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RATOWNICTWO MEDYCZNE

INVOLVEMENT OF POLISH STATE FIRE SERVICE OFFICERS WITH MEDICAL EDUCATION TO INTERVENCE IN A MEDICAL TRAIN FROM UKRAINE PATIENTS

KNOWLEDGE AND APPLICATION OF PATIENT RIGHTS BY PARAMEDICS

FACTORS OF DYSPNEA AMONG CHILDREN AT EMERGENCY DEPARTMENT

EVALUATION OF RESCUE MANAGEMENT IN INCIDENTS WITH A HIGH CASUALTY RATE

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Mini-midline or long peripheral catheter? An update on the definitions in the article: "Mini-midline: Vascular access in specific situations"

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KEY WORDS
vascular access, midline catheters, long peripheral catheters

COMMENTARY
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Since the publication of the manuscript „Mini-midline": Vascular access in specific situations, three important papers have been published that change the terminology used in our published paper. Due to the continued and growing interest of clinicians in the topic we have outlined in the paper, we see the need to update the definitions and the management protocol presented (Fig. 1).

The choice of an appropriate vascular access is crucial to the success of therapy and patient safety. Over the years, the protocol proposed by Chopra et al. has been cited 595 times in scientific publications, which shows how necessary the protocols of the proceedings are [1]. The current U.S. *Infusion Therapy Standards of Practice* guidelines issued by the Infusion Nurses Society (INS), the European consensus *European recommendations on the proper indication and use of peripheral venous access devices (the ERPIUP consensus): A WoCoVA project* and the document *Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters: part I: peripheral catheters* published by the World Health Organization organize the definitions of peripheral vascular accesses [2-4]. In many publications, the definitions of short intravenous catheters (SPCs), long peripheral catheters (LPCs) and midline catheters (MCs) are used interchangeably causing confusion in reporting results [5]. There are still slight differences in the terminology itself in the documents mentioned, but it is in principle the division of types of access that is similar. It is worth noting that the term "mini-midline" has become completely outdated, and the use of a standardized nomenclature facilitates the exchange of experience by presenting and comparing scientific results in different clinical situations. In Table 1, we present current definitions of peripheral catheters and proposals for future reporting published by Fabiani et al. [5].

Nowadays, LPCs are a diverse group that includes cannulas made of various material, inserted by different techniques with very different costs. Moreover, at present, even a part of the MCs that are inserted using the Direct Seldinger Technique are classified as LPCs due to their length (Table. 1). In adults, the length of the catheter is important because it determines the position of the tip, which in the case of LPC usually does not reach the axillary line or 1/3 of the subclavian vein (so-called "midlavicular"), which is characteristic of MCs [2, 3]. The number of complications, and thus premature catheter removal, decreases with length [6].

The Emergency Department (ED) is the second outside of the pre-hospital phase, and the first in the hospital system, where the strategies described in the literature can be implemented. This is especially important in light of the overuse of SPCs, which will never be used. In discussing the appropriate choice, we should not forget the economic aspect, particularly in the context of the choice of peripheral catheters: between SPCs and LPCs and LPCs and MCs. Currently, INS and ERPIUP guidelines differ on the expected duration of therapy for MCs (5-14 days *vs.* "weeks") [2, 3]. In real-world clinical scenarios, previously "mini-midline" and now LPCs can be used effectively in the delivery of intravenous therapy while maintaining an economic balance sheet. Different to traditional SPCs, both LPCs and MCs are always inserted in deep vessels under ultrasound (US) guidance, usually at the green Zone Insertion Method TM of the upper arm, through the basilic, brachial or cephalic vein [5]. LPCs can be used effectively in the first phase of treatment in the ED when the patient needs a higher flow of fluids and medications, while having difficult intravenous access, and is not in a life-threatening condition requiring, for example, intravenous access. Therefore, it can be assumed that LPCs should be used in patients with DIVA when MCs will not be possible due to its limitations: lower flow, how the pro-

cedure is performed). Patients with DIVA obviously have indications for MCs, but the main criterion should be the duration of intravenous therapy to preservation the peripheral veins.

