several centers, the approval of all of them; c) Declaration of Conflict of Interest; and d) acknowledgements, if applicable.

8. The Editorial Board reserves the right to correct nomenclature and stylistic errors as well as to introduce abbreviations without consulting the Author.

9. The Author receives 1 free copy of the issue in which his or her article has been published. For further copies, contact the Editor.

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# Management and treatment of isolated and multiorgan renal trauma at the Trauma Center of the Military Institute of Medicine

## Postępowanie oraz leczenie izolowanych i towarzyszących obrażeń nerek w Centrum Urazowym Wojskowego Instytutu Medycznego

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Department of General, Functional and Oncologic Urology, Central Clinical Hospital of the Ministry of National Defence, Military Institute of Medicine in Warsaw; head: Prof. Henryk Zieliński MD, PhD

**Abstract.** The aim of the study was to determine treatment strategies for isolated and multiorgan trauma according to the recommendations of AAST (American Association for the Surgery of Trauma) and EAU (European Association of Urology) in the Trauma Center of the Military Institute of Medicine. From January 2011 to May 2014 a total of 42 patients were treated for renal trauma at the Trauma Center of the Military Institute of Medicine. A retrospective study based on the clinical data of the CliniNet system assessed the following features of the renal trauma cases: etiology, stage, treatment method, prevalence of hematuria and need for blood transfusion. Conservative treatment was sufficient for 27 patients. Selective embolization of renal artery stopped the bleeding in 2 patients. Nephrectomy was necessary in 5 patients with extensive trauma who were hemodynamically unstable. In 6 cases, organ-sparing therapy with surgical techniques, such as suturing of the kidney, was applied. In 2 patients, placing of a DJ catheter was necessary. Proper renal trauma classification according to the AAST scale enables further management based on the EAU guidelines. In the vast majority of patients, conservative treatment is preferred and efficient.
**Key words:** renal trauma, isolated trauma, multiorgan trauma, renal trauma, treatment

**Streszczenie.** Cel pracy. Celem pracy jest ocena strategii leczenia izolowanych i towarzyszących innym obrażeniom narządowym urazów nerek zgodnie z zaleceniami AAST (Amerykańskie Towarzystwo Chirurgii Urazowej) i EAU (Europejskie Towarzystwo Urologiczne) w Centrum Urazowym Wojskowego Instytutu Medycznego. Materiał i metody. Od stycznia 2011 do maja 2014 roku w Centrum Urazowym WIM leczono 42 pacjentów z powodu urazów nerek. Retrospektywnej analizie na podstawie danych klinicznych systemu CliniNet poddano następujące cechy urazów nerek: etiologię urazu, stopień urazu oraz zastosowane metody leczenia, wystąpienie krwiomoczu i konieczność zastosowania przetoczeń krwi. Wyniki. U 27 chorych postępowaniem wystarczającym było leczenie zachowawcze. Selektywna embolizacja tętnicy nerkowej umożliwiła skuteczne opatrzenie krwawienia u 2 pacjentów. U 5 pacjentów z rozległymi urazami i niestabilnych hemodynamicznie konieczne było wykonanie ratującej nefrektomii. W 6 przypadkach zastosowano leczenie oszczędzające organ w postaci zaopatrzenia technikami chirurgicznymi, takimi jak szycie nerki. U 2 osób konieczna była instalacja cewnika DJ. Wnioski. Odpowiednie zaklasyfikowanie urazu nerki na podstawie skali AAST umożliwia dalsze postępowanie zgodnie z zaleceniami EAU. U zdecydowanej większości chorych preferowane i skuteczne było leczenie zachowawcze.
**Słowa kluczowe:** uraz nerki, uraz izolowany, uraz wielonarządowy, leczenie

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## Introduction

Genitourinary system injuries are observed in people of both sexes as well as all age groups, and constitute about 1-5% of all injuries. Because of their extraperitoneal location, the kidneys are relatively well protected from injury. Men are statistically a more vulnerable group, with injuries being three times more frequent than in women [1,2]. Thanks to the development of diagnostic possibilities and treatment strategies, the number of required surgical interventions has been reduced and the majority of injuries may be treated conservatively, preserving this important organ [3].

Kidney injuries can be divided into two groups: blunt force and penetrating injuries. Blunt force injuries occur most often due to a sudden deceleration in the horizontal axis (hard braking or collisions), sudden deceleration in the vertical axis (falls from heights) and transfer of energy from a blunt tool (assaults). Transport accidents are considered to be the main cause of renal injuries, while the most common causes of penetrating injuries are gunshot and stab wounds to the abdomen, lumbar area or lower chest. In most cases, penetration injuries are treated surgically [4].

The most common renal injury classification is the AAST scale, developed by the American Association for the Surgery of Trauma, popularized in the 1980s [5]. This enables a level of standardization of the various groups of patients and the choice of appropriate therapy, as well as creating the opportunity to predict the treatment results. The classification is based on the result of a CT scan and is as follows:

- Grade I: contusion or minor, non-expanding subcapsular hematoma without laceration,
- Grade II: perirenal hematoma, laceration of the renal cortex <1.0 cm in depth,
- Grade III: laceration of the renal cortex >1.0 cm, without urinary extravasation,
- Grade IV: laceration extending through the renal cortex, medulla, and collecting system or damage to the renal artery or vein with contained hemorrhage,
- Grade V: kidney rupture or devascularisation.

Hematuria is one of the main symptoms indicating a genitourinary system injury; however, in clinical practice we often deal with urological injuries without hematuria. The treatment strategy for renal injury patients depends on the mechanism, location and severity of the injury, as well as clinical symptoms, with the supreme role being given to hemodynamic stability [6, 7]. The main symptoms experienced by patients with renal injuries involve pains in the back, lumbar area, chest or abdomen.

The majority of the patients with direct renal injuries were hit bluntly to the side of their body, causing a dull pain in the lumbar area. After a period of time, some experience macroscopic hematuria. The intensity of the hematuria does not correlate directly with the extent of the injury. During the clinical examination of the patients it is possible to observe bruising in the lumbar area or upper abdominal quadrants, and a pain response to pressure in these areas [8].

## Aim of the study

The aim of the study is to determine treatment strategies of isolated and multiorgan renal trauma according to AAST and EAU recommendations in the Trauma Center of the Military Institute of Medicine.

## Material and Methods

From January 2011 to May 2014, 42 patients were treated for renal trauma at the Trauma Center of the Military Institute of Medicine. The studied group included 12 female (28.6%) and 30 male (71.4%) patients. The average age of the patients was 39 years, in the total age range from 19 to 81 years. The retrospective study was performed with the use of the CliniNet system database. The data were searched on the basis of ICD codes: S37.0 and S35.4 – injury to the kidney and injury to the renal blood vessels, respectively. The analysis included: etiology of the injury, injury grade, chosen treatment methods, presence of hematuria and the need to perform blood transfusions. The injury grade was analyzed on the basis of a 64-slice computed tomography and surgery protocols, and then evaluated with the use of the AAST scale, taking into account multiorgan injuries.

## Results

In 12 (28.6%) patients the injuries were diagnosed as isolated, and in 30 (71.4%) patients the kidney injuries formed one part of a set of multiorgan injuries. Of the 42 patients, most of the injuries were caused by transport accidents: 35 (83.3%), the rest resulting from falls from heights: 5 (11.9%) and assaults: 2 (4.8%). All patients with suspected renal injury underwent an abdominal CT with contrast, which served as the basis for the AAST scale classification of the injury (Fig. 1-2).

The most numerous group was grade I injuries: 23 (54.8%), followed by grade II injuries: 8 (19%), grade III: 5 (12%), grade IV: 3 (7.1%), and grade V injuries: 3 (7.1%) (Fig. 3).

Hematuria occurred in 14 (33%) patients: 2 with a grade I injury, 3 with a grade II injury, 7 with a grade III injury and 2 with a grade V injury.

**Figure 1.** Computed tomography – left kidney grade II trauma according to AAST

**Rycina 1.** Tomografia komputerowa – uraz nerki lewej II stopnia wg AAST

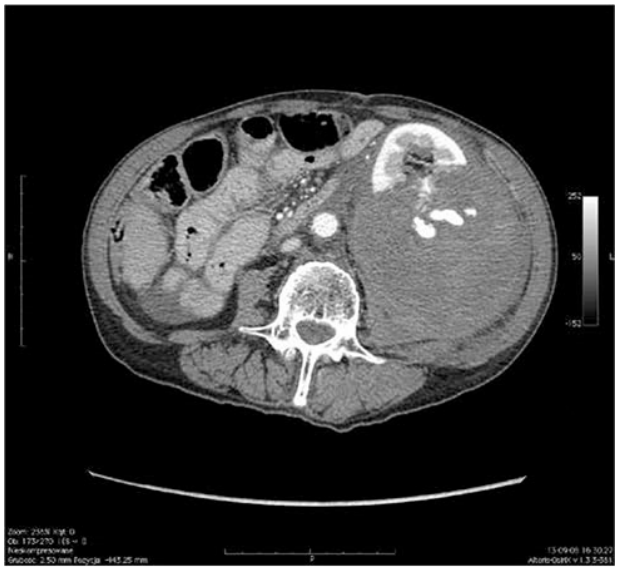

**Figure 2.** Computed tomography in the arterial phase, showing the fragmentation of the only functioning, left kidney, a grade V trauma

**Rycina 2.** Tomografia komputerowa w fazie tętniczej, obrazująca rozkawałkowanie jedynej czynnej nerki lewej, uraz V stopnia

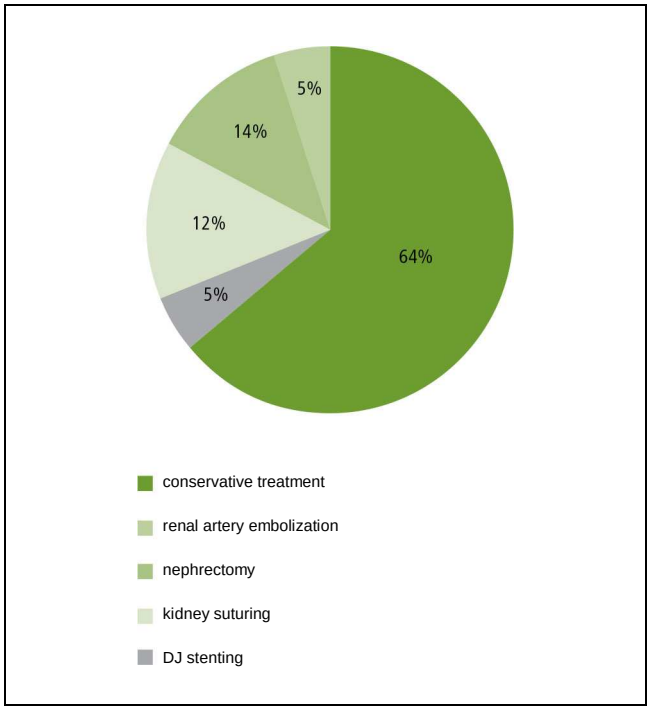


**Figure 3.** Renal trauma treatment strategy

**Rycina 3.** Strategia leczenia urazów nerek

All analyzed cases were blunt traumas, which directly influenced the recommended therapeutic process. In 27 patients (64.2%) it was enough to introduce conservative treatment enabling anatomical and functional maintenance of the renal function. This involved enforced bed rest, antibiotic therapy, monitoring of vital signs (pressure and pulse), laboratory parameters (CBC, creatinine and urea) and repeated abdominal ultrasounds. A valuable therapeutic option was selective renal artery embolization, which enabled efficient management of hemorrhage in 2 (4.8%) patients. Transperitoneal nephrectomy was necessary in 5 (11.9%) hemodynamically unstable patients with extensive traumas. In 6 (14.3%) cases an organ-saving treatment was administered in the form of surgical management (suturing of the ruptured parenchyma and pyelocaliceal system). Transfusion of compatible packed red blood cells for the whole treatment process was necessary in the case of 21 (50%) patients, the minimum transfusion volume was 2 units of PRBC while the maximum was 21 units. Because of the urinary extravasation caused by the damage to the pyelocaliceal system, 2 (4.8%) patients required the installation of a ureteral DJ catheter, which efficiently provided a natural route for urine flow from the kidney (Fig. 4).

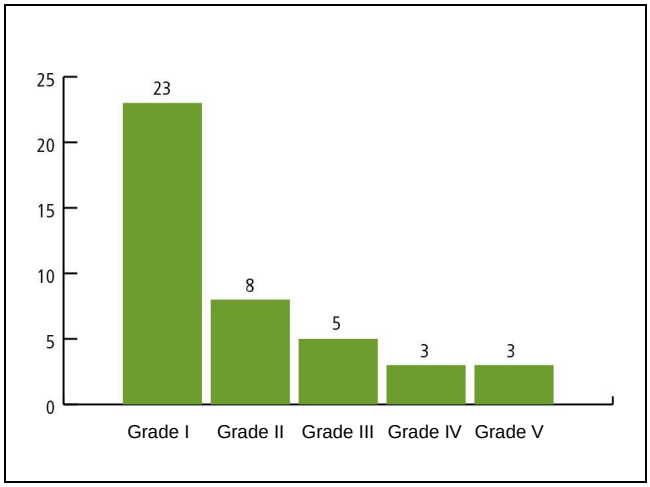


**Figure 4.** Grading of renal injury according to AAST
**Rycina 4.** Urazy nerek wg skali AAST

## Discussion

Kidney injuries are one of the most common injuries in urological practice. Computed tomography proved to be of extreme clinical usefulness in diagnostics, as it enabled precise assessment of the trauma extent as well as the condition of the other kidney and surrounding organs. Intravenous urography, formerly the basic functional and morphological examination of the urinary system, has been completely replaced with CT scans (performed usually as 'CT trauma scan') as the first line choice in the case of suspected renal injury [9, 10].

Organ-saving treatment is considered the basic rule in renal trauma treatment strategies, which is confirmed by the guidelines of the European Association of Urology [11]. In the analyzed group, 64% of patients were treated conservatively, as recommended in the literature. The treatment consisted of enforced bed rest, antibiotic therapy, monitoring of vital signs and laboratory parameters and abdominal ultrasound examinations. A good therapeutic effect was achieved, especially in grade I and II injuries.

The clinical condition of the patient was the decisive factor for the choice of appropriate treatment method. Hemodynamic instability (tachycardia, hypotension), intensified blood loss or expanding hematoma visible in the scans required surgical intervention [12].

The development of intravascular techniques in interventional radiology (percutaneous selective embolization) contributed to the increase in the effectiveness of renal trauma therapy, especially in the case of damage to the blood vessels. According to the EAU guidelines, angiography with selective embolization is the first-line method for the management of bleeding, with possible concurrent hematuria, if there are no indications for an immediate open surgical intervention. In the analyzed group, embolization was applied in two cases, and led to the stoppage of active bleeding and stabilization of the clinical status of the patients. The high effectiveness of this method makes it an alternative to surgical treatment in some cases [13].

In the case of damage to the pyelocalix system, the treatment should be adjusted to suit. If the injury is not large and repeated scans show that urinary extravasation tends to disappear, it is recommended to adopt a waiting attitude. Urinary extravasation with a tendency to persist or expand should be, if possible, managed with temporary drainage (4-6 weeks) with the use of catheter. It is extremely dangerous if combined with damage to the intestine or pancreas (septic danger). Massive damage to the pyelum requires surgical intervention, suturing of the collecting system with absorbable sutures and appropriate drainage. Grade V injuries are *a priori* burdened with a high percentage of surgical interventions, only single cases can be treated conservatively [14, 15]. Furthermore, renal function after a grade V injury is significantly impaired.

To sum up, it should be noted that the use of computed tomography as a precise method of assessing the extent of the trauma together with strict adherence to conservative treatment protocols and the possibility of using intravascular techniques gives good treatment results. Surgical intervention is conditioned by the hemodynamic stability of the patient and the choice of solution should be made prudently, as intraoperative exploration of the retroperitoneal space increases the risk of kidney loss (bleeding may be managed only by means of nephrectomy) [16, 17].

## Conclusions

Appropriate renal trauma classification according to the AAST scale enables further management based on the EAU guidelines. In the vast majority of patients, conservative treatment is preferred and efficient. Renal injuries are often accompanied by multiorgan injuries, which is why comprehensive specialist care in a specialized trauma center is recommended.

## Literature

1. Kautza B, Zuckerbraun B, Peitzman AB. Management of blunt renal injury: what is new? Eur J Trauma Emerg Surg, 2015; 41 (3): 251–258
2. Reynard J, Brewster S, Biers S. Oxford handbook of urology. Oxford University Press, 2009
3. Santucci RA, McAninch JW. Diagnosis and management of renal trauma: Past, present, and future. J Am Coll Surg, 2000; 191: 443-451
4. Santucci RA, Wessells H, Bartsch G, et al. Evaluation and management of renal injuries: Consensus statement of the renal trauma subcommittee. BJU Int, 2004; 93: 937-954

5. Moore EE, Shackford SR, Pachter HL, et al. Organ injury scaling: spleen, liver, and kidney. J Trauma, 1989; 29 (12): 1664-1666
6. Patel D P, Redshaw JD, Breyer BN, et al. High-grade renal injuries are often isolated in sports-related trauma. Injury, 2015; 46 (7): 1245-1249
7. Serafetinides E, Kitrey ND, Djakovic N, et al. Review of the current management of upper urinary tract injuries by the EAU Trauma Guidelines Panel. Eur Urol, 2015; 67 (5): 930-936
8. Broghammer JA, Fisher MB, Santucci RA. Conservative management of renal trauma: a review. Urology, 2007; 70 (4): 623-629
9. Fang JF, Wong YC, Lin BC, et al. Usefulness of multidetector computed tomography for the initial assessment of blunt abdominal trauma patients. World J Surg, 2006; 30: 176-182
10. Soto JA, Anderson SW. Multidetector CT of blunt abdominal trauma. Radiology, 2012; 265 (3): 678-693
11. Summerton DJ, Djakovic N, Kitrey ND, et al. Urological trauma. EAU Guidelines, 2015
12. Santucci RA, Fisher MB. The literature increasingly supports expectant (conservative) management of renal trauma-a systematic review. J Trauma, 2005; 59 (2): 493-503
13. Khan AB, Reid AW. Management of renal stab wounds by arteriographic embolization. Scand J Urol Nephrol, 1994; 28: 109-110
14. Altman AL, Haas C, Dinchman KH, et al. Selective nonoperative management of blunt grade 5 renal injury. J Urol, 2000; 164 (1): 27-30
15. Davis KA, Reed RL, Santaniello J, et al. Predictors of the need for nephrectomy after renal trauma. J Trauma, 2006; 60 (1): 164-169
16. Shariat SF, Roehrborn CG, Karakiewicz P, et al. Evidence-based validation of the predictive value of the American Association for the Surgery of Trauma kidney injury scale. J Trauma, 2007; 62 (4): 933-939
17. Heller MT, Schnor N. MDCT of renal trauma: correlation to AAST organ injury scale. Clin Imaging, 2014; 38 (4): 410-417

# Hospitalizations in military entities performing medical activities in 2014

## Hospitalizacje w resortowych podmiotach wykonujących działalność leczniczą w 2014 roku

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**Abstract.** Analysis of hospitalizations and their average values in military medicinal entities in 2014. A retrospective analysis of the data contained in the IT systems was carried out concerning hospitalizations and their average value in 2014. The average value of hospitalization in 2014, with respect to the military entities carrying out the medical activities, was higher than the average value of hospitalizations when taking into account all medical entities. Considering the hospitalizations by place of service performance, the greatest number of hospitalizations appears in these departments: general surgery, internal diseases, and cardiology. When analyzing the number of hospitalizations by military entities carrying out medical activities, the greatest number belongs to: Military Institute of Medicine in Warsaw, Central Research Hospital of the Ministry of the Interior in Warsaw, and the 5th Military Research Hospital and Independent Public Healthcare Centre Polyclinic in Kraków. The potential of military entities carrying out medical activities and the "reference level" of quality and quantity of the services provided indicate a significant acknowledgement of the high position of the entire healthcare department on the medical services market. The healthcare services of the Ministry of Defense (MON) and the Ministry of Interior form an important component of the healthcare service system in Poland.
**Key words:** National Health Fund, hospitalization, military medicinal entities

**Streszczenie.** Cel pracy. Analiza hospitalizacji oraz ich średnich wartości w resortowych podmiotach leczniczych w 2014 roku. Materiał i metody. Przeprowadzono retrospektywną analizę danych zawartych w systemach informatycznych dotyczących zrealizowanych hospitalizacji i ich średnich wartości w 2014 roku. Wyniki. Średnia wartość hospitalizacji w 2014 roku w odniesieniu do resortowych podmiotów wykonujących działalność leczniczą była większa od średniej wartości zrealizowanych hospitalizacji, z uwzględnieniem wszystkich podmiotów leczniczych. Biorąc pod uwagę hospitalizacje według miejsc wykonywania świadczeń, największą ich liczbę odnotowano na oddziale chirurgicznym ogólnym, na oddziale chorób wewnętrznych i oddziale kardiologicznym. W analizie liczby hospitalizacji według podmiotów resortowych wykonujących działalność leczniczą na pierwsze miejsca wysuwają się: Wojskowy Instytut Medyczny w Warszawie, Centralny Szpital Kliniczny MSW w Warszawie i 5. Wojskowy Szpital Kliniczny z Polikliniką SP ZOZ w Krakowie. Wnioski. Potencjał resortowych podmiotów wykonujących działalność leczniczą oraz „poziom referencyjny" jakości i ilości udzielanych świadczeń świadczą o znacznym uznaniu wysokiej pozycji całej resortowej opieki zdrowotnej na rynku świadczeń medycznych. Służba zdrowia MON i MSW jest ważnym elementem systemu świadczeń opieki zdrowotnej w Polsce.
**Słowa kluczowe:** Narodowy Fundusz Zdrowia, hospitalizacja, resortowe podmioty wykonujące działalność leczniczą

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## Introduction

Military healthcare is a specific medical service provider with a wide range of activities. For many years, the services provided by military healthcare have included almost all benefits financed from public resources.

Hospitalization services are provided in 23 hospitals, established and supervised by the Ministry of the Interior, and by 18 hospitals established and supervised by the Ministry of Defence. There are military hospitals located in every voivodship in Poland.

Following the structural changes in healthcare, hospitals accept all patients, not just the department-specific ones.

## Aim of the study

The aim of the study is to present information about the hospitalizations provided in military healthcare entities and their average value in 2014, based on reported data from the IT systems of the National Health Fund.

## Material and methods

A retrospective analysis of data contained in the IT systems was carried out concerning the provided hospitalizations and their average value in 2014. The hospitalizations in department-specific healthcare entities were analyzed according to the ICD-10 classification, as well as according to the place in which the services were provided. Moreover, the mean values of hospitalization in 2014 were analyzed with reference to military healthcare entities, and then compared to the mean values of hospitalizations provided in all healthcare entities.

## Results

Hospitalizations in military healthcare entities were analyzed, according to the ICD-10 classification with regard to their causes. The major causes of hospitalizations in military healthcare entities in 2014 included:

- diseases of the circulatory system (I00-I99), with 71,544 hospitalizations and 63,599 hospitalized patients; corresponding to 16.62% of all hospitalizations and 17.53% of the hospitalized patients, respectively;
- neoplasms (C00-D48), where 44,635 hospitalizations were provided, and 36,678 patients were hospitalized; corresponding to 10.37% of all hospitalizations and 10.11% of the hospitalized patients, respectively;
- diseases of the digestive system (K00-K93), with 43,471 hospitalizations and 39,058 hospitalized patients; corresponding to 10.10% of all hospitalizations and 10.77% of the hospitalized patients.

The most frequent primary diagnoses were analyzed according to the place they were provided in military healthcare entities. The data demonstrate that patients with the following were mainly hospitalized in:

- diseases of the circulatory system (I00-I99)
  - cardiology departments, where 30,170 hospitalizations were provided to 26,137 patients,
  - departments of internal diseases, where 11,787 hospitalizations were provided to 10,756 patients,
  - neurology departments, where 5,678 hospitalizations were provided to 5,473 patients;
- neoplasms (C00-D48)
  - general surgery departments, where 7,310 hospitalizations were provided to 6,614 patients,
  - urology departments, where 5,512 hospitalizations were provided to 4,206 patients,
  - surgical oncology departments, where 4,264 hospitalizations were provided to 3,805 patients;
- diseases of the digestive system (K00-K93)
  - general surgery departments, where 19,397 hospitalizations were provided to 18,221 patients,
  - gastroenterology departments, where 10,508 hospitalizations were provided to 8543 patients,
  - departments of internal diseases, where 7,246 hospitalizations were provided to 6,685 patients.

Another analysis presents those military healthcare providers that in 2014 offered the greatest number of hospitalizations according to the above ICD-10 groups:

- diseases of the circulatory system (I00-I99)
  - Central Clinical Hospital of the Ministry of the Interior in Warsaw – 9,873 hospitalizations, 8,046 patients hospitalized,
  - 4th Military Research Hospital with Independent Public Healthcare Centre Polyclinic in Wrocław – 8,584 hospitalizations, 7,632 patients hospitalized,
  - Military Institute of Medicine in Warsaw – 7,139 hospitalizations, 6,032 patients hospitalized;
- neoplasms (C00-D48)
  - Military Institute of Medicine in Warsaw – 9,117 hospitalizations, 6,382 patients hospitalized,
  - Central Clinical Hospital of the Ministry of the Interior in Warsaw – 5,464 hospitalizations, 4,709 patients hospitalized,

  - Independent Public Healthcare Centre with Warmińsko-Mazurskie Centre of Oncology in Olsztyn – 5,334 hospitalizations, 4,282 patients hospitalized;
- diseases of the digestive system (K00-K93)
  - Central Clinical Hospital of the Ministry of the Interior in Warsaw – 7,759 hospitalizations, 5,926 patients hospitalized,
  - Military Institute of Medicine in Warsaw – 5,582 hospitalizations, 5,038 patients hospitalized,
  - 5th Military Research Hospital with Independent Public Healthcare Centre Polyclinic in Wrocław – 2,569 hospitalizations, 2,531 patients hospitalized.

Hospitalizations in military healthcare entities were analyzed according the place where the service was provided (hospital department). The analysis presents hospital departments in military healthcare entities providing the greatest number of hospitalizations in 2014:

- department of general surgery, with 41,269 hospitalizations and 38,767 hospitalized patients; corresponding to 9.59% of all hospitalizations and 10.62% of the hospitalized patients, respectively;
- department of internal diseases, with 38,767 hospitalizations and 35,224 hospitalized patients; corresponding to 9.01% of all hospitalizations and 9.71% of the hospitalized patients, respectively;
- hospital emergency department, with 35,377 medical interventions and 33,873 patients who received medical services; corresponding to 8.22% of all hospitalizations and 9.34% of the hospitalized patients, respectively.

Another analysis presents the ICD-10 groups which constituted the primary diagnosis for hospitalizations in all the four quarters of 2014 for the hospital departments described earlier. They include

- for the department of general surgery:
  - diseases of the digestive system (K00-K93), with 19,397 hospitalizations and 18,221 patients hospitalized,
  - neoplasms (C00-D48) with 7,310 hospitalizations and 6,614 patients hospitalized,
  - diseases of the circulatory system (I00-I99), with 5,526 hospitalizations and 5,186 patients hospitalized;
- for the department of internal diseases:
  - diseases of the circulatory system (I00-I99), with 11,787 hospitalizations and 10,756 patients hospitalized,
  - diseases of the digestive system (K00-K93), with 7,246 hospitalizations and 6,685 patients hospitalized,
  - endocrine, nutritional and metabolic diseases (E00-E90) with 4,964 hospitalizations and 4,690 patients hospitalized;
- for the hospital emergency department:
  - injury, poisoning and certain other consequences of external causes (S00-T98), with 15,011 hospitalizations and 14,663 patients hospitalized,
  - symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99), with 6,352 hospitalizations and 6,009 patients hospitalized,
  - diseases of the circulatory system (I00-I99), with 3,064 hospitalizations and 2,755 patients hospitalized.

Below are presented the providers of military healthcare services that provided the greatest number of hospitalizations at selected hospital departments in 2014:

- general surgery:
  - Military Institute of Medicine in Warsaw – 3,565 hospitalizations, 3,326 patients hospitalized,
  - Central Research Hospital of the Ministry of the Interior in Warsaw – 3,140 hospitalizations, 2,980 patients hospitalized,
  - 4th Military Research Hospital with Independent Public Healthcare Polyclinic in Wrocław – 2,179 hospitalizations, 1,968 patients hospitalized;
- internal diseases:
  - 1st Military Hospital with Independent Public Outpatient Clinic in Lublin – 2,609 hospitalizations, 2,416 patients hospitalized,
  - 107th Military Hospital with Independent Public Outpatient Clinic in Wałcz – 2,417 hospitalizations, 1,980 patients hospitalized,
  - 105th Military Hospital with Independent Public Outpatient Clinic in Żary – 2,196 hospitalizations, 2,114 patients hospitalized;
- traumatology and orthopedics surgery:
  - Military Institute of Medicine in Warsaw – 3,263 hospitalizations, 2,981 patients hospitalized,
  - 4th Military Research Hospital with Independent Public Healthcare Centre Polyclinic in Wrocław – 1,855 hospitalizations, 1,781 patients hospitalized,
  - Central Research Hospital of the Ministry of the Interior in Warsaw – 1,843 hospitalizations, 1,718 patients hospitalized;
- cardiology:
  - Central Research Hospital of the Ministry of the Interior in Warsaw – 6,788 hospitalizations, 5,356 patients hospitalized,
  - 4th Military Research Hospital with Independent Public Healthcare Centre Polyclinic in Wrocław – 6,097 hospitalizations, 5,218 patients hospitalized,

– Military Institute of Medicine in Warsaw – 4,419 hospitalizations, 3,601 patients hospitalized.

The analysis of data for 2014 demonstrates that the mean value of hospitalizations in Poland in general was 3,089.96 PLN, whereas in the military healthcare entities it was 3,897.21 PLN. In individual voivodship departments of the National Health Fund and military healthcare entities the mean values of hospitalization were as follows:

- Dolnośląskie: voivodship – 3,371.96 PLN, military – 5,250.67 PLN,
- Kujawso-Pomorskie: voivodship – 3,553.55 PLN, military – 4,854.36 PLN,
- Lubelskie: voivodship – 3,545.36 PLN, military – 3,410.25 PLN,
- Lubuskie: voivodship – 3,722.01 PLN, military – 3,286.81 PLN,
- Łódzkie: voivodship – 3,032.46 PLN, military – 3,535.86 PLN,
- Małopolskie: voivodship – 3,711.85 PLN, military – 3,576.89 PLN,
- Mazowieckie: voivodship – 3,578.30 PLN, military – 4,226.11 PLN,
- Opolskie: voivodship – 3,408.62 PLN, military – 2,989.20 PLN,
- Podkarpackie: voivodship – 2,072.18 PLN, military – 2,533.92 PLN,
- Podlaskie: voivodship – 3,224.85 PLN, military – 5,177.16 PLN,
- Pomorskie: voivodship – 1,699.98 PLN, military – 2,392.89 PLN,
- Śląskie: voivodship – 3,313.85 PLN, military – 2,479.59 PLN,
- Świętokrzyskie: voivodship – 2,383.36 PLN, military – 2,865.00 PLN,
- Warmińsko-Mazurskie: voivodship – 3,166.24 PLN, military – 4,062.31 PLN,
- Wielkopolskie: voivodship – 3,593.07 PLN, military – 5,353.10 PLN,
- Zachodniopomorskie: voivodship – 2,952.44 PLN, military – 2,693.77 PLN.

The data demonstrate that the highest voivodship mean values of hospitalizations were found in the following voivodship departments of the National Health Fund:

- Lubuskie – 3,722.01 PLN,
- Małopolskie – 3,711.85 PLN,
- Mazowiecki – 3,578.30 PLN.

The lowest values of hospitalizations were found in the following voivodship departments of the National Health Fund:

- Pomorskie – 1,699.98 PLN,
- Świętokrzyskie – 2,383.36 PLN,
- Zachodniopomorskie – 2,952.44 PLN.

In military healthcare entities the highest mean values of hospitalizations were:

- Wielkopolskie – 5,353.10 PLN,
- Dolnośląskie – 5,250.67 PLN,
- Podlaskie – 5,177.16 PLN.

The lowest mean values of hospitalizations in military healthcare entities were found in:

- Pomorskie – 2,392.89 PLN,
- Śląskie – 2,479.59 PLN,
- Podkarpackie – 2,533.92 PLN.

Mean values of hospitalizations in military healthcare entities were the highest in:

- 4th Military Research Hospital with Polyclinic in Wrocław – 5,676.45 PLN,
- 10th Military Research Hospital with Polyclinic in Bydgoszcz – 5,482.81 PLN,
- Independent Public Healthcare Institution of the Ministry of the Interior in Poznań – 5,353.10 PLN.

The lowest mean values of hospitalizations in military healthcare entities were found in:

- 115th Military Hospital with Outpatient Clinic on the Hel peninsula – 1,741.78 PLN,
- Independent Public Healthcare Institution in Koszalin, Zachodniopomorskie Department of the National Health Fund – 1,884.16 PLN,
- Independent Public Healthcare Institution in Koszalin (entity in Słupsk) in Pomorskie Department of the National Health Fund – 1,949.72 PLN.

## Discussion

Following the structural changes in the healthcare system, hospitals accept all patients, not just department-specific ones. Military hospitals also provide treatment in emergencies, particularly regarding injuries in the broadest sense. This dedication is dictated by the needs of officers and soldiers who are professionally active. Both the character of service and the needs of departments necessitated structural changes, this is indicated by the large hospitals, emergency and surgical departments with specialist equipment, as well as co-operation of the above hospitals within the national emergency medical services. Currently the military entities are well-equipped with advanced diagnostic devices and medical equipment to enable accurate diagnosis and effective treatment. Physicians and nurses are highly qualified, both practically and academically. The hospitals provide continuous education and development of their staff, which allows the personnel to improve the level of professionalism and specialization.

Numerous healthcare providers offer comprehensive medical services. They include

research hospitals with polyclinics that provide medical care for research and teaching departments, clinical departments, and treatment departments, as well as diagnostic tests in institutes and laboratories. Military hospitals perform highly specialized, complicated and often innovative procedures, and they use advanced and state-of-the-art treatment methods. It encourages patients to seek treatment in these facilities, as they inspire confidence and are considered prestigious. Military hospitals are important entities providing services such as hospital treatment within the Polish healthcare system.

## Conclusions

As demonstrated in the study, military healthcare in hospital departments provides 8-11% of all the services provided nationally, which shows its important share in the market of healthcare services such as hospital treatment. In ten voivodships, the mean hospitalization values in these entities were higher than those in civilian entities. The mean value in reference to the catalogue value of services could be said to demonstrate the severity of the cases treated in military healthcare entities.

## Literature

1. National Health Fund's own materials

# Impedance diastolic to systolic wave ratio (O/C *ratio*) as a marker of left ventricular diastolic function in arterial hypertension

## Impedancyjny wskaźnik stosunku fali rozkurczowej do skurczowej (O/C *ratio*) jako marker funkcji rozkurczowej lewej komory w nadciśnieniu tętniczym

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**Abstract.** Although impedance cardiography (ICG) is seen to be a useful tool in cardiovascular diagnostics, little is yet known about the clinical meaning of the diastolic to systolic wave (O/C) ratio. The aim of this study was to estimate the relation between O/C ratio and the echocardiographic features of left ventricular diastolic (LVD) function in patients with arterial hypertension (AH). In 144 hypertensive patients (mean age: 45.2 years) the correlations between clinical variables (i.e. age, blood pressure, and heart rate) and O/C ratio derived from an at-rest ICG (Niccomo™ device), together with the echocardiographic features of the LVD function (E – mitral flow early phase velocity, A – mitral flow late phase velocity, E/A ratio; e' – mitral septal annulus early diastolic velocity, E/e' ratio; IVRT – isovolumic relaxation time) were analyzed. The mean O/C ratio was found to be significantly lower in patients with LVD dysfunction, as compared with patients with normal left ventricular systolic function: 32.6±14.1% *vs* 39.8±12.7%; p =0.001. Correlation analysis revealed a significant association of O/C ratio with: E (r=0.40; p <0.001), A (r=-0.22; p <0.05), E/A (r=0.44; p <0.001); e' (r=0.28; p <0.01); IVRT (r=-0.45; p <0.001). The only clinical variable stronger correlated with echocardiography was age (vs E: r=-0.39; p <0.001; A: r=0.43; p <0.001; E/A: r=-0.56; p <0.001; e': r=-0.36, p <0.001; IVRT r=0.45; p <0.001). In patients with normal and mildly impaired LVD function, O/C ratio is related with diastolic hemodynamics, especially mitral flow parameters. This distinct association with mitral flow pattern suggests that O/C ratio, lower in patients with impaired LV relaxation, can rise in those with more advanced stages of LVD dysfunction (pseudonormal and restrictive fillings).

**Key words:** hypertension, left ventricular diastolic function, echocardiography, impedance cardiography

**Streszczenie.** Wstęp. Kardiografia impedancyjna jest użyteczną metodą w diagnostyce układu sercowo-naczyniowego, choć znaczenie kliniczne wskaźnika stosunku fali rozkurczowej do skurczowej (O/C ratio) nie zostało jednoznacznie określone. Celem pracy była ocena związku pomiędzy wskaźnikiem O/C a echokardiograficznymi wykładnikami funkcji rozkurczowej lewej komory u chorych na nadciśnienie tętnicze (AH). Materiał i metody. W grupie 144 chorych z AH (średni wiek: 45,2 roku) dokonano analizy korelacji zmiennych klinicznych (takich jak wiek, ciśnienie tętnicze, częstotliwość rytmu serca) oraz wskaźnika O/C, ocenianego w spoczynkowym badaniu ICG (urządzenie Niccomo™), z echokardiograficznymi wykładnikami funkcji rozkurczowej lewej komory (E – prędkość wczesnego napływu mitralnego, A – prędkość późnego napływu mitralnego, wskaźnik E/A ratio, e' – prędkość wczesnorozkurczowa pierścienia mitralnego, E/e' ratio, IVRT – czas rozkurczu izowolumetrycznego). Wyniki. Wartość wskaźnika O/C okazała się w porównaniu z osobami z prawidłową funkcją skurczową lewej komory istotnie mniejsza u chorych z jej dysfunkcją rozkurczową: 32,6 ±14,1% *vs* 39,8 ±12,7%; p =0,001. Analiza korelacji ujawniła istotne powiązanie wartości wskaźnika O/C z parametrami echokardiograficznymi: E (r=0,40; p <0,001), A (r=-0,22; p <0,05), E/A (r=0,44; p <0,001); e' (r=0,28; p <0,01); IVRT (r=-0,45; p <0,001). Jedyną zmienną kliniczną o silniejszej korelacji z tymi wskaźnikami okazał się wiek (vs E: r=-0,39; p <0,001; A: r=0,43; p <0,001; E/A: r=-0,56; p <0,001; e': r=-0,36, p <0,001; IVRT r=0,45; p <0,001). Wnioski. W grupie chorych z prawidłową i łagodnie upośledzoną funkcją rozkurczową lewej komory wskaźnik O/C wykazuje powiązanie z parametrami echokardiograficznymi charakteryzującymi jej rozkurcz, zwłaszcza z napływem mitralnym. Ten szczególny związek z profilem napływu mitralnego sugeruje, że wskaźnik O/C może się zwiększać w przypadku bardziej wyrażonej dysfunkcji rozkurczowej (pseudonormalizacja i restrykcja napływu mitralnego).

**Słowa kluczowe:** nadciśnienie tętnicze, funkcja rozkurczowa lewej komory, echokardiografia, kardiografia impedancyjna

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## Introduction

Impedance cardiography (ICG) is a useful tool in cardiovascular diagnostics, and it has been proved that a variety of important types of information related to the mechanical and physiological cardiac function can be extracted from the ICG curve [1–4]. However, still little is known about the clinical meaning of the impedance diastolic (O) to systolic wave (C) ratio (O/C ratio) in hypertensive patients. Elevated O/C ratios were observed in patients with cardiac abnormalities such as heart failure (HF), acute myocardial injury and mitral regurgitation [5–7]. An association between O/C ratio and increased left-ventricular end-diastolic and pulmonary pressure has also been reported [8]. A high O-wave was even proposed as a predictor of poor outcome in patients with a myocardial infarct [9]. However, this phenomenon has also been noted in younger subjects with normal cardiac function [10], which cannot be explained by increased LV diastolic pressures.

Some other studies revealed that the O-wave was strongly associated with early mitral flow (E wave) [5–7]. If so, the trend of O/C ratio in patients with arterial hypertension (AH) should vary depending on left ventricular diastolic (LVD) function, as in case of mitral flow pattern, especially the early to late mitral flow ratio (E/A). Therefore, the assumption that the O/C ratio should rise with progression from normal LVD function to its impaired relaxation might be incorrect. The explanation of this phenomenon is important in view of the widening use of ICG in clinical practice.

## Aim

The aim of the study was to evaluate the relation between O/C ratio and echocardiographic features in patients with essential AH with normal and mildly impaired LVD function.

## Material and methods

### Study population

The study group consisted of patients with at least a 3-month history of AH defined according to the European Society of Cardiology guidelines [11]. The diagnosis of AH was verified with the use of out-patient blood pressure monitoring. The subjects treated with hypotensive drugs were recommended to discontinue them at least 7 days before the examination.

The exclusion criteria comprised: (1) confirmed secondary AH, (2) AH treated with three or more medicines before recruitment, (3) heart failure, (4) cardiomyopathy, (5) significant heart rhythm disorders, (6) significant valvular disease, (7) kidney failure (estimated glomerular filtration rate below 60 ml/min*1.73m$^2$), (8) chronic obstructive pulmonary disease, (9) diabetes, (10) polyneuropathy, (11) peripheral vascular disease, and (12) age <18 years and >65 years.

The group selected for this retrospective analysis comprised patients from a clinical study performed in the Department of Cardiology and Internal Diseases of the Military Institute of Medicine (ClinicalTrials.gov – NCT01 996 085). The study was conducted according to the Good Clinical Practice guidelines and the Declaration of Helsinki, with the approval of the local ethics committee. Each patient provided informed written consent to participate in the study.

The clinical examination was performed with consideration for the cardiovascular risk factors and symptoms indicating secondary causes of AH [11]. The laboratory tests included evaluation of renal function (creatinine, eGFR – calculated using the MDRD formula) and metabolic disturbances (total cholesterol, low density lipoprotein cholesterol, high density lipoprotein cholesterol, triglycerides, and fasting glucose) to identify patients with metabolic syndrome (MS), defined according to the IDF criteria [12].