The cost-effective aspect of care highlighted by the WHO is linked to reducing complications, such as catheter-related bloodstream infection (CRBSI) [4]. The performance of cannulation procedures, especially in units with patients of different profiles and stages of disease, should not focus solely on the goal of venipuncture. Avoiding CRBSI is one of the key aspects of "best practices" in obtaining vascular access [2, 3]. To this end, complication prevention protocols described by the INS, ERPIUP and WHO should be followed, including the use of simple tools to prevent, for example, infections when using the ultrasound probe, or the use of ready-made packages for the procedure (Fig. 2-3).

The use of current nomenclature is crucial not only for reporting results, but also for proper staff communication and medical staff education. Communicating in a common language is key to advancing the field of vascular access in Poland in the best possible way. The role of ED staff is invaluable, and in Polish conditions in the area we have addressed, we need analyses and clinical trials, which are still insufficient at present. This should be the direction of future research that we want to pay attention to.

Table 1. Definitions of peripheral catheters based on length and clinical use.

INS (Nickel B, Gorski L, Kleidon T, et al. 2024)	**ERPIUP 2023** (Pittiruti M, Van Boxtel T, Scoppettuolo G, et al. 2023)	**WHO** (Geneva: World Health Organization; 2024)	Fabiani A, Aversana N, Santoro M et al. 2024
Short Peripheral Intravenous Catheter (short PIVC)	Short Peripheral Catheter (SPC) <6 cm	Peripheral Intravenous Catheter (PIVC)	Short Peripheral Venous Catheter (S-PVC): PVC ≤6 cm
Long Peripheral Intravenous Catheter (long PIVC)	Long Peripheral Catheter (LPC) 6-15 cm	-	Long Peripheral Venous Catheter (L-PVC): PVC >6 cm and ≤15 cm
Midline Catheter (ML)	Midline Catheter (MC) or „Midclavicular" (>15 cm)	Midline Vascular Catheter (MVC)	Midline Peripheral Venous Catheter (M-PVC): PVC >15 cm

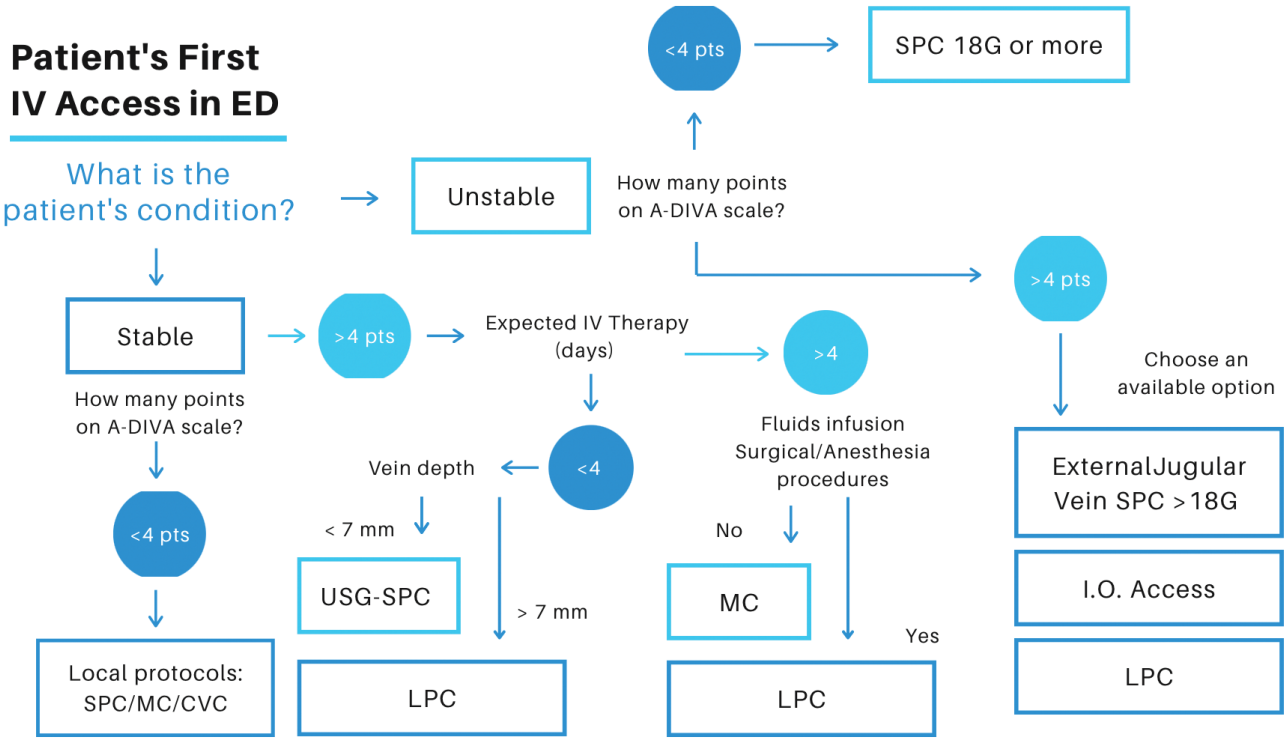

Fig. 1. Protocol of Patient's First IV Access in ED.

Fig. 2. A dressing that protects the cannulation site from contamination by the ultrasound probe.

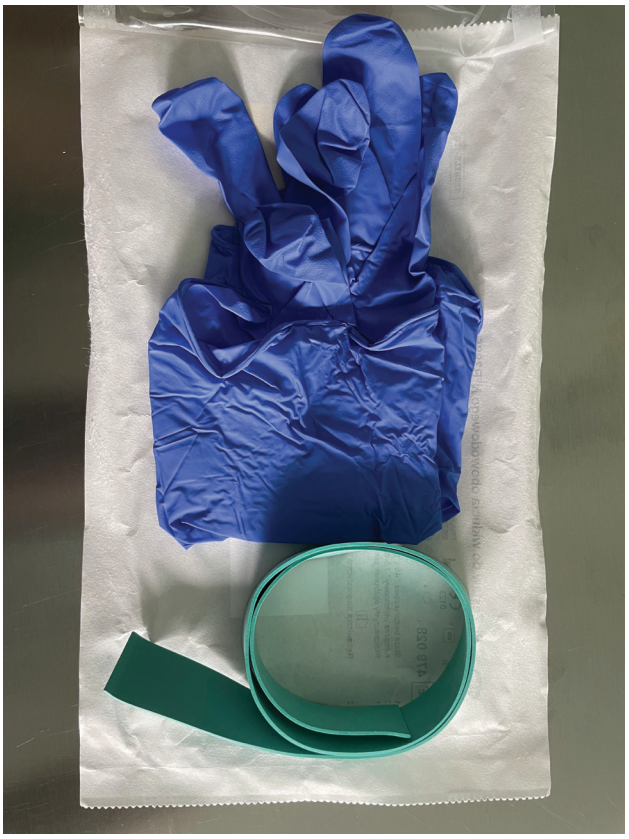

Fig. 3. Ready-made set for SPC insertion.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest.

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ORIGINAL ARTICLE

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Involvement of Polish State Fire Service officers with medical education to intervence in a medical train from Ukraine patients

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ABSTRACT

Aim: Analysis of medical transport by train from the Polish-Ukrainian border to Polish hospitals in 2022-2023

Material and methods: Data for analysis were obtained from the medical train coordinators, who kept detailed documentation of each transport. Consent to access to the data was given by the medical director of the Central Clinical Hospital of the Ministry of Interior and Administration in Warsaw in February 2024. The patients were 2 groups of people: victims of trauma as a result of military operations, patients evacuated from destroyed hospitals in Ukraine. The transport of patients began at the PL-UA border crossing. Place of transport to large hospitals in Polish cities, taking into account the patient's condition, medical diagnosis, age and gender

Results: A total of 380 patients were transported: 243 children (129 men; 114 women) from evacuated hospitals, mainly oncology hospitals, and 137 adults (transferred from hospitals and with war injuries.