### Office blood pressure measurement (OBPM)

The office blood pressure measurement was performed in the morning hours (07.30-08.30) automatically (Omron M4 Plus, Japan) with a technique compliant with the European Society of Cardiology guidelines [11]. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured in a quiet room, in the presence of a trained physician or nurse, after a minimum of 5 minutes of rest in a sitting position. The BP category of AH was defined according to the European Society of Cardiology guidelines [11]: grade 1 – OSBP 140-159 mm Hg and/or ODBP 90-99 mm Hg, grade 2 – OSBP 160-179 mm Hg and/or ODBP 100-109 mm Hg, grade 3 – OSBP exceeding 180 mm Hg and/or ODBP exceeding 110 mm Hg.

### Echocardiography

A two-dimensional echocardiography was performed using standard parasternal, apical and subcostal views (2.5 MHz transducer; VIVID S6 GE Medical System, Wauwatosa, WI, USA.). The dimension of the left atrium (LA), left ventricular end diastolic diameter (LVEDD) and interventricular septum diameter (IVSD) were measured in the parasternal long-axis view in the late diastole of the left atrium and left ventricle (LV), respectively. Left ventricular ejection fraction (LVEF) was calculated according to Simpson's formula employing a 2-dimensional image of the LV chamber during systole and diastole in the 4- and 2-chamber apical views. The left ventricular hypertrophy (LVH) was diagnosed according to the ASE-recommended formula for estimation of left ventricular mass index (LVMI) from 2D linear LV measurements indexed to body surface area (cut-off values for males LVMI > 115 g/m$^2$, for females > 95 g/m$^2$).

Mitral valve inflow was recorded in the apical 4-chamber view with a pulsed wave Doppler gate positioned in the LV on the level of the mitral valve edges. The following parameters were measured: mitral flow early (E) and late (A) phase ratio (E/A) and phase E deceleration time (EdecT). The apical 5-chamber view enabled simultaneous registration of the flow pattern through the aortic and mitral valves and isovolumic diastolic time calculation. Tissue Doppler imaging was performed in the apical views to acquire mitral annular velocity. The sample volume was positioned at or within 1 cm of the septal insertion sites of the mitral leaflets and adjusted as necessary (usually 5–10 mm) to cover the longitudinal excursion of the mitral annulus in diastole. Additionally, the mitral septal annulus early diastolic velocity (e') was measured and the E/e' ratio was calculated. The diagnosis of LVD dysfunction was based on the current guidelines [13–14].

The study group comprised only patients with normal LVD function and LVD dysfunction stage I (impaired relaxation diastolic filling pattern, which is related to the reduced left ventricular filling in early diastole). The following values were considered abnormal: e' < 8 cm/s; left atrium >40 mm for males and >38 mm for females; E/A < 0.8; EdecT > 200 ms; isovolumic relaxation time (IVRT) ≥ 100 ms; and E/e' ratio > 8.

### Impedance cardiography (ICG)

All ICG measurements were performed using the Niccomo™ device (Medis, Ilmenau, Germany) after 10 minutes of rest in a supine position. The data were recorded during a 10-minute assessment and exported to the dedicated software (Niccomo Software, Medis, Ilmenau, Germany). A ratio of diastolic O wave to systolic C wave (O/C [%]) was calculated from the ICG curve.

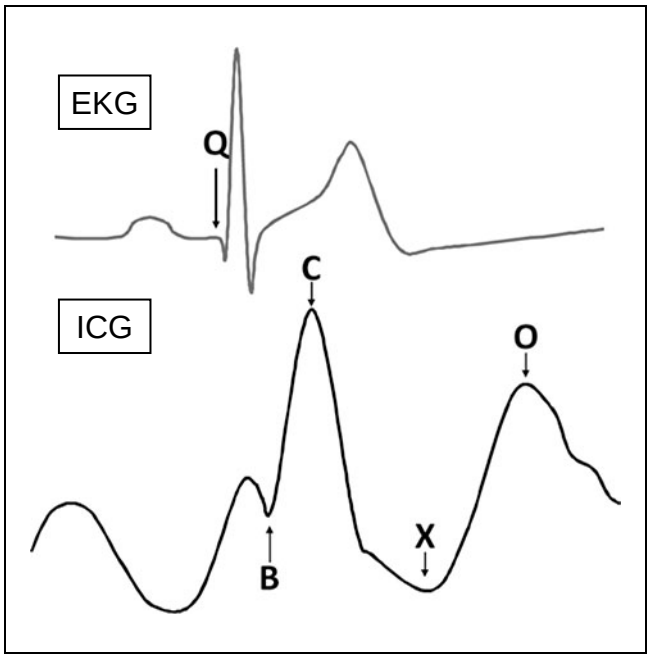



**Figure 1.** Characteristics of the impedance curve (ICG) where B is the start of left ventricular ejection, C is the maximum amplitude during systole, X is the point of closure of aortic valve and O is the diastolic upward deflection. Pre-ejection period (PEP) and left ventricular ejection time (LVET) are calculated in reference to Q in the electrocardiogram (ECG).

**Rycina 1.** Charakterystyka krzywej impedancyjnej (ICG), gdzie B odpowiada początkowi wyrzutu krwi z lewej komory, C – maksymalnej amplitudzie wyrzutu w skurczu, X – zamknięciu zastawki aortalnej, a O – rozkurczowemu wychyleniu ujemnemu. Okres przedwyrzutowy (PEP) i czas wyrzutu (LVET) są kalkulowane w odniesieniu do punktu Q elektrokardiogramu (EKG).

The O wave (amplitude between point X and point O) is the early diastolic upward defection of the dZ/dt curve (first derivate of impedance change) and the C wave is its maximum systolic amplitude, measured from the baseline (0) (fig 1).

Apart from that, the final analysis included mean values of hemodynamic parameters such as: heart rate (HR [bpm]); systolic and diastolic blood pressure (SBP and DBP [mmHg]); stroke index (SI [ml/m$^2$] = SV/ body surface area (BSA), where stroke volume (SV) is calculated using the Sramek and Bernstein formula SV = VEPT*dZmax*LVET/Z0 accounting for weight, height and sex (variable VEPT), dZmax and left ventricular ejection time (LVET); cardiac index (CI [l/min/ m$^2$] = SI*HR); systemic vascular resistance index (SVRI [dyn*s*m$^2$/cm$^5$] = 80*[MBP-CVP]/CI, where MBP Is mean blood pressure and CVP is central venous pressure (assumed value 6 mm Hg)); total arterial compliance (TAC [ml/mm Hg] = SV/pulse pressure [PP]).

### Statistical analysis

The statistical analysis was performed using Statistica 7.0 (StatSoft, Inc., Tulsa, OK, USA) software. The distribution and normality of data were assessed by visual inspection and the Kolmogorov-Smirnov test. Continuous variables were presented as means ± standard deviations (SD) and categorical variables as absolute and relative frequencies (percentages). The association between the chosen indices of cardiovascular function or structure was investigated with Pearson's correlation coefficients. For the purposes of multivariate linear regression for E/A, it was normalized to a natural logarithm (ln E/A). A p value of <0.05 was taken to indicate statistical significance.

## Results

The study group comprised the patients characterized in table 1, and was dominated by subjects with mild hypertension and more than half with coexisting metabolic disturbances.

The mean O/C ratio in the study group was 38.0 ± 13.4% (range: 8.7 – 77.3%) and was significantly lower in patients with LVD dysfunction than normal LVD function: 32.6 ± 14.1 *vs* 39.8 ± 12.7%; p = 0.001. No difference between males and females was observed (37.9 ± 13.8 *vs* 38.2 ± 12.7%, p = 0.828). O/C ratio was associated with age (r = -0.48, p < 0.00 001) and LA (r = -0.20, p = 0 .018). No significant correlation with BMI, SBP, DBP, HR, LVEDD, or LVMI was noted.

In general we observed that the correlation of O/C ratio with the parameters characterizing mitral flow pattern (E, A, E/A) and other clinical and hemodynamic variables was greater than with indices of LV filling pressure (e', E/e'). The O/C ratio was positively related to E/A, which was a consequence of the positive correlation with E and negative with A (tab. 2, fig. 2). We also observed an association of O/C ratio with e' but not with E/e'. The only other variable better correlated with echocardiography was age. The relations between echocardiographic parameters and impedance indices of LV performance (SI, CI), afterload (SVRI, TAC), as well as BMI, SBP, DBP and HR, were weaker.

The multivariable linear regression analysis in the best-fit model demonstrated that the O/C ratio and the variables such as: age, HR, SBP were significant predictors of the E/A accounting for 41% of its overall variance (tab. 3).

## Discussion

The results of our study revealed that O/C ratio is related to the echocardiographic features of LVD function, especially mitral flow pattern. We showed that O/C ratio decreases with age and LVD function deterioration, as does E/A.

**Table 1. Basic characteristics of the study group**
**Tabela 1. Charakterystyka podstawowa grupy badanej**

| | **study group (n=144)** |
|---|---|
| Age (years), mean ± SD | 45.2 ± 10.4 |
| HR (bpm), mean ± SD | 73.6 ± 10.7 |
| SBP (mm Hg), mean ± SD | 141.2 ± 13.0 |
| DBP (mm Hg), mean ± SD | 90.3 ± 9.3 |
| AH – grade 1, n (%) | 115 (79.9) |
| AH – grade 2, n (%) | 28 (19.4) |
| AH – grade 3, n (%) | 1 (0.7) |
| Previous hypotensive treatment, n (%) | 28 (19.4) |
| BMI (kg/m$^2$), mean ± SD | 29.0 ± 4.2 |
| MS, n (%) | 84 (58.3) |
| eGFR (ml/min/1.73 m$^2$), mean ± SD | 99.8 ± 18.7 |
| LVH, n (%) | 15 (10.4) |
| LVD dysfunction, n (%) | 35 (24.3) |

HR – heart rate, SBP – systolic blood pressure, DBP – diastolic blood pressure, AH – arterial hypertension, BMI – body mass index, MS – metabolic syndrome, eGFR – estimated glomerular filtration rate, LHV – left ventricular hypertrophy, LVD dysfunction – left ventricular diastolic dysfunction

Our results provide some explanation of the discrepancies between studies reporting high O-wave in both normal and severely ill subjects. In fact, in young and middle-aged hypertensives the O/C ratio tends to decrease with age, especially in the presence of mildly impaired LVD dysfunction. However, our observations do not contradict the previous studies mentioned above. We suppose that the shift to the increasing tendency may occur in the elderly and more advanced stages of LVD dysfunction.

The mean value of O/C ratio in our study group differed from those noted in HF [8,15]. As we reported previously, in stable HF patients the O/C ratio was higher both before and after cardiac rehabilitation (54.8 ± 24.0 and 47.9 ± 20.8%, respectively) [15]. Kuang et al. [10] also observed that a high O/C ratio was associated with cardiac insufficiency.

We showed that O/C ratio was related positively to E and negatively to A, and, as a consequence, had a stronger correlation with E/A than other ICG variables. Besides age, no other considered clinical characteristics had a stronger correlation to echocardiography. The correlation between O/C ratio and early diastolic mitral flow was previously reported. Lababidi et al. [16] proved that the O-wave occurs at the time of the opening of mitral valve. Schieken et al. [6] linked O/C ratio with the early maximal mitral flow in patients with mitral regurgitation. It was suggested that the O-wave is a derivate of pulmonary venous return related to end-diastolic pressure and pulmonary wedge pressure [8].

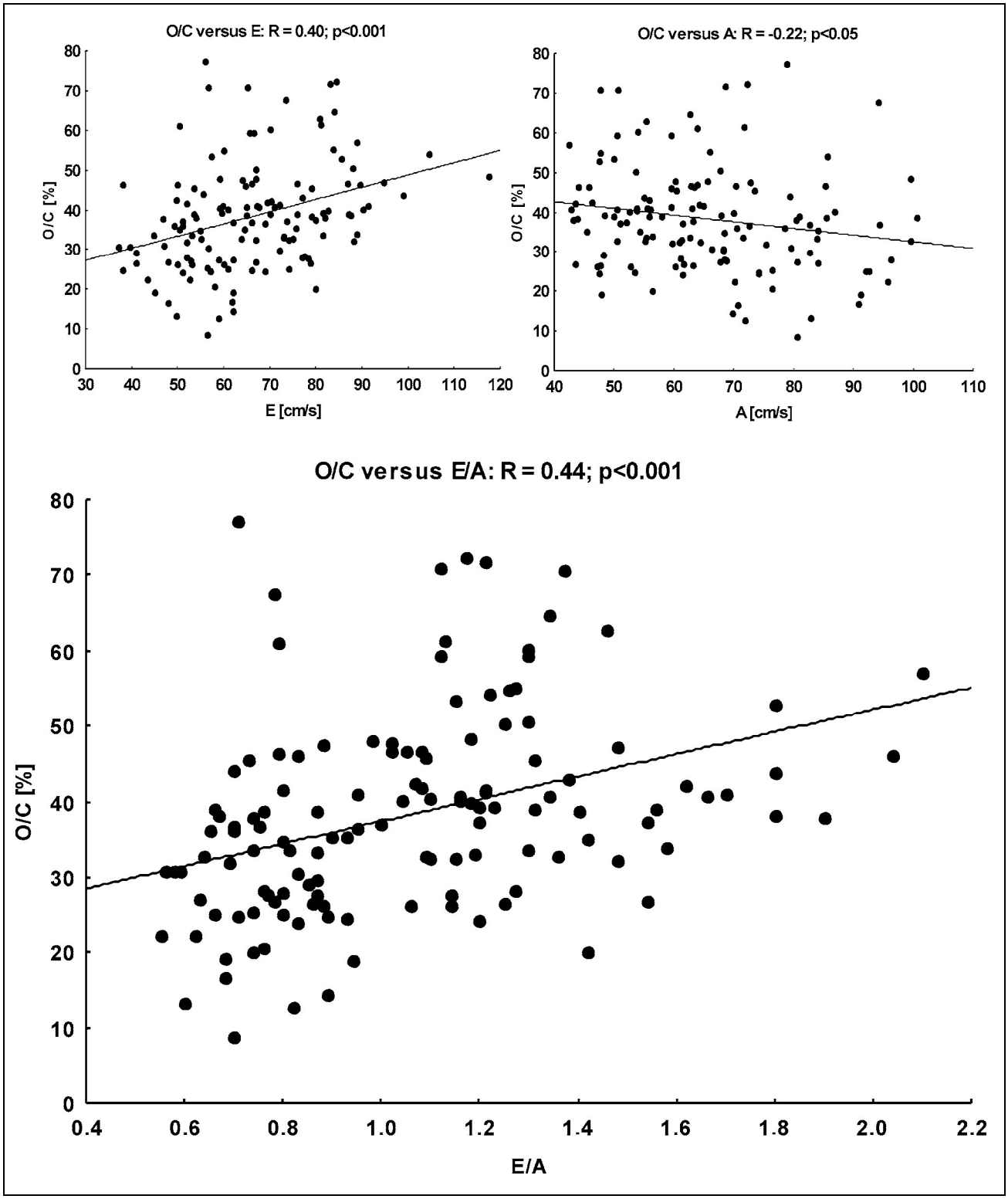



**Figure 2.** Correlation between O/C ratio and mitral flow characteristics (E, A, E/A). A – mitral flow late phase, E – mitral flow early phase, E/A – mitral flow early and late phase ratio, O/C – ratio of impedance diastolic wave to systolic wave.

**Rycina 2.** Korelacje pomiędzy wskaźnikiem O/C a wskaźnikami napływu mitralnego (E, A, E/A). A – prędkość późnego napływu mitralnego, E – prędkość wczesnego napływu mitralnego, E/A – wskaźnik E/A, O/C – wskaźnika stosunku impedancyjnej fali rozkurczowej do skurczowej.

**Table 2. Correlations between the echocardiographic indices of left ventricular diastolic function and clinical/hemodynamic parameters**
**Tabela 2. Korelacje pomiędzy echokardiograficznymi wykładnikami funkcji rozkurczowej lewej komory a wskaźnikami klinicznymi/ hemodynamicznymi**

| | E | A | E/A | e' | E/e' | EdecT | IVRT |
|---|---|---|---|---|---|---|---|
| Age | 0.39# | 0.43# | 0.56# | 0.36# | ns | 0.38# | 0.40# |
| BMI | ns | 0.23** | 0.18 * | ns | ns | ns | ns |
| SBP | ns | 0 .18* | 0.20* | 020* | ns | ns | ns |
| DBP | ns | ns | ns | ns | ns | ns | ns |
| HR | ns | ns | 0.20* | ns | ns | ns | ns |
| SI | 0.17* | ns | 0.27** | 0.I9* | ns | ns | ns |
| CI | 0.17* | ns | ns | 0.23** | ns | ns | ns |
| SVRI | 0.26** | ns | 0.28# | 0.30# | ns | 0.19* | ns |
| TAC | 0.20* | 0.18* | 0.27** | 0.19* | ns | ns | ns |
| O/C | 0.40# | 0.22* | 0.44# | 0.28** | ns | 0.33# | 0.45# |

* p <0.05
** p <0.01
# p <0.001
E – mitral flow early phase, A – mitral flow late phase, E/A – mitral flow early and late phase ratio, e' – mitral septal annulus early diastolic velocity, E/e' – ratio of mitral flow early phase to mitral septal annulus early diastolic velocity, EdecT – phase E deceleration time, IVRT – isovolumic relaxation time, BMI – body mass index, SBP – systolic blood pressure, DBP – diastolic blood pressure, HR – heart rate, SI – stroke index, CI – cardiac index, SVRI – systemic vascular resistance index, TAC – total arterial compliance, O/C – ratio of impedance diastolic wave to systolic wave, ns – not significant

**Table 3. Multivariable linear regression analysis of the natural logarithm of E/A (ln E/A)**
**Tabela 3. Analiza metodą wieloczynnikowej regresji liniowej dla zmiennej E/A zlogarytmowanej (ln E/A)**

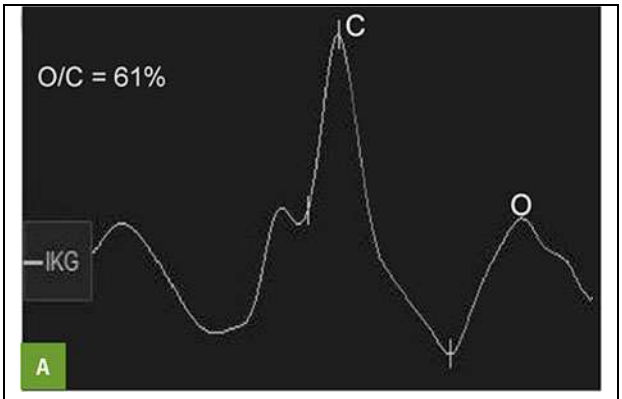
R = 0.64; R2 = 0.41; corrected R2 = 0.39; F (4,126) = 21.5; p<0.000 001

| | β | s.e. | B | s.e. | t (126) | p |
|---|---|---|---|---|---|---|
| | | | 0.588 | 0.12 5 | 4.715 | 0.000 006 |
| Age (years) | 0.47 | 0.077 | 0.006 | 0.001 | 6.159 | <0.000 001 |
| HR | 0 .16 | 0.071 | 0.002 | 0.001 | 2.335 | 0.021 |
| SBP | 0.15 | 0.071 | 0.002 | 0.001 | 2.191 | 0.030 |
| O/C | 0.19 | 0.077 | 0.002 | 0.001 | 2.527 | 0.013 |

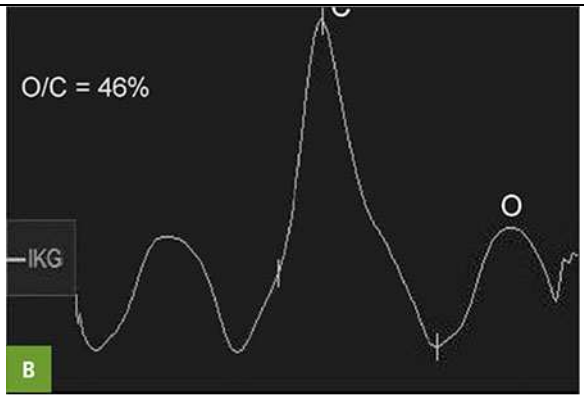
In E/A (mitral flow early and late phase ratio) it was considered to be a dependent variable.
Entry variables tested in the model were as follows: age; HR – heart rate, SBP – systolic blood pressure, O/C ratio of impedance diastolic wave to systolic wave, body mass index (BMI) did not enter the final multivariable model

Kuang et al. [10] investigated the formation of early diastolic defection of dZ/ dt signal and concluded that the O-wave is the effect of superposition of the impedance components for the right and left ventricle, aorta and pulmonary vessels with the dominating input of the heart chambers. In the study of Pickett and Buell [7] it was strongly correlated with the E wave (r=0.64, p=0.001) and preload dependent. They observed that body position influences both E and O/C ratio in the same way. The relationship with E suggest that the O/C ratio depends on the intraventricular pressure difference from LA to the LV apex, which is reduced in mild LVD dysfunction [17]. Thus, the O/C ratio may also present a "U-shaped" response to deterioration of LVD function, as observed for E. The examples depicting these hypothesis are presented in figure 3.

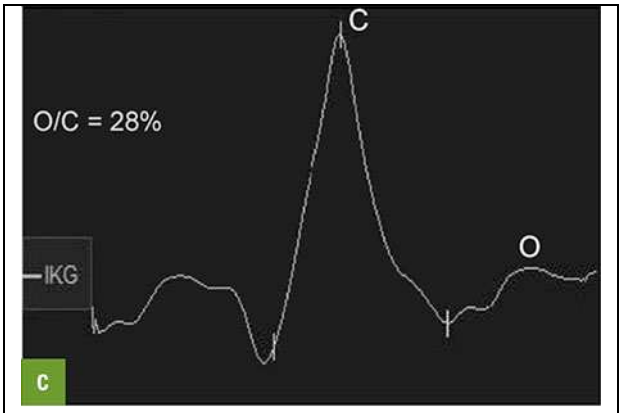
In our study the relation of O/C ratio to LVD function was confirmed by correlation not only with the mitral flow characteristics (E, A, E/A, EdecT) but also early diastolic tissue velocity (e') and isovolumic relaxation (IVRT).



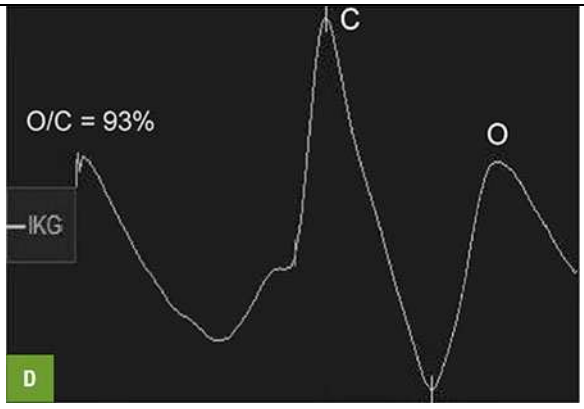

35-year-old healthy man
LV diastolic function: normal (E/A1.3)




47-year-old hypertensive man
LV diastolic function: normal (E/A1.1)




44-year-old hypertensive man
LV diastolic function: impaired relaxation (E/A 0.8)




74-year-old hypertensive man with HF (LVEF 40%)
LV diastolic function: restriction (E/A 2.2)

**Figure 3.** Four cases from our collection presenting the relations between O/C ratio (ratio of impedance diastolic wave to systolic wave) and E/A (mitral flow early and late phase ratio) in different stages of left ventricular diastolic function (LVD). In a young healthy male with normal LVD function the O/C ratio was high (A), in middle-aged hypertensives (B, C) it was lower, especially in the subject with impaired relaxation of the left ventricle (C). However, the highest O/C ratio was observed in the patient with severely impaired LV systolic and diastolic function (D). HF – heart failure, LV – left ventricle, LVEF – left ventricular ejection fraction.

**Rycina 3.** Cztery przykłady ze zbiorów własnych prezentujące związek pomiędzy wskaźnikiem O/C (stosunek impedancyjnej fali rozkurczowej do skurczowej) oraz E/A (stosunek prędkości wczesnej i późnej fazy napływu mitralnego) w różnych stadiach funkcji rozkurczowej lewej komory. U młodego i zdrowego mężczyzny z prawidłową funkcją rozkurczową wskaźnik O/C był wysoki (A), zaś u osób z nadciśnieniem w średnim wieku (B, C) niski, zwłaszcza przy współistnieniu upośledzonej relaksacji LV. Jakkolwiek wyższy wskaźnik O/C zaobserwowano u chorego z ciężką niewydolności skurczową i rozkurczową LV (D). HF – niewydolność serca, LV – lewa komora, LVEF – frakcja wyrzutowa lewej komory.

This suggests that the O/C ratio depicts the complex nature of the diastolic left atrial-ventricular interaction and its association with preload, afterload and LV stiffness [13]. We should also emphasize that the shift from low to high O/C ratio may result from a decreasing C-wave. This is observed in patients with impaired LV systolic function but even in hypertensives with preserved LVEF left ventricular performance may be impaired. Siegel et al. [18] showed that the C-wave was inversely related to the afterload. Similarly, we observed that patients with LVD dysfunction present higher SVRI (2439.4 ± 483.7 *vs* 2269.8 ± 457.9 dyn*s*m$^2$/cm$^5$, p<0.05) and slightly lower values of dZmax derivates: SI (46.1 ± 11.0 *vs* 48.2 ± 9.2 ml/m$^2$, p<0.05), velocity index (39.9 ± 12.4 *vs* 45.9 ± 12.2 1/1000*Ohm/s, p<0.05), and acceleration index (60.9 ± 25.5 *vs* 69.6 ± 26.0 1/100*Ohm/s$^2$, p<0.05) [data unpublished].

## Clinical implications

We hope that our observations will contribute to better understanding of the relation between the ICG curve parameters and the echocardiographic features of the LVD function. We observed that the O/C ratio should be interpreted with consideration of the mitral flow

pattern. This simple non-invasive parameter may support monitoring of the LV function. However, the change in O/C ratio should be compared with the patient's clinical state and, particularly, the diastolic mitral flow pattern in order to differentiate whether it reflects an improvement (regression) or deterioration (progression) of LVD function.

### Limitations

We are aware that the small sample size of the subgroups and the retrospective design are limitations of our study. The other limitation is that patients with more advanced LVD dysfunction (with pseudonormal and restrictive fillings) were not included in the analysis and only presented as example cases in Figure 3. It should be emphasized that our results apply to patients with uncomplicated AH and should not be extrapolated onto the general population. On the other hand, the strength of our results is that we recruited unmedicated hypertensives, without other serious chronic diseases. Thus, our observations are specific to AH, deprived of any potential bias related to pharmacotherapy and additional cardiovascular alterations.

## Conclusions

In hypertensive patients with normal and mildly impaired LVD function the O/C ratio is associated with mitral flow characteristics. Its trend in this specific group was observed to be opposite to that expected after the analysis of the observations in patients with heart failure, a myocardial infarct and valvular diseases. In our study group, O/C ratio decreased with age, especially in coexistence with impaired LV relaxation. However, the distinctive association with mitral flow pattern suggests that the O/C ratio can rise in more advanced grades of LVD dysfunction (pseudonormal and restrictive fillings), which should be investigated in further studies.

### Conflict of interest

None declared

### Acknowledgements

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## References

1. Kim DW. Detection of physiological events by impedance. Yonsei Med J. 1989; 30: 1–11
2. Woltjer HH, Bogaard HJ, de Vries PM. The technique of impedance cardiography. Eur Heart J, 1997; 18: 1396–1403
3. Van De Water JM, Miller TW, et al. Impedance cardiography: the next vital sign technology? Chest, 2003; 123: 2028–2233
4. Karnegis JN, Heinz J, Kubicek WG. Mitral regurgitation and characteristic changes in impedance cardiogram. Br Heart J, 1981; 45: 542–548
5. Woltjer HH, Bogaard HJ, de Vries PM. The technique of impedance cardiography. Eur Heart J, 1997; 18: 1396–1403
6. Schieken RM, Patel MR, Falsetti HL, Lauer RM. Effect of mitral valvular regurgitation on transthoracic impedance cardiogram. Br Heart J, 1981; 45: 166–172
7. Pickett BR, Buell JC. Usefulness of the impedance cardiogram to reflect left ventricular diastolic function. Am J Cardiol, 1993; 71: 1099–1103
8. Woltjer HH, Bogaard HJ, Bronzwaer JG, et al. Prediction of pulmonary capillary wedge pressure and assessment of stroke volume by noninvasive impedance cardiography. Am Heart J, 1997; 134: 450–455
9. Ramos MU. An abnormal early diastolic impedance waveform: a predictor of poor prognosis in the cardiac patient? Am Heart J, 1977; 94: 274–281
10. Kuang NZ, Xiao QJ, He BQ, et al. Analyzing the formation of normal and abnormal O waves in thoracic impedance graph using the impedance change components for aorta, blood vessels in lung and ventricles. Cardiol J, 2014: 21; 176–182
11. Mancia G, Fagard R, Narkiewicz K, et al. Task Force Members: 2013 ESH/ ESC Guidelines for the management of arterial hypertension: the Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). J Hypertens, 2013; 31: 1281–1357
12. Alberti KG, Zimmet P and Shaw J; IDF Epidemiology Task Force Consensus Group. The metabolic syndrome: a new worldwide definition. Lancet, 2005; 366: 1059–1062
13. Nagueh SF, Appleton CP, Gillebert TC, et al. Recommendations for the evaluation of left ventricular diastolic function by echocardiography. Eur J Echocardiogr, 2009; 10: 165–193
14. Lang RM, Bierig M, Devereux RB, et al. American Society of Echocardiography's Nomenclature and Standards Committee, Task Force on Chamber Quantification, American College of Cardiology Echocardiography Committee, American Heart Association, European Association of Echocardiography, European Society of Cardiology: Recommendations for chamber quantification. Eur J Echocardiogr, 2006; 7: 79–108
15. Gielerak G, Piotrowicz E, Krzesiński P, et al. The effects of cardiac rehabilitation on haemodynamic parameters measured by impedance cardiography in patients with heart failure. Kardiol Pol, 2011; 69: 309–317
16. Lababidi Z, Ehmke DA, Durnin RE, et al. The first derivative thoracic impedance cardiogram. Circulation, 1970; 41: 651–658
17. Iwano H, Pu M, Upadhya B, et al. Delay of left ventricular longitudinal expansion with diastolic dysfunction: impact on load dependence of e' and longitudinal strain rate. Physiol Rep, 2014: 2
18. Siegel, Fabian M, Lankau C, et al. Clinical and experimental use of thoracic impedance plethysmography in quantifying myocardial contractility. Surgery, 1970; 67: 907–917

# PMCF evaluation of the efficiency, safety and silver ion secretion from the TROMBOGUARD®hemostatic first aid and tactical dressing

## Ocena kliniczna PMCF skuteczności, bezpieczeństwa stosowania oraz uwalniania jonów srebra z opatrunku hemostatycznego do udzielania pierwszej pomocy i opatrywania ran urazowych TROMBOGUARD® (badanie uzupełniające fazę III)

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**Abstract.** TROMBOGUARD® is a sterile, hemostatic first aid and tactical dressing, consisting of a hydrophilic polyurethane foam, a semi-permeable polyurethane film, and an active layer having basic hemostatic properties, composed of chitosan, alginate and silver ions. The aim of the study was to evaluate the efficacy and safety of the TROMBOGUARD® hemostatic dressing in terms of silver ion release. The study also included a risk assessment for complications occurring after applying the dressing. The study group consisted of 5 individuals who met the study inclusion criteria, i.e. having wounds of different etiologies requiring surgery. The examination of the impact of the dressing on blood and urine parameters showed neither a statistically nor a clinically significant impact. The release of silver ions from the dressing to pseudothrombus was statistically insignificant. The use of TROMBOGUARD® dressings reduced perioperative blood loss. Furthermore, the bacteriostatic properties, maintained the wound "clean", allowing the postponement of definitive closure of the wounds until skin could be acquired or the wounds healed. No evidence of any complications or adverse reactions related to the direct action of the dressing has been found to date.
**Key words:** hemostatic dressing, hemostasis, chitozan, silver ions

**Streszczenie.** TROMBOGUARD® jest sterylnym hemostatycznym opatrunkiem do udzielania pierwszej pomocy i opatrywania ran urazowych, składającym się z hydrofilowej pianki poliuretanowej, półprzepuszczalnej folii poliuretanowej oraz warstwy aktywnej o podstawowym działaniu hemostatycznym, zawierającej chitozan, alginiany oraz sole srebra. Celem badania była ocena skuteczności oraz bezpieczeństwa stosowania hemostatycznego opatrunku TROMBOGUARD® pod kątem uwalniania jonów srebra. Badanie obejmowało ocenę ryzyka powstawania powikłań po zastosowaniu opatrunku. Grupę badaną stanowiło 5 chorych spełniających kryteria włączenia do badania, tj. uznano rany o różnej etiologii wymagające leczenia chirurgicznego. Badania wpływu opatrunku na parametry krwi i moczu nie wykazały żadnego wpływu istotnego statystycznie ani tym bardziej znaczącego klinicznie. Opatrunek uwalniał srebro do pseudoskrzepu w ilości śladowej – nieistotnej statystycznie. Zastosowanie opatrunków TROMBOGUARD® zmniejsza okołooperacyjną utratę krwi. Ponadto właściwości bakteriostatyczne utrzymują ranę „czystą", umożliwiając odroczenie definitywnego zamknięcia ran aż do pozyskania skóry lub zdeklarowania rany. Dotychczas nie stwierdzono występowania żadnych powikłań ani reakcji niepożądanych związanych z bezpośrednim działaniem opatrunku.
**Słowa kluczowe:** opatrunek hemostatyczny, hemostaza, chitozan, jony srebra

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## Introduction

Hemorrhage is the main cause of death in multiorgan injuries under combat field conditions [1-3]. According to the ERC guidelines, hemorrhage is a reversible cause of heart arrest, and 60% of deaths on the battlefield which could be avoided are related to massive hemorrhages from the limbs. Current strategies for first aid in battle injuries place the emphasis on quick identification of the source of bleeding followed by immediate staunching by pressure (tourniquets or pressure dressings) or use of hemostatic products, maintenance of respiration, circulation and proper vascular filling [4–6]. The guidelines for the US Army stipulate that there is no need for fluid transfusion in the case of superficial wounds [6]. 9.0% of battlefield injuries are deeply penetrating gunshot wounds, usually in the limbs [3]. The time from injury to first aid in urban areas is on average up to 30 minutes, while on the battlefield even over 1 hour [3]. Quick first aid significantly improves the prognosis [6]. Providing soldiers with effective and easy-to-use hemostatic products increases the chances of survival of those wounded as does the effectiveness of the first aid or self-aid applied under battlefield conditions.

The TROMBOGUARD® hemostatic dressing is a sterile, single-use product. It is a non-invasive dressing intended for first aid and temporal management of injuries and postoperative wounds. It is characterized by the ability to staunch the bleeding (local hemostatic activity) within 3 minutes from application. Thanks to its structure, the dressing also gives some protection from external factors. It is intended mainly for external use, but because of the specificity of the dressed wounds it may have contact with the soft tissues of the patient or, in the case of deep wounds, also with the bones.

TROMBOGUARD® is applied directly onto the wound, with the rough active layer in contact with the site of bleeding. Positively loaded molecules of chitosan located on the surface of the active layer can then bind with negatively loaded erythrocytes and thrombocytes, and create a pseudothrombus. Chitosan is a deacylated chitin derivative obtained from invertebrates [3]. It facilitates blood clotting by creating cross-bonds between erythrocytes [7]. In acidic environments it exhibits tissue adhesive properties. The positive load on the surface attracts the negatively loaded morphotic elements of the blood [3]. Apart from its impact on the internal coagulation route and negatively loaded platelets, chitosan is characterized by strong adhesion to mucous membranes, its adhesion to the tissues creating a barrier to the flow of blood [8, 9]. Chitosan fibers coated with nanocrystalline silver show high bacteriostatic effectiveness.

## Aim

The aim of the study was to evaluate the efficacy and safety of the TROMBOGUARD® hemostatic dressing, intended for first aid and injury wound management. The study involved the evaluation of the risk of complications after the application of the dressing, analysis of the efficacy and time needed to obtain hemostasis, and especially the analysis of the stability of the active layer as to the release of silver ions.

## Material and Methods

The study population consisted of 5 people meeting the inclusion criteria. The median age of the study group was 62 years (range from 29 to 74 [Fig. 1]). The patients included in the study required surgical wound management and/or wound closure with the use of autologous split-thickness skin grafts. The adopted inclusion criteria were the presence of wounds of various etiologies. Patients were observed for 24 hours. The visit on Day 0 involved the assessment of inclusion and exclusion criteria, as well as an interview and physical examination. After obtaining the written consent of the patient, blood and urine samples were collected for laboratory testing, and separate samples were taken for the assessment of silver concentration, in accordance with the Case Report File (CRF). The analysis covered the following examinations: CBC of peripheral blood, coagulation profile, chosen biochemical indices, urinalysis and silver concentration in the blood and urine.