Conclusions: Medical education of polish firefighters is useful in many activities within the country and in activities on an international scale. The train used for evacuation and medical transport is an ad hoc solution in response to large-scale emergencies. Medical transport as a result of military operations requires cooperation of many entities and appropriate coordination, and is a multidimensional activity.

KEY WORDS

medical evacuation, medical transport, medical train, warfare, qualified first aid, State Fire Service

INTRODUCTION

In February 2022, military operations commenced in Ukraine, which affected both the civilian population and infrastructure. The conflict posed a significant threat to millions of civilians and military personnel. It is estimated that over 5 million Ukrainian citizens crossed borders to seek refuge in other European countries. Among those who could not find effective shelter, many lost their lives, and even more sustained injuries. Most of the civilian injuries were caused by the widespread use of heavy artillery shells, long-range rockets, aerial bombs, and unmanned aerial vehicles [1].

From the outset of the military operations, the residents of neighbouring countries have supported Ukraine in various ways: providing food, clothing, medicines, and sheltering refugees. Immigration regulations had to be relaxed or adapted to the new situation and scale of the phenomenon. Additionally, international humanitarian efforts were undertaken by European countries [2].

Poland plays a particularly significant role in humanitarian aid, primarily due to its neighbouring location. Poland's eastern border, which is also the eastern border of the European Union, shares a border with Ukraine that spans over 500 km and includes two Polish provinces: Podkarpackie and Lubelskie [3, 4].

Poland's assistance as Ukraine's western neighbour in response to the military operations has been multifaceted from the start. One of the critical areas of support has been in healthcare. The increased number of trauma cases and the evacuation of patients from destroyed hospitals necessitated the transport and relocation of patients to other countries: Poland, Norway, Moldova, Slovakia, and Romania. Hospitals in other European countries are helping Ukrainian patients and alleviating the burden on Ukraine's healthcare system. The majority of patients were transported to Poland, with priority given to those with cancer, infections, and chronic diseases [5, 6].

The transportation of the wounded from Ukraine was organised and coordinated by the Central Clinical Hospital (CCH) of the Ministry of the Interior and Administration (MIA) in Warsaw, under whose auspices a special medical train was launched. This form of transport was carried out from the PL-UA border crossing to selected hospitals within Poland [7].

Polish firefighters participated in this initiative. Among the ranks of this formation are many officers

with medical education and experience in working within healthcare units and the State Medical Rescue System (MRS). By the decision of the Chief Commander of the State Fire Service (SFS) in March 2022, 34 officers with medical education (paramedics, nurses) from various organisational units of the SFS across several provinces were designated to be on standby to support the medical train's personnel [8, 9].

Medical transport by train required the coordination of many services and institutions. It was necessary to translate documents, qualify patients, and prepare available spaces in designated hospital wards with specific specialisations. Additionally, changes were planned in train schedules along the medical train's route, with passenger platforms temporarily closed to general use. Coordination of wheeled transport teams (ambulances) was crucial, as was the involvement of the police to halt traffic along ambulance routes, ensuring the smooth transport of patients to the passenger platform at the PL-UA border crossing and the reception of patients in the destination cities [9].

AIM

The analysis of the medical transport of the injured from Ukraine carried out by train from the Polish-Ukrainian border crossing to Polish hospitals in the years 2022-2023, with consideration of the support provided by Polish firefighters.

MATERIAL AND METHODS

Data for the analysis was obtained from the coordinators of the medical trains, who maintained detailed documentation of each transport. Permission to access the data was granted by the Medical Director of the CCH of the MIA in February 2024. Variables obtained from the medical documentation included: dates of departures (limited to month and year), the number of patients, patient age, patient gender, the nature of the patients' health threats (injury, illness), and destination cities in Poland. The analysis is fully anonymous concerning patients, staff, travel routes, stopover locations, exact dates, addresses, and the names of destination hospitals.

CHARACTERISTICS OF THE TRANSPORTED POPULATION

The patients consisted of two groups of individuals (evacuated from Ukraine):

- individuals with injuries resulting from military operations – orthopaedic injuries and soft tissue injuries in multiple body areas (frontline soldiers, civilians injured by explosions),
- patients evacuated from destroyed hospitals in Ukraine – mostly children (patients up to 18 years old) from oncology wards.
- patients with a positive SARS-CoV-2 test, which required the personnel to use additional personal protective equipment dedicated to infectious biological hazards [10].

TRANSPORT PROCEDURE

Medical train transport began in Warsaw at the assembly point for medical personnel from the CCH and the firefighters supporting the intervention. The travel time to the border crossing was utilised by the personnel to prepare patient areas, set up stations with equipment, establish stations for medical procedures, assign personnel to specific carriages, and discuss the clinical condition of the patients (nature of the injury or illness, medical diagnoses, age, gender). This time was optimally utilised. The trans-

Fig. 1. Location and methods of placement for medical products and equipment:

A- treatment area, B, C- medical kits in the form of packages.

portation of patients commenced at the PL-UA border crossing. Patients were transported to the passenger platform by transport ambulances. The transport to hospitals in Polish cities was carried out considering the patient's condition, medical diagnosis, age, and gender.

The entire duration of a single train journey averaged between 16 to 24 hours, depending partly on the number of patients and mainly on the number and locations of the destination hospitals (distance from the point of patient pick-up). At the point of patient handover in a specific city, transport ambulances collected the patients from the passenger platform, similarly to the start of the transport. The train accessible to the personnel consisted of 5 carriages:

1 - a social carriage for personnel - rest, meals provided by CCH in the form of food rations,
2 - a medical supplies carriage (Fig. 1 A-C),
3-5 - for patients – functioning as separate wards - general care (stable patients), trauma, intensive care.

During the medical train transport, the personnel maintained standard documentation for the Polish MRS: the Medical Emergency Procedures Card and for patients with injuries, the field evacuation card: Tactical Combat Casualty Care (TCCC). The documentation from the transport period, including performed procedures, recorded vital signs, and pharmacotherapy, was handed over with the patient to the destination hospital. After the handover of the last patient, the train returned to the original assembly point for the personnel [11, 12].

CHARACTERISATION OF MEDICAL PERSONNEL

In each journey of the medical train, the medical personnel consisted of 8-10 individuals from the CCH, including doctors, nurses, paramedics, and 3-6 firefighters. The number of personnel was determined by the number and clinical condition of the patients.

Among the personnel in each transport, a chief train coordinator, section (carriage) coordinators, and other personnel assigned to sections were designated. The medical personnel and firefighters (medics) were supported by volunteers who assisted with patient communication (Ukrainian language translators).

STATISTICAL ANALYSIS

The database was prepared in Microsoft Excel using the MS Office 2016 package for Windows 10. Descriptive statistics were utilised to characterise the variables. The numerical data obtained for the analysis are general and quantitative in nature. In the "Results" section, the authors used values such as n, %, and mean, which describe the variables related to the observed population and individual transports.

LIMITATIONS

1. The authors do not provide details regarding the transport in terms of dates, locations, and other identifying data due to the lack of information in the provided documents or due to the lack of consent to disclose these details, which could be related to the potential need to re-initiate the medical train transport procedure in the future.
2. The authors have no knowledge of any possible technical modifications to the carriages that might have been made (e.g., adapting compartments to meet all humanitarian needs or enabling the implementation of intensive care medical procedures).
3. Detailed clinical data regarding patients, ICD-10 diagnoses, and their treatment history in Ukraine were not made available to the authors.
4. The authors did not obtain access to the ages of all patients. Calculations in the results section were made for n=191 patients whose ages were known to the authors, specifically underage patients whose ages were available in the documentation.
5. The authors did not obtain data on the gender of all patients; calculations were made for n=243 (129 male; 114 female) [13].