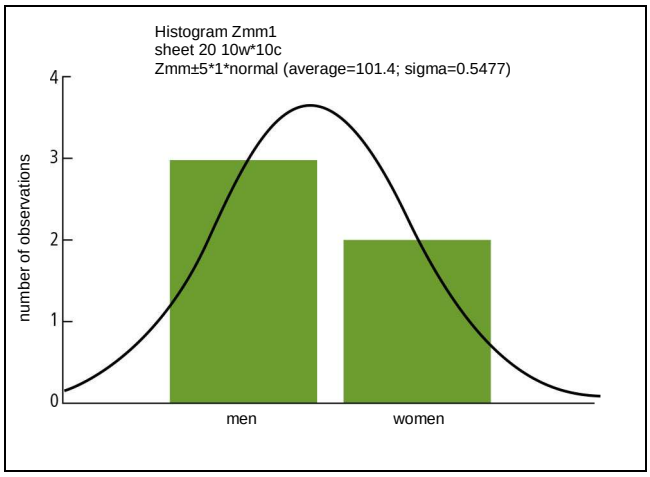


**Figure 1.** Histogram of the analyzed population

**Rycina 1**. Histogram prezentujący badaną populację

**Table 1. Description of treatment and dressing application sites**
**Tabela 1. Opis zastosowanego leczenia oraz miejsca aplikacji badanego opatrunku**

| Patient | Diagnosis | Treatment | Application site |
|---|---|---|---|
| 1 | 2nd stage of reconstruction of the dermis of the right forearm | Covering the forearm wound with a dermatome split-thickness graft from the right thigh | Donor site - right thigh |
| 2 | Chronic post-operative wound of the stump of the right lower limb | Debridement of the wound of the stump (right thigh) | Wound of the stump (right thigh) |
| 3 | Chronic ulceration of right shin caused in the course of chemical burns and venous failure | Debridement of the wound on the right shin, coverage with a dermatome skin graft from the right thigh | Wound on the right shin and donor site - right thigh |
| 4 | Post-burn right elbow contracture | Management of the contracture, dermatome skin graft from the right thigh | Donor site - right thigh |
| 5 | Skin tumor in the lumbar area | Tumor excision, dermatome skin graft from the left thigh | Donor site - left thigh |

**Table 2. CBC results**
**Tabela 2. Wyniki badań morfologii krwi obwodowej**

| Parameter | Screening visit | Follow-up 24 hours after application | Patient no. | Statistical significance |
|---|---|---|---|---|
| Hemoglobin (g/dl) | 14.6 | 14.1 | 1 | |
| | 11.6 | 10.8 | 2 | |
| | 12.5 | 12.1 | 3 | |
| | 15.6 | 14.6 | 4 | |
| | 14.4 | 13.1 | 5 | p = 0.14 |
| Erythrocytes ($10^6$/µl) | 4.88 | 4.74 | 1 | |
| | 4.04 | 3.82 | 2 | |
| | 4.46 | 4.32 | 3 | |
| | 5.27 | 4.89 | 4 | |
| | 4.87 | 4.39 | 5 | p = 0.36 |
| Leukocytes ($10^3$/µl) | 6.94 | 7 | 1 | |
| | 10.01 | 10.2 | 2 | |
| | 6.64 | 6.42 | 3 | |
| | 3.78 | 4.99 | 4 | |
| | 4.73 | 5 | 5 | p = 0.83 |
| Hematocrit (%) | 42 | 41 | 1 | |
| | 35 | 34 | 2 | |
| | 38 | 37 | 3 | |
| | 46 | 43 | 4 | |
| | 43 | 39 | 5 | p = 0.44 |
| Neutrophils (× $10^3$/µl) | 4.13 | 4.93 | 1 | |
| | 6.18 | 7.12 | 2 | |
| | 4.23 | 4.22 | 3 | |
| | 2.2 | 3.45 | 4 | |
| | 2.96 | 3.48 | 5 | p = 0.88 |
| Lymphocytes (× $10^3$/µl) | 2.02 | 1.41 | 1 | |
| | 2.8 | 2.35 | 2 | |
| | 1.71 | 1.35 | 3 | |
| | 1.1 | 0.97 | 4 | |
| | 1.15 | 0.96 | 5 | p = 0.41 |
| Monocytes (× $10^3$/µl) | 0.63 | 0.45 | 1 | |
| | 0.72 | 0.49 | 2 | |
| | 0.56 | 0.73 | 3 | |
| | 0.38 | 0.48 | 4 | |
| | 0.48 | 0.47 | 5 | p = 0.71 |
| Eosinophils (× $10^3$/µl) | 0.13 | 0.18 | 1 | |
| | 0.24 | 0.2 | 2 | |
| | 0.07 | 0.08 | 3 | |
| | 0.09 | 0.07 | 4 | |
| | 0.11 | 0.07 | 5 | p = 0.85 |

**Table 2. CBC results - continued**
**Tabela 2. Wyniki badań morfologii krwi obwodowej – cd.**

| Parameter | Screening visit | Follow-up 24 hours after application | Patient no. | Statistical significance |
|---|---|---|---|---|
| Basophils (× $10^3$/µl) | 0.03 | 0.003 | 1 | |
| | 0.07 | 0.04 | 2 | |
| | 0.07 | 0.04 | 3 | |
| | 0.01 | 0.02 | 4 | |
| | 0.03 | 0.02 | 5 | p = 0.24 |
| Thrombocytes (× $10^9$/l) | 234 | 212 | 1 | |
| | 277 | 257 | 2 | |
| | 395 | 365 | 3 | |
| | 140 | 123 | 4 | |
| | 228 | 202 | 5 | p = 0.69 |
| ESR (mm) | 19 | 12 | 1 | |
| | 102 | 102 | 2 | |
| | 56 | 53 | 3 | |
| | 4 | 3 | 4 | |
| | 11 | 14 | 5 | p = 0.95 |

**Table 3. Urine test results**
**Tabela 3. Wyniki badania ogólnego moczu**

| Parameter | Screening visit | Follow-up 24 hours after application | Patient no. | Statistical significance |
|---|---|---|---|---|
| Specific gravity (g/l) | 1.02 | 1.015 | 1 | |
| | 1.02 | 1.005 | 2 | |
| | 1.015 | 1.015 | 3 | |
| | 1.015 | 1.02 | 4 | |
| | 1.015 | 1.015 | 5 | p = 0.32 |
| Color clarity | Pale yellow clear | Pale yellow clear | 1 | |
| | Pale yellow clear | Pale yellow clear | 2 | |
| | Pale yellow clear | Pale yellow clear | 3 | |
| | Pale yellow clear | Dark yellow clear | 4 | |
| | Yellow clear | Yellow clear | 5 | p = 0.39 |
| pH | 6 | 6.5 | 1 | |
| | 6 | 7 | 2 | |
| | 7 | 7 | 3 | |
| | 6.5 | 6.5 | 4 | |
| | 5 | 6 | 5 | p = 0.22 |

**Table 3. Urine test results - continued**
**Tabela 3. Wyniki badania ogólnego moczu – cd.**

| Parameter | screening visit | Follow-up 24 hours after application | Patient no. | Statistical significance |
|---|---|---|---|---|
| Protein (mg/dl) | negative | negative | 1 | |
| | negative | negative | 2 | |
| | negative | negative | 3 | |
| | negative | negative | 4 | |
| | 25 | negative | 5 | p = 0.34 |
| Glucose (mg/dl) | negative | negative | 1 | |
| | negative | negative | 2 | |
| | negative | negative | 3 | |
| | negative | negative | 4 | |
| | 100 | 1000 | 5 | p = 0.39 |
| Ketone bodies (mg/dl) | negative | negative | 1 | |
| | negative | negative | 2 | |
| | negative | negative | 3 | |
| | negative | 15 | 4 | |
| | negative | 15 | 5 | p = 0.28 |
| Bilirubin | negative | negative | 1 | |
| | negative | negative | 2 | |
| | negative | negative | 3 | |
| | negative | negative | 4 | |
| | negative | negative | 5 | |
| Nitrates | negative | negative | 1 | |
| | negative | negative | 2 | |
| | negative | negative | 3 | |
| | negative | negative | 4 | |
| | negative | negative | 5 | |
| Erythrocytes | negative | negative | 1 | |
| | negative | negative | 2 | |
| | negative | negative | 3 | |
| | negative | negative | 4 | |
| | negative | negative | 5 | |
| Leukocytes | negative | negative | 1 | |
| | negative | negative | 2 | |
| | negative | negative | 3 | |
| | negative | negative | 4 | |
| | negative | negative | 5 | |

**Table 4. Selected biochemical parameters**
**Tabela 4. Wyniki wybranych parametrów biochemicznych**

| Parameter | Screening visit | Follow-up 24 hours after application | Patient no. | Statistical significance |
|---|---|---|---|---|
| AST (U/l) | 22 | 17 | 1 | |
| | 18 | 15 | 2 | |
| | 19 | 19 | 3 | |
| | 26 | 20 | 4 | |
| | 20 | 18 | 5 | p = 0.089 |
| ALT (U/l) | 17 | 11 | 1 | |
| | 24 | 18 | 2 | |
| | 11 | 11 | 3 | |
| | 34 | 29 | 4 | |
| | 17 | 16 | 5 | p = 0.5 |
| Creatinine (mg/dl) | 1 | 1 | 1 | |
| | 1.4 | 1.4 | 2 | |
| | 0.6 | 0.6 | 3 | |
| | 1 | 1 | 4 | |
| | 0.8 | 0.7 | 5 | p = 0.91 |
| Urea (mg/dl) | 43 | 36 | 1 | |
| | 67 | 71 | 2 | |
| | 20 | 19 | 3 | |
| | 35 | 27 | 4 | |
| | 28 | 24 | 5 | p = 0.8 |
| Nitrogen (mg/dl) | 20 | 17 | 1 | |
| | 31 | 33 | 2 | |
| | 9 | 9 | 3 | |
| | 16 | 13 | 4 | |
| | 13 | 11 | 5 | p = 0.83 |
| Albumin (g/dl) | 4.9 | 4.1 | 1 | |
| | 4.5 | 4 | 2 | |
| | 4.4 | 3.7 | 3 | |
| | 5 | 4.3 | 4 | |
| | 4.8 | 4 | 5 | p = 0.00167 |
| Total protein (g/dl) | 7.6 | 6.6 | 1 | |
| | 7.5 | 7.2 | 2 | |
| | 8.3 | 7.6 | 3 | |
| | 7.9 | 6.7 | 4 | |
| | 8 | 6.6 | 5 | p = 0.00562 |
| Glucose (mg/dl) | 75 | 105 | 1 | |
| | 105 | 151 | 2 | |
| | 96 | 96 | 3 | |
| | 91 | 114 | 4 | |
| | 280 | 281 | 5 | p = 0.7 |

**Table 4. Selected biochemical parameters**
**Tabela 4. Wyniki wybranych parametrów biochemicznych – cd.**

| Parameter | Screening visit | Follow-up 24-hours after application | Patient no. | Statistical significance |
|---|---|---|---|---|
| Bilirubin (mg/dl) | 0.4 | 0.4 | 1 | |
| | 0.4 | 0.5 | 2 | |
| | 0.8 | 1 | 3 | |
| | 0.8 | 0.8 | 4 | |
| | 0.3 | 0.6 | 5 | p = 0.45 |

Then the dressing was applied under operating theatre conditions, and a sample for microbiological examination was collected from the wound. The dressing was assessed as to the ease of application and the time needed to staunch the bleeding. 24 hours after the application, blood and urine samples for laboratory tests were collected in accordance with the CRF. Separate samples were taken to measure silver content in the blood and urine and a sample for microbiological examination taken from the wound. Also the removed pseudothrombus was weighed and examined for silver content, and digital photographic documentation was created. The study was approved by the Bioethics Committee of the Military Institute of Medicine.

The subjects underwent standard surgical treatment and the application of the studied dressing: in one case the dressing was simultaneously applied both on the wound and the skin graft donor site; in one case the dressing was used only on the wound after its surgical debridement, while in three remaining cases the dressing was applied only on the donor site after split-thickness skin grafts (Table 1).

## Results

The results of the blood laboratory tests were assessed during the screening visit and 24 hours after the application of the dressing. The presence of statistically significant differences between the results of the two measurements was analyzed with a test for variable-independent data.

The results of the CBC and ESR did not show any statistically significant differences between the screening visit and the follow-up visit 24 hours after the application (Table 2). All patients had some blood loss related to the surgery and related activities, but this did not have a statistically significant impact on the CBC parameters.

The results of the laboratory tests show without doubt that there was no statistically significant influence of the dressing on the CBC and ESR of the studied patients. No statistically significant differences

were observed in the urinalysis (Table 3), between the tests before dressing application and 24 hours after application.

The blood laboratory tests revealed a statistically significant difference, p <0.05, between the total protein and albumin concentrations assayed on Day 0 (screening visit) and 24 hours after the application of the dressing. The differences result from the administered surgical treatment, which had some impact on the protein and albumin concentration levels. Statistical significance does not necessarily mean clinical significance, it is of practically no importance from the clinical perspective. It is obvious that biochemical parameters are assessed by machines on the basis of strict mathematical forms (device norms). The tests of behavior of the coagulation indices did not show any statistically significant influence of the treatment in the form of the studied dressing on blood coagulation indices (Table 4).

The concentration of silver in the blood, urine and pseudothrombus were assayed (Table 5). In one case, an increased (>0.5) silver concentration in the blood was observed. Two patients (2 and 3) with chronic wounds had used dressings, including silver dressings, which could account for the increased silver concentration before and after the application of the dressing.

The differences in silver concentration in the blood and urine between the screening visit and follow-up visit 24 hours after the application of the studied dressing was statistically insignificant (>0.05 [Table 6]). The amounts of silver released to the pseudothrombus were of a trace character and the permeation to the blood and urine was statistically insignificant.

Knowing the amount of silver per 1 gram of pseudothrombus and the total weight of the pseudothrombus, it is possible to calculate how much silver was released to the pseudothrombus (total assayed silver). The surface of the dressing and the maximum amount of silver that can be released from it are known (the dressing contains 18.6 µg Ag/cm$^2$), therefore it is possible to calculate the percentage of silver released from the dressing to the pseudothrombus (Table 7).

**Table 5. Coagulogram results**
**Tabela 5. Wyniki koagulogramu**

| Parameter | Screening visit | Follow-up 24-hours after application | Patient no. | Statistical significance |
|---|---|---|---|---|
| APTT (s) | 29.9 | 29.1 | 1 | |
| | 27.2 | 28.8 | 2 | |
| | 30.6 | 28.9 | 3 | |
| | 26.2 | 26.4 | 4 | |
| | 28.8 | 30.1 | 5 | p = 0.9 |
| PT (s) | 12 | 12.7 | 1 | |
| | 10.7 | 13.1 | 2 | |
| | 11 | 11.3 | 3 | |
| | 10.6 | 11 | 4 | |
| | 10.1 | 10.7 | 5 | p = 0.16 |
| Quick's prothrombine time (%) | 91 | 84 | 1 | |
| | 109 | 96 | 2 | |
| | 104 | 100 | 3 | |
| | 110 | 104 | 4 | |
| | 119 | 109 | 5 | p = 0.23 |
| TT (s) | 14.5 | 15 | 1 | |
| | 12.3 | 13.1 | 2 | |
| | 13.6 | 14.3 | 3 | |
| | 13.6 | 14.6 | 4 | |
| | 15.4 | 15.4 | 5 | p = 0.38 |
| Fibrinogen (mg/dl) | 412 | 351 | 1 | |
| | 663 | 533 | 2 | |
| | 267 | 244 | 3 | |
| | 374 | 404 | 4 | |
| | 345 | 311 | 5 | p = 0.61 |

**Table 6. Results of silver concentration analysis in the test material**
**Tabela 6. Wyniki analizy stężenia srebra w badanym materiale**

| Patient | Blood - screening visit (µg/l) | Blood - follow-up 24 h after application (µg/l) | Urine - screening visit µ/g of creatinine | Urine - follow-up 24 h after application µ/g of creatinine | Pseudothrombus - µg/g of the pseudothrombus tissue, presence of silver after 24 h |
|---|---|---|---|---|---|
| 1 | 0.3 | 0.31 | 0.02 | 0.03 | 5.95 |
| 2 | 0.57 | 0.81 | 0.01 | 0.08 | 31.22 |
| 3 | 0.35 | 0.67 | 0.03 | 0.03 | 1.59 |
| 4 | 0.28 | 0.38 | 0.03 | 0.02 | 2 |
| 5 | 0.38 | 1.67 | 0.03 | 0.05 | 2.72 |

**Table 7. Results of independent variables test for silver concentration in the blood and urine**
**Tabela 7. Test prób niezależnych względem zmiennej dla wartości stężenia srebra w krwi i moczu**

| | Average group 1 | Average group 2 | p |
|---|---|---|---|
| Blood - screening visit (µg/l) vs. blood - follow-up 24 h after application (µ/l) | 0.376 | 0.768 | p=0.153859 <0.05 |
| | Average group 1 | Average group 2 | p |
| Urine - screening visit µ/g of creatinine vs. urine - follow-up 24 h after application µ/g of creatinine | 0.024000 | 0.042000 | p=0.153859 <0.05 |

**Table 8. Analysis of silver concentration in pseudothrombus**
**Tabela 8. Dokładna analiza zawartości srebra w pseudoskrzepie**

| Patient no. | Pseudothrombus µg Ag/g of pseudothrombus tissue | Surface area of applied dressing ($cm^2$) | Weight of pseudothrombus (g) | Maximum release from the dressing 18.6 µg/$cm^2$ | Total assayed silver release g/µg | Released silver/maximum silver |
|---|---|---|---|---|---|---|
| 1 | 5.95 | 200 | 0.22 | 3720 | 1.309 | 0.04% |
| 2 | 31.22 | 200 | 0.04 | 3720 | 1.248 | 0.03% |
| 3 | 1.59 | 200 | 9.29 | 3720 | 14.77 | 0.39% |
| 4 | 2 | 100 | 0.18 | 1860 | 0.36 | 0.02% |
| 5 | 2.72 | 150 | 0.22 | 2790 | 0.59 | 0.02% |

**Table 9. Relation of silver concentration in the blood and urine, and total dressing content**
**Tabela 9. Stosunek stężenia srebra we krwi i moczu do maksymalnie możliwego pochodzącego z całego opatrunku**

| Patient no. | Total assayed silver µg/weight of pseudothrombus | Silver in the blood µg/l | Silver in blood/maximum silver - percentage ratio | Silver in the urine µg/l | Silver in the urine/maximum silver - percentage ratio | Maximum release from the dressing 18.6 µg/$cm^2$ |
|---|---|---|---|---|---|---|
| 1 | 1.309 | 0.31 | 0.008% | 0.03 | 0.0008% | 3720 |
| 2 | 1.248 | 0.81 | 0.02% | 0.08 | 0.002% | 3720 |
| 3 | 14.77 | 0.67 | 0.02% | 0.03 | 0.0008% | 3720 |
| 4 | 0.36 | 0.38 | 0.02% | 0.02 | 0.001% | 1860 |
| 5 | 0.59 | 1.67 | 0.06% | 0.05 | 0.017% | 2790 |

The amounts of silver which permeated to the pseudothrombus in a single release had no clinical significance. This may be confirmed by means of comparison with the amounts of silver released from the dressing to the blood and urine, which were not statistically significant. This means that pseudothrombus constitutes a barrier preventing the permeation of silver from the dressing to the blood and urine (Table 8).

The results of cultures from smears from the wounds managed with the studied dressing were analyzed. In three cases, no growth of bacterial flora was reported (Table 9). In two cases, where there was bacterial flora before the application of the dressing, the tests 24 hours later resulted in the growth of identical flora (no change of bacterial strain).

The smears during the screening visit were collected under surgical conditions, with adhesion to the rigorous rules of antiseptics. In patients 1, 4 and 5, the initial samples were collected from fresh wounds on the donor sites of split-thickness skin grafts prepared with an electrical dermatome. The positive result in the first test of patient 1 may indicate that the patient was a carrier of *Staphylococcus.* In the tests 24 hours after the application of the dressing, the smears from the wounds of patients 1, 4 and 5 gave no bacterial flora in cultures. Patients 2 and 3 were treated for chronic wounds. Before the inclusion to the study, patient 2 was treated with antibiotics and locally in other healthcare centers. The sample collected for the culture came from the non-healing wound. Patient 3 had been treated locally for many years. Lack of wound healing was one of the clinical symptoms and the consequence of the infection. The results of the tests of specimens from the patients 2 and 3 24 hours later revealed no change

in the bacterial flora. The presence of bacteria in the wounds 24 hours later in patients 2 and 3 had no influence on the healing of the donor sites, which in all studied cases was similar (outpatient observation). The results allow us to conclude that the studied dressing has the capabilities to control and protect the wound even in the cases of contamination or colonization. None of the patients had an infection in the donor site of the graft, even if the principal wounds of the patients were infected (patients 2 and 3).

**Table 10. Results of wound bacteriological swab tests**
**Tabela 10. Wyniki wymazów bakteriologicznych z badanych ran**

| Patient no. | Screening visit | Follow-up 24 hours after application | Result |
|---|---|---|---|
| 1 | In the donor site and in the wound - *Staphylococcus aureus* | No bacteria cultured | No growth of bacterial flora |
| 2 | In the donor site and in the wound *Pseudomonas aeruginosa* | In the donor site and in the wound *Pseudomonas aeruginosa* | No changes of the bacterial flora |
| 3 | *Staphylococcus aureus*, *Streptococcus* in the donor site and in the wound | *Staphylococcus aureus*, *Streptococcus* in the donor site and in the wound | No changes of the bacterial flora |
| 4 | No bacteria cultured | No bacteria cultured | No growth of bacterial flora |
| 5 | No bacteria cultured | No bacteria cultured | No growth of bacterial flora |


**Figure 2**. **Case 1.** Diagnosis – post-trauma scars of right forearm. Application site – right thigh. **A.** The treated side before application of the dressing. **B.** Closure of the donor side. **C.** The dressing after 24 hours – the surface of the dressing is dry, with good adhesion to the wound. **D.** Complete hemostasis 24 hours after application, with visible flat pseudoclot, which was examined for content of silver. No symptoms of infection or irritation of tissues was observed.

**Rycina 2**. **Przypadek 1.** Rozpoznanie blizny pourazowe przedramienia prawego. Miejsce aplikacji – miejsce dawcze – udo prawe. **A.** Wygląd miejsca pobrania przeszczepu przed założeniem opatrunku. **B.** Sposób opatrywania miejsca pobrania przeszczepu. **C.** Wygląd opatrunku po dobie – opatrunek suchy, dobrze przylega do rany. **D.** Pełna hemostaza po dobie od aplikacji, widoczne płaskie pseudoskrzepy, które pobrano do analizy zawartości srebra. Brak objawów infekcji i podrażnienia tkanek.

Another element assessed in the study was the effectiveness of staunching blood from the wound. Each time after the creation or debridement of the wound, the dressing was applied as in the instruction, using even pressure on the wound through the dressing. The pressure was applied for 3 minutes and then the effectiveness of hemostasis was assessed (Table 10). 24 hours after the application, the look of outer dressing and effectiveness of blood staunching after the removal of the dressing were evaluated. In all cases, bleeding was stopped effectively after 3 minutes of pressure. Effective hemostasis was confirmed in all patients during the follow-up 24 hours after the application of the dressing.

**Table 11. Efficacy of dressing in hemostasis**
**Tabela 11. Skuteczność tamowania krwawienia przez badany opatrunek**

| Patient no. | Screening visit examination - time necessary to staunch the bleeding (with pressure) | Examination 24 hours after application - control of staunching effectiveness |
|---|---|---|
| 1 | <3 min | Dry outer dressing, no bleeding from the wound |
| 2 | <3 min | Dry outer dressing, no bleeding from the wound |
| 3 | <3 min | Dry outer dressing, no bleeding from the wound |
| 4 | <3 min | Dry outer dressing, no bleeding from the wound |
| 5 | <3 min | Dry outer dressing, no bleeding from the wound |


**Figure 3**. **Case 2.** Diagnosis - chronic wound of right thigh stump. Application site - right thigh. **A.** Chronic wound of right shin after amputation. **B.** Application of the dressing on the wound debrided with versa-jet. **C.** The dressing 24 hours after application with good adhesion and correct appearance. **D.** The wound after removal of the dressing 24 hours later.

**Rycina 3. Przypadek 2.** Diagnoza - przewlekła rana kikuta uda prawego. Miejsce aplikacji - miejsce dawcze - udo prawe. **A.** Przewlekła rana ziarninująca kikuta po amputacji goleni prawej. **B.** Aplikacja badanego opatrunku na ranę po oczyszczeniu hydrochirurgicznym systemem *versa-jet.* **C.** Obraz opatrunku po 1 dobie od aplikacji: opatrunek dobrze przylega, ma prawidłowy wygląd. **D.** Stan po usunięciu badanego opatrunku dobę po aplikacji.


**Figure 4**. **Case 3.** Diagnosis - Chronic shin wound. Application site - right thigh. **A-B.** Simultaneous surgical debridement *(water-jet)* of chronic vascular ulcer of right shin and taking meshed graft from right thigh. **C-F**. Covering debrided wound and donor side with the dressing. **G.** The dressing good adhesion and correct appearance, appropriate absorption. **H.** Effective hemostasis 24 hours after application with good appearance, no signs of bleeding or infection and irritation.

**Rycina 4. Przypadek 3.** Diagnoza - przewlekła rana kikuta uda prawego. Miejsce aplikacji - miejsce dawcze - udo prawe. **A-B.** Jednoczasowe oczyszczenie *(debridement)* chirurgiczne *(water-jet)* naczyniopochodnego owrzodzenia goleni prawej oraz pobranie przeszczepu skóry pośredniej grubości z uda prawego. **C-F.** Pokrycie oczyszczonej rany goleni oraz miejsca pobrania przeszczepu opatrunkiem. **G.** Prawidłowy stan badanych opatrunków - dobrze przylegają, nie ślizgają się, nie są nieprawidłowo nasiąknięte wydzieliną przyranną. **H.** Skuteczna hemostaza po dobie od aplikacji opatrunku na miejsce pobrania przeszczepu oraz jego prawidłowa powierzchnia, bez krwawienia ani objawów zakażenia lub podrażnienia miejscowego.

**Figure 4. Case 3. – cont. G.** The dressing good adhesion and correct appearance, appropriate absorption. **H.** Effective hemostasis 24 hours after application with good appearance, no signs of bleeding, infection, or irritation.

**Rycina 4. Przypadek 3. – cd. G.** Prawidłowy stan badanych opatrunków – dobrze przylegają, nie ślizgają się, nie są nieprawidłowo nasiąknięte wydzieliną przyranną. **H.** Skuteczna hemostaza po dobie od aplikacji opatrunku na miejsce pobrania przeszczepu oraz jego prawidłowa powierzchnia, bez krwawienia ani objawów zakażenia lub podrażnienia miejscowego.

The dressing was effective, safe and easy to use locally. Although it is quite rigid on the convex surfaces, it easily gave way to pressure and fixation in a simple manner.

We enclose photographic documentation for the evaluation of the efficiency of its hemostatic activity.

Figure 2A presents the graft donor site before the application of the dressing. Figure 2A shows the manner of applying the dressing on the donor site. Effective hemostasis was achieved in less than 3 minutes of pressure. Figure 2C shows the dressing after 24 hours – the surface of the dressing is dry, with good adhesion to the wound. In Figure 2D we can see complete hemostasis 24 hours after application, with visible flat pseudothrombi, which were examined for the content of silver. No symptoms of infection or tissue irritation were observed.

Figure 3A shows a chronic granulating wound of the stump after the amputation of the right shin. Figure 3B presents the application of the dressing on the wound debrided by versa-jet. Complete hemostasis was achieved in under 3 minutes. In Figure 3C we can see the dressing 24 hours after application, with good adhesion and correct appearance, while Figure 3D presents the condition of the wound after removal of the dressing 24 hours later. There are no signs of bleeding. The surface of the dressing is intensively red and there are no clinical marks of infection or inflammatory irritation. The surface of the wound is ready for a meshed skin graft and guarantees correct revascularization of the graft.

Patient 3 underwent a simultaneous surgical debridement *(water-jet)* of the chronic vascular ulcer of right shin and the taking of a split-thickness skin graft from the right thigh (Fig. 4A–B). The debrided shin wound and the donor site were covered with the dressing (Fig. 4C–F). Successful, effective hemostasis was achieved in less than 3 minutes from the application of the studied dressing. After 24 hours after the application of the studied dressing on the debrided shin wound, there were pseudoclots on the prepared wound bed, with no traits of infection, inflammatory irritation or suppurative inflammation of the tissues. The surface was ready for a meshed skin graft. In Figure 4G it is possible to see the correct condition of the dressings; they ensure good adhesion, do not slide down and absorb the wound exudate properly. Figure 4H presents the effective hemostasis 24 hours after the application on the donor site, with good appearance, no signs of bleeding or symptoms of infection or local irritation.

Patient 4 underwent a surgical freeing of a post-burn contracture in the area of the right cubital fossa (Fig. 5A). Figure 5B presents the donor site and Figure 5C the application of the dressing. Effective hemostasis was achieved in under 3 minutes. Figure 5D shows the effective hemostasis 24 hours after the application, with good appearance, no signs of bleeding, infection or irritation. There are no reservations as to the appearance of the dressing and the wound surface after taking the graft.

Figure 6A shows the clinical situation, with an extensive skin tumor of the back. Patient 5 underwent a radical excision of the tumor, with temporal coverage of the wound with the studied dressing. Complete hemostasis at the excision site was achieved in less than 3 minutes (Fig. 6B). Simultaneously, a split-thickness skin graft was taken from the right thigh in order to perform a delayed definitive closure of the wound (Fig. 6C). Figure 6D shows the correct look of the wound after the removal of the dressing 24 hours later. The surface does not bleed, is clinically clean, without signs or symptoms of any inflammatory or suppurative process, or tissue irritation.


**Figure 5**. **Case 4.** Diagnosis – post-burn right elbow contracture. Application site – right thigh. **A.** Surgical treatment of post-burn elbow contracture. **B.** Donor side. **C.** Application of the dressing. **D.** Effective hemostasis 24 hours after application, with a good appearance, no signs of bleeding, infection or irritation.

**Rycina 5. Przypadek 4.** Rozpoznanie – pooparzeniowy przykurcz stawu łokciowego prawego. Miejsce aplikacji – miejsce dawcze – udo prawe. **A.** Operacyjne uwolnienie pooparzeniowego przykurczu w okolicy dołu łokciowego prawego. **B.** Miejsce pobrania przeszczepu. **C.** Aplikacja badanego opatrunku. **D.** Skuteczna hemostaza po dobie od aplikacji i brak objawów świeżego krwawienia, infekcji czy podrażnienia tkanek.

## Discussion

Hemostatic dressings may be divided into two groups: biological and synthetic [7]. Biological dressings are most often based on chitosan, a polysaccharide obtained from the shells of crustaceans [7]. One of its advantages is total biodegradability and biocompatibility [7, 10]. The materials are used in strongly bleeding wounds and chronic wounds, as they have antibacterial properties, maintain proper wound humidity and exhibit the ability to absorb the secretion from the wound [10]. Chitosan-containing dressings used in the US Army are HemCon® (Medical Technologies, Inc.) and Chito Gauze® [7] while the British Army uses Celox Rapid Gauze® [11] and Kerlix® (Convidien, USA) [14]. Chitosan is a deacylated chitin derivative [3]. It facilitates blood clotting by creating cross-bonds between erythrocytes [12]. In acidic environments it exhibits tissue adhesion properties. Furthermore, the positive load on the surface attracts the negatively loaded morphotic elements of the blood [3].

The currently used dressings are third-generation [13]. One of the delayed and most serious complications of battlefield injuries involve wound infections, occurring in about 25% of cases [14]. Chitosan fibers coated with nanocrystalline silver show high bacteriostatic effectiveness. The sources state that about 100% elimination of *Pseudomonas aeruginosa* and 99% elimination of *Staphylococcus aureus* occurs [15]. The Polish dressing Tromboguard® is a polyurethane foam covered with film on one side, and containing chitosan, alginate and silver ions on the other. Apart from the hemostatic properties typical of chitosan, it has antibacterial properties thanks to the sequestration of the pathogens in the fibrous structure and the impact of silver ions on bacteria.


**Figure 6**. **Case 5.** Diagnosis – back tumor. Application site donor site – left thigh. **A.** Large skin cancer of the back. **B.** Radical surgical excision with temporary coverage of the wound with the dressing. **C.** Simultaneous removal of mesh graft from the right thigh in order to perform delayed definitive closure. **D.** Good appearance of the wound after removal of the dressing 24 hours later.

**Rycina 6. Przypadek 5.** Diagnoza – guz pleców. Miejsce aplikacji – miejsce dawcze – udo lewe. **A.** Rozległy guz skóry grzbietu. **B.** Chirurgiczne radykalne usunięcie guza z czasowym pokryciem ubytku badanym opatrunkiem. **C.** Jednoczasowe pobranie przeszczepu skóry pośredniej grubości z uda w celu definitywnego zamknięcia ubytku metodą pierwotnego odroczenia. **D.** Prawidłowy wygląd miejsca pobrania po zdjęciu badanego opatrunku po dobie od aplikacji.

The study confirmed the observations from the phase III clinical study, and especially the effectiveness and durability of its anti-hemorrhagic properties in a 24-hour observation period. It confirmed the safety of using the dressing in the 24 hour period from application (no complications of adverse reactions were observed in this time). Examination of the impact of the dressing on the blood and urine parameters showed neither a statistically nor clinically significant impact. The studied dressing released silver to the pseudothrombus in trace, statistically insignificant amounts. Also the permeation of silver ions to the blood and urine was detected, but similarly, the amounts were statistically and clinically insignificant, even in two patients with chronic wounds who earlier received silver in dressings and ointments. The study showed that the dressing can also control colonized and contaminated wounds. In all patients, including those whose specimens collected from a primarily clean graft donor site revealed bacterial flora in the culture, no early symptoms of infection were observed, and the donor sites treated conservatively 24 hours later healed correctly within 5-7 days (observation not related to the project). In patients 2 and 3, with chronic wounds, after 24 hours after the debridement and application of the dressing, the wounds were clinically stable with good vascularization and no symptoms of infection, only with bacteriologically confirmed colonization with pre-existing bacteria. In those two cases, the infection was limited, which in the opinion of the researchers, resulted both from the WBP strategy involving wound debrided and the activity of the dressing.

The Tromboguard® dressing used in the PMCF project released silver ions to the pseudoclot, blood and urine of the patients in trace, statistically insignificant amounts. No statistically significant influence on the blood and urine parameters was observed. The dressing proved to be capable of the prevention and control of clean and colonized wounds. In the infected wounds, after surgical debridement, it showed the capability to control and prevent the wound from the clinical relapse of the infection within 24 hours of the debridement, regardless of the fact that the bacterial flora in the

wound before and after the debridement was evaluated as the same (qualitative examination).

## Conclusion

The study confirmed the safety and effectiveness of the dressing as well as the trace, statistically insignificant release of silver to the pseudoclot, blood and urine.

## Acknowledgements

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## Literature

1. Machała W, Olszewski A. Rozpoznanie i postępowanie we wstrząsie hipowolemicznym [Diagnosis and proceedings in hypovolemic shock]. Mil. Phys., 2014; 92 (3): 275–290
2. Brzozowski R, Machała W, Guła P, et al. Ostra utrata krwi – co możemy zrobić w warunkach przedszpitalnych? Doświadczenia pola walki. [Acute blood loss - what can we do in prehospital conditions? Battlefield experiences]. Mil. Phys., 2014; 92 (3): 248–254
3. Gordy S, Rhee P, Schreiber M. Military applications of novel hemostatic devices. Expert Rev Med Devices, 2 011; 8 (1): 41–47
4. Chesters A, Roberts I, Harris T. Minimising blood loss in early trauma resuscitation. Trauma, 2013; 16 (1): 27–36
5. Gruen R, Brohi K, Schreiber M, et al. Haemorrhage control in severely injured patients. Lancet, 2012; 380: 1099–1108
6. Holland R, Apodaca A, Mabry R. MEDEVAC: survival and physiological parameters improved with higher level of flight medic training. Military Med, 2013; 178 (5): 529
7. Behrens AM, Sikorski MJ, Kofinas P. Hemostatic strategies for traumatic and surgical bleeding. J Biomed Mater Res Part A, 2013; 00A: 4182–4194
8. Chen S, Tsao C, Chang C, et al. Assessment of reinforced poly(ethylene glycol) chitosan hydrogels as dressings in a mouse skin wound defect model. Materials Science and Engineering C 33, 2013; 2584–2594
9. Bennet t B, Lit tlejohn L. Review of new topical hemostatic dressings for combat casualty care. Military Med, 2014; 179 (5): 497
10. Boonkong W, Petsom W, Thongchul N. Rapidly stopping hemorrhage by enhancing blood clotting at an opened wound using chitosan (polylactic acid) polycaprolactone wound dressing device. J Mater Sci Mater Med, 2013; 24: 1581–1593
11. Kunio N, Riha G , Watson K , et al. Chitosan based advanced hemostatic dressing is associated with decreased blood loss in a swine uncontrolled hemorrhage model. The Am J Surg, 2013; 205: 505–510
12. Watters J, Van P, Hamilton G, et al. Advanced hemostatic dressings are not superior to gauze for care under fire scenarios. Injury Infect Crit Care, 2011; 70 (6): 1413–1419
13. Rall J, Cox J, Songer A, et al. Comparison of novel hemostatic dressings with QuikClot combat gauze in a standardized swine model of uncontrolled hemorrhage. J Trauma Acute Care Surg, 2013; 75 (Suppl. 2)
14. Jayakumar R, Prabaharan P, Kumar S, et al. Biomaterials based on chitin and chitosan in wound dressing applications. Biotechnol Adv, 2011; 29: 322–337

# Using the experience of the military medical service to ensure national security

## Wykorzystywanie doświadczeń wojskowej służby zdrowia w zapewnieniu bezpieczeństwa państwa

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**Abstract.** In the many decades since the end of the Second World War, the Polish Armed Forces have taken part in international peacekeeping and stabilization operations. In some of these operations the military health service have taken an active role, earning priceless experience in medical support in crisis and military situations. Its organization has implemented procedures and mission experience to enable the military health service to provide medical support in crisis situations in both war and peace. This article presents a proposal of incorporating the military medical services into the structures of the public medical support system in crisis situations occurring within the territory of Poland.
**Key words:** international operations, military health service, medical support

**Streszczenie.** Przez dziesięciolecia po zakończeniu II wojny światowej Siły Zbrojne RP brały udział w międzynarodowych operacjach pokojowych i stabilizacyjnych. Niektóre operacje były zabezpieczane przez personel wojskowej służby zdrowia, który zdobywał bezcenne doświadczenie w zabezpieczaniu medycznym sytuacji kryzysowych i konfliktów zbrojnych. Organizacja, procedury i doświadczenia operacyjne w szczególny sposób uprawniają wojskową służbę zdrowia (WSZ) do działań medycznych w sytuacjach zagrożenia czasu wojny i pokoju. W artykule przedstawiono propozycję włączenia WSZ w system zabezpieczenia medycznego sytuacji kryzysowych prowadzony przez publiczną służbę zdrowia na terenie naszego kraju.
**Słowa kluczowe:** operacje międzynarodowe, wojskowa służba zdrowia, zabezpieczenie medyczne

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## Introduction

Since the Second World War a number of local military conflicts have erupted in various parts of the world. These conflicts required international interventions in which, since 1953, representatives of the Polish Armed Forces have actively participated. Over the years, the Polish Armed Forces have participated in 87 operations, including 3 missions for commissions, 42 observation missions, 23 peacekeeping missions, 6 humanitarian missions, 7 policing missions, 4 training missions and 2 stabilization missions [1, 2].

The military health service has also participated in many of the tasks carried out within these operations. This has allowed it to gain invaluable experience in the field of medical support during warfare and crisis situations in respect of the methods related to the care of wounded and injured people.

How the military medical experience has influenced the quality of treatment and patient care has been discussed by many authors who participated in the operations in Iraq and Afghanistan [3]. In this study, the authors wish to refer to experiences in the field of organizing medical support during warfare, which, in certain circumstances, can be used by the civilian health service.

## The regulations for medical support in the Polish Armed Forces

The objective of the health services, civilian and military alike, is to provide comprehensive medical care to society. Pursuant to the Constitution of the Republic of Poland, in times of peace all Polish citizens have access to healthcare services, and all healthcare staff participate in their provision, irrespective of the organizations associating them, even more so as the public health services are financed under health insurance by the National Health Fund, and every citizen has the right to choose their own doctor and place of treatment [4]. Therefore, the tasks of the organizational entities, founded by various organizations of the State and pursuing their statutory obligations, are interconnected and complement one another in times of peace. We should not forget, however, that the specificity of activities and the purpose of some founding bodies in the health services stems from the execution of specific tasks that ensure the safety of the nation.

The Armed Forces, whose integral part is the military health service, are intended to secure military safety, within their homeland both on their own and under treaties, as well as abroad in the international system. Therefore, the military health service, due to its specific tasks for the benefit of the Armed Forces, has a specific organizational structure, established rules of procedure, equipment, supply and training medical personnel in field conditions. All this is to make sure that the service is specially prepared to provide medical support in the event or threat of war, even when the actions require significant mobility. The experience of the military health service can prove especially useful and should be taken into account in the operation of the civilian health service under crisis situations.

The rules defined in "Military Support for the Armed Forces of the Republic of Poland" are in force in respect of military support for the armed forces. The rules provide for:

- compatibility of assistance with the International Humanitarian Law of Armed Conflict (IHLAC),
- observance of ethical rules,
- observance of the highest standards stemming from available medical knowledge and experience acquired during the provision of medical assistance,
- care for the wellbeing and needs of patients,
- observance of the time requirements for medical support,
- continuity, stages and consequentiality of assistance based on the four levels of medical support,
- proportionality of forces and resources of the health service to needs,
- multinationality – the possibility of using the personnel, medical materials and procedures of different members of a coalition [5].

At every level of medical support there are specified medical structures, which are organizationally complete and adequately equipped and managed.

At the tactical level, the first level of medical assistance is carried out by the Battalion Aid Station (bas) established by the first level medical team, assigned from among the Medical Support Group (MSG), intended to provide first aid (Fig. 1) [6].

The second level of medical assistance, i.e. the Brigade Aid Station (BAS), which is organized by the second level medical team, also assigned from the MSG, where qualified medical aid is granted (Fig. 2) [7].

The third level of medical support is composed of military field hospitals (MFHs) that secure the division, and the fourth level for civilian and military hospitals in the prevention and treatment districts (P&TDs).

The medical evacuation system, depending on medical indications, guarantees first aid on the battlefield through first aid given by a doctor, qualified medical aid, specialist medical aid, hospital treatment and rehabilitation. Not all wounded and injured individuals will require medical evacuation in the presented order and time. Some of them, after obtaining aid at a given level, will return to duty (Fig. 3) [7]. Such treatment of the wounded and diseased is necessitated by the reality of modern warfare, i.e. the mobility of actions and the significant casualties. In a given tactical situation, these actions must be, however, adjusted to the current needs.

In terms of organization, the efficiency of action is ensured by the presence of the following at the consecutive levels and medical assistance:

- well-trained medical personnel organized under efficiently operating organizational structures in the established elements of the dressing station,
- constant sanitary-and-hygienic and epidemiological surveillance in the area of responsibility,
- efficient triage teams,
- appropriate medical equipment with the possibility of restocking on an ongoing basis,
- evacuation possibilities (by ground, air and sea) depending on the situation,
- effective communication with both inferiors and superiors,
- an appropriately prepared medical commander.

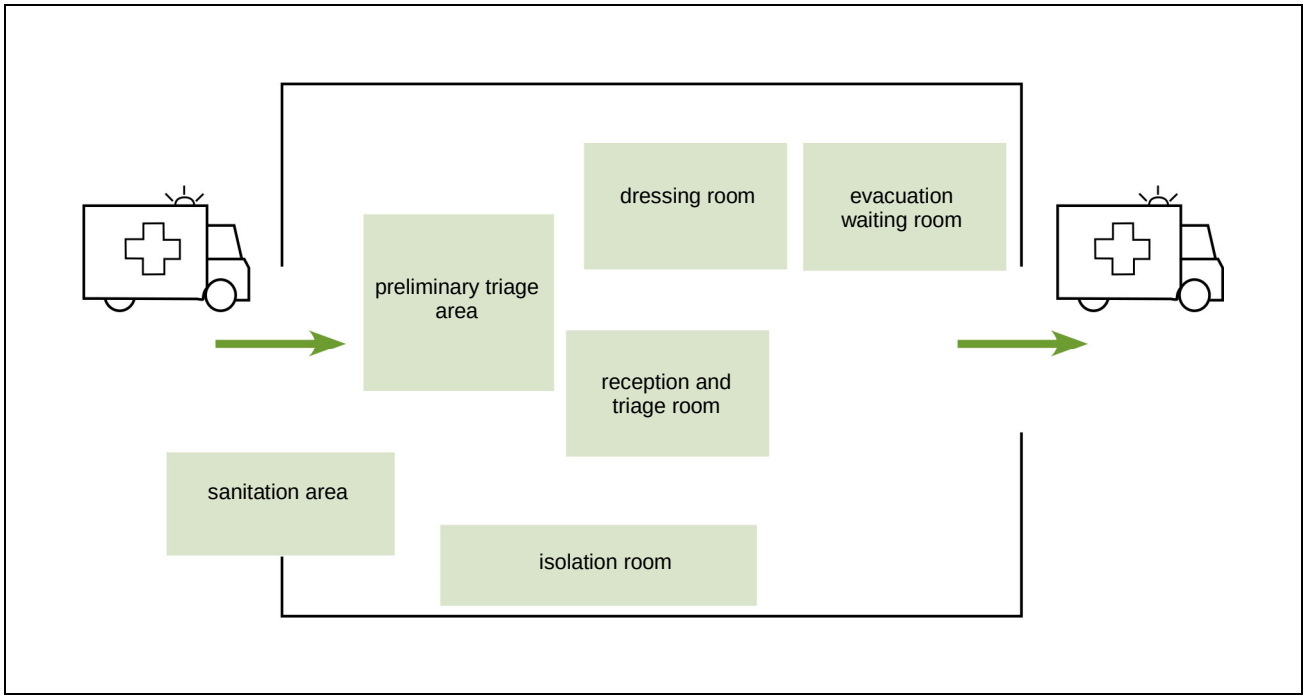



**Figure 1.** Organizational scheme of a Battalion Aid Station [6]
**Rycina 1.** Schemat organizacyjny Batalionowego Punktu Medycznego [6]

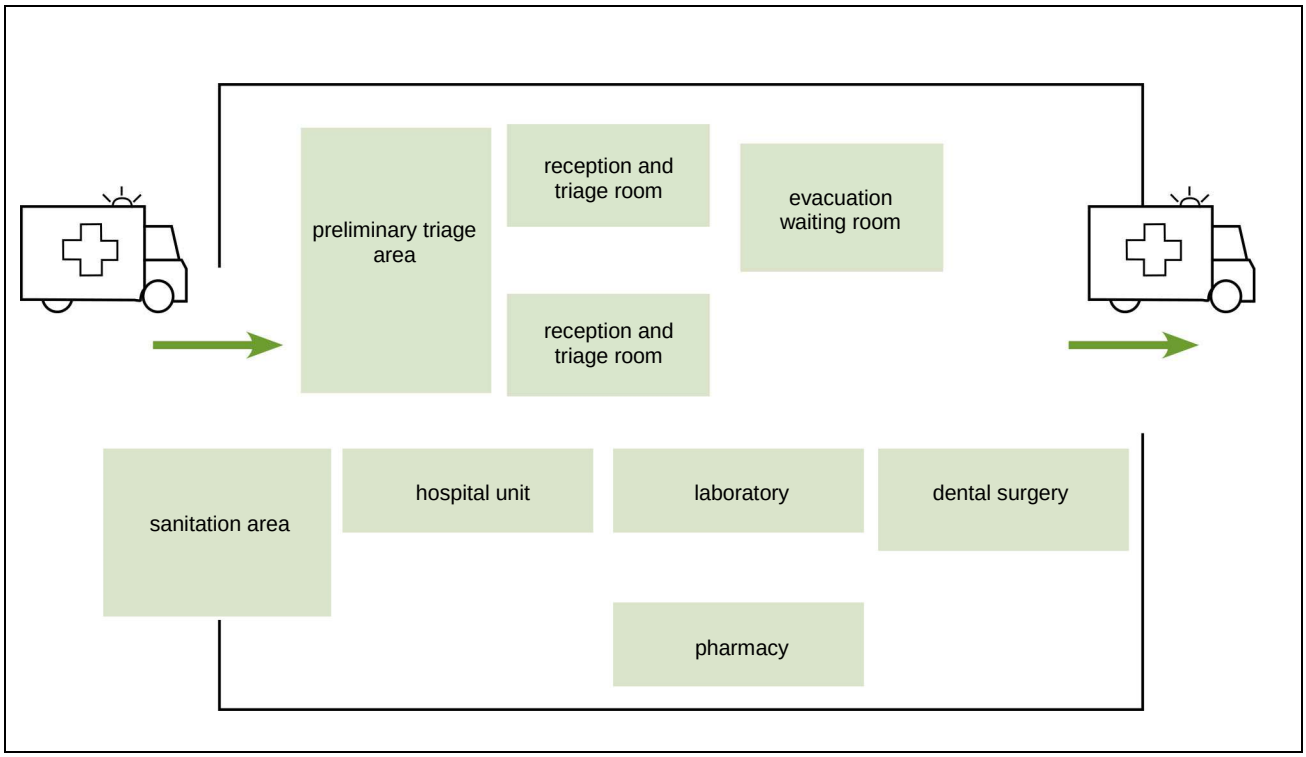
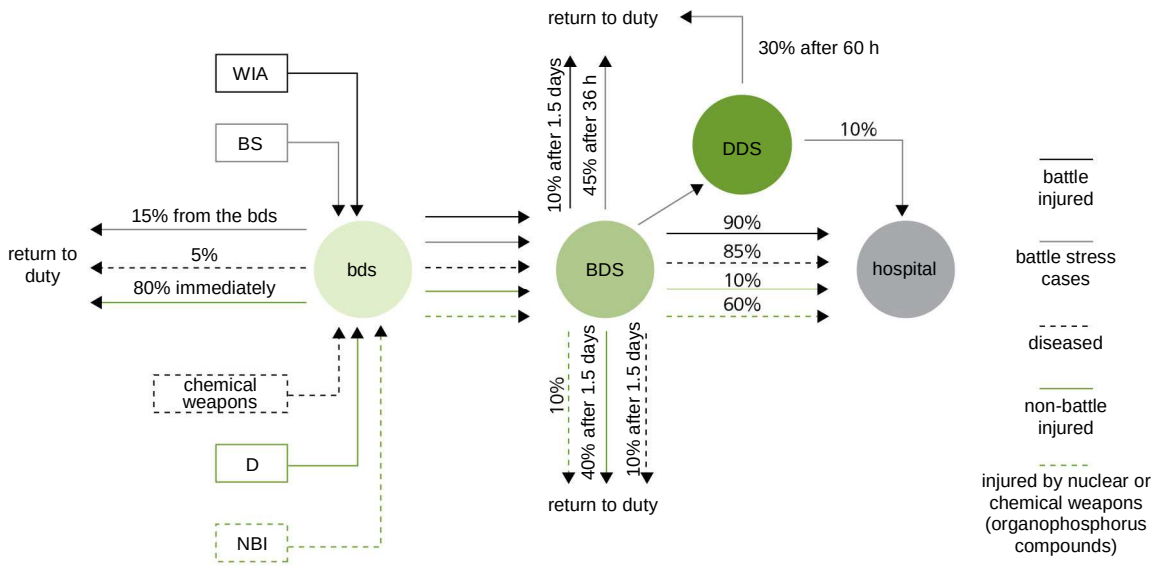



**Figure 2.** Organizational scheme for a Brigade Aid Station [7]
**Rycina 2.** Schemat organizacyjny Brygadowego Punktu Medycznego [7]




bds – battalion dressing station, BDS – brigade dressing station, BS – battle stress cases, D – diseased, DPO – division dressing station, NBI – non-battle injured, WIA – wounded in action

**Figure 3.** Directions of medical evacuation and return to duty within the battlefield medical support system [7]

**Rycina 3.** Kierunki ewakuacji medycznej i powrotów w szeregi walczących wojsk w ramach systemu zabezpieczenia medycznego pola walki [7]

The implementation of medical support is largely conditioned by previous planning, which requires the assessment of the threat, reconnaissance and the allocation of (own or higher-level) forces and resources. In order to provide these options, it is necessary to train medical personnel in terms of both the theory and practice of field medical equipment use, based on medical simulations that reflect real battlefield conditions to the greatest possible extent.