RESULTS

In 2022-2023, 13 medical train interventions were carried out. Polish firefighters took part in 8 interventions. A total of 380 patients were transported - table. 1.

Patient age, data for n=191 (Mean 9.81; SD 5.24) shown in Fig. 2. apply only to minors. The data are presented in age ranges of several years. The age of adults n= was not known to the authors, except for the information: adult patient.

DISCUSSION

The involvement of firefighters in the medical train intervention is not considered as part of the international operations for which Polish firefighters are known. In previous years, Polish rescue teams participated in rescue

Table 1. General characteristics of the intervention - data on 13 transports in 2022-2023.

Transport	1	2	3	4	5	6	7	8	9	10	11	12	13
Patients	15	37	56	37	35	26	18	19	31	29	30	14	22
Traget cities	1	2	2	2	1	1	4	4	5	5	5	5	6
Firefighters	0	4	0	3	3	3	5	6	0	6	5	0	0
Distance	850	850	850	850	850	850	850	850	960	1035	1430	1430	1445

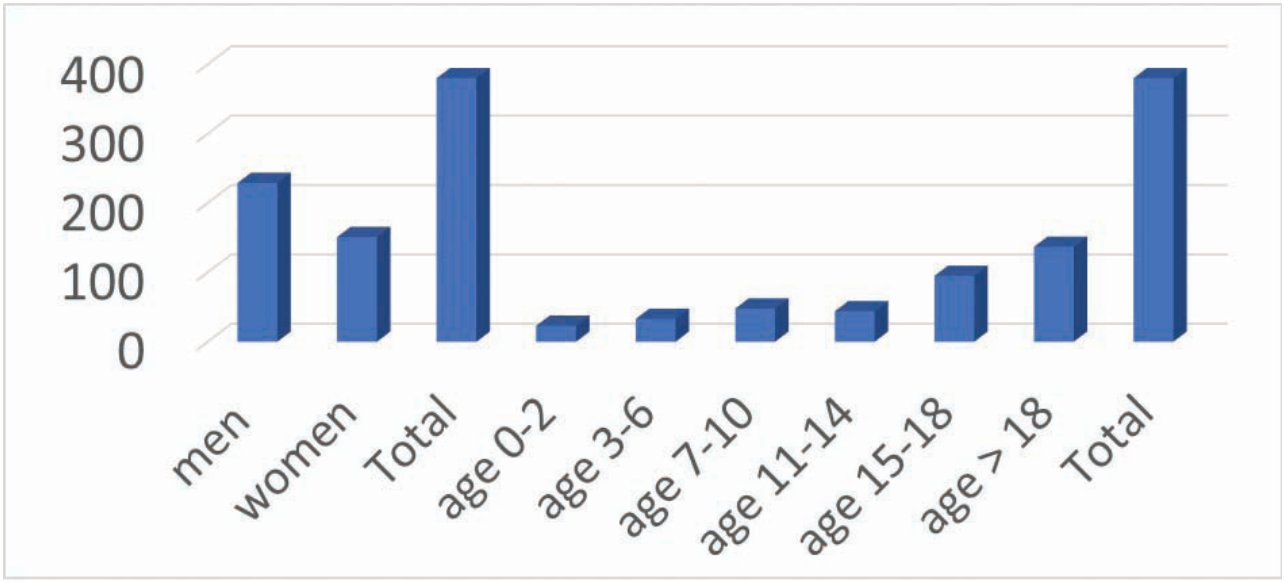

Fig. 2. Age characteristics of patients including age groups of minors.

operations in various parts of the world, including Greece, Turkey (2023), Lebanon (2020), and Haiti (2010), within the following modules:

- GFFF-V (Ground Forest Fire Fighting with Vehicles),
- USAR (Urban Search and Rescue),
- HCP (High Capacity Pumping) [14].

Participation of firefighters in the medical train trips is a continuation of the cooperation and joint actions that took place during the COVID-19 pandemic between the SFS and the CCH. During the main waves of the pandemic, firefighters supported the CSK personnel at the National Hospital in Warsaw [15].

The transport by medical train represents only a small fraction of the people who left Ukraine for the EU due to the armed conflict. Thousands of people were transported by various means of transport, including passenger trains, which, however, did not have the status of a medical train. Polish firefighters have been supporting border service personnel since the beginning of the increased traffic at the Polish-Ukrainian border crossings, providing assistance in the relocation of refugees to reception points located in various areas of the border zone and larger cities in eastern Poland [16].

The concept of medical transport using a specially adapted train is also described by other authors. In the work by Walravens et al., medical evacuation by train during the conflict in Ukraine was carried out using two trains. Over eight months, the medical trains made 74 journeys, evacuating 2,481 patients from 11 cities located near the front line. The current study describes medical evacuation from areas far from the front line, without crossing the border by Polish personnel; however, the health risks of the patients are often directly related to the warfare (injuries) [17].

Marble et al. conclude that the warfare disrupted healthcare facilities near the front line, necessitating the urgent evacuation of a significant number of people. The authors describe the value of this type of transport as relatively fast, safe, and capable of mass evacuation of victims, which led to the adoption of this concept in many places during armed conflicts [18].

Bielka et al. noted that the conflict in Ukraine has become the largest war in Europe since World War II, resulting in hundreds of thousands of deaths and injuries. 1,218 healthcare facilities were partially destroyed, and 173 were completely destroyed, which forced the rapid evacuation of a significant number of patients both within Ukraine and beyond its borders. The numbers indicated in this study reflect the scale of the need for medical transport, to which the concept of the medical train is well suited [19].

Mueller et al. describe the involvement of many institutions in coordinating large-scale medical evacuation in a short time, including the participation of the European Union's Emergency Response Coordination Centre in developing routes and methods of transport [20].

Litwinek et al. list a series of challenges faced by Poland in February 2022 as Ukraine's neighbour. The new situation required the preparation of a cohesive action plan involving many institutions: the government, local authorities, uniformed services, including the fire service. The active measures taken by the National Fire and Rescue System (KSRG), including professional firefighters (SFS) and a large number of volunteer firefighters (OSP), collectively contributed to minimising the refugee crisis [21, 22].

According to the regulations of the MIA, Polish firefighters operating within the structures of the National Fire and Rescue System (NFRS) must be certified to provide Quali-

fied First Aid (QFA). This amounts to approximately thousand people (from the State Fire Service, thousand from the Volunteer Fire Service) with the skills to assist people in life-threatening conditions. The procedures are complemented by the equipment and medical devices that firefighters use, which are carried on their response vehicles. Some firefighters hold medical qualifications such as doctors, paramedics, or nurses, which significantly enhances the rescue capabilities of the service [23, 24].

CONCLUSIONS

The medical education of Polish firefighters is valuable in many operations within the country and in international activities. The train used for evacuation and medical transport is an ad hoc solution in response to large-scale emergency situations. Medical transport due to warfare requires the cooperation of many entities and proper coordination, making it a multidimensional operation.

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Knowledge and application of patient's rights by Emergency Response Team paramedics in the beginning of the SARS-CoV-2 pandemic

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ABSTRACT

Aim: The analysis of the attitudes exhibited by paramedics in the beginning of the SARS-CoV-2 pandemic in regard to the rights held by patients.

Material and methods: The study involved a total of 134 paramedics (100%), including 129 males and 15 females. The mean age of the male participants was 39.03±9.27 years, while for women it was 31.93±7.76 years. The paramedics participating in the study declared both professional higher education (67,16%) and post-secondary education (32,84%). The statistical analysis was carried out in the Statistica 13.1 PL statistical software.