## Summary

The current, complicated political and military circumstances in different regions of Europe and the world, and the increased participation of Poland in combating global terrorism as part of different treaties, certainly increase the possibility of retaliatory terrorist attacks in Poland. To minimize losses, it is necessary to improve the organization of the provisions for assistance to injured individuals by all services, civilian and military alike.

The civilian health service, in addition to providing everyday services to its patients, should be prepared, or at least have allocated the forces and resources to act not only within the state medical rescue system but also to cooperate with the military health service, including during natural disasters, as well as to provide medical assistance to those sick and injured due to terrorist attacks or local military conflicts. The inclusion of the whole of the military health service in the systemic securing of crisis situations, training civilian healthcare personnel in the use of field medical equipment and improving the health service planning and management system, will have a positive impact on the efficiency of the whole system.

The obtained experience, enriched with theoretical knowledge and verified in the course of training with the military, will make the whole of the health service an important and effective element that influences citizen safety.

## Literature


1. Wojsko Polskie w operacjach pokojowych [The Polish Army in peacekeeping operations]. Available on the Internet: http://pl.wikipedia.org/wiki/Wojsko_Polskie_w_operacjach_pokojowych [accessed on: 2015-04-25]
2. W służbie pokoju [In service to peace]. Available on the Internet: http://archiwalny.mon.gov.pl/pl/ strona/314/LG_160_244 [accessed on: 2015-04-25]
3. www.machala.info. Available on the Internet: http://www.machala.info [accessed on: 2014-09-10]
4. Infor.pl. Available on the Internet: http://www.infor.pl/prawo/konstytucja/konstytucja/76 413,7, Rozdzial-II-Wolnosci-prawa -i-obowiazki-czlowieka-i-obywatela.html [accessed on: 2015-06-24]
5. D D- 4.10(a). The Ministry of National Defence. The Doctrine and Training Centre of the Polish Armed Forces. Zabezpieczenie Medyczne Sił Zbrojnych Rzeczypospolitej Polskiej [Medical support for the Polish Armed Forces]. Bydgoszcz 2015
6. Dójczyński M, Jamrozik P, et al. Organizacja zabezpieczenia medycznego związku taktycznego w działaniach bojowych [The organization of medical support for force troops in military operations]. Mil. Phys., 1996; 1: 62–69
7. Skalski M, Jankowski A, Abramowicz J. Drugi poziom pomocy medycznej – ocena potrzeb w zakresie zabezpieczenia medycznego działań bojowych [The 2nd level of military assistance – an assessment of needs associated with medical support in military operations]. Mil. Phys., 2011; 89 (1): 56–59

# The necessity to incorporate the military health service into the medical system to manage the casualties of terrorism

## Potrzeba włączenia wojskowej służby zdrowia w system zabezpieczenia medycznego poszkodowanych w ataku terrorystycznym

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**Abstract.** Poland's involvement in solving local military conflicts around the world and our alliance with the United States against Islamic organizations increase the risk of terrorist attacks, as well as placing Poland in the group of countries which should be especially well prepared to counteract the effects of terrorist attacks. The security of the citizen is a priority, and while planning to ensure this it is necessary to involve all organizations and formations having the potential and capabilities to support the victims of such attacks. The authors of the article postulate that the military health service should participate in the activities of the National Emergency Medical Services in order to increase the efficiency of the medical support system in emergency situations.
**Key words:** international terrorism, medical support, military health service

**Streszczenie.** Zaangażowanie Polski w rozwiązywanie konfliktów lokalnych na świecie oraz czynny udział w sojuszach u boku Stanów Zjednoczonych Ameryki w walce z organizacjami islamistycznymi powoduje zwiększenie zagrożenia terroryzmem i plasuje Polskę w grupie państw, które powinny być szczególnie przygotowane do przeciwdziałania skutkom ataków terrorystycznych. Bezpieczeństwo obywateli jest wartością nadrzędną i planując jego zapewnienie, trzeba zaangażować wszystkie organizacje i struktury, które mają potencjał i możliwości niesienia pomocy ofiarom ataków. Autorzy postulują udział potencjału wojskowej służby zdrowia w działaniach Państwowego Ratownictwa Medycznego, skutkujący zwiększeniem sprawności systemu zabezpieczenia w sytuacjach kryzysowych.
**Słowa kluczowe:** terroryzm międzynarodowy, wojskowa służba zdrowia, zabezpieczenie medyczne

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*"Why do you use an axe when you can use a bulldozer…"*

Osama Bin Laden [1]

## Introduction

The phenomena of terror and terrorism have accompanied humankind for centuries. Through the ages the character and the objectives that people have wanted to achieve through terrorism have changed.

The events that took place on 11 September 2001 shook the public, and showed that terrorism had become a global phenomenon, closely connected to politics. On that day terrorists from the Al-Qaeda terrorist organization conducted an attack within the USA, which had been planned in and coordinated from Afghanistan [2-4]. This act of terrorism was condemned by many states and circles, including the filmmaking industry [2,5,6]. The North Atlantic Council stated that this attack against the United States was directed from abroad, and, for the first time regarded it as an attack against one of the signatories of the Washington Treaty of 4 April 1949, pursuant to Art. 5: "The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all and

consequently they agree that, if such an armed attack occurs, each of them, in exercise of the right of individual or collective self-defense recognized by Article 51 of the Charter of the United Nations, will assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, such action it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area". All NATO member countries officially recognized that the conditions of Article 5 had been satisfied, which, from the legal point of view, meant the entry into force of the so-called "commitment clause", which obliged all allied countries to provide the United States with necessary assistance. An intervention by allied forces in Afghanistan, codenamed Enduring Freedom, started in October 2001 [2,7,8]. The operation saw the active participation of assigned components of the Polish Armed Forces, which to this day have been providing counselling and training services to the Afghan army and police. The commencement of military operations resulted in an increase in the number of terrorist attacks against not only the coalition forces stationed in the operational zone, but also against those outside Afghanistan. Islamic terrorism has spread; terrorist attacks prepared by the Islamic State (IS), which was established in June 2014 during the campaign in Iraq and Syria, have recently intensified. It originated from the Islamic State of Iraq and the Levant (ISIS), which was conducting terrorist operations earlier, and by cooperating with Al-Qaeda it has currently become the largest terrorist organization in the world [9]. IS combatants, currently more than 3,000 strong, also include citizens of European countries, such as France, the United Kingdom, Germany, Belgium, the Netherlands, Sweden, Denmark, Spain, Italy, Ireland and Austria. According to Gilles de Kerchove, EU Counter-Terrorism Coordinator, some combatants have allegedly returned to the countries whose citizenships they hold, and now form potential threats to public safety in Europe [10].

## The terrorist threat to Poland

International literature still lacks a clear-cut definition of terrorism. Alexander P. Schmidt analyzed approximately 109 definitions of terrorism, and noted 22 elements that occurred more frequently than the rest. Next, using these elements, he devised the following definition of terrorism: "an attack by subversive forces against innocent human beings which is intended to cause fear and kill or injure people, and by this, to force other people who were not the direct victims of the attack or an organization not associating the victims to make political concessions" [11].

When investigating threats to our country, we should take into account both internal and external factors. Currently, threats posed by local terrorist groups, which probably do not exist, should be disregarded. On the other hand, threats can be created by structures reaching Poland from outside, and their risk is increasing year by year, due to the following causes:

- active participation in military operations against global terrorism,
- the solidification of Poland's image as a close ally of the USA,
- the disclosure of arrangements included in European institutions' reports on support granted to the Central Intelligence Agency by European countries, including Poland,
- an increase in Poland's activity in the political arena and the organization of important international events in Poland.

As already indicated, a possible terrorist attack can be the work of external groups; however, it cannot be ruled out that members of terrorist units, who are already in Poland, will support them in terms of logistics [12-15]. As indicated by different analysts, the targets of attacks may include:

- cities with more than 200,000 residents,
- religious buildings on Sundays and holidays,
- bus and rail stations,
- schools frequented by more than 500 people a day,
- hospitals,
- hospital emergency departments and medical transportation services,
- embassies, particularly of states participating in antiterrorist actions,
- state administration buildings, and buildings owned by institutions responsible for safety and combating terrorism: police stations and buildings of the Internal Security Agency,
- power plants, chemical plants, drinking water intakes, nuclear reactors and fuel reserve stores [16].

Therefore, the following question should be raised – *is Poland prepared, in legal and organizational terms, to provide the victims of terrorist attacks, in the event of mass casualties, with medical assistance?*

Crisis management in Poland is based on specific legal acts, such as:

- Act of 26 April 2007 on crisis management (Journal of Laws of 2007, No. 89, item 590), as amended,
- Ordinance No. 86 of the President of the Council of Ministers of 14 August 2008 on the organization and modus operandi of the Government Crisis Management Team (Official Gazette of the Republic of Poland of 2008 No. 61, item 538),

**Table 1. Number of casualties caused by the release of hazardous chemical agents into the atmosphere, dependent on the time of day and season of the year (illustrated with the example of a chemical plant) [22]**
**Tabela 1. Wysokość strat powstałych po uwolnieniu do atmosfery niebezpiecznych środków chemicznych w zależności od pory dnia i roku (na przykładzie zakładu chemicznego) [22]**

| Type of agent | Degree of impact | Spring | casualties | Summer | casualties | Fall | casualties | Winter | casualties |
|---|---|---|---|---|---|---|---|---|---|
| **Day** | | | | | | | | | |
| HCA | fatal | 1641 | | 1413 | | 1529 | | 1529 | |
| | moderate | 291 | | 73 | | 215 | | 239 | |
| | light | 291 | | 239 | | 215 | | 239 | |
| | threshold | 434 | 1016 | 604 | 916 | 322 | 558 | 359 | 873 |
| Contaminated area, in km$^2$ | | 1.73 | | 1.42 | | 1.49 | | 1.56 | |
| Time of contamination spread, in min | | 2 | | 8 | | 1 | | 2 | |
| **night** | | | | | | | | | |
| HCA | fatal | 3125 | | 10379 | | 1529 | | 2709 | |
| | moderate | 1279 | | 6115 | | 215 | | 1002 | |
| | light | 1279 | | 6115 | | 215 | | 1002 | |
| | threshold | 1919 | 4477 | 9172 | 21,402 | 322 | 558 | 1503 | 3507 |
| Contaminated area, in km$^2$ | | 4.95 | | 20.68 | | 1.49 | | 4.05 | |
| Time of contamination spread, in min | | 3 | | 8 | | 1 | | 2 | |

- Ordinance of the President of the Council of Ministers of 10 July 2008 on the organization and modus operandi of the Government Centre for Security (Journal of Laws of 2008 No. 128, item 821),
- Ordinance of the Council of Ministers of 15 December 2009 on the determination of government administrative bodies that will create crisis management centers and their modus operandi.

The crisis management system in Poland is multilevel and composed of the following components:
- crisis management bodies,
- consultative and advisory bodies applicable to the matters of initiating and coordinating actions taken in the field of crisis management,
- crisis management centers on 24-hour duty to take actions [17,18].

Medical support in Poland is guaranteed by the State Emergency Medical Services, whose two-part structure is composed of 255 emergency departments (ERs) and approx. 1460 emergency response teams (ERTs) [19,20]. This system is currently operating at the limit of its capacity, and its potential is enough only in the case of incidents involving a dozen or so injured people [21].

To present the magnitude of this problem, the authors analyzed the circumstances of mass casualties following a sudden release of a significant amount of hazardous chemical agents (HCA) in one plant in a provincial capital. A computer simulation of the release of a HCA in the plant was made for the following seasons: spring, summer, autumn and winter, taking into account such atmospheric factors as wind speed, temperature and vertical air stability. Table 1 presents a breakdown of casualties resulting from a release of the maximum amount of a HCA with regard to the aforementioned factors [22].

The indicators presented in Fig. 1 were used to determine vertical air stability. From the presented data we gather that the number of heavy casualties rules out the possibility of providing quick medical assistance and transport of the injured to hospitals, due to the lack of evacuation resources and hospital beds. It becomes necessary to organize so-called intermediate medical evacuation stages, in which triage is carried out, evacuation cards completed, and the groups requiring specialist medical assistance, as indicated, separated from the rest of the wounded and injured (Fig. 2.).

| Wind speed in m/s | NIGHT | | | DAY | | |
|---|---|---|---|---|---|---|
| | clear sky | partly cloudy | overcast | clear sky | partly cloudy | overcast |
| 0.5 | inversion | | | convection | | |
| 0.6–2.0 | | | | | | |
| 2.1– 4.0 | | isotherms | | | isotherms | |
| >4.0 | | | | | | |

Comments:
Clear sky – 0-2 degrees, partly cloudy – 3-7 degrees, overcast – 8-10 degrees by low-level and altostratus clouds
In the case of high altocumulus and cumulus clouds, the weather conditions should be regarded as clear sky.
Isotherms appears in the case of snow cover during the day
Convection usually occurs approx. 2 hours after sunrise and disappears approx. 2-2.5 hours before sunset. An inversion usually appears approx. one hour before sunset and disappears within an hour after it.

**Figure 1.** Approximate assessment of vertical air stability (without snow cover) [22]

**Rycina 1.** Orientacyjna ocena pionowej stateczności powietrza (bez pokrywy śnieżnej) [22]

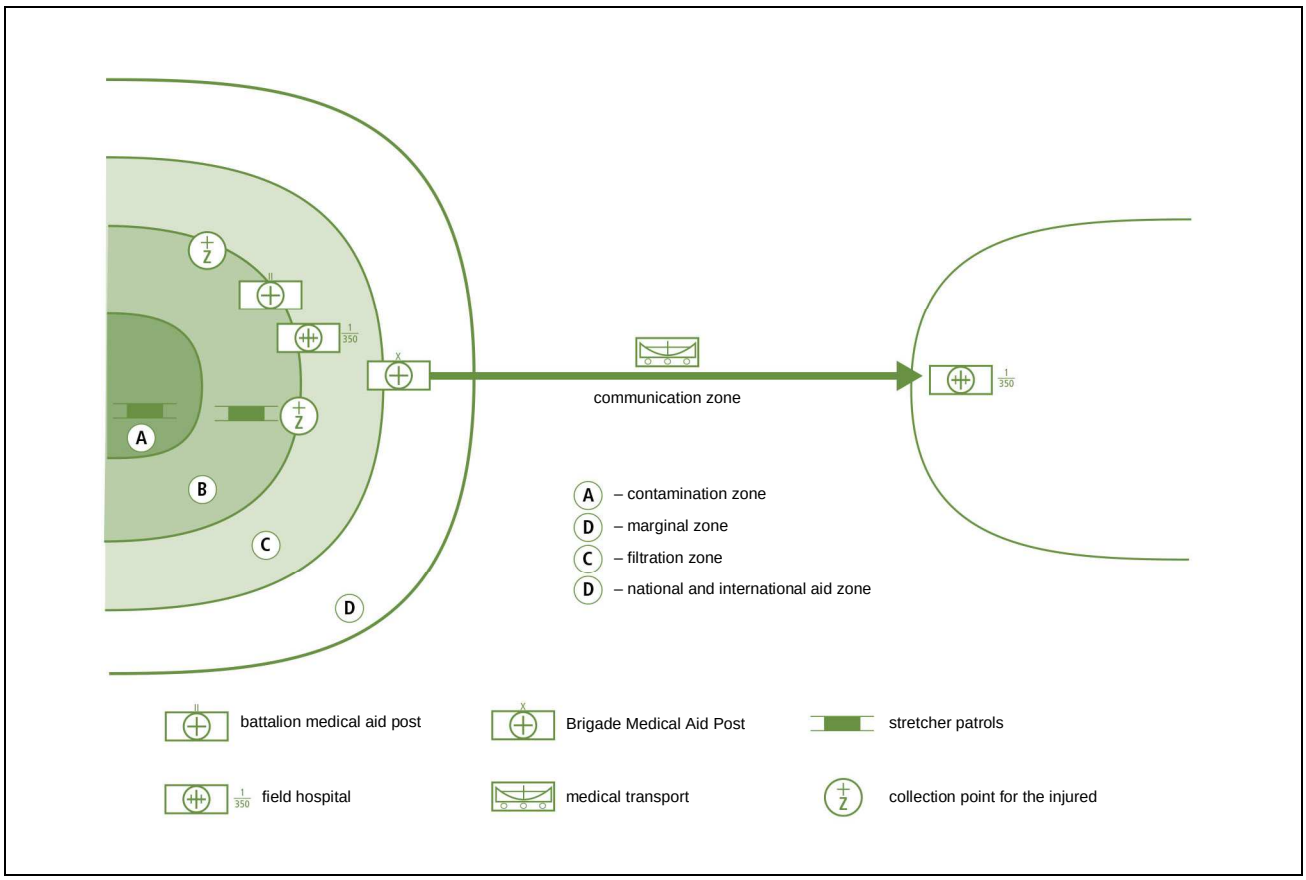


**Figure 2.** Mass casualty support zones with placement of intermediate stages of medical evacuation [22]

**Rycina 2.** Strefy zabezpieczenia medycznego masowych strat sanitarnych z rozmieszczeniem pośrednich etapów ewakuacji medycznej [22]

## Conclusions:

The results of the simulation concerning the release of the maximum amount of a HCA in a single plant presented by the authors, illustrate an extreme, catastrophic case of a terrorist incident. So far we have never witnessed such an event. The most

devastating terrorist attacks in Europe, e.g. the 7 July 2005 London bombings with 52 victims (and approx. 700 wounded) and the Madrid train bombing which took place on 11 March 2004 with 191 deaths (and more than 1400 wounded), all took place in public means of transport, and did not concern chemical or industrial installations [23]. Drawing conclusions from the experiences so far, and taking into account the numerous definitions of terrorism, as well as the message of John Paul II included in the "Sollicitudo rei socialis" encyclical of 30 December 1987, it should be explicitly stated that the State has to use every available measure to guarantee the safety of its citizens [24, 25]. The minimization of the military sector's participation in the crisis management system should be unconditionally stopped [26]. An example of the need for legislative changes that would increase the citizens' safety is the absolute necessity to introduce to the Act on State Emergency Medical Services a change regarding the matter of military rescuers, which would also incorporate the potential of the field equipment of the military health service into the system. As indicated by the results of the aforementioned simulation, in the event of mass casualties, the military health service is the only organization capable of deploying the intermediate stages of medical evacuation. Therefore, opportunities should be created nationally to utilize this potential fully.

## Literature


1. http://www.antyterroryzm.republika.pl/mas_ekst_aq.pdf [accessed on: 2015-08-09]
2. https://pl.wikipedia.org/wiki/Zamach_z_11_wrze%C5%9Bnia_2001_roku [accessed on: 2015-07-15]
3. http://wiadomosci.onet.pl/swiat/zamach-terrorystyczny-11-wrzesnia-2001/yele2 [accessed on: 2015-07-15]
4. http://www.stosunkimiedzynarodowe.info/kraj,USA,problemy,Terroryzm [accessed on: 2015-07-15]
5. http://www.bryk.pl/wypracowania/historia/xxi_wiek/15 721-reakcje_wybranych_pa%C5%84stw_na_%C5%9Bwiecie_na_wie%C5%9Bci_o_atakach_terrorystycznych_z_dnia_11_wrze%C5%9Bnia_2001_roku.html [accessed on: 2015-07-15]
6. http://www.filmweb.pl/news/Reakcje+filmowego+%C5%9Bwiata+na+tr agedi%C4%99+w+USA-3758 [accessed on: 2015-07-15]
7. http://www.stosunki.pl/?q=content/zas%C5% 82u%C5%BCona-emerytura-nato [accessed on: 2015-07-15]
8. The North Atlantic Treaty, signed in Washington on 4 April 1949, Journal of Laws of 2000, No. 87, item 970
9. https://pl.wikipedia.org/wiki/Pa%C5%84stwo_Islamskie [access on: 2015-07-23]
10. http://swiat.newsweek.pl/europie-groza-zamachy-terrorystyczne-panst-wo-islamskie-newsweek-pl,artykuly,348 487,1.html [accessed on: 2015-04-24]
11. http://www.terroryzm.com/na-linii-frontu-europa-wobec-%E2%80%9Ewojny-z-terroryzmem%E2%80%9D/#more-1821 [accessed on: 2014-12-20]
12. http://www.chodkowska.edu.pl/app_cm3/files/90 390.pdf [accessed on: 2015-07-18]
13. http://www.google.interia.pl/szukaj/?q=Ewolucja+strategii+i+metod+dzia%C5%82ania+islamskich+ugrupowa%C5%84+terrorystycznych+i+ich+ wp%C5%82yw+na+bezpiecze%C5%84stwo+Polski [accessed on: 2015-04-24]
14. http://fakty.interia.pl/polska/news-nik-materialy-wybuchowe-moga-trafic-w-rece-gangsterow,nId,1 845 303 [accessed on: 2015-07-02]
15. http://wiadomosci.dziennik.pl/swiat/artykuly/490 613,libia-ostrzega-islamscy-bojownicy-moga-byc-przemycani-do-europy-jako-uchodzcy.html [accessed on: 2015-06-24]
16. http://www.terroryzm.com/najbardziej-narazone-na-atak-terrorystyczny-obiekty-w-polsce/ [accessed on: 2015-07-23]
17. https://www.czk.pl/zk/index03.php [accessed on: 2015-07-31]
18. http://rcb.gov.pl/?page_id=489 [accessed on: 2015-07-31]
19. http://ue.poznan.pl/data/upload/articles_download/24 286/20 141 028/ artyku%C5%82Kisia%C5%82a.pdf [accessed on: 2015-07-31]
20. http://www.mz.gov.pl/system-ochrony-zdrowia/panstwowe-ratownictwo-medyczne/zespoly-ratownictwa-medycznego [accessed on: 2015-07-31]
21. http://www.polskieradio.pl/7/1691/Artykul/1 123 481,Chaos-ratunkowy-po-karambolu-na-S8-Winni-ludzie-czy-system [accessed on: 2015-07-31]
22. Skalski M. Doctoral thesis. 1998
23. http://wartowiedziec.org/index.php/start/styl-zycia/22 584-krwawe-niwo-terroryzmu-najwiksze-zamachy-terrorystyczne-xxi-wieku [accessed on: 2015-01-23]
24. http://pl.wikiquote.org/wiki/Terroryzm [accessed on: 2015-02-12]
25. http://diecezja.radiopodlasie.pl/upl/files/resource/9fcdbc95c9b0f0d18ae4d 84fb81c71a2.doc [accessed on: 2015-07-31]
26. http://www.sobieski.org.pl/slabosci-systemu-zarzadzania-kryzysowego-w-polsce/ [accessed on: 2015-07-31]

# Territorial medical support for defense-related activities

## Terytorialne zabezpieczenie medyczne działań obronnych

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**Abstract.** Conducting defensive operations within the territory of one's own country requires the military medical service to process a number of different tasks, where the performance of these tasks determines the effectiveness of the medical support system. This system should be based on local medical organizations which would manage the distribution of healthcare. The article presents the location of P&TDs created for the purposes of defensive operations, including the drawbacks of current solutions. By analyzing the day-to-day activities of the military health service the authors have tried to demonstrate its current requirements. The authors suggest that certain changes should be introduced in order to improve the organizational structure and the activities of P&TDs to ensure that they are capable of supplying adequate medical support within their areas of operation.

**Key words:** medical support, Prevention and Treatment District

**Streszczenie.** Prowadzenie działań obronnych na własnym terytorium stawia przed wojskową służbą zdrowia szereg zadań warunkujących sprawne zorganizowanie systemu zabezpieczenia medycznego tych działań. Celowe jest oparcie systemu o terytorialne struktury medyczne zarządzające udzielaniem pomocy medycznej. W artykule omówiono umiejscowienie obwodu profilaktyczno-leczniczego (OPL) w działaniach obronnych oraz wady istniejących rozwiązań w tym zakresie. Na podstawie stałych zadań wojskowej służby zdrowia autorzy starali się wykazać potrzeby w pracy OPL w obecnej sytuacji. Proponują zmiany wpływające na usprawnienie struktury oraz działania OPL niezbędne do prowadzenia skutecznego zabezpieczenia medycznego działań na jego terytorium.

**Słowa kluczowe:** zabezpieczenie medyczne, obwód profilaktyczno-leczniczy

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## Introduction

A Prevention and Treatment District (P&TD), also referred to here as a district, is the highest organizational form of the military health service in Poland. Its fundamental role relates to crisis situations and warfare, and in these conditions the P&TD becomes a structure that organizes and manages the medical support within its area. The existence and operation of P&TDs in times of peace is conditioned and subjected to the purposes of medical support in combat activities. The same P&TDs in times of peace should first and foremost pursue the mobilization needs of the military health service, and, in second place, take care of the coordination of healthcare and preventive actions within their areas [1]. The role of P&TDs, understood in this way, corresponds to the political and military situation in Europe. Contrary to the established rules and opinions about the international order in the last decades, this situation has become much more complicated and aggravated. The Republic of Poland has found itself in the impact zone of a conflict in the east of Europe. The symptoms indicating its growth have been observed for several years now; although not carefully enough. The last re-evaluation of the understanding of the national defense strategy, articulated especially by the President of the Republic of Poland, in principle focuses on defending the country's territory and its security. In this context, the priorities of the military health service and P&TDs are changing. The role of organizational units for the provision of medical support for military operations is increasing substantially.

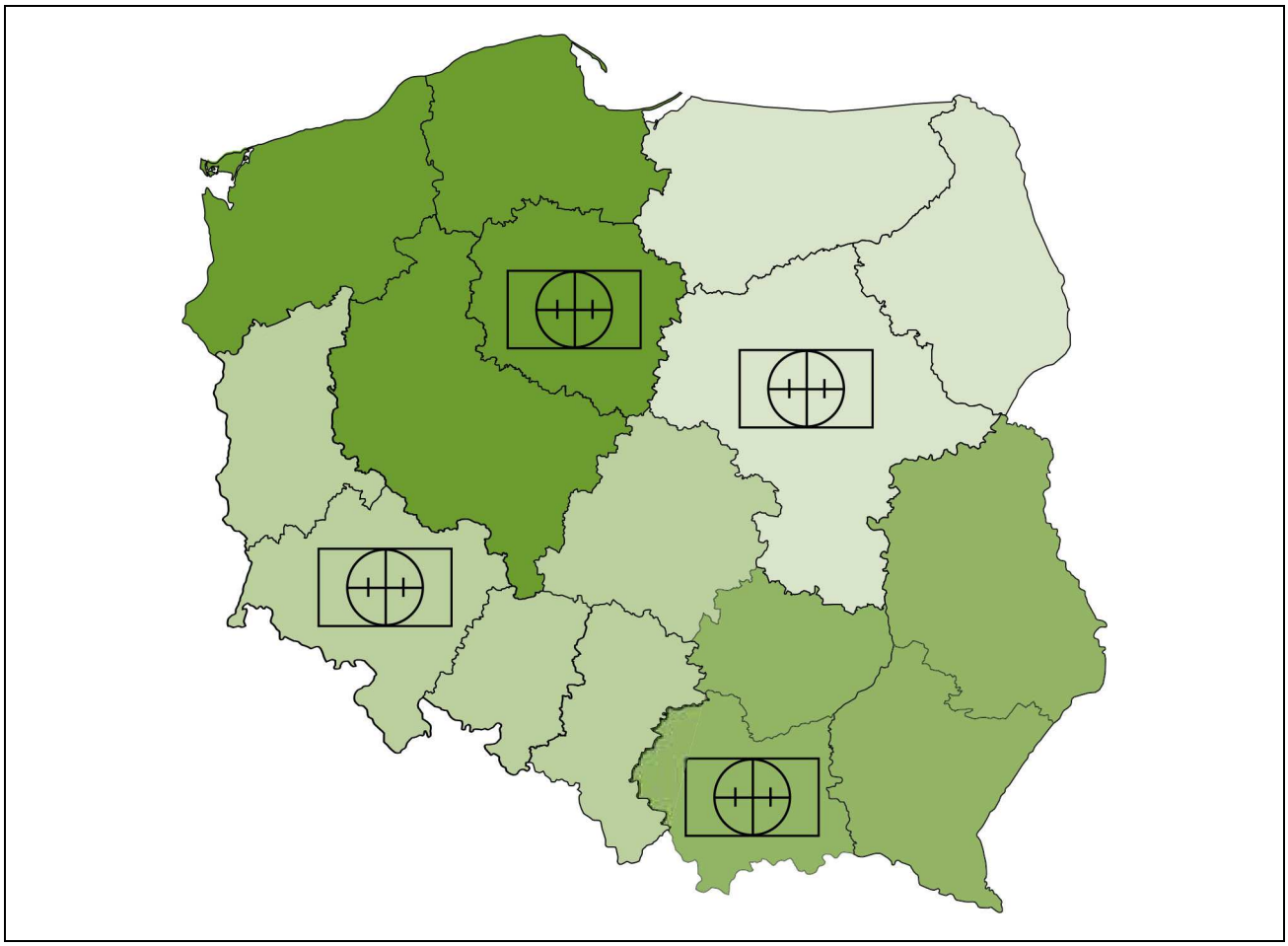

**Figure 1.** Placement of P&TD within Poland (option)

**Rycina 1.** Rozmieszczenie OPL na obszarze kraju (wariant)

## The tasks of P&TDs under a system of medical support for defensive operations

The utilization of defensive forces in crisis situations or in the case of war will be associated with the necessity of developing the military health service and launching a system of medical support for defensive operations. P&TDs form the top level of the medical support system, and the basic elements of the systems will be developed within their districts. These will constitute medical facilities providing medical support for levels 1, 2 and 3. The P&TD will be responsible for the provision of medical assistance at level 4, including in particular specialist medical assistance and rehabilitation procedures, in addition to other activities under the need for medical support in the district area. Therefore, the fundamental objective of a P&TD will be the treatment and rehabilitation of the sick and wounded, carried out in military hospitals within the district, with the leading hospital having the managing role in substantive terms and in respect of leadership [2]. Also required are other medical elements of the military health service (outpatient units and specialist outpatient clinics) within the P&TD, as well as newly established reserve hospitals, allocated beds from the hospital network of the public health service, and possible reinforcements in the form of field hospitals.

The district operations will be based on coordinating and managing the provision of medical assistance, monitoring the patient bed occupancy rate and treatment, and conducting rehabilitation procedures and final rehabilitation. Medical support at levels 1-3 in the area of operations should be provided in close coordination with the P&TD and under its substantive control, which will ensure the correct economics and efficiency of the support system it contains.

An important function of the P&TD is the provision of sanitary, hygiene and epidemiological to all regions. The full-time military health service personnel within the military units should take measures to establish

close cooperation with the P&TD. The activities of the Military Preventive Medicine Centre (MPMC) and the Epidemiological Response Centre of the Polish Armed Forces (ERCPAF) in the district should be closely connected with the needs in this regard, both for soldiers operating within the P&TD and civilians.

The task of safeguarding the medical elements of the P&TD against weapons of mass destruction must be carried out using the forces of the local MPMC at the disposal of the district.

Each P&TD is responsible for medical supplies during mobilization and military operations. This includes all the aspects of supplying medical materials and equipment, as well as the necessary logistics and accommodation equipment, in conjunction with the Regional Logistics Base (RLB). The District provides medical supply services for the medical units located within it, also as part of the self-supply of hospitals and other medical equipment. During operations, it distributes medical supplies within the system of restocking and material and medical equipment wear.

A further aspect of P&TD activities during military operations is the training of medical personnel. This should be continuous and offer occupational variants for newly mobilized individuals, as well as supplementary training for permanent medical staff and personnel staying within the district. It should be substantively based on the leading hospital and other hospitals in the district.

Leading and managing the structural and the attached medical elements within the P&TD is the core function of the district commander. This is aimed at developing and implementing a coherent system of medical support within the area, as well as maintaining the same during military operations, adjusting it to meet the changing circumstances and facilitating, whenever possible, zone support. Actions in this field should maximize the economic use of utilizing the forces and resources at hand.

## The role of P&TDs in medical support concerning casualties in the corps

Approximately 80,000–100,000 troops, i.e. a corps, deployed at various distances from the forward edge of the battle area, will operate within each P&TD. This distance is not particularly important when it comes to the occurrence of casualties, as modern firing weapons can penetrate formations to any depth. All aspects associated with the type of, usually defensive, operations will have a greater impact on the occurrence of such casualties [3]. These casualties will be remedied by medical support from the P&TD and other medical facilities located within the district. Next, casualties can be transferred and distributed to other P&TDs, where they will be subject to specialist and final treatment, including rehabilitation. Due to the occurrence of casualties over a short period and restricted area where the forces will operate, the primary objective of the district is to provide medical assistance to military personnel [3, 4]. With that in mind, activities coordinating the systems of medical support at medical support levels 1, 2 and 3, and zone support should be carried out within the general medical support plan for military operations in the district.

As for the P&TD itself, the effective management of casualties requires an increase in the number of facilities, with hospital beds being made available by the public health service for one-off use. There is also the need for hospital profiling in respect of the war-related and changing nature of the injuries sustained by the sick and wounded.

The aforementioned endeavors require changes to be made in medical personnel, its reinforcement, as well as an increase in the resources as well as medical, logistics and transport support, etc. An increase in P&TD operations in the event of providing medical support for military operations within their area requires earlier preparation and reinforcement of the district headquarters, the preparation of appropriate medical support plans for the operations, schemes coordinating the activities of the military health service within the P&TD, devising methods of cooperation with civilian administration and the public health service, and coordination of the chains of command, as well as managing the health services within the area [5].

## Weakness in the operation of the existing P&TDs

Under the present eight P&TDs established by the decision of the Minister of National Defence, no. 182/MON of 2 July 2004, if military threats to the Republic of Poland occur then P&TDs will fail to comprise an effective structure conditioning the maintenance of an efficient system of medical support for military operations [6]. Their fragmentation and poor connection with local state administration bodies and local governments influences their subjective and decision-making weakness. During peacetime the district's hospitals, operating outside the budget of the Ministry of National Defence and financed by the National Health Fund, are not interested in conducting training that would prepare them for operation under crisis and warfare conditions. The P&TD headquarters form a fragmentary structure under a leading hospital, which does not translate into activities aimed at ensuring hospital mobilization, and hence the mobilization of other medical elements included in the district. Under the current legal conditions, the coordinating role and substantive supervision of medical resources within the P&TDs are illusory and impossible to enforce. The current medical entities, by focusing on economic calculations, avoid mobilization-

related tasks and the costs associated with them. The situation of P&TDs throughout Poland, and especially the location of military hospitals, is not adequate when it comes to the present and future military threats to the country and the possible directions of support from our allies. This is a relic of the country's membership in the Warsaw Pact. In the first phase of military operations, the military hospitals in Ełk and Lublin, and the P&TDs associated with them, will be clearly at risk [2].

## Changes streamlining the work of P&TDs

Taking into account the aforementioned premises of the operations of P&TDs in crisis situations and during warfare, as well as the characteristics of the current organizational conditions and the tasks and capacities of the district, remodeling is necessary in this field. This means the appropriate adaptation of P&TDs to the challenges to be faced by the Military Health Service and the development of a model for the provision of medical service within their area under warfare conditions.

- The role and potential of the P&TDs should be increased by decreasing their number and extending their areas.
- The legal status of P&TDs should be established in the national safety system, and connected, in this regard, with administrative bodies and local governments.
- The leading and coordinating roles of the leading hospital within a district and headquarters located in this hospital needs to be improved.
- Maximum interest should be drawn to the coordinated activities of the medical elements within the district as part of the mobilization work and cooperation with civilian organizations in this field.

The projected casualty figures (potentially thousands of sick and injured people) resulting from military operations within the P&TD will require the provision of medical supply by the district.

- The expansion of hospital-bed facilities should be increased by increasing the number of hospital beds in hospitals within the P&TD and other military medical facilities in the area. Also the reserve of stationary reserve hospitals should be established in advance to ensure its formation under mobilization, as well as a hospital bed resource for one-off use, acquired by way of mobilization.
- The system of military hospital profiling, in line with the nature of injuries, should be planned and devised in detail.
- To create hospital-bed facilities it is necessary to create a resource of medical, logistical, accommodation, etc. assets and equipment, and to maintain it as part of military supply in the district.
- The expansion of hospital-bed facilities requires an increase in the number of medical personnel, both military and those acquired by military draft. This will be associated with the launching of appropriate training and exercises in time of peace and the intensification of specializations in the desired fields of medicine [5].

According to the authors, a model based on four P&TDs, each including several Polish provinces, which will comprise coherent areas in geographic terms and in respect of distance to the district borders in order to execute these functions in an optimal manner.

Based on the Military Institute of Medicine in Warsaw, the P&TD would include the following provinces: Warmińsko-Mazurskie, Podlaskie and Mazowieckie, the 5th Military Hospital in Kraków: Lubelskie, Podkarpackie, Małopolskie and Świętokrzyskie, the 4th Military Hospital in Wrocław: Śląskie, Opolskie, Łódzkie, Dolnośląskie and Lubuskie, and the 10th Military Hospital in Bydgoszcz: Wielkopolskie, Kujawsko-Pomorskie, Zachodniopomorskie and Pomorskie.

The above-mentioned medical facilities would be the leading hospitals for their respective P&TDs [5]. The P&TDs between the eastern and northern state borders (constituting the eastern NATO frontier) and the Vistula would provide the actual medical support for crisis and warfare operations; therefore, all conditions and difficulties associated with this fact should be predicted, and appropriate procedures put in place in this regard. The remaining two P&TDs, between the Vistula and the western state border, will be the reserve and support for the eastern districts, and will carry out tasks resulting from the obligations of the host-nation (HNS).

The proposed division of P&TDs matches the existing logistic structure (RLB), which will translate into adequate coordination in this field of action. It is necessary to further integrate the MPMCs with local P&TDs to standardize sanitary, hygiene and epidemiological procedures within the districts [1,5]. In the context of threats from the east and north-east it is necessary to transfer the military hospitals in Ełk and Lublin, as well as other permanent medical faculties, away from the warzone, to a safe distance, or, at least, to draw up evacuation procedures in the event of a threat, which, however, will not be optimal due to the condition of the sick and injured.

The role of the P&TDs, when understood as important links in the organization of medical support for military operations in times of crisis or war, as well as the coordinators of medical aid provided to the military and activities in the field of mobilization preparations in the Military Health Service in times of

peace, makes them especially important in the medical support system.

## Literature


1. Trybusz A, Magier S, Kapusta H. Zabezpieczenie medyczne strategicznej operacji obronnej [Medical support for strategic defense operations]. Mil. Phys., 1996; 1: 73–75
2. Wiśniewski A. Obwód profilaktyczno-leczniczy w systemie zabezpieczenia medycznego wojsk i jego podstawowe problemy [Prevention and Treatment Districts in the medical support system and their basic problems]. Valetudinaria Post Med Klin Wojsk, 2004; 9 (Suppl. 2): 27–31
3. Dójczyński M, Trybusz A, Wegner A, Perliński K. Organizacja zabezpieczenia medycznego działań bojowych korpusu zmechanizowanego w operacji obronnej [The organization of medical support for the military operations of mechanised corps in defense operations]. Mil. Phys., 1996; 1: 70–72
4. Dójczyński M, Wiśniewski A, Zoń R. Planowanie zabezpieczenia medycznego operacji korpusu [Planning medical support for corps operations]. Biuletyn Wojskowego Szpitala Klinicznego. Bydgoszcz 1998; 3: 57–62
5. Wegner A, Jankowski A, Skalski M, et al. Operacja obronna Korpusu Wojska Polskiego – wymagane zabezpieczenie medyczne [Military operations of the Polish Army Corps – required medical support]. Mil. Phys., 2013; 91 (3): 3 07– 311
6. Decision No. 182/mon of the Minister of National Defence of 2 July 2004 on the establishment of Prevention and Treatment Districts of the military health service, their organization and tasks. The Official Gazette of the Minister of National Defence of 2004 No. 8, item 88

# Middle East respiratory syndrome (MERS) – a new threat on the epidemiological map of the world

## Bliskowschodni zespół niewydolności oddechowej (MERS) – nowe zagrożenie na epidemiologicznej mapie świata

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**Abstract.** Middle East respiratory syndrome (MERS) is an acute infectious disease caused by β coronavirus (MERS-CoV). The disease is transmitted through direct contact with animals (dromedary camels), contact with their products (milk), excrement or the consumption of inappropriately cooked meat. A secondary infection may be transmitted human-to-human via droplets, as evidenced by the MERS outbreak in South Korea in mid-2015. MERS CoV was first isolated from a patient who died of respiratory failure in Jeddah, Saudi Arabia in June 2012. By 7 July 2015, 1368 laboratory-confirmed MERS-CoV infections had been reported worldwide, of which 487 cases were fatal. As of today, MERS has been reported in 26 countries, mainly in Saudi Arabia (1037 cases), South Korea (185) and the United Arab Emirates (76). The mortality rate of MERS is high, reaching 36%, especially in elderly patients or those suffering from chronic diseases. The only method of preventing the spread of coronaviruses is to maintain the sanitary regime recommended by the World Health Organization, the Center for Disease Control and Prevention in Atlanta and the Ministry of Health in Saudi Arabia.
**Key words:** MERS, coronavirus, epidemiology, Middle East

**Streszczenie.** Bliskowschodni zespół niewydolności oddechowej (*Middle East respiratory syndrome* – MERS) jest ostrą chorobą zakaźną wywoływaną przez β koronawirusa (MERS-CoV). Do transmisji choroby dochodzi poprzez kontakt bezpośredni ze zwierzętami (wielbłądy) lub pośredni z ich wydalinami i wydzielinami (mleko) albo spożywanie niepoddanego właściwej obróbce termicznej mięsa. Wtórnie zakażenie może być przenoszone drogą kropelkową z człowieka na człowieka, o czym świadczy epidemia choroby w Korei Południowej w połowie 2015 roku. Po raz pierwszy MERS-CoV został wyizolowany od pacjenta, który zmarł w przebiegu niewydolności oddechowej w czerwcu 2012 roku w Jeddah, w Arabii Saudyjskiej. Do 7 lipca 2015 roku na świecie rozpoznano i potwierdzono laboratoryjnie 1368 przypadków choroby, z których 487 zakończyło się zgonem. Przypadki MERS raportowano dotychczas w 26 krajach, głównie w Arabii Saudyjskiej (1037 zachorowań), w Korei Południowej (185) oraz w Zjednoczonych Emiratach Arabskich (76). MERS charakteryzuje się dużą śmiertelnością, sięgającą 36%, zwłaszcza u osób starszych i obciążonych chorobami przewlekłymi. Reżim sanitarny, zalecany przez Światową Organizację Zdrowia, Centrum Kontroli Chorób Zakaźnych w Atlancie oraz Ministerstwo Zdrowia Arabii Saudyjskiej, pozostaje główną metodą zapobiegania rozprzestrzenianiu się koronawirusów.
**Słowa kluczowe**: MERS, koronawirus, epidemiologia, Bliski Wschód

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## Introduction

Middle East respiratory syndrome (MERS) is an acute contagious disease of high mortality rate, caused by betacoronavirus (MERS-CoV), an RNA virus belonging to *Coronaviridae.* It is assumed, and has been confirmed by epidemiologic and genetic examination, that MERS-CoV is a zoonotic virus. The first cases in people occurred in the Arabian Peninsula as a consequence of direct contact with infected Arabian camels (dromedaries) or indirectly with their secretions and excrement (feces, urine, milk, or respiratory mucus) [1]. The research conducted in the last ten years has shown the common occurrence of specific MERS-CoV antibodies in camel herds in the Arabian Peninsula and North Africa, which confirms the circulation of MERS coronaviruses in the population of these animals for several decades [2].

MERS-CoV is structurally similar to the SARS (severe acute respiratory syndrome) virus, discovered in the Guangdong province of China, which in the years 2002-2003 spread to 37 countries, resulting in a total of 8,437 cases and causing 813 deaths in 11 countries, mainly in China [3, 4]. According to WHO, mortality due to MERS virus infection is 36%, which is much more than in the case of the SARS virus (9%) [5]. Taking into consideration the source of MERS-CoV infections in the Arabian Peninsula, especially in Saudi Arabia, epidemiologists were concerned about the risk of importing a MERS pandemic in relation to the annual pilgrimages of Muslims to Mecca from 184 countries of the world. However, it was determined that the cases of the disease in the years 2013-2014 were not related to the pilgrimages of Muslims to Saudi Arabia [6].

Cases of MERS (suspected, probable and confirmed) were defined by the World Health Organization (WHO), Center for Disease Control and Prevention in Atlanta (CDC) and Ministry of Health of Saudi Arabia. Patients with fever and pneumonia or acute respiratory failure suspected of MERS-CoV infection should confirm that they have stayed in the Middle East and returned not earlier than 14 days before the onset of the disease, or have had contact with people who returned from those regions of the world and experienced symptoms indicating a MERS infection. The diagnosis should be confirmed by laboratory detection of MERS-CoV with the use of molecular biology methods (PCR) [6].

## Epidemiology

The transmission of MERS-CoV remains unclear, although the hypotheses assume zoonotic infection and further human-to-human transmission, with the formation of epidemic foci among people [7]. It is assumed that the primary infection source in humans involves dromedaries from the Middle East, especially the Arabian Peninsula. MERS-CoV was first isolated in a 60-year-old man who died of pneumonia and acute respiratory failure in June 2012, in Jeddah, Saudi Arabia [8]. Zoonotic infection in humans may occur as a result of contact with the excrement and secretions of camels or consumption of non-pasteurized camel milk (MERS-CoV remains virulent in milk stored at 4℃ for 72 h) or meat after insuff icient heat treatment [9]. A secondary infection may be transmitted human-to-human via droplets, as evidenced by the MERS outbreak in South Korea in mid-2015. On 20 May 2015, a case of MERS was confirmed in a 68-year-old Korean who had travelled around several countries of the Arabian Peninsula; 7 days after his return to Korea, the symptoms of the disease appeared. During the next two weeks, there were 64 new cases, including 5 deaths, all infected people having had contact with the patient during their stay or visit to the hospital. Within two months, there were 185 cases of the disease in South Korea, with 33 deaths, mainly among elderly patients and patients burdened with chronic diseases. The infection was transmitted as a result of close contact between family members and contact between patients and medical staff in the healthcare facilities [1]. By 7 July 2015, 1368 laboratory-confirmed MERS-CoV infections had been reported worldwide, of which 487 cases were fatal (Fig. 1).

As of 28 July 2015, MERS was reported in 26 countries, mainly in Saudi Arabia (1037 cases), South Korea (185), the United Arab Emirates (76), Qatar (13) and Jordan (12). Cases of MERS in Saudi Arabia, which constitute 76% of all diagnosed cases worldwide, have been reported from urban areas throughout the country (e.g. in Jeddah, Riyadh, Ta'if, Mecca and Hofuf). In June 2015, the first fatal case of MERS in Europe was reported; this was in Germany, in a 65-year-old man, the infection occurring in the United Arab Emirates, probably at a camel market. Up to now, most cases in Europe have been detected in the United Kingdom (4), Germany (3), France (2) and the Netherlands (2) [1]. The total number of cases of MERS brought to the European Union is 15 (including 7 fatal cases) [10].

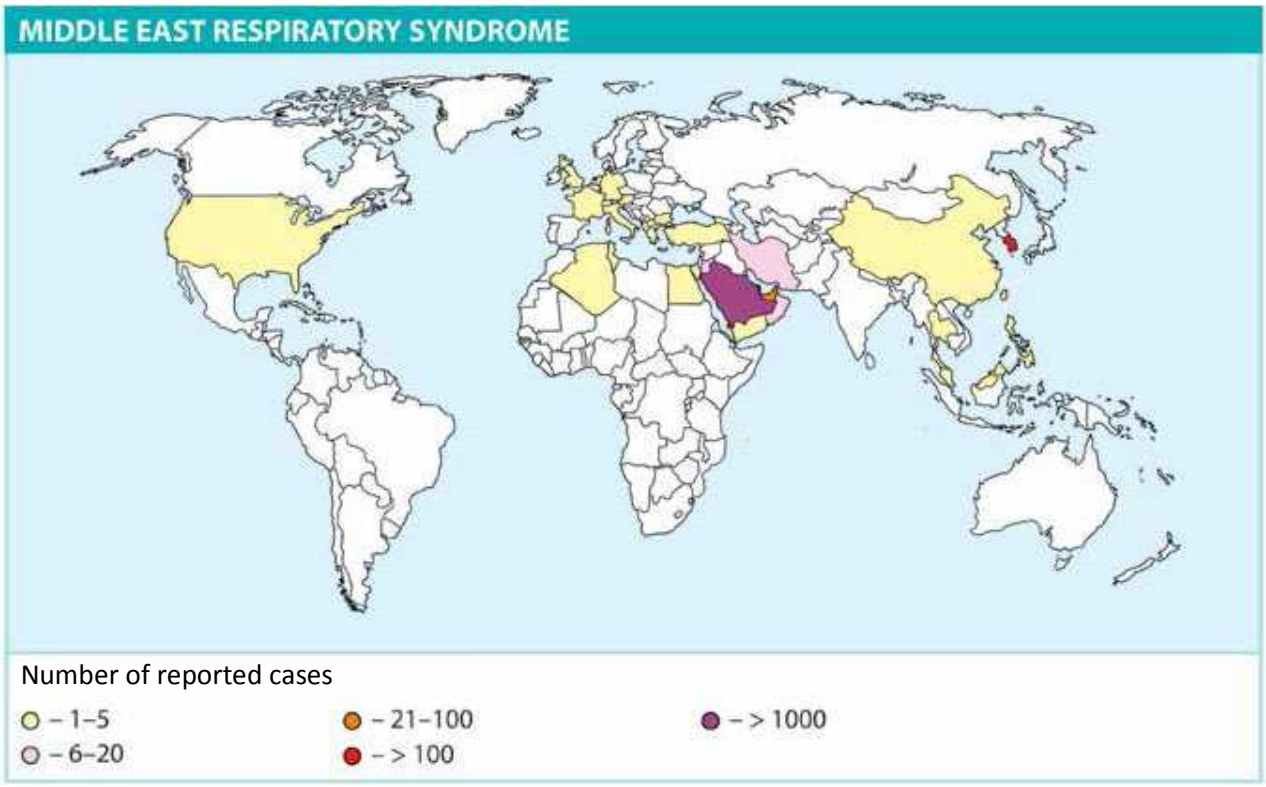


**Figure 1.** Confirmed cases of Middle East respiratory syndrome in the years 2012–2015

**Rycina 1.** Potwierdzone przypadki bliskowschodniego zespołu niewydolności oddechowej w latach 2012–2015

Source: Korzeniewski K. Medycyna podróży. Kompendium [Travel medicine. A Compendium]. Wydawnictwo Lekarskie PZWL, Warsaw, 2015.

## Clinical image

The incubation time of MERS is 2-14 days, at an average of 5-6 days. The average time from the onset of the first symptoms to hospitalization is 4 days; from admission to hospital to hospitalization in the ICU: 5 days, and to death: 11.5 days [11, 12]. MERS-CoV infections occur mostly in men, and over half of the cases were people over 50 years old [13]. Most frequent symptoms include: fever >38℃, cough, headache, muscle and joint pains, breathing difficulties and dyspnea. Also rarer, atypical symptoms related to the digestive system, such as abdominal pains, vomiting and diarrhea may occur [14].

Some of the patients go through the infection without any symptoms or with gentle symptoms in the form of an upper respiratory tract infection [15-17]. However, the infection may result in severe pneumonia, acute respiratory failure, septic shock and multiorgan failure leading to death, especially in older people (over 65 years old), people with chronic diseases: circulatory failure, respiratory diseases, renal failure, diabetes, acquired or inborn immunodeficiency, neoplasms, as well as people with low albumin concentration and concurrent infections [6,18,19].

## Diagnosis

The diagnosis is made on the basis of an interview (stay in a region of endemic or epidemic occurrence of the disease), clinical image (fever, cough, traits of respiratory failure) and the results of additional tests (chest X-ray: multifocal or bilateral exudative lesions; laboratory tests: leukopenia, lymphopenia, thrombopenia, high creatinine, high activity of lactate dehydrogenase and alanine and aspartate transaminases). Also the co-occurrence of other viral infections, such as influenza and SARS, and bacterial infections should be taken into consideration. Due to the high content of coronaviruses, the diagnostic material should be mucus from the bronchial tree, especially coming from a bronchoalveolar lavage collected during a bronchoscopy.

There are specific tests to detect the DNA of MERS-CoV based on molecular biology (PCR). Samples of the material from the respiratory tract of the infected patients under treatment should be taken every 2-4

days, until two consecutive tests for the presence of MERS-CoV are negative [6-13].

## Treatment

There are no specific medicines used in the treatment of MERS infections. Medications recommended for MERS-CoV replication inhibition are: interferon α, interferon β, lopinavir/ritonavir, ribavirin, cyclosporine and virus cell receptor blockers (DPP4, also called CD26) [6, 20]. Work on a vaccine are still in the experimental stage [20].

## Prevention

Preventive activities are one of the basic forms of managing MERS-CoV infections. They include: washing hands with soap and water or using disinfectants, covering the nose and mouth with disposable tissues while coughing and sneezing, avoiding contact with people who have symptoms of a respiratory infection, avoiding contact with animals (especially camels), their secretions and excrements, adhering to hygiene rules for food processing and eating (washing and peeling of fruit and vegetables, avoiding consumption of non-pasteurized dairy products and meat which has not undergone proper heat treatment). In the case of the occurrence of respiratory infection during a stay in countries in which there have been cases of MERS reported (mainly the countries of the Middle East), travelers should visit a healthcare center for an examination of their health condition. If within 14 days after the return from the aforementioned regions someone experiences fever of >38℃ accompanied by cough, shortness of breath and dyspnea, they should consult a doctor and inform about their stay in a region affected by MERS-CoV infections. The Ministry of Health of Saudi Arabia has issued recommendations for pilgrims to Mecca, informing that people who are over 65 years old, patients burdened with chronic diseases (circulatory failure, respiratory diseases, renal failure, diabetes, acquired or inborn immunodeficiency, neoplasms), pregnant women and children under 12 should reconsider participating in the pilgrimage [21]. The recommendations and guidelines for people travelling to the countries of the Middle East are regularly updated and can be found on the websites of WHO and CDC [20]. WHO does not recommend any limitations in passenger traffic, but people planning to travel to the Arabian Peninsula should be especially cautious [10].

## Conclusions

The mortality rate of MERS is high, reaching 36%, especially in elderly patients or those suffering from chronic diseases. Until now, no vaccinations of pharmaceutical measures of high therapeutic effectiveness for the disease have been developed. The sanitary regime recommended by the WHO, CDC and Ministry of Health of Saudi Arabia remains the main method preventing the coronaviruses from spreading.

## Literature


1. World Health Organization: Middle East respiratory syndrome coronavirus (MERS-CoV). Summary of current situation, literature update and risk assessment. Geneva, Switzerland, 07 July 2015
2. Meyer B, Muller MA, Corman VM, et al. Antibodies against MERS coronavirus in dromedary camels, United Arab Emirates, 2003 to 2013. Emerg Infect Dis, 2014; 20: 552–559
3. Chinese SARS Molecular Epidemiology Consortium. Molecular evolution of the SARS coronavirus during the course of the SARS epidemic in China. Science, 2004; 303: 1666-1669
4. World Health Organization: Cumulative number of reported probable cases of SARS. Available at: http://www.who.int/csr/sars/country/2003_07_11/ en/. Accessed: 28 July 2015
5. Banik GR, Khandaker G, Rashid H. Middle East Respiratory Syndrome Coronavirus "MERS-CoV": Current Knowledge Gaps. Paediatr Respir Rev, 2015; Apr 18 [paper ahead of print]
6. Zumla A, Hui DS, Perlman S. Middle East respiratory syndrome. Lancet, 2015; 376: S0140-6736(15)60 454–8
7. Tsiodras S, Mentis A, Iliopoulos D, et al. Middle East respiratory syndrome coronavirus infection and public health response, Greece, April 2014. Euro Surveill, 2014; 19. pii: 20,782
8. Zaki AM, van Boheemen S, Bestebroer TM, et al. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. N Engl J Med, 2012; 367 (19): 1814-1820
9. Van Doremalen N, Munster VJ. Stability of Middle East respiratory syndrome coronavirus (MERS-CoV) under different environmental conditions 2013. Available at: http://www.eurosurveillance.org/ViewArticle. aspx?ArticId=20 590. Accessed: 28/07/2015
10. Chief Sanitary Inspectorate. Informacja nt. nowego koronarowirusa MERS- CoV dla osób podróżujących w rejon Bliskiego Wschodu i do Korei Południowej [Information about a new coronavirus MERS-CoV for people travelling to the Middle East and South Korea]. Warsaw, accessed: 28/07/2015 http://www.gis.gov.pl/ckfinder/userfiles/files/EP/…/8_06-%20MERS.pdf
11. Assiri A, McGeer A, Perl TM, et al. Hospital outbreak of Middle East respiratory syndrome coronavirus. N Engl J Med, 2013; 369: 407-416
12. Arabi YM, Arifi AA , B alkhy HH, et al. Clinical course and outcomes of critically ill patients with Middle East respiratory syndrome coronavirus infection. Ann Intern Med, 2014; 160: 389-397
13. Al-Tawfiq JA, Hinedi K, Ghandour J, et al. Middle East respiratory syndrome coronavirus: a case-control study of hospitalized patients. Clin Infect Dis, 2014; 59 (2): 160-165
14. Pavli A, Tsiodras S, Maltezou HC. Middle East respiratory syndrome coronavirus (MERS-CoV): Prevention in travelers. Travel Med Infect Dis, 2014; 12: 602–608
15. Haamans BL, Al Dhahiry S, Reusken C, et al. Middle East respiratory syndrome coronavirus in dromedary camels: an outbreak investigation. Emerg Infect Dis, 2014; 14: 140–145
16. Drosten C, Meyer B, Müller MA, et al. Transmission of MERS-coronavirus in household contacts. N Engl J Med, 2014; 371: 828–835
17. Al-Taw fiq JA, Zumla A, Memish Z A. Coronaviruses: severe acute respiratory syndrome coronavirus and Middle East respiratory syndrome coronavirus in travelers. Curr Opin Infect Dis, 2014; 27: 411–417
18. Al-Abdallat MM, Payne DC, Alqasrawi S, et al. and the Jordan MERS-CoV Investigation Team: Hospital-associated outbreak of Middle East respiratory syndrome coronavirus: a serologic, epidemiologic, and clinical description. Clin Infect Dis, 2014; 59: 1225–1233
19. Saad M, Omrani AS, Baig K, et al. Clinical aspects and outcomes of 70 patients with Middle East respiratory syndrome coronavirus

infection: a single-center experience in Saudi Arabia. Int J Infect Dis, 2014; 29: 301–306
20. Memish ZA, Al-Tawfiq JA, Makhdoom HQ, et al. Screening for Middle East respiratory syndrome coronavirus infection in hospital patients and their healthcare worker and family contacts: a prospective descriptive study. Clin Mikrobiol Infect, 2014; 20: 469–474
21. World Health Organization. Health conditions for travellers to Saudi Arabia for the pilgrimage to Mecca (Hajj). Wkly Epidemiol Rec, 2013; 88: 343–347

# A program for the prevention of parasitic diseases of the gastrointestinal tract

## Program profilaktyki chorób pasożytniczych przewodu pokarmowego

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**Abstract.** Poland is among the group of countries with no available data on the prevalence of parasitic diseases of the gastrointestinal tract. Over the last few years, the Military Institute of Medicine (MIM) has been the leader in the field of parasitological research in the Polish population. From 2010 to 2014, more than 24,000 Polish soldiers participated in overseas military operations and were screened for intestinal parasites by the Department of Epidemiology and Tropical Medicine of the MIM (5.7% were infected with nematodes, cestodes, trematodes and/or pathogenic protozoa). Similar studies were conducted among 3,124 Afghans and 3,159 citizens of the Central African Republic as a part of a humanitarian aid project. Thus the department has become Poland's largest research center working on the detection and elimination of intestinal parasites, both among Polish citizens and African and Asian populations. The aim of the article is to present a new program for the prevention of parasitic diseases of the gastrointestinal tract in the Polish Armed Forces. It is a continuation of the previous 2010–2014 program, and its aim is to maintain the continuity of epidemiological surveillance of parasitic infections in the military environment.
**Key words:** health prevention, intestinal parasites, military environment

**Streszczenie.** Polska należy do krajów o nieznanych wskaźnikach zachorowalności na choroby pasożytnicze przewodu pokarmowego. Wojskowy Instytut Medyczny (WIM) od kilku lat jest liderem w realizacji badań parazytologicznych w polskiej populacji. W latach 2010–2014 Zakład Epidemiologii i Medycyny Tropikalnej WIM w ramach skriningu epidemiologicznego przeprowadził badania u ponad 24 tysięcy polskich żołnierzy – uczestników operacji wojskowych poza granicami państwa (5,7% zarażonych nicieniami, płazińcami i patogennymi pierwotniakami), z kolei w ramach pomocy humanitarnej wykonał badania 3124 Afgańczyków i 3159 mieszkańców Republiki Środkowej Afryki, tym samym stając się największym w Polsce realizatorem badań w kierunku wykrycia i eliminacji pasożytów jelitowych zarówno wśród mieszkańców naszego kraju, jak i wśród ludności pochodzącej z kontynentu azjatyckiego i afrykańskiego. Artykuł przedstawia projekt nowego programu profilaktyki chorób pasożytniczych przewodu pokarmowego w Siłach Zbrojnych RP, stanowiącego kontynuację poprzedniej edycji programu z lat 2010–2014, mającego na celu utrzymanie ciągłości nadzoru epidemiologicznego nad występowaniem inwazji pasożytniczych w środowisku wojskowym.
**Słowa kluczowe:** profilaktyka zdrowotna, pasożyty jelitowe, środowisko wojskowe

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## Introduction

Despite considerable progress in therapeutic and diagnostic methods, gastrointestinal parasitic diseases remain among the greatest challenges for modern medicine [1, 2]. Over 2 billion people in the world are estimated to be infected with intestinal parasites, and 5 billion live in areas where they are at constant risk of infection with parasitic pathogens [3, 4]. Climate change, migration, poor sanitary conditions, lack of medical care, immunological deficiency and the presence of the host (reservoirs of parasites) in the ecosystem contribute to the spreading of parasitic invasions among the population of developing countries, as well as in developed ones [5-8]. In Europe high infection rates of intestinal parasites pertain to the populations of the countries in the 3rd and 4th quartile according to gross domestic product *per capita* (GDP 1,809 – 17,630 USD). Poland is one of those countries [9].

## Epidemiology of gastrointestinal parasitic diseases in Poland

Poland is one of few European countries where the incidence rate for gastrointestinal parasitic diseases is unknown. This lack of epidemiological data is associated with the Act of 5 December 2008 on the prevention and control of infections and infectious diseases in people, which eliminated 19 items from the list of obligatorily notifiable diseases, including all Aschelminthes invasions (e.g. ascariasis, enterobiasis, strongyloidiasis) and intestinal flatworm infections (taeniases) [10]. Reports from the National Institute of Public Health – National Institute of Hygiene from 2003-2008 clearly indicated a rise in parasitic infections (the following were reported in Poland in 2008: 5,817 cases of ascariasis and 5,666 cases of enterobiasis) [11]. Nevertheless, epidemiological supervision over the dissemination of roundworm and flatworm infections in Poland was abolished. Since 2009, there has been no data available on infections caused by aschelminthes and platyhelminthes. The Department for Prevention and Control of Infections and Infectious Diseases in People of the Chief Sanitary Inspectorate cannot assess the incidence rate of the most invasive foodborne diseases in the Polish population, and sanitary epidemiological stations are not under any obligation to monitor infections. As reporting intestinal parasitoses (except for giardiasis, cryptosporidiasis, cysticercosis and echinococcosis) is not obligatory in Poland, the interest in parasitological studies is continuing to decrease. The limitations in laboratory diagnostics are due to the lack of experience of the laboratory diagnosticians performing the tests, which results mostly from the fact that the Medical Centre for Postgraduate Education in Poland has not offered courses in parasitological diagnostics for many years, and specializations in laboratory medical parasitology have been suspended. Therefore, the number of parasitologists is decreasing, and the gap in the Polish market of laboratory services is filled by centers that substitute standard diagnostic procedures for the detection of parasitic diseases by alternative diagnostic methods which do not require the collection of biological test material [12].

## Epidemiological supervision over intestinal parasitic invasions in the military environment

Parasitology screening in the military environment is justified due to discontinuation of the epidemiological monitoring of intestinal parasitic infections in Poland, which is unacceptable in the case of soldiers deployed in difficult environmental conditions, where they are exposed to pathogens causing invasive diseases. The necessity of screening tests for the detection and elimination of parasitic invasions is exemplified by preventive actions implemented among the soldiers of the Polish Military Contingent in Chad in 2009, who were diagnosed with numerous infections resulting from low sanitary standards in the military operation area [13]. High infection rates in Polish soldiers deployed in Africa led to the introduction of epidemiological supervision over intestinal parasitic invasions in the military environment. The implementation of a program for the prevention of gastrointestinal parasitic diseases among participants of military operations abroad, conducted in the Polish Armed Forces in 2010-2014, following Decision No. 442/MON of the Minister of National Defence from 29 December 2009 [14], brought measurable effects in the form of the systematic detection and elimination of parasitic infections in soldiers and in civilian employees of the army [15]. A total of 24,638 participants of foreign operations were tested in the program, of whom 1,396 were diagnosed with pathogenic intestinal parasites (nematodes, platyhelminthes, protozoa; 5.7% of all the subjects tested in the analyzed period). The largest group studied in 2010-2014 were soldiers of the Polish Military Contingent in Afghanistan [16]. It must be stressed that they were the only large-scale screening tests performed to detect and eliminate intestinal parasites in the Polish population. They demonstrated high efficiency, justifying the undertaken actions (decrease in the infection rates from 15.4% in 2010 to 0.8% in 2014) [17].

The environment in which Polish soldiers are stationed abroad is not the only source of intestinal parasitic infections. The presence of parasitic diseases in the Polish population is confirmed by studies conducted by the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine in the years 2011-2012, involving families of soldiers deployed in Afghanistan. In the group of 379 families of soldiers in Poland there was not one case of transmission of intestinal parasites from the soldiers (the infected soldiers were treated in Afghanistan) to their family members. The absence of parasitic invasions among the participants of military operations, and infections among their wives and children, indicate the incidence of parasitic diseases in the population of Poland [18, 19].

The justification for the continuation of the program in the military environment is confirmed by the studies conducted by the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine among soldiers preparing to serve abroad in the years 2013-2014, some of whom were diagnosed with intestinal parasitic infections. The presence of parasitic infections in soldiers whose biological material was tested a few weeks earlier by a laboratory providing services for military medical board examinations indicates that qualification of soldiers in the

examination process is superficial, and that parasitic invasions occur in Poland [20, 21].

As a part of the program for prevention of parasitic diseases implemented in the years 2010-2014, a modern, multiple-workstation parasitological laboratory was established at the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine, the only research and commercial facility of its kind in military healthcare, performing thousands of tests annually, and being the diagnostic center for gastrointestinal parasitic diseases for the Polish Armed Forces. This justifies the continuation of the prophylactic program on the basis of the human and technical resources available. Conducting screening tests within the proposed prophylactic program will ensure measurable benefits for the military environment in the form of improved health awareness and the health condition of soldiers, increased detection of diseases at early stages, lower numbers of new cases, reduced health-related absence of soldiers, as well as reduced treatment costs due to complications [20].

## Draft of the Program for the prevention of gastrointestinal parasitic diseases among soldiers of the Polish Army [20]

The main goal of the proposed continuation of the prophylactic program is to undertake actions to reduce the incidence of gastrointestinal parasitic diseases in the military environment by the detection of intestinal parasitic infections and introducing antiparasitic treatment in infected professional soldiers. Epidemiological monitoring of gastrointestinal parasitic diseases in the Polish Army, together with the use of highly specialist diagnostic methods, will enable the determination of the actual incidence and prevalence rates in the military environment, which is very important in the context of the health condition of soldiers in the Polish Army, as the lack of reliable parasitological diagnostics results in the misdiagnosis of certain diseases affecting soldiers, thus some nparasitological conditions may be diagnosed as invasive diseases.

The type of pharmacotherapy used to treat infected soldiers will depend on the type of intestinal parasite:

- *Ascaris lumbricoides* – albendazol, tablets 400 mg in a single dose,
- *Ancylostoma duodenale, Necator americanus* – albendazol, tablets 400 mg in a single dose,
- *Enterobius vermicularis* – albendazol, tablets 400 mg in a single dose, treatment repeated after 2-4 weeks,
- *Trichostrongylus s pp.* – albendazol, tablets 400 mg in a single dose,
- *Strongyloides stercoralis* – ivermectin, tablets 200 µg/kg bw for 2 days; alternative treatment: albendazol, tablets 400 mg for 5 days,
- *Taenia spp.* (*T. saginata*, *T. solium*), *Diphyllobothrium latum* – praziquantel, tablets 5-10 mg/kg bw in a single dose,
- *Hymenolepis nana, H. diminuta* – praziquantel, tablets 25 mg/kg bw in a single dose,
- *Dicrocoelium dendriticum* – praziquantel, tablets 3 × 25 mg/kg bw for 1 day,
- *Schistosoma mansoni, S. japonicum*, *S. mekongi* – praziquantel, tablets 20 mg/kg bw 3 × a day within 24 hours,
- *Entamoeba histolytica* – metronidazole, tablets 750 mg 3 × day, for 10 days,
- *Giardia intestinalis* – metronidazole, tablets 500 mg 2 × day, for 5 days,
- *Blastocystis spp.* – metronidazole, tablets 500 mg 2 × day, for 10 days,
- infection with non-pathogenic protozoa (*Iodamoeba bütschlii*, *Entamoeba coli*, *Endolimax nana*) in case of gastrointestinal symptoms – metronidazole, tablets 500 mg 2 × day, for 5 days,
- other types of intestinal parasites – following current procedures for the treatment of parasitic invasions.

Recently, there have been reports about the pathogenic character of *Blastocystis spp.* protozoan; therefore, this species of intestinal parasite should be considered potentially pathogenic, and all the infected soldiers, including asymptomatic carriers, should be treated [22, 23].

The diagnostics for intestinal parasites are conducted on the basis of fecal examination using light microscopy.

- **Direct preparation in Lugol's solution** Approx. 2 mg of feces is collected with a glass rod on a glass slide, a drop of Lugol's solution is added, and the material is smeared on a surface of approx. 4 $cm^2$. Then the preparation is covered with a coverslip and examined under a light microscope at x 20 magnification. This preparation enables preliminary assessment of unconcentrated material, and coloring with the Lugol's solution improves the image quality of any parasites observed.
- **Preparation from decantation in distilled water** Approximately 2 g of feces are mixed carefully with a small quantity of water in a test tube, then the tube is topped up with water. After 30 minutes the liquid above the sediment is decanted, and another portion of water is added. This action is repeated until the liquid above the sediment is clear, usually 3-4 iterations being required. Next, a sample of the sediment is transferred onto a glass slide, colored with Lugol's solution, and examined under a light microscope at x 20 magnification.

- **Preparation from flotation** – **Fülleborn's method**
  Approximately 2 g of feces are mixed in a test tube with a saturated aqueous NaCl solution, then the tube is topped up with the solution. A coverslip is placed on the surface, then removed with tweezers, and placed on a glass slide, wet side down. The preparation is examined under a light microscope at x 10 magnification.
- **Preparation from flotation** – **Faust's method**
  Mix carefully approx. 3 g of feces in 3-5 ml of water, and drain through a layer of gauze into a centrifuge test tube. Top up the tube with water, mix carefully, and centrifuge for 45 seconds at 2,300 rpm. Then decant the liquid, add water, mix and centrifuge as above. Repeat until the liquid over the sediment is clear. Next, decant the liquid, 3/4 fill the tube with zinc sulfate solution, mix and centrifuge for 45-60 seconds at 2,500 rpm. Using an inoculation loop, transfer the sediment from the surface onto a slide glass, color with Lugol's solution, cover with a coverslip and examine under a light microscope at x 10 magnification.
- **Preparation made using the Kato-Miura method**
  Prepare small pieces of cellophane; before use soak them for 24 hours in a solution of water, glycerin and malachite green. Transfer approximately 50 g of feces onto a slide glass, cover with cellophane and crush with a rubber plug. Examine the preparations after 60 minutes under a light microscope at x 10 magnification. To reduce the waiting time, preparations may be placed for 30 minutes in a warmer, at 37℃. The method is used to detect the eggs and larvae of helminths.
- **Preparations from sedimentation with the DIASYS/PARASEP system**
  The PARASEP system contains reagents (formalin + triton); the tube acts as a concentrator of parasites, and is equipped with special filters which allow impurities to be removed and concentrate the eggs, larvae or cysts of parasites. The DiaSys apparatus is used to make the preparation quickly and effectively. This method ensures a closed system for circulation of the biological material – the staff has contact with the material only during the phase of preparation for sedimentation. The solvents in PARASEP tubes used to separate fecal debris from the parasites demonstrate fixing properties, so they also have biocidal effect. Another advantage is the automated process of collection and transfer of the material for examination, so preparation, cleaning and utilization of new slides is not required. The test material is delivered from an automatic aspirator placed in a sample prepared earlier. The examination module enables bright-field microscopy, using phase contrast, in polarized light and with oil lenses. The aspirator is placed in the test material. The device collects 15 µl of material at one time, of which 10 µl goes directly to one observation cell of the module in the microscope rack, and 5 µl, after mixing with 5 µl of coloring solution, to the other cell. The preparation is examined under standard procedures for parasitological tests. The observed area is similar in size to a standard coverslip.

Feces for the tests should be collected from each soldier on 3 occasions, at 2-3 day intervals. The material will be processed in the parasitological laboratory of the program manager using three diagnostic methods, and in the case of diagnostic difficulties or high infection rates in the study group, using six methods. In cases which require differentiation of intestinal parasites with molecular biology methods (*Entamoeba histolytica/dispar*, *Ancylostoma duodenale/Necator americanus*) the material will be tested by the Institute of Marine and Tropical Medicine, Medical University in Gdańsk (National Centre of Tropical Medicine) to achieve a final diagnosis.

As part of the program, 5-day long practical and theoretical training sessions in parasitological diagnostics should be regularly organized (12 times a year) for military healthcare physicians and laboratory diagnosticians in the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine.

## Health situation in the Polish Armed Forces

Since the abolition of obligatory military duty in the Polish Armed Forces in 2009, information regarding the health status of soldiers has been based on two sources: decisions of the Military Medical Boards (MMB), and prophylactic healthcare screening programs in the military environment. The decisions of the MMB pertain primarily to military service candidates, deployment abroad and soldiers completing their military service. In the years 2010-2014, approximately 50,000 soldiers were examined by the MMB, which means that the health status of the remaining 50,000 is unknown. The main reasons include: transfer of primary healthcare from military units to the civilian environment, staff shortages in military units, and lack of occupational medicine and health prophylaxis in the military units in Poland. Presently, we cannot determine the health status of the soldiers in the Polish Army in the context of combat capability. We cannot determine the exact number of soldiers suffering from obesity, arterial hypertension, diabetes, neoplastic diseases, or infectious and parasitic diseases. The health situation is very different in the 1.5 million-strong USA Armed Forces. The epidemiological portals of the military healthcare service, accessible to the public, present current information on the ratio and number of soldiers

suffering from infectious and non-infectious diseases. The American authorities have developed an effective health policy which allows them to assess the combat capability of their own troops in terms of the health status. The Polish Armed Forces and military healthcare service in Poland do not have the same opportunities, and the Department of Military Healthcare Service of the Ministry of National Defence does not implement any actions to improve the situation. This is manifested, for instance, by indecisiveness regarding the continuation and implementation of new prophylactic and screening programs for soldiers in the Polish Armed Forces.

Another problem is posed by the legal acts, which require immediate correction as they are incompatible with the current conditions in the military healthcare service. The Minister of the National Defence resolution of 23 December 2010 on certain healthcare benefits for professional soldiers is a classic example. Polish soldiers participating in military operations abroad, suffering from conditions of potentially infectious or invasive etiology, are treated mainly symptomatically, without the support of targeted microbiological and parasitological diagnostics, without even the determination of the cause of illness. Then they return to Poland after completing their service, where within a few days their health condition is assessed by the military medical board only on the basis of a test for *Salmonella-Shigella* bacteria, fecal examination for gastrointestinal parasites using a low-sensitivity direct smear test, and serological diagnostics for hepatitis B and C, HIV and syphilis; then they receive a decision about their fitness for professional military service, which they continue in Poland. Section 6 of the above resolution, pertaining to "additional tests for specific tropical and parasitic diseases characteristic for the region where the soldier was deployed" is an empty clause (military medical boards do not have a list of endemic diseases prevalent in those regions where the Polish Military Contingent is deployed, and there are no procedures for performing diagnostic tests for specific tropical and parasitic diseases), which the author of this article has observed many times, as he was examined by medical boards several times in the years 2009-2015 having completed service in Chad, Afghanistan and the Republic of South Africa. If the symptoms of a disease occur, the after the evaluation by the military medical board the soldiers usually see a general practitioner or a specialist within the civilian healthcare system, so their health records remain outside the military medical information system.

## Summary

Presently, Europe is facing the greatest crisis since the Second World War related to mass migrations of people, which may significantly affect the health safety of European Union citizens. Within the last few months, several hundred thousand immigrants from Asia and Africa have arrived in Europe, using maritime and land routes. In Germany alone they are planning to accept 800,000 refugees, at the same time demanding that other European Union members, including Poland, take responsibility for the management of future waves of migration, primarily from the Near and Middle East. Poland, having issued 6,000 positive decisions regarding asylum applications in 2014, announced the planned reception of further thousands of immigrants. The position of the Polish government concerning the reception of only a few thousand from the overall hundreds of thousands of refugees (the final number is believed to be over one million people) met with criticism from the many western countries that bear the greatest burden associated with accepting waves of immigrants, and it should be expected that the number of immigrants and asylum-seekers who may treat Poland not only as a transit country but as a place to apply for permanent residence will increase.

**Table 1. A schedule for the training course for physicians and diagnosticians in laboratory diagnostics of the parasitic diseases of the gastrointestinal tract**
**Tabela 1. Program szkolenia dla lekarzy i diagnostów w zakresie diagnostyki laboratoryjnej chorób pasożytniczych przewodu pokarmowego**

| Date | Subject | Form | Number of hours |
|---|---|---|---|
| Day 1 | Current epidemiological situation regarding intestinal parasitoses in Poland and in the world<br>Diagnostics of gastrointestinal parasites in the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine | lecture | 2 |
| | Intestinal parasites – pathogenic and non-pathogenic protozoa | lecture | 2 |
| | Principles for preparation of material for testing:<br>Direct preparation<br>Fülleborn's flotation<br>Sedimentation methods (decantation in distilled water) | practical session | 1 |
| | Unassisted making of fecal preparations using three methods | practical session | 1 |
| | Microscopic examination of preparations<br>Principles of differentiation between protozoan cysts and the eggs of helminths | practical session | 2 |
| Day 2 | Intestinal parasites – nematodes | lecture | 2 |
| | Microscopic examination of preparations<br>Detection of cysts and trophozoites of protozoa<br>Detection of the eggs of nematodes | practical session | 6 |
| Day 3 | Intestinal parasites – cestodes | lecture | 2 |
| | Microscopic examination of preparations<br>Detection of cysts and the trophozoites of protozoa<br>Detection of the eggs of nematodes and cestodes | practical session | 6 |
| Day 4 | Intestinal parasites – trematodes | lecture | 2 |
| | Microscopic examination of preparations<br>Detection of cysts and the trophozoites of protozoa<br>Detection of the eggs of nematodes and cestodes<br>Detection of the eggs of trematodes | practical session | 6 |
| Day 5 | Other methods used in parasitological diagnostics:<br>Faust's flotation<br>PARASEP sedimentation<br>Kato-Miura<br>Culture methods | lecture | 2 |
| | Summary of the information presented during the training | seminar | 4 |
| | Completion of training | theoretical and practical exam | 2 |

Source: Epidemiology and Tropical Medicine Department of the Military Institute of Medicine. Own study.

Given that refugees usually come from countries where sanitary conditions are poor and numerous cases of infectious and invasive diseases are reported, it is likely that thousands of immigrants will bring various diseases, including gastrointestinal parasitic diseases, to Europe.

According to experts from the Agency for THE Evaluation of Medical Technologies and Pricing, who in May 2015 issued an opinion regarding the program for prevention of gastrointestinal parasitic diseases among Polish Army soldiers, which is the intellectual property of the Military Institute of Medicine, since 2009 in Poland there has been a lack of sufficient population data concerning infections caused by intestinal parasites. The Chief Sanitary Inspectorate cannot assess the incidence rate of invasive foodborne diseases in the Polish population, and sanitary epidemiological stations are not under any obligation to monitor infections. Therefore, implementation of the above program is very significant from the perspective of epidemiological supervision.

The Military Institute of Medicine has been a leading agency in parasitology studies in Poland for several years now. In the years 2010-2014, the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine examined over 24,000 soldiers, who were participants of military operations abroad, as part of epidemiological screening in the military environment. Employees of

the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine have extensive experience in organizing screening tests, and carry out parasitological examinations using multiple light microscopy methods. In the years 2011-2013, as part of the humanitarian aid project, they performed tests to detect and eliminate intestinal parasites in 3,124 Afghans in Ghazni province (infection ratios of 36-45%); in the years 2014-2015 they organized examinations for 3,159 citizens of the Central African Republic from the Bangui, Bagandou and Monassao areas (infection rates of 48-90%). Thereby the Military Institute of Medicine became the most important Polish center performing studies for the detection and elimination of invasive diseases among the citizens of Poland, as well as people from Asia and Africa. Thanks to its experience in conducting screening tests of large groups of people, the Epidemiology and Tropical Medicine Department of the Military Institute of Medicine is prepared in terms of staff and equipment to perform parasitological studies both in the military environment and among the refugees received by Poland, pertaining to epidemiological supervision of parasitic invasions and monitoring and prevention of invasive diseases brought to Poland.

## Literature


1. Ziegelbauer K, Speich B, Mäusezahl D, et al. Effect of Sanitation on Soil-Transmitted Infection: Systematic Review and Meta-Analysis. PLoS Med, 2012; 9: e1 001 162
2. Bethony J, Brooker S, Albonico M, et al. Soil-transmitted helminth infections: ascariasis, and hookworm. Lancet, 2006; 367 (9521): 1521─1532
3. Hotez PJ, Molyneux DH, Fenwick A, et al. Control of neglected tropical diseases. N Engl J Med, 2007; 357: 1018-1027
4. Horton J. Human gastrointestinal helminth infections: are they now neglected diseases? Trends Parasitol, 2003; 19: 527─531
5. El-Sherbini GT, Abosdera MM. Risk factors associated with intestinal parasitic infections among children. J Egypt Soc Parasitol, 2013; 43: 287-294
6. de Silva NR, Brooker S, Hotez PJ, et al. Soil-transmitted helminth infections: updating the global picture. Trends Parasitol, 2003; 19: 547-551
7. Pham-Duc P, Nguyen-Viet H, Hattendorf J, et al. *Ascaris lumbricoides* and *Trichuris trichiura* infections associated with wastewater and human excreta use in agriculture in Vietnam. Parasitol Int, 2013; 62: 172-180
8. Schär F, Inpankaew T, Tr aub RJ, et al. The prevalence and diversity of intestinal parasitic infections in humans and domestic animals in a rural Cambodian village. Parasitol Int, 2014; 63: 597-603
9. Hotez PJ, Gurwith M. Europe's neglected infections of poverty. Int J Infect Dis, 2011; 15: e611─619
10. Ustawa z 5 grudnia 2008 r. o zapobieganiu oraz zwalczaniu zakażeń i chorób zakaźnych u ludzi (Dz. U. z 2013 r. poz. 947) [Act of 5 December 2008 on prevention and control of infections and infectious diseases in people (Journal of Laws of 2013, Item 947)]
11. National Institute of Public Health. National Institute of Hygiene. Choroby zakaźne i zatrucia w Polsce w 2008 roku. [Infectious diseases and poisonings in Poland in 2008] Department of Epidemiology. Warsaw 2009
12. Korzeniewski K, Prokop E. Diagnostyka i leczenie chorób pasożytniczych przewodu pokarmowego. Sytuacja epidemiologiczna w Polsce i na świecie. [Diagnostics and treatment of gastrointestinal parasitic diseases. Epidemiological situation in Poland and around the world] Top Medical Trends. Poznań 15─17.03.2013
13. Korzeniewski K, Skórczewski K. Health problems of peacekeepers carrying out mandatory tasks in Chad, Central Africa. Int Marit Health, 2011; 62 (1): 37-40
14. Decyzja Nr 442/MON Ministra Obrony Narodowej z dnia 29 grudnia 2009 r. w sprawie wprowadzenia w resorcie obrony narodowej Programu profilaktyki chorób pasożytniczych przewodu pokarmowego wśród żołnierzy Wojska Polskiego pełniących służbę poza granicami państwa [Decision no. 442/MON of the Minister of National Defence from 29 December 2009 on implementation in the national defence department of the Programme for prevention of gastrointestinal parasitic diseases among the Polish Army soldiers deployed abroad]
15. Korzeniewski K. Examination regarding the prevalence of intestinal parasitic diseases in Polish soldiers contingents assigned to missions abroad. Int Marit Health, 2011; 62 (1): 31-36
16. Korzeniewski K. Elimination of intestinal parasites among Polish soldiers serving in eastern Afghanistan, 2010─2014. 41st ICMM World Congress on Military Medicine. Bali, Indonesia 17─22.05.2015
17. Korzeniewski K. Raport końcowy z realizacji Programu profilaktyki chorób pasożytniczych przewodu pokarmowego wśród uczestników operacji wojskowych poza granicami państwa w okresie od 01.01.2010 r. do 31.12.2014 r. Wojskowy Instytut Medyczny. [Final report from implementation of the Programme for prevention of gastrointestinal parasitic diseases among the participants of military operations abroad in the period from 01/01/2010 to 31/12/2014. Military Institute of Medicine] Warsaw, 05/01/2015
18. Korzeniewski K. Występowanie chorób pasożytniczych przewodu pokarmowego wśród rodzin żołnierzy pełniących służbę w odmiennych warunkach klimatycznych i sanitarnych. Temat badawczy No 113/2011. [Prevalence of gastrointestinal parasitic diseases in the families of soldiers deployed in areas with different climate and sanitary conditions. Research topic No. 113/2011] Military Institute of Medicine. Warsaw 2011
19. Korzeniewski K, Augustynowicz A, Lass A. Intestinal parasites in Polish community on the example of military environment. Int Marit Health, 2014; 65 (4): 216-222
20. Korzeniewski K. Projekt Programu profilaktyki chorób pasożytniczych przewodu pokarmowego wśród żołnierzy Wojska Polskiego [Draft of the Programme for prevention of gastrointestinal parasitic diseases among the Polish Army soldiers]. Military Institute of Medicine. Warsaw, 15/04/2015
21. Korzeniewski K. Wniosek dotyczący kontynuacji Programu profilaktyki chorób pasożytniczych przewodu pokarmowego wśród żołnierzy Wojska Polskiego. [Application for continuation of the Programme for prevention of gastrointestinal parasitic diseases among the Polish Army soldiers] Military Institute of Medicine. Warsaw, 07/08/2015
22. Basak S, Rajurkar MN, Mallick SK. Detection of *Blastocystis hominis*: a controversial human pathogen. Parasitol Res, 2014; 113: 261-265
23. Duda A, Kosik-Bogacka D, Lanocha-Arendarczyk N, et al. The prevalence of Blastocystis hominis and other protozoan parasites in soldiers returning from peacekeeping missions. Am J Trop Med Hyg, 2015; 92 (4): 805-806

# They were the authors of Military Physician, a medical journal from the interwar period. The precursors of medicine as seen through the pages of the journal during its first decade. Part I

## Oni tworzyli „Lekarza Wojskowego" w okresie dwudziestolecia międzywojennego. Prekursorzy medycyny polskiej na łamach „Lekarza Wojskowego" w pierwszym dziesięcioleciu jego istnienia. Część I

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**Abstract.** The medical journal known as Military Physician, "Lekarz Wojskowy" in Polish, has been continuously published for 95 years and owes its existence to the people who created it. The creators were fully aware that the journal should provide essential content to serve physicians, who mostly did not have access to up-to-day knowledge influencing the progress of medical thinking and promoting inventive diagnostics and treatment methods. The purpose of this paper, intended to be the first in a series of articles introducing prominent people associated with the journal, is to present the pioneers of Polish medicine who contributed to Military Physician in the 1920s. Among them were Edward Flatau, Eufemjusz Herman, Samuel Goldflam, Jan Nelken, Władysław Dzierżyński, Stanisław Władyczko, Leon Kryński, Romuald Węgłowski, Wiktor Arkin, Władysław Antoni Gluziński, Alfred Sokołowski, Odo Bujwid, and Rudolf Weigl.
**Key words:** history of 20th century medicine, medical journals, physicians

**Streszczenie.** Wstęp. „Lekarz Wojskowy", czasopismo funkcjonujące na rynku wydawniczym od 95 lat, swoje istnienie zawdzięcza przede wszystkim ludziom, którzy je tworzyli. Twórcy „Lekarza" mieli świadomość, że czasopismo powinno dostarczać istotnych treści, które będą służyć lekarzom najczęściej nieposiadającym dostępu do nowoczesnej wiedzy, mającej wpływ na rozwój myśli medycznej, propagującej nowatorskie metody diagnostyczno-lecznicze. Celem pracy, będącej w zamiarze autorów pierwszym z cyklu artykułów na temat wybitnych postaci związanych z czasopismem, jest zaprezentowanie publikujących w „Lekarzu Wojskowym" w latach dwudziestych XX w. prekursorów polskiej medycyny. W tym gronie znaleźli się Edward Flatau, Eufemjusz Herman, Samuel Goldflam, Jan Nelken, Władysław Dzierżyński, Stanisław Władyczko, Leon Kryński, Romuald Węgłowski, Wiktor Arkin, Władysław Antoni Gluziński, Alfred Sokołowski, Odo Bujwid, Rudolf Weigl.
**Słowa kluczowe**: historia medycyny XX w., czasopisma medyczne, lekarze

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*Only a life lived for others is a life worth living.*
Albert Einstein

*Nothing truly valuable arises from ambition or from a mere sense of duty; it stems rather from love and devotion towards men and objectivity*
Albert Einstein, journal existence

The President of the Military Sanitary Council, Lt. Col. Zbigniew Dmochowski MD, revealed in the first number of Lekarz Wojskowy ("Military Physician") that one of the main tasks of such a new journal is to provide military physicians with complete medical knowledge. What is more, by inviting many prominent representatives of the scientific world from the leading institutes in Poland to contribute to the journal, the journal was to popularize the most recent achievements in medicine. The list of authors included primarily university lecturers, clinicians and physicians performing military service in military units. The following contributed to the first number of the journal: Professor Antoni Gluziński, Head of the Department of Internal Diseases at the University of Warsaw, Bronisław Sawicki, a surgeon and professor of the University of Warsaw, and Professor Alfred Sokołowski, former Dean of the Free Polish University. Each of them contributed to the history of medicine.

The articles published in Military Physician very often described modern views influencing the development of more than just Polish medical thought, explained innovative diagnostic and treatment methods and gave examples of pioneering surgeries. The editorial staff published articles not only about military medicine, judging from the letter of Col. Stefan Hubicki MD, PhD, of 1922 in which he wrote to the editorial staff: “What I mean is that the adjective 'military' in the journal title determines the contents of the journal. However, it appears to me that only the first part of the title of Military Physician justifies its contents, whereas the second part has no possible justification, as almost all numbers of the journal are, so to speak, just like other medical journals, e.g. 'Gazeta [Lekarska]', 'Przegląd [Lekarski]', devoted to civil medicine, apart from medical association reports" [1].

Today, while reading the names of the authors of articles and the titles of articles, we value the great desire of the editorial staff to pursue a high level of information in the contents published in particular years of Military Physician. The note of 1924 from the editorial staff reads as follows: “We want to provide our physicians with all progress made in medical knowledge (...) After all, we clearly see military physicians' writings are strongly inspired by our journal”. Works by civil physicians sent to our Editorial Office reflect how the cooperation between civil and military medical services has been strengthened. We consider it necessary not only for the purposes of war, unfortunately not only possible but even predicted, but also for the development of medicine, and to establish its beneficial influence on the strength of the Polish nation in creating peace" [2]. In 1929, an editor wrote: “(...) Any military physician or pharmacist who has found our journal to be a source of intellectual nourishment owing to which they never had to live in ignorance or feel left behind, has also been given an opportunity to follow the rapid progress of medical knowledge. Any such new thought deserved support (...)" [3]. The editorial staff of Military Physician considered honorable the fact that remarkable scientists were contributing to the journal.

While analyzing the contribution of such outstanding people to the military and medical journal, one should bear in mind that since 1918 the staff of military hospitals had been initially made up of volunteers. However, the number of volunteers appeared to be insufficient compared to the needs. On 16 January 1919, under a Decree of the Chief of State, registered physicians under 35 years of age were for the first time called up for active service. In June and July of the same year more physicians and pharmacists under 42 years old enlisted. The physicians who voluntarily joined or were called up into the army included outstanding Polish scientists, such as Odo Bujwid, Władysław Dzierżyński and Stanisław Władyczko.

After the restoration of independence, scientific work in respect of military health care in Poland was organized by the Military Sanitary Council, which started to operate on 1 April 1919 in Ujazdów Castle in Warsaw [Figure 1]. [1]. One of the first initiatives of the Military Sanitary Council was the creation of the Military Physician journal, which was published for the first time in January 1920. On 27 August 1921, the Council was renamed the Military Sanitary Institute.
The early 1920s were a time of revival for Poland's sovereignty, setting the scene for scientific and social life. The University of Warsaw took advantage of the freedom of science and education, and started to provide education. In a very short time, owing to prominent Polish professors who transferred to Warsaw from universities in Russia, Galicia and Western Europe, it was possible to establish a university with numerous faculties representing a European level. It was also they who boosted the prestige of Military Physician. In “Dzieje medycyny w zarysie”, Bronisław Seyd describes the development of medicine in the 1920s, and, at the same time, draws attention to the fact that the scientific

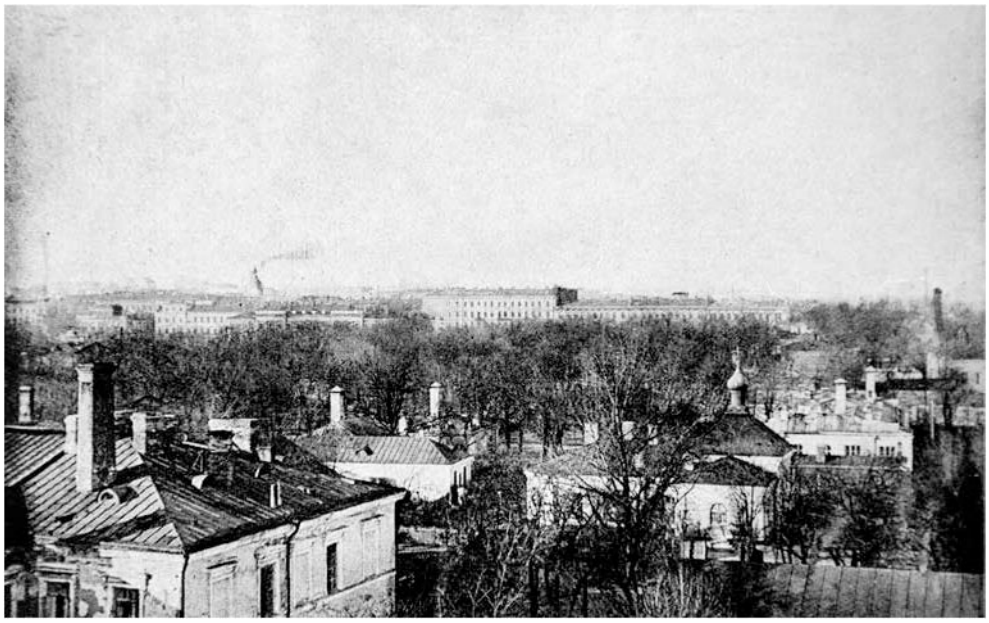


**Figure 1**. Polish Legions Hospital in Ujazdów Castle, Warsaw – 1918
**Rycina 1**. Szpital Legionów Polskich w Warszawie w Zamku Ujazdowskim – 1918 r.
Source: From authors' collections

achievements of physicians rarely pertained to the actual needs of society. He also noted that: "Some achievements (...) enriched not only Polish medicine, but sometimes also world medicine". Among the scientists he mentioned were Edward Flatau, Rudolf Weigl and Antoni Gluziński [4].

Edward Flatau, one of the most prominent of Polish scientists, creator of the neurology school in Warsaw, known around the world, is connected with the most widely described specialty in the pages of Military Physician of the 1920s. At this time, Flatau was already an esteemed and respected scientist at home and abroad. This legend of Polish neurology, one of the creators of international neurology, and a pioneer in neurosurgery in Poland, was a student of distinguished Russian and German schools [4]. From among his numerous works, it is worth paying attention to "Atlas mózgu człowieka i przebieg włókien", published in Berlin in 1894, which explains in detail, the surface, cross-sections and anatomic relations of sulci and ganglia of the newly dissected brain. The publication was the first modern atlas of the nervous system. It was published in German and soon after that it was translated into English (Figure 2).
Also, "Das Gesetz der excentrischen Lagerung der langen Bahnen im Rückenmark" (Zeitsch. für klin. Med. 1898) (in German) is considered to be a superb work in neurology at the turn of the 19th and 20th centuries. In the article, the author explained the law of eccentric positions of the long fibers in the spinal cord (so called Flatau's law) according to which the further the nerve fibers run lengthwise in the cord, the closer they are situated toward the periphery. His scientific works focused on the pathology of nerve cells and the system of the spinal cord pathways, as well as on studies on brain and spinal cord cancers

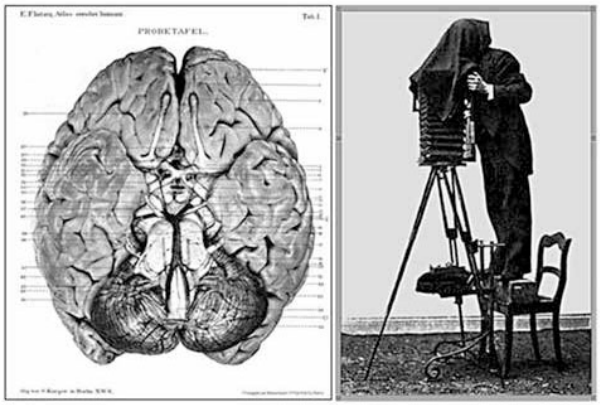


**Figure 2**. Page of Atlas of the human brain … and the author preparing images for the Atlas

**Rycina 2**. Strona z Atlasu mózgu człowieka… oraz autor przygotowujący zdjęcia do swojego atlasu

Source: https://pl.wikipedia.org/wiki/Edward_Flatau [accessed on: 7.07.2015]

and their treatment. Edward Flatau was also a great clinician who investigated meningitis, as well as brain and spinal cord tumors. He was the first person in the world to deal with experimental myelography in rabbits [5, 6]. He died of a brain tumor.

Edward Flatau's student and colleague was Eufemiusz Herman, who worked at the Czyste Hospital in Warsaw from 1922. He took an interest in scientific work as a student when his first works were published, describing the results of studies on nerves, blood circulation in the brain, proteinuria and brain

tumors, cerebellum symptoms, and pseudoathetosis. From 1918 to 1920, he served in the Polish Armed Forces as a lieutenant and was assigned to the 3rd sanitary battalion in Grodno, and he took part in the Polish-Bolshevik war. His scientific accomplishments include the discovery and description of neurological symptoms and disease entities. Apart from that, he wrote textbooks and monographs, and chapters for collective works. New nosological entities he described include Herman's syndrome (post-traumatic syndrome with *livedo racemosa*), and types of neurological syndromes in typhus and chronic disseminated encephalomyelitis. Eufemiusz Herman is also known for his publications devoted to the history of Polish neurology [7]. Antoni Prusiński wrote about Herman in his obituary: "(...) Professor Herman penetrated this sole secret of overcoming the invisible, delicate and hidden barrier which exists between two people, in this case between the patient and the physician, and which closes the individual world of each entity. This barrier can be overcome in only one way: by showing genuine cognitive and emotional interest in the patient in order to get to the bottom of his suffering and to truly sympathize with him" [8].

Another figure associated with the school of Edward Flatau was his friend, Samuel Goldflam, a scientist, physician, community worker, and doyen of Polish neurology. He focused on the semiotics of abdominal reflexes and intermittent claudication. He was the author of a popular description of pain that appeared while shaking the kidneys (Goldflam's sign). His scientific accomplishments include about 100 works from which publications devoted to Rossolimo's reflex, myasthenia gravis, commonly known as Erb-Goldflam's disease, are of scientific value. Since he was the first to describe a familial presentation of the periodic paralysis, and by *in vivo* muscle microscopic examination he was able to show that it was not neurosis, the disease should bear his name [9]. Samuel Goldflam was not professionally connected with any hospital or scientific center. He was a "migrant" neurologist, conducting his medical practice and scientific research in various hospitals in Warsaw, not just in the neurology departments but also in the surgery, infectious disease, and pediatric departments. E. Herman described this prominent scientist as follows: "(...) With his incredible sense of perception and inborn powers of observation, Goldflam cannot ignore the disease symptoms and syndromes, which are frequently overlooked by his colleagues, whereas his analytical approach and cognitive passion allow him to delve into each issue thoroughly (...)" [5].

In its first year, Military Physician featured an article by Jan Nelken, a scientist for whom: "(...) Military psychiatry was the second (the first was psychoanalysis – author's note), in connection with forensic psychiatry (...) his organizational and scientific accomplishments in this field, valued even more as these were achieved in the first years after the restoration of independence, allow us to recognize him as a pioneer in military psychiatry in Poland" [10]. Jan Nelken joined the Polish Armed Forces on 2 August 1919. He first started work at Ujazdów Hospital in Warsaw and in 1925 became a leading expert at the Psychiatric Department of Psychoanalysis, while forensic and military psychiatry were also among his interests. He was the creator of the first department for soldiers with mental-health disorders. Numerous works on neurology and psychiatry written by him were published in Military Physician over a 15 year period. From 1929 he was a member of the Editorial Committee of the journal.

In 1926, another neurologist, Władysław Dzierżyński, began to contribute to the journal. After graduating from the University in Moscow, he took a job in the Department of Nervous Diseases in Moscow. Before his arrival in Poland in 1922, he also worked in Kharkiv. While in Poland, he joined the Polish Armed Forces and was assigned to the 10th Military Hospital in Przemyśl. He is the author of the first Polish academic textbook about neurology. "Volume I: A Guidebook to the neurological diseases – general neurology", which was published in 1927. In the introduction to the second volume of the same monograph, Prof. Kazimierz Orzechowski wrote: "(...) The author gathered in the manual all the required fundamental information from all branches of medicine needed to improve the knowledge of a corresponding neurological department". In it we can find concise information that, until now, we had to look for in the numerous textbooks of the corresponding branches of medicine (...) [11]. Most of all, Dzierżyński's scientific interests included the function of the endocrine glands. His name appears among other neurologists who considerably influenced the development of neuroendocrinology [5].

Stanisław Karol Władyczko, like Władysław Dzierżyński, graduated from the University in Moscow, and began his career in Russia. After his return to Poland in 1918, he devoted himself to organizing the structures of Vilnius University, and in particular the Faculty of Medicine. On 30 December 1918, he was appointed Dean of the Faculty. On 11 October 1919, when the Vilnius Region was still not legally part of Poland, the University was officially opened by Józef Piłsudski, who held jurisdiction over this territory. In July 1920, just before the Red Army seized Vilnius and ceded the city to Lithuania, the University was evacuated and part of the academic personnel joined the army. At the beginning, Prof. Władyczko was sent to the hospital in Grudziądz and was later nominated the head of a military mental hospital in Świecie. In October 1920, after the retreat of Bolshevik forces, he became consultant of the Military Hospital for Central Lithuania in the field of neurology and psychiatry. In

1922, he organized the Neurology Department in Vilnius, which he then managed until 1933. He advocated the division between psychiatry and neurology – as a result of his endeavors in 1923, a separate Psychiatry Department was established at Vilnius University. From his travels to other leading medical centers (internships under the supervision of Babiński, Dupré and Miecznikow in Paris, Kraepelin in Munich, and Ziehen in Berlin) he introduced new treatment methods in Poland. New methods for identifying and localizing brain and spinal cord disease processes, as practiced in Tartu, were introduced in the department, while histopathological examinations psychotherapy were also applied. Professor Władyczko's other interests involved pressure in the eyeball, glaucoma, and the importance of the nervous system's functioning in scleroderma and Raynaud's disease. Owing to his endeavors the medical care over neurotic and disabled children developed substantially. He originated the Men's Association for "overworked, easily fatigued people and drug addicts" which focused on combating alcoholism and other addictions, and he was in charge of an outpatient clinic for alcohol addicts. "(...) If we are to care for humankind as regards eugenics (...and) spirituality, then we have to take up a fierce battle with alcoholism. Furthermore, the brain – 'a marvel among God's other marvels' guarantees the independence of the nation and therefore the 'destruction of the brain equals a coup'" [12].

Surgery, which in the early 20th century encompassed a series of solutions for surgical techniques, started to develop its specialties. We owe this to the prominent surgeons practicing at the turn of the 19th and 20th centuries, who also co-created Military Physician, such as Adam Gruca, Leon Kryński, Romuald Węgłowski and Wiktor Arkin.

Adam Gruca, a prominent orthopedist, began to publish his works in the pages of Military Physician as a sanitary second lieutenant. His military career began in 1914, when he served in the Austrian army. On 6 November 1918, he joined the Polish Army as a volunteer, which was being formed at that time, and was assigned to the 6th Uhlan Regiment, later to the Military Hospital in Lwow and to the 34th Infantry Regiment. On 20 December 1920, he was demobilized and returned to the University in Lwow where in 1924 he received his medical diploma. The beginnings of his scientific work were devoted to surgery and the mobilization of post-operative patients, which – according to the author – avoided peritoneal adhesions, phlebitis, embolisms and decomposition of the organism, and also shortened the duration of the hospital stay. He improved the stomach resection technique by the principle of the primary cutting and of the reparation of the duodenum followed by the resection of the stomach. He put forward an original continuous circular suture and several methods for reconstructive surgeries of the skin. From 1928, his publications involved orthopedics, especially locomotor system abnormalities in infants and children. He invented many original treatment methods and was a global pioneer in the tuberculosis of the bones and joints. An excellent operator, originator and creator of new solutions in the field of orthopedic technology, he wrote a monumental three-volume work: "Orthopedic surgery", enriched with 1140 figures created by himself, which discusses entire contemporary and historical knowledge of orthopedic surgery with particular emphasis on his own and nationwide achievements. This textbook became an essential source of knowledge for many generations of Polish orthopedists [13,14].

Another prominent figure in the history of surgery was Leon Kryński, Professor of the Jagiellonian University and the University of Warsaw. He described a new disease unit, mesenteric sclerosis, by defining its etiology, known in surgery as Kryński's disease. He was the author of the first in the Polish literature comprehensive discussion of the theory of pathogenesis of cancers, presented in the work: "Etymology of cancer in light of comprehensive studies" [16]. R. Sosnowski, W. Rogowski, and T. Demkow, the authors of one of the works devoted to this prominent person, wrote: "Leon Kryński can be considered to be one of the most outstanding, next to A. Obaliński, J. Kosiński and M. Rutkowski, Polish urologists of the last two decades of the 19th century and the first half of the 20th century. (...) He dealt with, among other things, bladder exstrophy, surgery of the ureters, kidney stones and tuberculosis, and benign prostatic hyperplasia. His most important work regarding urology was: "The treatment of bladder exstrophy (*ectopia vesicae*)". His contribution to the surgery of ureters means he began with a very challenging subject (...)". [17] The titles of biographical work about Leon Kryński gives evidence of his accomplishments in surgery: "The otolaryngological achievements of Leon Paweł Wawrzyniec Kryński (1866-1973), an excellent Surgeon of Krakow and Warsaw" [18], "Leon Kryński – a prominent urologist of the late 19th century" [19], "Leon Kryński – a great contributor of fight against cancer in Poland in the late 19th century" [20], and "Leon Kryński – a co-founder of Warsaw surgery school" [21-23].

One of the pioneers in vascular surgery was Romuald Węgłowski, a graduate of the University in Moscow. During the First World War, like most of his colleagues, he was enlisted in imperial Russian army and worked in a military hospital. On 2 September 1918, he joined the Polish Army and started to work in a military hospital in Zamość, where he lived from 1921. He settled in Lwow, where he could work with many outstanding physicians; for instance, he operated together with Adam Gruca. It was written

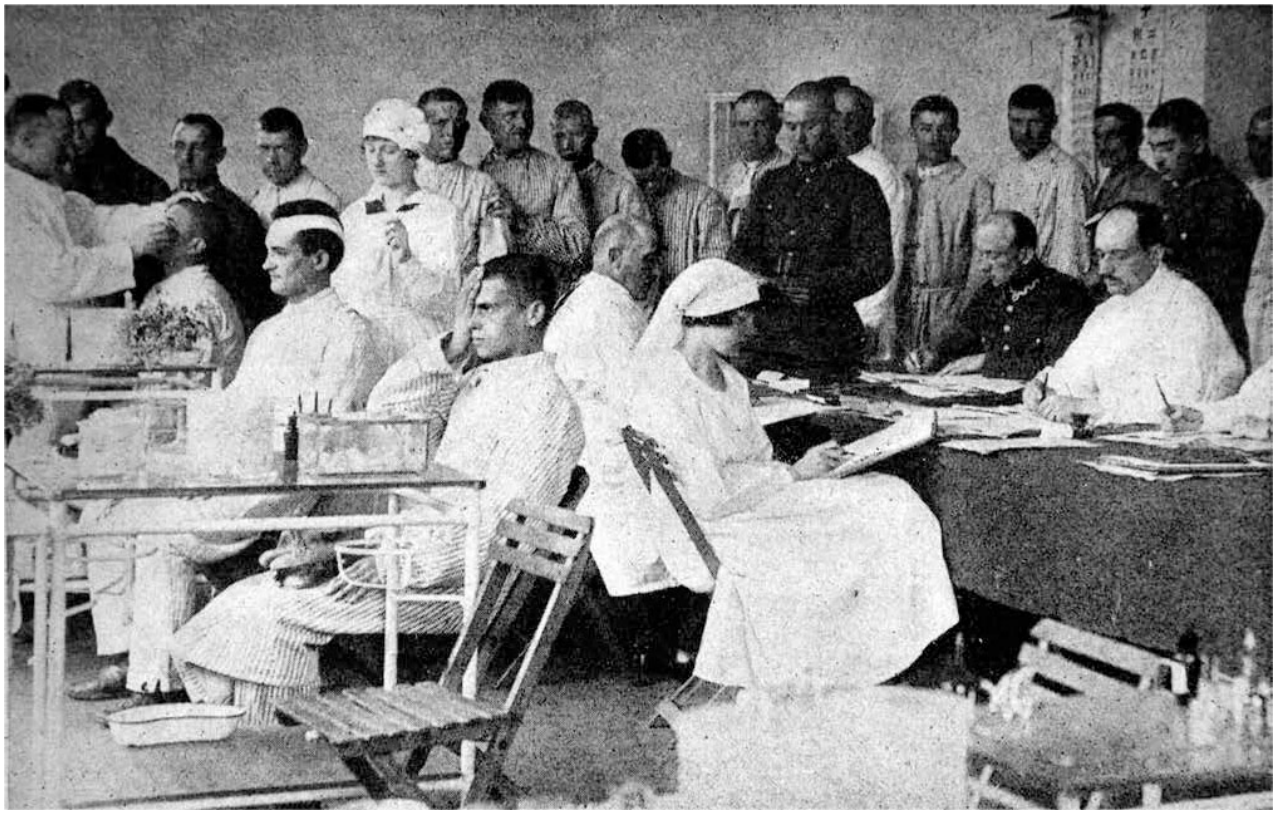


**Figure 3.** Ophthalmic out-patients clinic in Ujazdów Castle, Warsaw
**Rycina 3.** Ambulatorium Oczne w Szpitalu Ujazdowskim w Warszawie
Source: Tygodnik Lekarski 1920; 36: 695

about Węgłowski's works that: W. Noszczyk and M. Kielar: "(...) Romuald Węgłowski (in comparison to Eugeniusz Parczewski – author's notes) could boast even greater achievements. In the years 1914-1920, he operated on 193 arterial injuries. As the operations during which he performed the anastomosis of arteries were too often failures, he started to join the stumps of the arteries using an autologous vein graft. (...) after many years, Harris B. Shumacker, an American surgeon, ranked Węgłowski among the narrow circle of pioneers of vascular surgery in the world" [24]. His scientific interests were very deep; he left us many publications and monographs. In 1987 published Shumacker's work: "Romuald Węgłowski: a neglected pioneer in vascular surgery", reflecting on his role in the development of this specialty [25, 26].

Surgeons were also the pioneers of ophthalmology, which was lectured on as part of surgical classes. Only in the second half of the 19th century did it became a separate academic subject. The Ophthalmology Department in Ujazdów Hospital began functioning in independent Poland in 1920 [Figure. 3], similarly to the "Eye Clinic" of the University of Warsaw headed by Kazimierz Noiszewski [27].

Wiktor Arkin, who worked at the "Eye Clinic" of the University of Warsaw, is considered today a pioneer of keratoplasty in Poland. In 1956, he published his monograph "Corneal graft", in which he wrote: "(...) one of more frequent reasons for blindness or limitation of the vision is minor or major corneal opacity. The cornea is particularly at risk of injuries or infections while other eye structures have better protection owing to their anatomical location" [28]. His medical and scientific experience included not only keratoplasty, but also glaucoma and intraocular pressure. He carried out histopathological and histochemical examinations of eye tissues, authored numerous modifications of surgical methods and instruments used in ophthalmology.

Articles concerning surgical specialties published in Military Physician did not constitute the majority of the publications; these were works on internal diseases. In the time of peace, just after the period of battles on different fronts and the countless migrations of people, the most frequent were instances of infectious diseases – tuberculosis, dysentery, spotted

fever and venereal diseases. Favorable factors for these to spread were difficult financial and living situations, malnutrition, and low level of personal hygiene and health awareness among the poorest, including soldiers [29-31]. In “Historia medycyny”, Władysław Szumowski describes the division of 19th century clinical medicine into the departments of internal diseases and external diseases [32]. He mentions two of many distinguished internists, whose names can be found in the list of works of Military Physician. These are Antoni Gluziński and Alfred Sokołowski, both mentioned above.

Antoni Gluziński is “(...) the most outstanding and honored Polish internist of recent times (...)” [32], co-creator of gastroenterology in Poland, who graduated from the Jagiellonian University in 1880. His career started at the Faculty of Physiology at that University, but later he worked in the Internal Diseases Department. In the years 1893-1897, he was the Head of the Faculty of General and Experimental Pathology. In 1896, he published a monograph “An outline of fever pathology and treatment", which was the first monograph in Poland and one of the first in the world to describe the subject comprehensively. Unfortunately, it did not pay a significant role in the development of medicine in the world since it was published only in Polish. Gluziński’s interests, clinical as well as scientific, regarded many fields of internal medicine, including diagnostics and treatment of stomach diseases. His achievements include the introduction of a protein breakfast as a test to simulate stomach secretion. After the University in Lwow was opened in 1987, Antoni Gluziński moved to Lwow, where he became Head of the Faculty of Pathology and Detailed Methods of Treatment (i.e. Internal Medicine), which remained under his supervision until 1918. Here, in 1902, he published his work "On early diagnosis of stomach cancer" about the most significant accomplishment of the author, known as the “Gluziński test”, still used until recently for detecting stomach cancers. “It involved the examination of the gastric content three times: on an empty stomach, after breakfast and after dinner. The symptoms of stomach cancer may be decreasing acidity in the gastric content (gastritis accompanying the cancer), while increasing acidity is a symptom of gastric ulceration. In 1907, Gluziński and M. Reichenstein announced, as a first in world literature, a clinical description of plasma cell leukemia – a work quoted to date” [33]. In 1919, Gluziński moved to Warsaw, where he governed the Internal Medicine Clinic. His most interesting works of that time were about diagnostics and the treatment of internal organs in children with a syphilis infection [34].

Among the pioneers of the modern methods of treatment of the respiratory system was Alfred Sokołowski, Professor of the University of Warsaw, internist, phthisiatrist, and founder of the Anti-Tuberculosis Association. Władysław Szumowski wrote about Sokołowski: “(...) an excellent specialist of pulmonary diseases from Warsaw, suffering from tuberculosis, an author of many Polish works, known also in this field in foreign publications (Klinik der Brustkranheiten (in German), 1906, 2 volumes), one of the propagators of sanatorial treatment for patients with tuberculosis (...)” [32]. Another historian of medicine, Tadeusz Brzeziński, also drew attention to the Professor’s accomplishment, mentioned by Szumowski, i.e. his first textbook of pulmonary diseases, translated into many languages. In this textbook Sokołowski described various presentations of tuberculosis proceedings in a way typical of other diseases. The descriptions, known as “Sokołowski’s masks”, have been mentioned in world literature [35]. He received credits for organizing numerous preventive care campaigns to raise awareness about tuberculosis. Professor Sokołowski laid the foundation of knowledge about the diseases of the nose, throat and larynx. Andrzej Kierzek wrote: “(...) Sokołowski taught young physicians how to use a reflector fixed to the forehead and how to perform laryngoscopy. He rightly claimed an internist has to have the skill to use a speculum” [36]. His tangible achievement was the limitation of the therapeutic use of alcohol for tuberculosis treatment, which, according to the knowledge of the time, served to weaken the metabolism in the course of fever and night sweats, improve pulmonary blood supply and increase the resorption of infiltration through an activating effect on the heart muscle. Sokołowski claimed that the most crucial thing is clean and healthy mountain air, short and cold showers, and a high-protein and high-fat diet [37].

The father of Polish bacteriology, Odo Feliks Bujwid, also wrote for Military Physician for several years. His first work for the journal was published in issue 7 in 1921 (the same year he joined the editorial staff). Odo Bujwid was a graduate of the University of Warsaw and, like the majority of physicians of this period, was interested in science, receiving and improving the knowledge in leading European centers. Keen on a new field of study, bacteriology, in 1885 he left for Berlin where he worked with Robert Koch. After his return to Poland, he organized the first microbiological laboratory in Poland. He was also a co-founder of the first Pasteur station outside France – its establishment was possible after training in Paris from Louis Pasteur, who carried out research on rabies. He brought from Pasteur two rabbits with rabies, which enabled him to develop a vaccine. Due to the long-term nature of Bujwid's scientific research, the colorful reaction of the vibrio chloreae bacteria and the favorable influence of glucose on the development of staphylococcus were discovered. Another trip to Berlin, from which he brought back a cure for tuberculosis patented by Robert Koch, caused Bujwid

to begin his own work aimed at improving this medicine. The first work to discuss the discovery of the medicine in question, named by its inventor as "tuberculin", published in "Gazeta Lekarska" in 1891. Three years later Bujwid prepared a diphtheria antitoxin and opened two facilities to produce it. In the next few years he increased the production of vaccines and sera, including anti-tetanus serum, anti-streptococcus serum, and an anti-rubella serum used in veterinary medicine [38]. Among the many interests of this distinguished scientist was research into bacteriology concerning the water of the Vistula River, food and air. The Professor joined the Polish Army in January 1919, where he was appointed a member of the Military Sanitary Council. He greatly contributed by promoting new ideas about clean water and air, and hygiene among soldiers and military physicians.

Bujwid's center employed many outstanding future physicians, including Rudolf Weigl, the inventor of a vaccine against typhus. Weigl was a biologist, microbiologist and zoologist, completing his education in natural science at the Faculty of Philosophy of the University of Lwow. From 1914, he worked as a parasitologist in the military bacteriological laboratories of the Austrian army and then, in refugee and captive concentration camps, carried out scientific research on typhus. After the First World War he started work at the Jan Kazimierz University in Lwow and in the same year he was appointed as the head of the bacteriological laboratory in Przemyśl. The following year he worked as a parasitologist in the Military Sanitary Council of the Ministry of the Interior, where he became the head of the Typhus Research Laboratory. In 1920 he received the degree of Professor and became the head of the Faculty of General Biology at the Faculty of Medicine of the Jan Kazimierz University. He carried out his academic studies on typhus, a disease which had taken its toll during armed conflicts for many years and in many places, such as in Abyssinia, by studying different types of the disease. Weigl was the first in the world to reveal that *Rickettsia prowazekii* is a germ carried by a body louse and is the cause of typhus. The original methods of breeding and dissecting louses infected with pathogenic rickettsia enabled the scientist to invent a vaccine for preventing this disease. In the years 1939-1944, he conducted research in the Institute of Typhus and Viruses Research in Lwow. The reputation that Weigl gained and his vaccine was reflected in the words of Father Ruten, head of the medical department of Belgian mission in China, who was the first to use it on a large scale: "(...) Our most horrifying enemy – typhus... this terrible disease killed more people than all epidemics, illnesses, and murders put together. It is enough to say that out of the 130 priests who died between 1906 and 1931, 88, i.e. over 70%, died due to typhus... We found out about eight years ago that in faraway Poland one of your scientists invented a mighty vaccine against typhus. The name of the professor was Weigl, Professor Rudolf Weigl from the University in Lwow. (...) From the moment that vaccination began, i.e. seven years ago, none of the vaccinated missionaries or natives have died of typhus. Your Polish vaccine saved not only the lives of missionaries, but thousands of people in China (...)" [41]. Professor Weigl became very popular in the world owing to the vaccine. He received the highest order awarded by the Pope – the Order of St. Gregory the Great, Belgian orders and membership in many scientific institutions. What is more, he was nominated for the Nobel Prize [42-44].

**Summary**

The analysis of the articles published in the 1920s in Military Physician clearly shows that the main task assigned to the journal by the President of the Military Sanitary Council, Zbigniew Dmochowski, i.e. to write about the most recent medical discoveries and achievements, was fulfilled. The authors of Military Physician demonstrated high levels of science and training. Academic staff from the universities in Warsaw, Kraków, Lwow, and Vilnius, representatives of governmental and military authorities, teachers, and apprentices of the Sanitary Training Centre as well as physicians from military units nationwide – they all wrote for the journal, and all of them played a crucial role in its history.

Source: https://pl.wikipedia.org/wiki/Edward_Flatau [accessed on: 7.07.2015]

**Edward Flatau** (born 27 December 1868 in Płock, died 7 June 1932 in Warsaw) – a Polish neurologist and psychiatrist; an authority in the field of physiology and the pathology of meningitis; a co-founder of modern Polish neurology (together with Samuel Goldflam); one of the neurology pioneers in the world. A co-founder of the medical journals Neurologia Polska [Polish neurology] and Warszawskie Czasopismo Lekarskie [Warsaw medical journal]. His name in medicine is linked to the Redlich-Flatau syndrome, Flatau-Sterling syndrome, Flatau-Schidler disease and Flatau's law. In 1892 he graduated *cum eximia laude* from medical studies at Moscow University. In 1893-1899 he worked on neuropathology, neuroanatomy and neurohistology in Berlin. In 1899 he moved to Warsaw where he worked at the Czyste Hospital. He was a member of the Polish Academy of Learning, a member and head of the Department of Neurobiology of the Warsaw Scientific Society, a corresponding member of the Neurological Society of Paris and of the Vienna Psychiatric and Neurological Society, an honorary member of the Neurological Society in Moscow, and one of the first 27 members of the Polish Academy of Medical Sciences.

**Publications in Military Physician**

- About the meningitis epidemic and its three forms: lethargic, dislethargic and alethargic - a speech given at the meeting of the Neurological and Psychiatric Section of the Warsaw Medical Society, on 6 March 1920. 1920; 1 (18/19): 40-57
- "The neck and the mydriatic sign". 1921; 2 (15): 449-456
- "About the epidemic of disseminated inflammation of the nervous system". 1929; 14 (1-4): 81-87

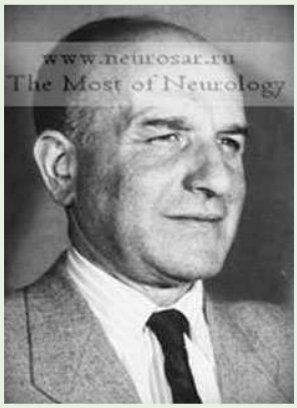
Source: https://commons.wikimedia.org/wiki/File:Samuel_Goldflam_%28cropped%29.jpg [accessed on: 7.07.2015]

**Samuel Goldflam** (born 15 February 1852 in Warsaw, died 26 August 1932 in Otwock) – a Polish neurologist. He analyzed myasthenia gravis (also referred to as the Erb-Goldflam syndrome) and intermittent claudicationi. His name in medicine is associated with Goldflam's symptom. In 1870-1875, he studied at the Medical Faculty of the Imperial University of Warsaw. In 1875, he received his medical diploma and began work as an assistant at the 1st Therapeutic Faculty and Clinic of the Imperial University of Warsaw. In 1878 he was appointed full-time medical director. In 1882 he went abroad and was trained by Carl Westphal in Berlin and by Jean-Martin Charcot in Paris. Following his return to Warsaw, he began work at the Lambla Clinic, and then in his own apartment at 10 Graniczna St. (from 1883 to 1922), setting up a free polyclinic of internal and neurological diseases, providing services to patients of limited financial means. From 1922 to 1932 he worked as a volunteer in the Department of Neurology at Czyste Hospital. It was through his and Edward Flatau's efforts that the Scientific Pathological Institute was established there. He was the organizer of the Warsaw Medical Society, one of the founders of the Warsaw Neurological Society and its first chairman (1921-1923), an active member of the Warsaw Scientific Society (1908), the Lublin Medical Society (1905), an honorary member of the Polish Association of Social Medicine, and a co-founder of Warszawskie Czasopismo Lekarskie ["Warsaw medical journal"].

He was a remarkable community worker. He set up the Zofówka Society for Jews with Nervous and Mental Illnesses in Otwock, and the Bersons and Baumans Children's Hospital in Warsaw.

**Publications in Military Physician**

- "The reason for diversified forms of meningitis of non-infectious origin". Polioencephalitas superior lethargica benigna. 1920; 1 (18-19): 1-27



Source: http://www.nlm.nih.gov/hmd/ihm/maintenance.html [accessed on: 7.07.2015]

**Eufemiusz Herman** (born 28 September 1892 in Tomaszów Mazowiecki, died 8 May 1985 in Łódź) – a renowned physician and scientist, the father of Polish neurology. He undertook medical studies at the John II Casimir University in Lwow, completing his education at the Jagiellonian University in Kraków in 1918. During and after the war in 1920 he worked as a physician in the Polish Army. He settled in Warsaw and accepted a job in the Department of Neurology at Czyste Hospital, run by E. Flatau. After Flatau's death, in 1932, he was appointed head of the Department and performed this function until 1942. During the Second World War, the Department operated within the ghetto area. The Professor provided assistance to patients dying of typhus, at the same time conducting research on the neurological symptoms of this disease. In 1946, he was appointed extraordinary professor of neurology at the University of Łódź and took the position of head of the Faculty and Clinic of Neurology. He was an outstanding physician, lecturer and teacher. He set up the first Polish sanatorium operating as a scientific and research center, which focused on treating neuroses and vegetative states. He retired in 1962.

He acted as the deputy president of the World Federation of Neurology (1969-1972), a member of the Committee of the History of the World Federation of Neurologists, a co-founder of the Polish Neurological Society and a president of the Polish Neurological Society (1959). He was also a member of several international societies, and in 1952 an editor of Neurologia Polska [Polish neurology].

**Publications in Military Physician**

- "The casuistry of war neuroses. Neoplasms", 1921; 2 (35): 1107-1109
- "The clinic and anatomy of malignant carcinomas of the lumbar and sacral vertebrae. (The significance of aspirative vertebra punctures for the diagnostics and X-radiation treatment of such types of carcinomas)". 1929; 14 (1-4): 88-110


Source: https://pl.wikipedia.org/wiki/Stanis%C5%82aw_Karol_W%C5%82adyczko [accessed on: 7.07.2015]

**Stanisław Karol Władyczko** (born 4 November 1878 in Kaunas, died 18 July 1936 in Vilnius) – a Polish neurologist and psychiatrist; a professor. Having received his PhD degree in 1907, he became an assistant to Biechtieriew at the Department of Mental and Nervous Diseases of the Medical and Surgery Academy in St. Petersburg. For a short period he worked for the Neurological and Psychiatric Clinic, run by Łapiński, at the Saint Volodymyr University in Kiev. In 1910, he was appointed associate professor of neurology and psychology at the Medical and Surgery Academy in St. Petersburg. He also completed internships in Paris, Munich and Berlin. In 1911, he received the degree of professor at the Psychoneurological Institute in St. Petersburg. In 1914, he was recruited to the army. From 1918 on, he contributed to establishing the Vilnius University in Poland, being appointed dean of the Medical Faculty. He was the founder and manager of the Neurological Department in Vilnius. After its liquidation in 1933, he moved to Warsaw but then returned to Vilnius shortly before his death. He was a member of the French Association of Psychiatry, the Neurological Society in Estonia, the International Tuberculosis and Cancer Association, the International Society of Sexual Medicine and the Polish Pharmaceutical Society. He also performed the function of president of the organizing committee of the Third Conference of the Polish Psychiatric Society in Vilnius in 1922.

**Publications in Military Physician**

- "About sleep and night dreams". 1928; 11 (3-4): 304-311

Source: http://bibl.amwaw.edu.pl/histmed/HTML/str5.html [accessed on: 7.07.2015]

**Leon Kryński** (born 20 February 1866 in Warsaw, died 8 October 1937 in Warsaw) – a leading figure in Polish surgery. He graduated from the Medical Faculty of the Medical University in 1889 and in the same year became an assistant at the academic 1st Surgery Department chaired by Julian Kosiński. In the following year he accepted a job at the Surgery Department in Kraków, run by Professor Rydygier, where he earned his PhD degree in medicine. He defended his habilitation thesis in 1896 at the Jagiellonian University, and in 1902 he earned the degree of extraordinary professor there. In 1906 he was appointed head of the Surgery Department at the Hospital of the Holy Ghost in Warsaw, and in 1918 he became a professor of clinical surgery and head of the Surgery Clinic. He set up the Experimental Medicine Workshop within the Warsaw Scientific Society, running the Surgery Department. In 1919 he took over the chair and was appointed head of the Department of Topographic Anatomy and Operative Surgery, which he built up from scratch and ran until his retirement in 1931.

Prof. Kryński held several titles and honorary positions. He was a member of many scientific societies, including the Warsaw Medical Society and the Warsaw Scientific Society (a founding member).

He pursued his education in foreign centers, which gave him an opportunity to many meet prominent figures, such as Robert Koch, Ernest Bergmann, Francesco Durante and Felix Guyon.

**Publications in Military Physician**

- “Femoral hernia and the Cloquet's node. An anatomic and clinical outline”. 1921; 2 (7): 193-196
- “About the mobile gallbladder (cystis fellea mobilis). An anatomic and clinical outline”. 1921; 2 (8): 226-229

Source: https://upload.wikimedia.org/wikipedia/commons/c/cd/Dzierzynski_Wladyslaw_w_garniturze_1920.jpg [accessed on: 7.07. 2015.]

Władysław Dzierżyński (born 11 March 1881 in Oziembłów, died 20 March 1942 in Zgierz) – a Russian and Polish neurologist and psychiatrist; a professor. He graduated from the Medical Faculty of the Moscow University in 1906. He received his PhD degree in Moscow in 1911. In 1913, he was appointed medical director of the Guberniya Country Hospital in Kharkiv. In the same year, he published his most famous work devoted to developmental disorders: Dystrophia periostalis hyperplastica familiaris. In 1915, he was appointed assistant professor at Kharkov University in the Chair of Neurology and Psychiatry. He was one of the founding fathers of the University in Ekaterinoslav, in 1920 being appointed dean of the Medical Faculty and in 1921 deputy vice-chancellor. In 1919 he received the degree of professor there. In 1922, he emigrated to Poland and joined the Polish Army, being delegated to the 10th Military Hospital in Przemyśl. In 1928, he began to work for the 5th District Military Hospital in Kraków and in 1930 he was appointed medical director of the Neurological Department at the 4th District Military Hospital in Łódź. He retired in 1934. From 1933 he was a member of the Polish Neurological Society; from 1936 the first president of the Polish Neurological Society in Łódź, and from 1937 a member of the Board of the Polish Neurological Society. In 1942, he was arrested by the Gestapo. He died during the mass execution of 100 Poles in Zgierz.

**Publications in Military Physician**

- “The splitting of combined contractions or protective reflexes". 1926; 8 (5-6): 429-443
- “Remarks related to Col. Koelichen's assessment of my 'Handbook of Nervous Diseases'". (Lekarz Wojskowy 1925 No. 6 and 1927 No. 3). 1925; 1927 (10): 5-6, 631-633
- “The reason for protective reflexes". 1927; 10 (3): 233-248
- “Torsion spasms and extrapyramidal hemiplegia. Neoplasms", 1929; 13 (10): 489-511
- “A handbook of nervous diseases. Part II. Detailed neurology". Lwow–Warsaw 1927. /Assessment/. 1927; 10 (3): 296-297
- “Plant layout and its clinical systems". 1931; 18 (7): 253-262
- “Plant layout and its clinical systems (continuation)". 1931; 18 (8): 308-321
- “Premature cranial suture closure. (Synostosis duturarum praematura)". 1932; 9 (8): 409-420; 1932; 9 (9): 486-498; 1932; 9 (10): 555-570
- “Of the casuistry of rare skeletal diseases". 1933; 21 (4): 307-313
- “Of the casuistry of rare skeletal diseases. Neoplasms", 1933; 21 (7): 608-618

Source: http://www.ogrodywspomnien.pl/index/showd/14 638 [accessed on: 7.07.2015]

**Jan Władysław Nelken** (born 16 March 1878 in the village of Skomoroszki in the Kiev Governorate, murdered in April 1940 in Katyn). In 1896, he undertook studies at the Medical Faculty of the Imperial University of Warsaw. At the beginning of 1898, during his 2nd year of studies, he was expelled from the University, having been served a police order to leave Warsaw due to his active participation in the manifestation funeral of a student who was a social activist. He went to Kazan to continue his education. In 1902, received his medical diploma and having returned to Warsaw in 1902, he began his medical practice at the Psychiatric Hospital in Tworki. He also joined the Polish Socialist Party, for which he was arrested and detained several times. Seeking to avoid another detention, he moved to Sosnowiec. In 1908, he accepted a job at the out-patient facility of the Neurological and Psychiatric Clinic in Kraków, where he earned his PhD degree. He then left for Switzerland and took the position of assistant at the academic Psychiatric Clinic in Zurich. Having returned to Poland in 1912, he worked for the National Centre for Mentally Ill Patients in Kulparkow near Lwow.

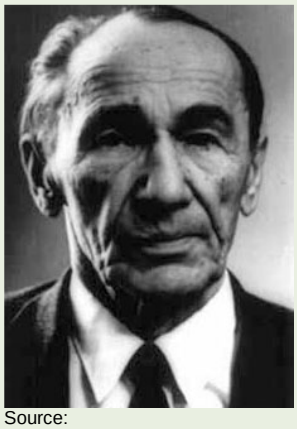
During the First World War he was enrolled in the army and worked at the Garrison Hospital in Lwow in the position of medical director of the Psychiatric Department. In 1919-1934 he performed military service in the Polish Army. He was deployed at Ujazdów Hospital in Warsaw. Following the establishment of the Sanitary Training Centre in 1930, he worked in the position of a scientific manager at the Psychiatric Department of the CWSan Teaching Hospital. Having completed his professional military service, he practiced medicine in the Solec Out-Patient Clinic and in the Social Insurance Institution. He was a member of the Board of the Polish Psychiatric Society and an editor of Rocznik Psychiatryczny [Psychiatric Yearbook].

Following the outbreak of the Second World War, along with the staff of the Sanitary Training Centre, he withdrew to the eastern regions. After the Soviet invasion of Poland he was arrested by the Russians. He was initially detained in Kozielsk camp. In the spring of 1940 he was transported to Katyn and executed.

Doctor Jan Nelken wrote a number of scientific papers devoted to psychiatry, neurology, alcoholism treatment and mental hygiene.

**Publications in Military Physician**

- “Alcohol and crime in the army during wartime". 1920; 1 (21): 9-18
- “A psychiatric congress". 1920; 1 (37/38): 21-23
- "Reactive psychoses during wartime. A lecture given at the 2nd Congress of Polish Psychiatrists in Poznań". 1921; 2 (30): 941-950
- “The 2nd Congress of Polish Psychiatrists in Poznań". 1921; 2 (21): 682-683
- “Simulating mental disorders vs. military service". 1926; 7 (1): 1-22
- “Medical-forensic evaluations". Warsaw 1927. Assessment. 1927; 10 (1): 75-76
- “Six cases of nervous and mental disorders after being shot in the head in an attempt to commit suicide". 1931; 17 (1/4): 3-24
- “About mental illness complications induced by erysipelas". 1932; 19 (12): 689-714
- “Cases of heavy intoxication in the army". 1932; 19 (6): 297-309
- “Mental hygiene in the army". Warsaw. 1934. Assessment. 1934; 23 (9): 508
- “Psychopathy during wartime". 1935; 25 (1): 31-33



Source: http://www.czytelniamedyczna.pl/3276,zyciorys-prof-dra-hab-med-adama-grucy-18 931 983.html [accessed on: 7.07.2015]

**Adam Gruca** (born 3 December 1893 in the village of Majdan Sieniawski, died 3 June 1983 in Warsaw) – a Polish orthopedist and professor of medicine, who was one of the leading physicians in his professional field. In 1913, he undertook medical studies at the University of Lwow. In July, just after the outbreak of the First World War, he was enrolled in the Austrian army, fighting on the Russian, Romanian and Italian fronts. From 6 November 1918, he served in the Polish Army, taking part in the defense of Lwow in the war against Bolshevik Russia in 1920 and in the Lithuanian campaign. In December 1920, he was demobilized and returned to university to continue his medical studies. While studying, he accepted the job of junior assistant at the Surgery Clinic of the John II Casimir University in Lwow. He defended his habilitation thesis in 1928, being awarded the degree of assistant professor and veniam legendi. In 1931-1938, he held the position of medical director of the Department of Surgery at the Social Insurance Hospital, and then of the Department of Pediatric Surgery at St. Sophia Hospital, where he worked until January 1940. At the beginning of 1938 he was appointed professor titular by President Ignacy Mościcki. During the September Campaign he participated in the defense of Lwow, performing the function of chief surgeon of the military hospital situated in the main building of the Polytechnic National University in Lwow. During the first military occupation by the Soviet Union (1939-1941), he ran the General Surgery Clinic at the Lwow Medical Institute, also acting as the sanitary director of the Area Command of the Union of Armed Struggle.

During the German occupation (starting in July 1941) he worked as an instructor of occupational medical courses in Lwow. Facing the threat of being arrested by the Germans and execution by the Ukrainian Insurgent Army, he left Lwow in 1943 and hid in Kalwaria Zebrzydowska. By the end of June 1945 he began to set up and work for the Central Institute of Injuries, which was situated on the ground floor of the former Surgery Clinic at the Hospital of the Infant Jesus in Warsaw. In 1947, he was awarded the degree of extraordinary professor and in 1955 of ordinary professor. He ran the Orthopedic Department until 1964.

He was a member of the Polish Academy of Learning, a full member of the Polish Academy of Sciences, the founder and most prominent representative of the Warsaw school of orthopedics and traumatology, and Doctor *honoris causa* of the Medical Academy in Warsaw and Wrocław.

**Publications in Military Physician**

- "About the causes of epidermal injuries and leg ulcers among front line soldiers". 1921; 2 (7): 201-203

Source: collections of the Central Medical Library – files of the Warsaw and Białystok Medical Chamber, No. PL/327/1/0/64

**Wiktor Arkin** (born 8 April 1894 in Warsaw, died 7 January 1982 in Warsaw) – the pioneer of Polish ophthalmologists, a prominent scientist, an outstanding clinician and teacher, and an educator of many generations of ophthalmologists. He undertook studies in 1912 at the Medical Faculty of the University of Warsaw, receiving his diploma on 12 January 1917 at the Imperial University in Rostov and validating it in Warsaw in 1920. In 1918-1923, with a break for his military service, he worked as a volunteer in the out-patient clinic at the Institute of Ophthalmology, and from 1921 in the Ophthalmology Clinic, operating within the University of Warsaw, at the Hospital of the Holy Ghost. In 1923-1940, his professional career was connected with the Hospital of Starozakonnych at Czyste. During the occupation he did not practice medicine. Shortly after the Second World War he began work for the Social Insurance Institution and in 1949 he was appointed medical director of the Hospital of the Holy Ghost. In the same year he received his PhD degree in medicine, and in 1951 he defended his habilitation thesis. In 1953-1960, he was the chief manager of the Department of Ophthalmology at the Institute of Medical Staff Training and Specialization. In 1959, the Department was renamed the Faculty and Clinic of Ophthalmology of the Medical Training School, operating within the Medical Academy in Warsaw. He retired in 1964.

He represented the Polish ophthalmology at international congresses and took an active part in all congresses of the Polish Ophthalmologic Society.

He also performed the function of deputy president of the Polish Ophthalmologic Society, was a member of the Barraquer Institute in Barcelona, and in 1953 joined the Editorial Board of the "Eye Clinic".

**Publications in Military Physician**

- "Serological tests in penetrating uvea injuries". 1924; 5 (5): 408-415

Self-portrait. Source: Noszczyk W (ed). A brief history of Polish surgery. PZWL Publishing House, Warsaw 1989

**Romuald Węgłowski** (born 17 March 1876 on the Stara Rudnia estate, died 26 November 1935 in Lwow) – the pioneer of Polish vascular surgery. Graduated from the Moscow University in 1901. He began his medical practice at the academic Surgery Clinic. This was where he defended his PhD thesis in 1903, and a year later he was offered the position of assistant professor of surgery at Moscow University. In 1909, he was appointed chief physician at St. Anna Hospital, which belonged to the Red Cross. In 1911, he received the degree of professor and was offered the position of medical director of the Surgery Clinic at the Medical Institute in Moscow. In 1914, he was enrolled into the Russian army and appointed chief physician of the 16th Evacuation Hospital in Moscow. At the same time, he worked as the chief surgeon – consultant at the St. Paul Central Military hospital in Moscow and at the Surgical Hospital for the Seriously Injured. In 1918, he moved to Poland, stating that he was willing to render medical services to the Polish Army. In 1919, he was appointed senior medical director of the Department of Surgery at the Reserve Military Hospital in Zamość. After the battles had come to an end in 1921, he was relocated to Lwow, where he became First Commander at District Hospital No. 4 with the rank of colonel. Having completed his military service in 1926, he was appointed medical director of the Department of Surgery at the Lychakiv Hospital in Lwow. Along with Prof. Adam Gruca, he set up a private surgery clinic.

Prof. Romuald Węgłowski's contribution to the development of Polish vascular surgery cannot be overestimated. Among his diversified scientific activities, special attention should be drawn to the surgical treatment of vascular injuries. He was the author of the first Polish surgery textbook and developed his own method of surgical treatment of post-traumatic aneurisms.

**Publications in Military Physician**

- "Foreign bodies in the esophagus and their removal". 1920; 1 (22): 1-16
- "About thighbone fracture treatment". 1920; 1 (13): 2-6
- "About blood vessel transplantation in extensive injuries". 1920; 1 (47-50): 1-7
- "15-months of service at the military hospital in Zamość". 1921; 2 (27): 845-857; 1921; 2 (27): 877-891
- "A few remarks on how to save dressings". 1926; 7 (6): 552-558
- "Surgical activities in various facilities, as prescribed in 'Health Care Regulations on the Battle Field'". 1926; 8 (3): 213-224

**Rudolf Stefan Jan Weigl** (born 2 September 1883 in Przerów, died 11 August 1957 in Zakopane) – a Polish biologist, the inventor of the first efficient vaccine against typhus, the forerunner of using insects, including the body louse, as laboratory animals to raise typhus bacilli.

In 1913, he did habilitation in zoology, comparative anatomy and histology, working as a Privatdozent at the University of Lwow. During the First World War he was enrolled in the army in the capacity of parasitologist. He worked at a military hospital in Przemyśl, and in 1918 he was appointed head of the Typhus Research Workshop. In 1942, his candidature was proposed to the Nobel price but the Germans withheld their support in retaliation for his refusal to sign the Reichslist and to take the chair in Berlin. He saved the life of many representatives of scientific circles, hiring them in his laboratory. After the war he resided in Kraków and continued his research work at the Jagiellonian University, and then at the University in Poznań. The Communist authorities countermined the award of the Nobel Prize to him in 1948, accusing him of collaborating with the Germans.

He was posthumously honored with the Righteous Among the Nations medal (2003).

**Publications in Military Physician**

- "About 'rickettsia prowazeki' and its significance in the typhoid fever". 1920; 1 (17): 1-16
- Rickettsia Rocha-Lime (nova species). 1921; 2 (9): 257-264

Source: https://pl.wikipedia.org/wiki/W%C5%82adys%C5%82aw_Antoni_Gluzi%C5%84ski [accessed on: 7.07.2015]

**Władysław Antoni Gluziński** (born 18 May 1856 in Włocławek, died 10 April 1935 in Warsaw) – a Polish internal medicine specialist, pathologist, clinician and teacher. He graduated from the Jagiellonian University in Kraków (1880) and continued his education in Tartu and Vienna. He also validated his diploma in Russia. Following his return to Kraków, he worked as an assistant at the Faculty of Physiology run by Gustaw Piotrowski. He was also trained in Leipzig by Carl Fredrich Ludwig, Berlin by Robert Koch and Paris by Jean Martine Charcot. He read his habilitation in 1885 and earned the degree of professor in 1890. From 1893, he worked as a professor at the Jagiellonian University in Kraków. In 1897, he moved to Lwow, where in 1905-1906 he was the vice-chancellor of the University of Lwow and a virilist member of the Diet of the Kingdom of Galicia. In 1919 he was appointed head of the Faculty and Clinic of Internal Diseases at the University of Warsaw. During the Polish-Bolshevik war he built up strong science and training levels, as well as a treatment center from scratch.

He wrote several scientific papers devoted to physiology, pathology and the diagnostics of the alimentary system. He co-founded the Polish Society of Internal Medicine and the Society for Tuberculosis Control. He also developed a method of early diagnosis of gastric cancer. He organized the first Polish tuberculosis out-patient clinic. He was also aember of the Polish Academy of Learning.

**Publications in Military Physician**

- "About the influence of endocrine organ changes on muscular system diseases". 1920; 1 (1): 4-13
- "Purpura resulting from the use of arsenobenzol preparations. (Based on a lecture given at the meeting of the Warsaw Medical Society)". 1923; 4 (6): 458-467
- The Polish delegates' report on the Congress of the Slavic Delegates in Dubrovnik (1925) and Belgrade (1926). 1926; 8 (4): 380-382

Source: https://upload.wikimedia.org/wikipedia/commons/0/05/Sokolowski.JPG [accessed on: 7.07.2015]

**Alfred Marcin Sokołowski** (born 11 November 1849 in Włodawa, in the Podlasie region, died 8 March 1924) – a Polish internal medicine specialist, physiatrist, and professor at the University of Warsaw. He was one of the pioneers of the modern treatment of respiratory system diseases. He graduated from the Imperial University of Warsaw (1869). He completed otolaryngology specialization courses in Vienna (1875) and Heidelberg (1876). He received his PhD degree in Paris (1880).

He set up the Society for Tuberculosis Control (1908), disseminated knowledge about this disease, organized several prophylactic actions and initiated the establishing of sanatoriums in Zakopane and Otwock. He worked as the medical director of the Department of Breast Diseases at the Hospital of the Holy Ghost (1880). The Jagiellonian University awarded him a degree honoris causa. He contributed to the recovery of the University of Warsaw (1915). He was also a member of the Supervisory Board of the Macierz Szkolna Polish Educational Society (1916), of the Warsaw Scientific Society and of the Council of State (1918), and the vice-chancellor of the Free Polish University, where from 1919 he worked as a professor of social medicine (until 1920) and medical propedeutics (until 1922).

**Publications in Military Physician**

- "The military physician's role in diagnosing pulmonary tuberculosis in recruits". 1920; 1 (1): 22-26
- "The military physician's role in diagnosing pulmonary tuberculosis in recruits (continuation)". 1920; 1 (2): 10-16
- "The study of pulmonary tuberculosis". Warsaw, 1921. Assessment. 1921; 2 (46): 1467-1469

**Odo Feliks Kazimierz Bujwid** (born 30 November 1857 in Vilnius, died 25 December 1942 in Kraków) – the first Polish bacteriologist, a pioneer among the Polish scientists dealing with vaccine development (e.g. against of rabies), a professor. He studied medicine at the University of Warsaw and completed bacteriology specialization courses in Berlin, under Robert Koch's supervision, and in Paris at the Pasteur Institute. He established the first Polish institute of rabies prevention in Warsaw, along with food control stations. In 1883, he took the Hygiene Chair at the Jagiellonian University where, among other things, he established the second Pasteur vaccination department in Poland. He promoted hygiene and health prophylaxis.

Apart from his scientific activity, he was a social activist and a Kraków councilor, contributing to the establishing of the municipal water supply network. He promoted the idea of disseminating education and supported women's rights to pursue academic studies, attracting the most progressing representatives of the Kraków intelligentsia. During the interwar period, he was a member of the President's Privy Council, in 1931-1933 a member of the Temporary Municipal Council, a member of the Polish Esperanto Association, the initiator of establishing the Polish-Yugoslavian Society, a member of the Organizing Committee of the Polish Human and Civic Rights League in Kraków, and a member of the Friends of Peace Committee.

**Publications in Military Physician**

- "A few remarks on military hygiene". 1921; 2 (7): 199-201
- "The basis for issuing water hygiene assessment statements". 1921; 2 (39): 1229-1236
- "Quartz-lamp treatment of frostbite". 1922; 3 (3): 149
- "A report of the International Congress of Military Medicine and Pharmacy in Brussels dated 15-20 July 1921. Water hygiene". 1922; 3 (4): 280-282
- "Drinking water chlorination in military units". 1922; 3 (11): 917-919
- "The 100th anniversary of Pasteur's birth and a handful of private memoirs". 1922; 3 (12): 995-1000
- "Billroth's outworn viewpoint on Pasteur's method of treating rabies and how this method has evolved". 1923; 4 (2): 111-118
- "A brief historical outline of the smallpox vaccine. Memoirs on the anniversary of Jenner's death". 1923; 4 (3): 194-200
- "A handful of private memoirs of the first efforts to provide sanitary assistance to Polish legionaries in 1914". 1927; 9 (5): 647-648
- "The grand opening of the Ophthalmology Clinic in Vilnius". 1928; 11 (6): 530
- "The congress of physicians from borderline areas in Łuck". 1929; 13 (1): 30
- "Combating infectious parasitic diseases in Brazil". 1929; 13 (2): 72-74

## Literature


1. Ilnicki S. An unpublished letter from Colonel Stefan Hubicki MD, PhD to the Editorial Board of Mil. Phys., Mil. Phys., 2010; 88 (1): 83-86
2. Od redakcji [Editorial]. Mil. Phys., 1924; 5: 1
3. Od redakcji [Editorial]. Mil. Phys., 1929; 13: 1
4. Seyda B. Dzieje medycyny w zarysie [History of medicine in outline], part PZWL Publishing House, Warsaw 1977 60
5. Historia neurologii polskiej [The history of Polish neurology]. The National Ossoliński Institute, Wrocław 1975: 296 296
6. Professor Edward Flatau (1868-1932). Neurol Neurochir Pol, 2008; 42 (4): 366-371 366-371
7. 7. Prusiński A. Professor Eufemiusz Herman (1892-1985). Neurol Neurochir Pol, 2008; 42 (6): 366-371 564-566, 567-579.
8. Prusiński A. Wspomnienie pośmiertne [Posthumous memoirs]. Prof. Eufemiusz Herman MD, PhD Hon Causa Neurol Neurochir Pol, 1987; 21 (2): 366-371 177-179
9. Domżał TM. Samuel Goldlam. Neurol Neurochir Pol, 2010; 44 (1): 366-371 96-98
10. Ilnicki S, Nelken J. Gen. bryg. dr med. Jan Władysław Nelken (1878-1940) [Brig. Gen. Jan Władysław Nelken MD, PhD (1878-1940)]. Military Institute of Medicine, Warsaw 2009: 40
11. Prof. dr med. Władysław Dzierżyński (1881-1942) [Prof. Władysław Dzierżyński MD, PhD (1881-1942)]. Med Nowożytna, 2011; 17 (1): 227-237
12. Herczyńska G. Stanisław Władyczko (1878-1936). Post Psychiatr Neurologii, 2003; 12 (3): I-IX
13. Malawski S. Życiorys prof. dra hab. med. Adama Grucy (1893-1983) [Biography of Prof. Adam Gruca MD, PhD (1893-1983)]. Postępy Nauk Medycznych, 2010; 2: 108-113. Access: http://www.czytelniamedyczna.pl/3276,zyciorys-prof-dra-hab-med-adama-grucy-18 931 983.html
14. Dziak A. Zarys dziejów ortopedii polskiej [A brief history of Polish orthopedic]. The National Ossoliński Institute, Wrocław 1976: 296 149-151
15. Noszczyk W (ed). O chirurgii polskiej końca XX wieku [Polish surgery at the end of the 20th Century]. Polski Przegląd Chirurgiczny Foundation, Warsaw 2001: 359
16. Kryński L. Etyologia raka w świetle badań najnowszych [Cancer etiology in the light of recent studies]. Przegl Lek,1893; 32 (14): 181-182; 15: 192-194; 16: 204-205; 17: 218-220; 18: 232-234; 19: 243-244; 21: 273-274; 22: 289-290; 24: 317-319
17. Sosnowski R, Rogowski W, Demkow T. Leon Kryński – wybitny urolog końca XIX wieku – twórca podśluzówkowego wszczepienia moczowodów do esicy [Leon Kryński – an outstanding urologist at the end of the 19th Century – the creator of the method of submucosal urethra implantation to the sigmoid]. Urol Pol, 1999; 52: 4. Access: http://www.urologiapolska.pl/artykul. php/ 2116
18. Kierzek A. Otorynolaryngologiczne dokonania Leona Pawła Wawrzyńca Kryńskiego (1866-1937), wybitnego krakowskiego oraz warszawskiego chirurga [Otholaryngologic achievements of Leon Paweł Wawrzyniec Kryński (1866-1937), a prominent Kraków and Warsaw surgeon]. In: Materiały naukowe Sekcji Historycznej Polskiego Towarzystwa Otorynolaryngologów – Chirurgów Głowy i

Szyi [Scientific materials of the Historic Section of the Polish Society of Otorhinolaryngologists – Head and Neck Surgeons]. V. 25 No. 2, Warsaw 2009: 8-13
19. Sosnowski R, Śródka A.Leon Kryński – wybitny urolog końca XIX wieku [Leon Kryński – an outstanding urologist at the end of the 19th Century]. Prz Urol, 2003; 3: 133-136
20. Sosnowski R, Rogowski WW, Zakościelny A, et al. Leon Kryński – postać zasłużona dla walki z rakiem w Polsce w końcu XIX wieku [Leon Kryński – a meritorious Polish cancer control scientist at the end of the 19th Century]. Nowotwory, 1999; 49 (3): 342-346
21. Sosnowski R, Sosnowska I, Śródka A. Leon Kryński – współtwórca warszawskiej szkoły chirurgicznej [Leon Kryński – the co-founder of the Warsaw school of surgery]. Med Dydakt Wychow, 1999; 31 (3-4): 59-68
22. Chojna J. Zarys dziejów urologii w Polsce [A brief history of Polish urology]. The National Ossoliński Institute, Wrocław 1974: 296 190-193
23. Nielubowicz??, Karwowski A. Leon Kryński 1866-1937. In: Sylwetki chirurgów polskich [A presentation of Polish surgeons]. The National Ossoliński Institute, Wrocław 1982: 116-111
24. Noszczyk W, Kielar M. Chirurgia tętnic [Aortic surgery]. In: O chirurgii polskiej końca XX w. [Polish surgery at the end of the 20th Century]. Polski Przegląd Chirurgiczny Foundation, Warsaw 2001: 205
25. Shumacker HB. Ramuald Weglowski: neglected pioneer in vascular surgery. J Vasc Surg, 1987; 6 (1): 95-97
26. Lisowski W. Romuald Węgłowski (1876-1935) – pionier chirurgii naczyniowej w Polsce [Romuald Węgłowski (1876-1935) – the pioneer of Polish vascular surgery]. In: Prekursorzy medycyny polskiej [Pioneers of Polish medicine]. Vol. 2 Bellona, 2006: 224-223
27. Melanowski W. Dzieje okulistyki [The history of ophthalmology]. PZWL Publishing House, Warsaw 1972: 380
28. Udziela M. Keratoplastyka [Keratoplasty]. Przeszczep rogówki [Cornea transplantation] [accessed on: 10.07.2015 http:// swiatlekarza.pl/keratoplastyka-przeszczep-rogowki/
29. Sadowska J. Choroby zakaźne w dwudziestoleciu międzywojennym [Infections diseases in the inter-war period]. Prz Epidemiol, 1997; 51 (3): 321-328
30. Trzcińska-Dąbrowska Z. Prof. dr hab. med. Wiktor Arkin. Wspomnienie pośmiertne [Prof. Wiktor Arkin MD, PhD. Posthumous memoirs]. Pol Tyg Lek, 1982; 37 (13): 397
31. Podgórska-Klawe Z (ed.). Słownik biograficzny polskich nauk medycznych XX wieku [Biographical dictionary of Polish medical sciences in the 20th Century]. T. I, z. 1. IHNOiT PAN Publishing House, Warsaw 1991; vol. 9-10
32. Szumowski W. Historia medycyny [The history of medicine]. PZWL Publishing House, Warsaw 1961 395
33. Ciszyńska M. Antoni Gluziński (1856-1935). Medyk Białostocki [Antoni Gluziński (1856-1935). A physician from Białystok], 2010: 85. Access: http://www.umb.edu.pl/photo/pliki/medyk/historia/18_pdfsam_ MB_2010.2_net%20kopia.pdf Kucharz E. Władysław Antoni Gluziński – wybitny internista polski, założyciel Towarzystwa Internistów Polskich [Władysław Antoni Gluziński – a remarkable Polish internal medicine specialist and the founder of the Polish Society of Internal Medicine]. Pol Arch Med Wew, 2007; 117 (5-6): 270-273
34. Brzeziński T (ed). Historia medycyny [The history of medicine]. PZWL Publishing House, Warsaw 1995 345
35. Kierzek A. Apel Konrada Dobrskiego (1849-1915) w sprawie dokształcania w otiatrii i laryngologii [The appeal of Konrad Dobrski (1849-1915) to pursue otological and otolaryngological education]. Otorynolaryngologia, 2012; 11 (2):
36. Kierzek A. Podyplomowe szkolenia Alfreda Marcina Sokołowskiego (1849-1924) w Wiedniu i Heidelbergu [Post-gradual training undergone by Alfred Marcin Sokołowski (1849-1924) in Vienna and Heidelberg]. Ann Acad Med Stetin, 2 0 06; 52 (3): 137-14 0
37. Wiśniewski J, Nowicki M. Profesor Odo Bujwid (1857-1942) pionier polskiej bakteriologii, higieny i profilaktyki w lecznictwie [Profesor Odo Bujwid (1857-1942) - the pioneer of Polish bacteriology, hygiene and medical prophylaxis]. In: W: Felsmann MZ, Szarek J, Felsmann M (eds). Dawna medycyna i weterynaria [Former medicine and veterinary medicine]. Militaria, Chełmo 2009: 531-540
38. Życie i działalność Odona Bujwida – polskiego lekarza, społecznika i esperantysty [The life and activity of Odon Bujwid – a Polish physician, social activist and esperantist]. Wiad Lek, 1986; 39 (2): 123-129
39. Lisowski W. Professor Odo Feliks Bujwid (1857-1942), the father of Polish bacteriology. Mater Med Pol, 1988; 20 (3): 209-213
40. Czartoryski-Sziler P. Wielcy zapomniani [The great forgotten]. Rudolf Weigl – odkrywca szczepionki przeciwtyfusowej [Rudolf Weigl – the creator of the typhus vaccine]. [accessed on: 10.07.2015]. http://www.lwow.home.pl/ naszdziennik/weigl.html
41. Rudolf Weigl (2 IX 1883 Přerov–11 VIII 1957 Zakopane). Album lekarzy i farmaceutów polskich [The album of Polish physicians and pharmacists]. 527-528
42. Stuchly Z. Weigl Rudolf Stefan. In: Podgórska-Klawe Z (ed). Słownik biograficzny polskich nauk medycznych XX wieku [Biographical dictionary of Polish medical sciences in the 20th Century]. IHNOiT PAN Publishing House, Warsaw 1991; vol. 1, issue 1: 84-86
43. Prof. Rudolf Stefan Weigl. [accessed on: 8.07.2015] http://www.lwow.home.pl/rudolf-weigl-uk.html

# Lieutenant-Colonel Antoni Tomasz Aleksander Jurasz, professor of medicine (1882-1961) – surgeon, scientist, community worker and patriot. Part IV

## Podpułkownik, profesor medycyny Antoni Tomasz Aleksander Jurasz (1882–1961) – chirurg, naukowiec, społecznik i patriota. Część IV

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**Abstract.** Lieutenant-colonel Antoni Tomasz Aleksander Jurasz, professor of medicine (1882–1961) was an outstanding man – a surgeon, a scientist and a community worker. Born as a German citizen, all his skills he gave to Poland, the homeland of his father, Antoni Stanisław Jurasz, once it regained its independence in 1918, and he continued his work for Poland despite the outbreak of the Second World War. The aim of this series of five articles is to present the cause and effect analysis of his development, work and life achievements.
**Key words:** Antoni Tomasz Aleksander Jurasz

**Streszczenie.** Ppłk prof. med. Antoni Tomasz Aleksander Jurasz (1882–1961) był nietuzinkowym człowiekiem: chirurgiem, naukowcem i społecznikiem. Urodził się jako obywatel niemiecki, ale wszystkie swoje umiejętności ofiarował Polsce, ojczyźnie swojego ojca, Antoniego Stanisława Jurasza, po odzyskaniu przez nią niepodległości w 1918 roku. Realizacji tego celu nie przerwał wybuch II wojny światowej. Celem niniejszego – pięcioczęściowego – opracowania jest przedstawienie przyczynowo-skutkowej analizy rozwoju bohatera, jego twórczości i dorobku całego życia.
**Słowa kluczowe:** Antoni Tomasz Aleksander Jurasz

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## Introduction

The aim of this series of articles dedicated to Lieutenant Colonel Antoni Tomasz Aleksander Jurasz, professor of medicine (1882-1961), is not only to present his contribution to Polish and international surgery, Polish society and Poland after it regained independence in 1918, but also to analyze the mechanisms through which his parents and teachers formed his character, as well as the circumstances that allowed him to generate such impressive and multi-faceted achievements during his long and rich life.

Professor A.T.A. Jurasz is the creator of Poznań school of surgery (also known as "Jurasz's school of surgery"), the Polish School of Medicine at the University of Edinburgh, *Chirurgia Clinica Polonica*, a buoyant Academic Sports Association in Poznań, and an active branch of the Polish Red Cross in the Greater Poland region. With the Second World War not yet over, Jurasz was already organizing the necessary equipment for Polish hospitals, with the restoration of the Polish health care service in mind. Unfortunately, it was not appraised later by the Polish communist authorities and, forced to emigrate, he eventually died in New York.

The first part of this work is dedicated to his family and school environment, the second part discusses his professional life before the outbreak of the Second World War, the third tells about the events of 1939

and the creation of the Polish Medical Faculty at the University of Edinburgh, the fourth is devoted to his post-war life and the fifth sums up his life and scientific accomplishments.

## Part IV

The decision of the Paderewski Fund Management Board to close the Paderewski Hospital in Edinburgh, which served as the teaching hospital of the Polish Medical Faculty (PMF) in Edinburgh, also proved to be the result of certain political machinations by both the Polish immigrant community and the communist authorities of the People's Republic of Poland [1]. As the war drew to a close, the end of the PMF, for which the Paderewski Hospital served as a teaching hospital, was clearly imminent. Consequently, the Hospital's role had to change. Since the institution's establishment, it had been the intention of Professor Antoni Tomasz Jurasz to relocate the entire hospital, along with the equipment and staff, to Poland soon after the war was over. These plans also included 1,200 crates with unused medical equipment [2] that had accumulated and been stored in Glasgow during the Second World War. This equipment was purchased using the money Jurasz received from the Paderewski Fund [3], and constituted the Fund's property. Professor Jurasz, therefore, had to gain the Fund's approval before moving the equipment to Poland. In his commitment to achieving this, he travelled a number of times to the United States to negotiate with the Fund's authorities [2]. Eventually in 1946, following these negotiations, Ms Mitana [3], a representative of the Fund's Committee, visited the Ministry of Health in Warsaw. There, discussions were held on transferring the durable medical equipment of the Paderewski Hospital, along with the so-called mobile hospital (medical equipment with the staff in trucks), to hospital institutions in Poland. Professor Jurasz planned to give the equipment to the Teaching Hospital of the Medical University of Silesia in Katowice [4]. The underlying reason was the establishment of the Civic Preparation Committee of the Silesian Social Medical Academy in Zabrze in 1946, whose aim was to form a medical university in Upper Silesia. The plan was also to relocate the research and teaching staff from the PMF in Edinburgh [5].

Professor Jurasz explained his vision for creating a modern academic center to the authorities of both Poland and the Fund, a center that would be financed entirely by the Paderewski Fund [4]. He wanted, however, certain conditions to be met before he would provide the medical equipment. Namely, the Polish authorities were supposed to arrange for appropriate rooms in which the equipment would be set up. Also, he wanted an American representative to see whether these rooms were suitable for the equipment and to make sure the equipment was installed properly. During the negotiations, events took a surprising turn, as one of the members of the delegation was arrested by the Security Office (Urząd Bezpieczeństwa/UB) of the People's Republic of Poland, so the visit ended earlier than planned. Professor Jurasz also visited Poland in May 1946, bringing with him the so-called movable part of the Polish Hospital as a gift from the Polish diaspora of the United States [4]. With this equipment, and with the support from the Polish branch of Caritas, led by Cardinal Adam Sapieha, a hospital with 120 beds could be established in Oświęcim. The medical equipment also went to the Saint Adalbert Hospital in Opole, which was managed by a private foundation under the supervision of a local bishop. Some of the "mobile/movable" equipment relocated from the Polish Hospital also went to the Saint Joseph Children's Hospital in Poznań, which was managed by the Daughters of Charity. Jurasz brought much equipment; in fact, it was enough to equip a number of other medical facilities in the Gorzów Wielkopolski Region. Central Poland received an ambulance with a high-performance x-ray machine which could produce small images. W. Tomaszewski [3] estimated the value of the hospital equipment provided by Jurasz in 1947 at nearly USD 300,000. A certain pattern can be observed in Jurasz's decisions on distributing the equipment in that it went to institutions managed either by the Church or by private people.

In March 1947 Professor Jurasz arrived in Poland with the intention of taking up the Chair of Surgery at the University of Poznań (UP). Later, he went to Scotland and then to the US to settle certain affairs with the PMF and the Paderewski Hospital sponsored by the US-based Paderewski Fund, as the Fund was planning to increase the number of beds of the relocated hospital from 114 to 2,000-3,000. These beds were supposed to go to Warsaw or one of the cities in Lower Silesia [6]. Meanwhile, while Jurasz was away from Poland, the authorities of the Poznań University dismissed him from his position of head of the Chair of Surgery at the University of Poznań. This was a sign that Jurasz was now an unwelcome figure in the People's Republic of Poland.

Despite the hostility from the authorities and the earlier incident with the Security Office, when a member of the delegation was arrested, driven by the inner need to help his war-devastated country, Professor Jurasz returned to Katowice in 1947. There, it turned out that nothing had been done in the Teaching Hospital of the Medical University of Katowice to accommodate the equipment from the Paderewski Hospital. The communist authorities also refused to allow the American representative into Poland. He also learned that the mobile equipment provided earlier by the Paderewski Fund [2] had disappeared, and no one seemed to know what had

happened to it. The relocation of the Paderewski Hospital to Poland in spring 1947 was mentioned in the "*Dziennik Polski and Żołnierz Polsk*i", a daily published in London. It said: "According to our information, the Hospital (i.e. the Paderewski Hospital –author's note) will move to Poland in May this year. Two physicians from the existing staff will go to Poland together with Professor Jurasz, the hospital's director and founder" [7]. A month later, the same daily wrote: "The relocation of the Paderewski Hospital from Edinburgh to Poland is a foregone conclusion. This decision was a major blow to the Polish community in Great Britain, as expressed by the protest of the Council for Polish Associations in Edinburgh. (...) Having learnt about the plan to dismantle the Paderewski Hospital, the Council for Polish Associations put in an extensive petition to Ms Charlotte Kellogg, Chairwoman of the Paderewski Hospital Foundation. The Paderewski Hospital was definitely set to go to Poland." In reply, Ms Kellogg wrote: "(...) achieving our primary goal (...) of establishing the Paderewski Hospital in Poland (...). The complete equipment of the Paderewski Hospital, which is currently in Edinburgh, has long been intended for this purpose. Unfortunately, even all the equipment now stored in Edinburgh will not be enough, and it must be sent over to Poland immediately" [8].

During his stay in Poland in the autumn of 1947, Professor Jurasz learned that the University of Poznań would not let him take up the Chair of Surgery, which he established in 1920 and headed until war broke out in 1939. While living in the United States, he wrote a letter to his family in Poland, in which he described the treatment he had met with and how he felt about it: "After the war, I was thrown out of the Department like a dog" [2]. This was a painful lesson, which made him realize that the communist authorities in Poland were interested only in the medical equipment [9], and so his entire concept of rebuilding medical research and teaching institutions in post-war Poland was unachievable [3].

Confronted with the bitter reality, struggling to come to terms with Poland's communist authorities and with Professor Roginsky, the new dean of the PMF in Edinburgh [1], Professor Antoni Tomasz Jurasz decided to emigrate to America. He arrived there in 1948 at the age of 65, settling with his wife in New York. Soon after, he was granted American citizenship and obtained a license to practice medicine [2]. Despite being a fluent English speaker, he struggled to adapt to the new professional community, with which he had always wanted to share his knowledge in a genuinely altruistic and disinterested manner [1]. Becoming a university lecturer, however, remained an unreal prospect for him. Therefore, he looked for a job as a surgeon, which proved to be anything but easy [10]. Eventually,

**Figure 1.** The headstone of Stanisław Jurasz (1847–1923), Antoni Tomasz Jurasz (1882–1961) and Kazimierz Jurasz (1884-1939) at Cytadela in Poznań.

**Rycina 1.** Nagrobek Antoniego Stanisława Jurasza (1847–1923), Antoniego Tomasza Jurasza (1882–1961) i Kazimierza Jurasza (1884–1939) na Cytadeli w Poznaniu

Doctor L. Madden, an American surgeon, lent Jurasz a helping hand by accepting him into his surgeons' team at St. Clare's Hospital in New York [11]; Jurasz worked there from 17 November 1950 for the next nine years [12].

While living in the United States, Professor Jurasz hosted some of his alumni – they liked to visit their Professor, who retained his characteristic vitality, intellectual dynamism and vigor, perhaps slightly undermined by age. He was a keen observer of the developments in surgery and continued to devise plans for future [3]. On 4 December 1960, Professor Dega, an orthopedist from the University of Poznań, paid Jurasz a visit. They talked about their memories of their time in Poznań, when Professor Wierzejewski, who supervised Dega on his way into lectureship, died suddenly of pneumonia, and Dega needed a new supervisor. Professor Jurasz was asked to replace the late Professor Wierzejewski [10].

In September 1961, at the age of 79, Professor Jurasz visited Dublin, Ireland, for the International Surgical Congress [13]. Being the most senior participant present, he gave an opening speech. At the Congress, he met his former student and assistant, Professor Roman Drews, who, to Jurasz's great satisfaction, had taken over the Chair of Surgery in Poznań once led by Jurasz [3]. As ever, he was full of vital energy and keenly interested in the progress of medicine, actively participating in the Congress. Also, he took the occasion to visit Edinburgh, where he met with his Polish and Scottish friends and made a promise to himself to return there for the 25th anniversary of the PMF [13]. While in Europe, he visited a number of people he befriended during his time at the PMF in Edinburgh, including Doctor Lax

and Professor Sidney Smith [10]. He also visited Edmund, his youngest and only surviving brother, who lived in Eastbourne. After his stay in the south of England, he made a short trip to Paris and then returned to New York [3]. There, on the night of 19-20 September 1961 [13], he died of a heart attack. He was buried in Margaretville. According to his will, his ashes were laid to rest [14] near his father in the family tomb at the cemetery in Park Cytadela, Poznań [4] (Figure 1). The personal set of surgical instruments of Professor Antoni Tomasz Jurasz was donated, according to his wishes, to the Second Surgical Teaching Hospital of the Medical Academy of Poznań, which at the time was headed by his student, Professor Roman Drews (1908–1977). Jurasz's collection of books went to the General Medical Library in Warsaw [1].

## Literature


1. Meissner R. Pamiętnik prof. Antoniego Tomasza Jurasza – dokument epoki [The diary of Prof. Antoni Tomasz Jurasz – a document of the era]. Fakty AM, 2003; 3–4: 12-14
2. Magowska A. A doctor facing turbulent times: Antoni Tomasz Jurasz, Citizen of the Word. World J Surg. 2011; 35: 2167-2171
3. Tomaszewski W. Na szkockiej ziemi [On Scottish soil]. London, 1976: 220-222, 238-239
4. Lisowski W. Twórca Polskiego Wydziału Lekarskiego w Edynburgu – prof. med. Antoni Tomasz Jurasz, organizator i dziekan PWL w Edynburgu w latach 1941–1945 [The creator of the Polish School of Medicine in Edinburgh – Prof. Antoni Tomasz Jurasz MD, founder and dean of PWL in Edinburgh in 1941-1945] Scale 2007:6. www.nil.org.pl/xml/oil/oil72/gazeta/ numery/n2007/n200 706/n20 070 618 [Access: 20.06.2010]
5. Historia Wydziału Lekarskiego w Zabrzu, Śląski Uniwersytet Medyczny w Katowicach [The History of the Medical Faculty in Zabrze, the Medical University of Silesia]. http://www.sum.edu.pl/aktualnosci.php?news=18&wid=15 [access: 07/04/2012]
6. Szpital Paderewskiego Jedzie do Polski [The Paderewski Hospital Set to Go to Poland]. Dziennik Polski i Żołnierz Polski, 03.03.1947; (53): 3
7. Dziennik Polski i Żołnierz Polski, 09.04.1947; (83): 3
8. Dziennik Polski i Żołnierz Polski, 09.05.1947; (109): 3
9. Misterska M. Rozwój dermatologii uniwersyteckiej w Poznaniu do końca XIX wieku [The development of University dermatology in Poznań until the end of 19th century]. Doctoral thesis. Poznań, Poznan University of Medical Sciences, 2007:
10. Jurasz AT. Wspomnienia pisane w języku angielskim w latach 1950–1960. The original copy is in the files of a family friend, Mrs Helen Schelling-Scholtz in New York
11. Profesor Dr Med. Antoni Jurasz (1882–1961). Fakty AM, 2004; 7-9: 23-24
12. Magowska A. (ed). Listy prof. Antoniego T. Jurasza i jego dotyczące z lat 1944–61. [Letters of Antoni T. Jurasz and about him from the years 1944–1961]. Acta Medicorum Polonorum, 2012; 2: 141-165
13. Tomaszewski W (ed). The University of Edinburgh and Poland. Edinburgh 1969:
14. Wryk R. Jurasz Antoni (1882–1961). Wychowanie Fizyczne i Sport 1983; 1: 109

# Col. Jerzy Rowiński "Jurand" MD, PhD (1906–1998) and Maj. Zbigniew Badowski "Dr Zbigniew" MD (1916–1991) – in memory of the physicians of the Warsaw Uprising from the Garrison Hospital in Żary

## Płk dr med. Jerzy Rowiński „Jurand" (1906–1998) i mjr lek. Zbigniew Badowski „Dr Zbigniew" (1916–1991) – w hołdzie lekarzom Powstania Warszawskiego ze Szpitala Garnizonowego w Żarach

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**Abstract.** The Warsaw Uprising was the largest operation in the Second World War conducted by the Polish Home Army, intended to liberate Warsaw from Nazi German occupation. It began on 1 August 1944 at 17:00. Warsaw physicians and nurses took part in the battle against the Germans to the same degree as the other Home Army units. The Medical Chief of the Main Headquarters of the Home Army was Colonel Leon Strehl MD, PhD, while the Medical Chief of the Warsaw District was Lieutenant Colonel Henryk Lenk MD, PhD. Two physicians from the Garrison Hospital in Żary also took part in the Warsaw Uprising: Colonel Jerzy Rowiński and Major Zbigniew Badowski. The former organized the field hospital of 8th Battle Group "Krybar" on Tamka Street, and the latter worked as a physician in the field hospital of 3rd Armoured Battalion "Golski" on Koszykowa Street. After the Second World War, together they organized the Garrison Hospital in Żary. On 29 July 2015, at the 105th Kresy Military Hospital with Outpatient Clinic in Żary, a commemoration plaque was unveiled in memory of the Warsaw insurgents from that hospital.
**Key words:** Warsaw Uprising, military medical services, Rowiński, Badowski, Żary

**Streszczenie.** Powstanie Warszawskie było największą w czasie II wojny światowej operacją polskiej Armii Krajowej, której celem było wyzwolenie Warszawy spod okupacji nazistowskich Niemiec. Rozpoczęło się 1 sierpnia 1944 r. o godzinie 17.00. Warszawscy lekarze i pielęgniarki brali udział w walce z Niemcami w tym samym stopniu, co inne pododdziały Armii Krajowej. Szefem Sanitarnym Komendy Głównej Armii Krajowej był płk dr med. Leon Strehl. Szefem Sanitarnym Okręgu Warszawa był ppłk dr med. Henryk Lenk. W Powstaniu Warszawskim brało udział dwóch lekarzy ze Szpitala Garnizonowego w Żarach: płk Jerzy Rowiński i mjr Zbigniew Badowski. Pierwszy z nich zorganizował Szpital Polowy VIII Zgrupowania „Krybar" na ulicy Tamka, drugi pracował jako lekarz w Szpitalu Polowym 3. Batalionu Pancernego „Golski" na ulicy Koszykowej. Po II wojnie światowej obaj organizowali Szpital Garnizonowy w Żarach. 29 lipca 2015 r. w 105. Kresowym Szpitalu Wojskowym z Przychodnią w Żarach została odsłonięta tablica pamiątkowa ku czci powstańców warszawskich z tego szpitala.
**Słowa kluczowe:** Powstanie Warszawskie, wojskowa służba zdrowia, Rowiński, Badowski, Żary

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## Introduction

The Warsaw Uprising began on 1 August 1944 at 17:00 (in some districts, fighting had already started at about 14:00) and was aimed at the German occupying forces. The decision to start the uprising was made by the commander in chief of the Home Army, General

**Figure 1.** Col. Jerzy Rowiński, MD, PhD (1906–1998)
**Rycina 1.** Płk dr dent. Jerzy Rowiński (1906–1998)

**Figure 2.** Maj. Zbigniew Badowski MD (1916-1991)
**Rycina 2.** Mjr dr Zbigniew Badowski (1916–1991)

resulted in the deaths of tens of thousands of civilians and caused the destruction of over 80% of left-bank Warsaw (including material cultural assets, museum collections and archival resources). Before "W-hour", the forces of the Warsaw District of the Home Army, including forces that had arrived from outside the district, comprised of 50 thousand sworn-in soldiers bearing only small arms, which were only enough for one in ten soldiers. They were faced with a German garrison comprising 15 thousand well-trained soldiers and commanded by Gen. Reiner Stahel, a war criminal. The garrison was regularly reinforced in the first days of August 1944 with numerous police and military units (including infamous criminal units, such as the brigade under SS-Oberführer Oskar Dirlewanger, the Ukrainian Volhynia Legion under Petro Dyachenko, the RONA regiment under SS-Brigadeführer Mieczysław Kamiński, the Russian Liberation Army led by Gen. Andrey Vlasov, and others), whose total forces amounted to 55 thousand well-trained and well-equipped soldiers with the support of armored units, artillery and air forces. The military disproportion between the two sides of the uprising and the lack of support from the Red Army led to the failure of the insurgents. The fact that the fighting for the city lasted for 63 days can only be attributed to the incredible heroism and fortitude of the Warsaw inhabitants and the soldiers [1,2].

Wola Hospital, Baby Jesus Hospital, etc.), as well as on hastily organized small field hospitals and medical and rescue stations. The locations of the latter two types of military medical facilities were dependent on the military situation and the intensity of military actions in a given region. The dynamic nature of events during the uprising led to changes in the names used to refer to the existing facilities, e.g., a rescue and medical station was expanded and transformed into a field hospital due to a large influx of the wounded. That is why in the literature on the medical services during the uprising, different names are used to refer to the same facilities [3, 4].

## Physicians from Żary in the Warsaw Uprising

Various fates lay in store for the physicians from the medical services after the uprising. This paper presents the profiles of two physicians and officers who, after the defeat of the uprising, served in the ranks of the Polish Armed Forces, where they played a significant role in organizing and developing the Garrison Hospital in Żary (previously called the 8th Mobile Surgical Field Hospital, later, Garrison Hospital, and now, the 105th Kresy Military Hospital with Public Outpatient Clinic).

One of them was Jerzy Rowiński, born on 12 January 1906 in Peczeniżyn in the Kołomyja powiat in Stanisławowskie Voivodeship. His parents were Marian and Barbara née Zielińska. He graduated from the Faculty of Medicine at the Charles University in Prague on 7 May 1932. In August 1932, he was

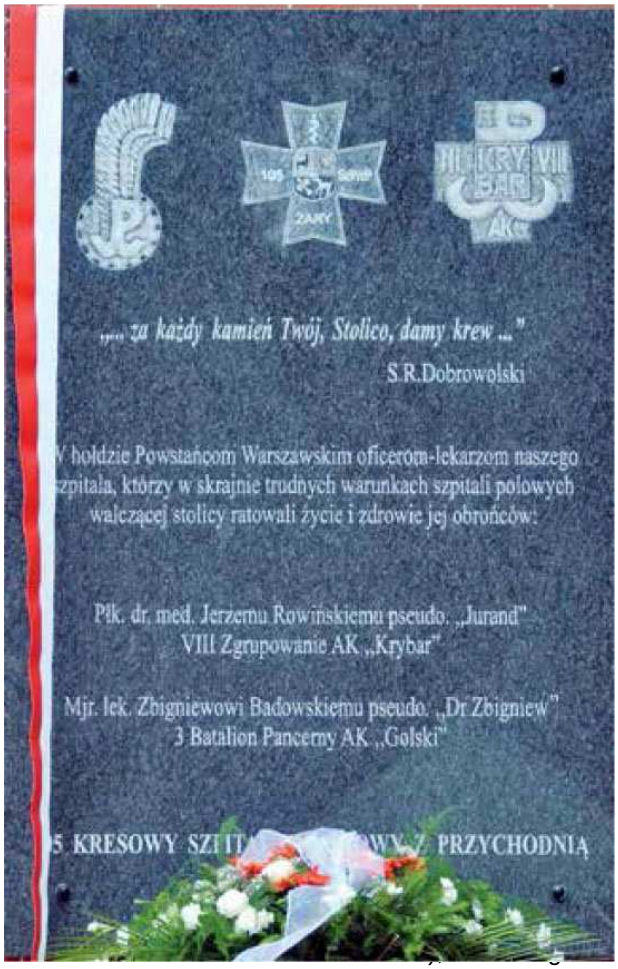


**Figure 3.** Tablica pamiątkowa z inskrypcją ku czci Powstańców Warszawskich ze Szpitala Garnizonowego w Żarach, Żary, 29 lipca 2015 r.

**Rycina 3.** Tablica pamiątkowa z inskrypcją ku czci Powstańców Warszawskich ze Szpitala Garnizonowego w Żarach, Żary, 29 lipca 2015 r.

**Figure 4.** Ewa and Andrzej Duraj with Zbigniew Kopociński (in the middle), in the background, the commemoration plaque with an inscription in honor of the Warsaw insurgents from the hospital in Żary, Żary, 29 July 2015

**Rycina 4.** Ewa i Andrzej Durajowie ze Zbigniewem Kopocińskim (w środku), w tle tablica upamiętniająca szpital Powstańców Warszawskich z Garnizonowego Szpitala, Żary, 29 lipca 2015 r.

(more than a dozen people) who could not be evacuated from Dirlewanger's Brigade, and to kill the patients and personnel, the facility functioned until 1 October 1944, when it was evacuated to Ołtarzew [3,4].

commandant at the Military Medical Academy (WAM), with the rank of brigade general. On 25 February 1967, when he turned 60, Dr J. Rowiński went to the reserve. Almost until his death, he was a practicing physician in civilian medical service facilities. In recognition of his outstanding service, he was awarded the Knights Cross of the Order of Polonia Restituta, the Gold Cross of Merit, the Cross of Valor and many departmental and other medals. He died on 12 June 1998 and was buried in the Doły Military Cemetery in Łódź [3,5-7].

The other physician from Żary, who took part in the Warsaw Uprising was Zbigniew Badowski. He was born on 28 November 1916 in Warsaw, to Tytus and Sabina. During the German occupation, he was a soldier in the Home Army. Beginning in 1941, he underwent medical training at Ujazdów Hospital, and in 1943 he was employed at the Hospital of the Holy Spirit in Warsaw. Upon the outbreak of the uprising, he was assigned to the dressing station of 3rd Armoured Battalion "Golski" at 31 Koszykowa St., which was reorganized during the uprising into a field hospital, "Architektura", for the slightly wounded. The facility was supervised by the battalion physician, 2nd Lt. Longin Dolny "Daniel", who was subordinate to the Chief Medical Officer of the Śródmieście Południe Area, Maj. Wacław Kafiński "Jurow". Zbigniew Badowski managed to survive the uprising and, after the liberation in 1945, he volunteered for service in the Polish Armed Forces. On 29 October 1945, he was assigned to the post of staff radiologist at the Garrison Hospital in Iłowa (the facility was later relocated to Żary and is now known as the 105th Kresy Military Hospital with Public Outpatient Clinic), where he was also a secretary of the then established Garrison Military Medical Board. His career path was complicated because, during the occupation, there were no official medical universities. He received his medical doctor diploma in 1951 from the Medical Academy in Warsaw. He later worked in various medical service facilities, such as in the Health Department of the Mokotów District. He was awarded the Medal for the Oder, the Nissa and the Baltic, the Medal of Victory and Freedom, the Grunwald Badge, among others. He died on 10 October 1991 and was buried in Powązki Cemetery in Warsaw [4,8,9].

## Żary's tribute to their insurgents

On 29 July 2015, on building no. 5 of the 105th Kresy Military Hospital with Public Outpatient Clinic in Żary, a commemorative plaque was unveiled on the initiative of the authors of this paper in honor of the physicians from the military clinic in Żary, who took part in the Warsaw Uprising. The unveiling ceremony was profoundly solemn and accompanied by the 11th Jan III Sobieski Lubusz Armoured Cavalry Division, whose soldiers mounted a guard of honor at the unveiled plaque. The ceremony was attended by the representatives of the voivodeship, powiat and local self-government authorities, a number of patriotic and veterans' organizations, scouts, riflemen and the inhabitants of Żary. To accentuate the bonds between the hospital staff and their predecessors, some doctors and nurses appeared at the ceremony wearing period costumes resembling the attire of soldiers from the medical services as worn during the Warsaw Uprising.

The plaque was ceremonially unveiled by the relatives of Col. Jerzy Rowiński – Ewa and Andrzej Duraj. It was designed by Zbigniew Kopociński. At the top of the plaque, there are commemorative badges of 3rd Armoured Battalion "Golski", the 105th Kresy Military Hospital with Public Outpatient Clinic, 8th Battle Group "Krybar" and the quotation "...for every stone of yours, our City, we'll shed blood..." taken from the song "Warsaw Children" by S. R. Dobrowolski.

The activity of the Warsaw medical services during the Warsaw Uprising is one of the most commendable episodes in the history of the Polish military and civilian medical services. It is important to remember that the toll after 63 days of combat was 16-18 thousand casualties, 26 thousand insurgents injured and over 150 thousand civilians killed. The toll would have been much greater if not for the heroic efforts of the Polish doctors, nurses, medical orderlies and stretcher-bearers, who worked in extremely difficult conditions, without a sufficient amount of medications or medical equipment, often under immediate threat of death. It should be remembered that, during the uprising, many employees of the medical services, mostly nurses and medical orderlies, were raped and brutally murdered by the soldiers from Dirlewanger's brigade or the Volhynia Legion, who did not abide by the Geneva Convention and often slaughtered the patients and personnel of Polish hospitals.

Our older colleagues from the military clinic in Żary managed to survive the hecatomb of Warsaw. Despite going through these traumatic experiences, they had never lost faith in the goodness of human nature and remained true to the Hippocratic Oath. It was people of such stature and principles that organized the Military Hospital in Żary, which is why it is no coincidence that they had created one of the best medical service facilities in the Land of Lubusz – the 105th Kresy Military Hospital. The staff of this facility is proud of "their" insurgents and the commemorative plaque will serve as a reminder to future generations that they spent part of their lives here and contributed to the development of the medical clinic in Żary, which should not be forgotten in the capital of Polish Lusatia.

## Literature


1. Celejewski R, Kotowski L, Kreusch J, et al. Oddziały powstania warszawskiego [Units of the Warsaw Uprising]. Warsaw 1988: 7–20
2. Ciechanowski JM. Powstanie warszawskie [The Warsaw Uprising]. Warsaw 1989: 107–185
3. Lisowski W. Polska służba zdrowia w powstaniach narodowych 1794–1944 [Polish medical services in national uprisings 1794–1944]. Vol. II. Warsaw, Bellona, 2006: 177–180
4. Urbanek B. Pielęgniarki i sanitariuszki w powstaniu warszawskim 1944 r. [Nurses and medical orderlies in the Warsaw Uprising of 1944]. Warsaw, PWN, 1988: 30–42, 75, 107–109, 322
5. Central Military Archive (CAW): TAP 1483/70/318
6. Military Archive in Oleśnica: Set 214, Garrison Hospital in Żary, file No. 1417/ 5 / 51
7. Rowiński J. Moja służba wojskowa [My military service]. Manuscript made available by A. Duraj.

8. Archive of the Office for War Veterans and Victims of Oppression (UdSKiOR): W-5208
9. Archive of the 105th Kresy Military Hospital with Public Outpatient Clinic: KSG: p. 51–57

# Col. Franciszek Przybył MD (1940–2014). PRO MEMORIA

"Yet when I now hear the bell of memory tolling, old sorrow is my bell-ringer". These are words of Leopold Staff, whom Franek enjoyed so much.

Franciszek Przybył was born on 3 October 1940 in the village of Myślibórz, near Żarnów, a town located half way between Piotrków and Kielce. He was the youngest child of Marianna and Jan Przybył, and had two sisters and two brothers. His parents and his elder brothers were farmers. He went to primary school in Żarnów and finished high school in the nearby town of Opoczno. Between 1958 and 1964, he studied at the Faculty of Medicine at the Military Medical Academy of Łódź.

He served his internships between 1964 and 1966 at the Military Garrison Hospital in Szczecin as a junior assistant with the rank of second lieutenant. While there he met his future wife, Anna Michalska, a nurse. He was transferred to Silesian Military District and, in 1966-1967, he served as a lieutenant in the sick ward of the 1st Pontoon Regiment in Brzeg, and for the subsequent two years also in the sick ward of the 1st Warsaw Pontoon Brigade. Between 1969 and 1978, he was promoted to captain and taught military medicine at the Medical Academy in Wrocław. As a major, he was transferred to the Internal Diseases Clinic of the 4th Military Clinical Hospital in Wrocław, where he further explored this medical discipline between 1978 and 1980. In 1980-1981, he took part in the 15th rotation of the Polish Military Contingent of UN Forces in the Golan Heights in Syria as a senior contingent physician and the head of the clinic. After his return to Poland, he resumed work at the Internal Diseases Clinic in Wrocław, where he continued his specialization in 1981-1983 as an assistant with the rank of major. He was again deployed to Syria to participate in the 21st rotation of the Polish Military Contingent of UN Forces in 1983-1984 with the same position as during the 15th rotation. From 1984, he worked in the 4th Military Clinical Hospital with Outpatient Clinic, between 1984 and 1985 at the department of cardiology of the Internal Diseases Clinic as a senior assistant with the rank of lieutenant colonel, between 1985 and 1991 at the department of infectious diseases as a senior assistant, and in 1991–1992 as an acting chief of the department. He was a specialist in internal and infectious diseases, and, at that time, he received his promotion to colonel. From 1992 until 1998 he served as the chief of that department, before taking military retirement.

After he retired, almost to the very end, as long as his health permitted, he remained a practicing physician and always treated people as well as his colleagues and their families selflessly and without hesitation. As a physician, he was pleased with his every success, which ensured the health and even sometimes the life of his patient. He was deeply affected by situations where medicine was helpless. He himself was an example of this.

He was a man who strongly believed in Christian principles, a physician for whom his profession was a mission, and a patriot who loved his country. He was a soldier of the Polish Army, who was not affiliated to any political party. As a Pole, he taught others how to be wisely proud of Poland. We will no longer be able to talk to him about history, which he understood so

well, about politics, which, sometimes, just as us, his friends, he did not understand, and about the economic situation of our country.

Most of all, however, he was a good, gentle and unusually modest man who, together with his wife, created a home that was always open to those who needed help, not only medical. He left behind two adult sons and a daughter, as well as four grandchildren.

He was a passionate sports fan. We will never again watch a match together, or listen to Dąbrowski's Mazurka. He was also a bridge master: "It was he, who, as a bridge master, explained to us and his grandchildren the rules of bridge, bidding and dealing," recollect his sons, Piotr and Wojciech. Regrettably, he will never again take part in the Oder River Blue Ribbon Bridge Meeting, he will no more bid three no trump or score a slam.

He loved spending time on his allotment. "The allotment was another of Dad's great passions – ever since we can remember: seedlings, watering, and gathering. We will never taste again the peppers and tomatoes from his plastic tunnel, nor make a toast next year with Dad's latest cherry liqueur. Perhaps today he is already trimming and grafting shrubs in the Garden of Eden," his sons reminisce with emotion.

A wonderful colleague and a reliable friend that you could always depend on, he passed away on 20 November 2014. He departed this life peacefully, as peacefully as he led his life. Jan Nielubowicz, a well-known surgeon and humanist from Warsaw, used to say that "at the final judgement, all orders fall down, applause subsides, diplomas fade away and what remains is what was good and real". What was good in Franek's life was those whose health he restored and those whose lives he saved, always offering not only his remarkably professional approach but also his smile, a smile that was full of joy and sympathy for another person. He shared his profound wisdom with the people around him. He lived among other people and, most of all, he lived for them. He did not attach any significance to positions, he did not like to shine. He was just and valued objectivity as an important premise of his actions. True to his principles, he always remained modest. He seemed to be genuinely delighted at the thought that his vast knowledge could be of use to others.

As Jan Twardowski used to say: "One can leave for ever to always remain close". Franek, so sensitive and always selfless, you are and always will be close to us!

*Andrzej Kierzek*

# Visit to the Dugway Proving Ground in the United States of America

## Wizyta na poligonie Dugway Proving Ground w USA

**Agnieszka Woźniak-Kosek**
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Dugway Proving Ground in Utah is the largest proving ground of its type for the U.S. Forces related to the detection of biological agents using equipment based around GPS technology. Although the use of weapons of mass destruction, including biological weapons, is prohibited and hedged around by specific conventions, many developed countries invest in the methods of their detection. The U.S. Forces have advanced technologies to detect biological weapons, as the author could see for herself when, as a microbiology specialist, she took part in a meeting of a group of experts at the proving ground.

Dugway Proving Ground (DPG) is a facility located 80 miles south-west of Salt Lake City. The basic mission of this base is testing of the U.S. and international biological and chemical weapon defense systems. DPG has been functioning for over 50 years on an area covering 3244 $km^2$ of the Great Salt Lake Desert. Aside from field research, the facility uses its in-house laboratories and huge hangars to conduct research under controlled environmental conditions. Since it is a military area and taking photos is prohibited, the only way to see the ground without an invitation is to visit their official website at: www.dugway.army.mil.

The 2015 S/K II Challenge program of the Transatlantic Collaborative Biological Resiliency Demonstration (TaCBRD), in which the author participated during a week's stay between 8 and 12 June 2015, offered an opportunity to test equipment used to detect biological agents. The tests at DPG were conducted according to previously created scenarios, while the main goal of the exercises was to improve collaboration between the USA and the partner countries concerning solutions related to crisis management in the event of a biological threat. Participation in the exercises was financed by the USA as part of a program carried out with Poland for the past few years.

The LIDAR system was tested during the first days of the exercises, and this system was created by scientists from the Military University of Technology in Warsaw. This device can detect the presence of a biological/chemical agent in the air within a short time, which it achieves by emitting laser beams and then analyzing how the beams are dispersed in the air or how the particles in the air are illuminated by the beam. In this way it is possible to detect contamination by a chemical or biological weapon. By comparing the reading with information in the database, scientists can immediately determine whether there are any viruses, bacteria or toxic substances in the air. The uniqueness of this solution lies in the present necessity for the crisis response services to personally investigate any warning signal of contamination caused by weapons of mass destruction (biological or chemical). Samples for laboratory analyses are then collected in the field by people wearing special protective suits and masks, making the whole process complicated and time-consuming. The LIDAR remote detection system makes it possible to detect a threat in advance, ensuring time to retreat or to organize protection against its effects both for military personnel and civilians, especially in the case of mass events. The device was also used during Euro 2012 in Warsaw.

During the author's visit to DPG, a decision-making support software tool called Tactical Dynamic Operational Guided Sampling Tool (TaCDOG) Android Quick Reference was tested. This allows a plan to be prepared for collecting material/environmental samples from a suspected

contaminated region and supports the sampling procedure by assigning a number, GPS location, and sampling technique. The tool makes it possible to quickly catalogue the material, which is later sent to be analyzed in a laboratory and the results of the analyses are then entered directly into the TaCBRD database. Obtaining positive results from the conducted analyses, which are entered into the system, makes it possible to submit NBC and CBRN reports, as well as to place a warning on the location plan for the suspected contaminated region. Apart from the representatives of the Military University of Technology and a microbiologist from the Epidemiological Response Centre for the Polish Armed Forces involved in this periodic event, this year the exercise participants involved personnel representing U.S. military organizations (Defense Threat Reduction Agency (DTRA), Civil Support Team (CST) from Illinois) and U.S. government organizations related to crisis management (U.S. Army Edgewood Chemical Biological Center (ECBC)). The sampling procedures were secured by the employees of the in-house microbiology reference laboratory at the DPG research facility. During the exercises, spore-forming bacteria were used, whose characteristics correspond to the characteristics of organisms considered to be that of biological weapons. *Bacillus thuringiensis var. Kurstaki (Btk)* was used to conduct the exercises. A diffuse biological contamination event was simulated, which corresponded to the release of a biological weapon in an open area. The contamination assessment following the release of a biological agent during the exercises was conducted by two four-person biological reconnaissance teams that were put together for the duration of the one-week-long exercises (the author was a member of one team). Additionally, a decontamination team was created to carry out contamination removal after returning with samples from the contamination site. The tasks of the sampling teams included collecting representative environmental samples from the suspected contaminated area. These were surface swab samples taken from devices located in designated places on the proving ground, soil samples and air samples collected by filtration through a felt filter. All activities related to collecting and packaging materials were conducted in compliance with the procedures set out in NATO Sampling and Identification of Biological, Chemical and Radiological Agents (SIBCRA) AEP-66. The teams participating in the exercises used the TaCDOG tool for automatic labelling and entering the samples into the TaCBRD database. During the exercises, a site contamination map was created, which made it possible to formulate a plan to remove the biological contamination. The TaCDOG software, together with other components of the TaCBRD system, greatly facilitated the process of collecting material and the dynamics of the general assessment of the contamination level in an area where an attack might have occurred. At the end of the one-week-long meeting, the exercises were summarized and the usefulness of the tools was assessed together with the dynamics and the work methodology of the biological reconnaissance teams.

Putting the experience gained through participation in such exercises into practice is an important element of improving the readiness of Polish biological reconnaissance teams to prepare them to undertake actions aimed at removing biological contamination. During the S/K II Challenge exercises at Dugway Proving Ground, the author, as a specialist in microbiology, took part in simulations with active biological agents, the use of which is prohibited by law in Poland, hence making the experience even more valuable. This type of training is especially significant now, with the agreement to hand over the TaCBRD software to Poland due to be signed. In September, together with DTRA, the Epidemiological Response Centre for the Polish Armed Forces will conduct training workshops, including lectures from DTRA, where the experience gained at Dugway Proving Ground will prove particularly useful and valuable.

# ANNOUNCEMENT


## THE IMPACT OF AIR POLLUTION ON OUR HEALTH
## COMPETITION FOR SCIENTIFIC PAPERS

The Military Institute of Medicine
and the Polish Federation of Asthma, Allergy and COPD Patients Organizations
announce the competition

**"DUM SPIRO, SPERO"**

for the best scientific papers on the impact of air pollution on our health, published in 2015 in a foreign or domestic journal

The competition is open to physicians, engineers, and specialists in environmental protection. The winners will be awarded recognition statuettes and cash prizes.

The paper submission deadline is 31 January 2016. The award ceremony will be held during the 6th "Dum spiro, spero" scientific conference in honor of Brig. Gen. Assoc. Prof. Wojciech Lubiński MD, PhD, which will take place in April 2016 at the Military Institute of Medicine.

Air pollution and the resulting respiratory and cardiovascular diseases are causing increasingly serious health issues for people in Poland. The World Health Organization and the recent report of the Supreme Audit Office underline the unresolved problem of air pollution. The Military Institute of Medicine and the Federation have been researching the problem for many years, seeking solutions, promoting healthy lifestyles and supporting environmental education.

Further information and the Terms and Conditions of the "Dum spiro, spero" Competition for the award of the Military Institute of Medicine and the Polish Federation of Asthma, Allergy and COPD Patients Organizations are available on the websites of the Military Institute of Medicine and the Federation:

- http://www.wim.mil.pl/nauka/nauka-i-badania/2139-wplyw-zanieczyszczen-powietrza-na-stan-zdrowia-konkurs-na-prace-naukowe
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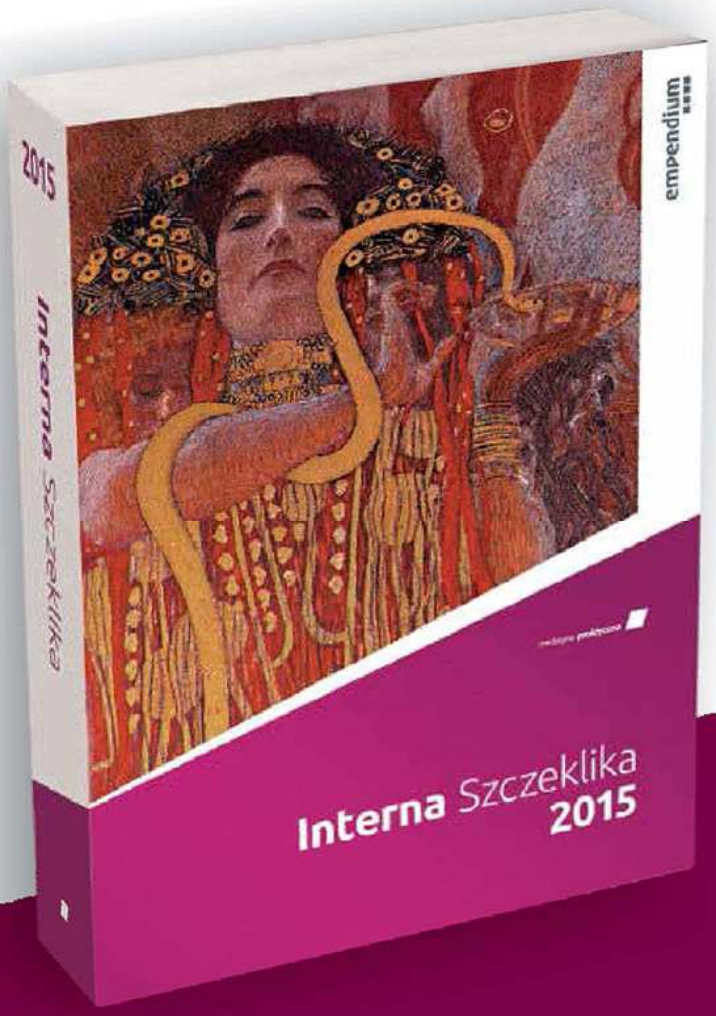


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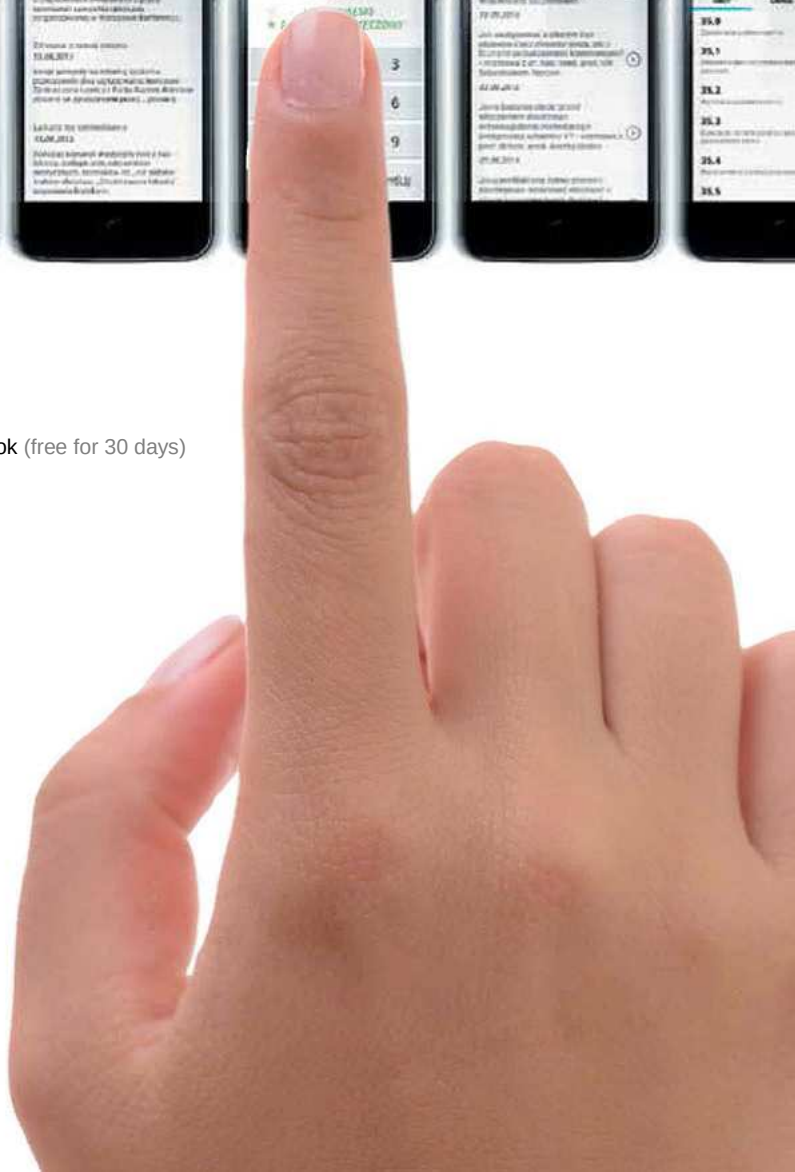

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