Results: The analysis of the obtained results showed that only 22.40% of the participating paramedics became familiar with patient's rights during their education, with the remaining 71.60% doing so only during their work experience. A satisfactory level of knowledge regarding patient's rights was declared by 71.60% of the respondents, with the remaining 28.40% deeming it unsatisfactory. Meanwhile, 40.30% of the participating paramedics stated that patient's rights are always complied with in their workplace, while according to the remaining 59.70%, that is the case only sometimes.

Conclusions: Almost 1/3 of the paramedics participating in the research possess an unsatisfactory level of knowledge regarding patient's rights. Simultaneously, more than half of them were of the opinion that the contemporary patient's rights are not respected in their workplace. The above indicates a need for educational measures to be undertaken in this professional group in regards to the rights of patients.

KEY WORDS

patient, patient rights, paramedic, COVID-19 pandemic

INTRODUCTION

According to the World Health Organization (WHO), quality is one of the most important priorities as far as universal healthcare is concerned, with treatment success rate, patient safety, focus on the person and healthcare service integration highlighted as its key domains. It sets the standard towards which medical facilities must strive to meet patient demands, while also continuously improving the quality of the services they provide. Quality and its significance are continuously on the rise, which is related to the ongoing standardization of medical services and individual approach to the patient gaining in significance, as well as the rising level of expectations and demands of patients themselves [1].

Healthcare services and their provision involve both the patient and their expectations and needs, but also medical personnel, who have an impact on the relationship with the patient. This relationship has a large impact on the treatment process at large, including its form and patient satisfaction [1, 2].

Patient rights are defined in detail in the Act on the Patient's Rights and the Patient's Rights Ombudsman (APR) from November 6th, 2008 [3]. The APR included, amongst general patient's rights, the individual rights to health services, information, reporting undesirable effects of medical products, confidentiality of personal information, consenting to being administered health services, respect for their intimacy and dignity, medical records, objecting a doctor's opinion or judgment, respect for their private and family life, pastoral service and storing valuables in a depository.

In Poland, the State Emergency Medical Service (SEMS) was established in order to fulfill the state's statutory obligation of providing medical assistance to every person in a situation threatening to their life or health. The SEMS includes emergency response teams (ERTs), and hospital

Table 1. Reports to the Patient's Rights Ombudsman regarding ERT conduct violations to TPI services in 2020.

No.	Scope of the reported violation	Number of reports
1.	Right to health services	859
	access to health services	577
	issues with ensuring the patient is transferred to the nearest hospital	41
	concerns regarding the health services administered to patients with special needs	13
	lack of available emergency response teams (delay or refusal of departure)	9
	accusation of discrimination (vaccination status, age, questioning the gravity of reason behind the call for help)	3
	participation of uniformed services and issues with their intervention	3
	refusal to transfer the patient to the medical facility they are signed up to	12
	refusal to qualify ERT for departure by the dispatcher	81
	refusal to issue a death certificate	16
	issues regarding services provided to patients suspected of COVID19	64
	complaint stage issued against ERT employees (no information from ERTs)	142
	other issues related to providing services (certificates, sick leaves, not allowing family members to participate in transport)	193
2.	Standards and conditions of health service provision	282
	systemic notes and issues regarding ERT conduct	9
	ERT employee behavior in cases of direct coercion	16
	accusation of ethical misconduct by ERT employees	87
	issues regarding dispatcher activity	49
	seeking compensation due to accusations of medical error	3
	notes and issues with the procedures carried out by ERT members	66
	breach of rules concerning arrival to the site of the call (time of arrival)	41
	issues concerning the level of mobile ERT equipment	11
3.	Adverse event report	1
4.	Right to medical records	39
	refusal of access	21
	issues regarding the content of medical records	18
5.	Right of respect for intimacy and dignity	25
	issues with the conditions ensuring intimacy	6
	presence of unauthorized parties during health service administration	19
6.	Accusation of providing services without patient's consent	5
Total	**929**	

emergency departments (EDs) which function nonstop, 24 hours a day, throughout the whole year [4].

The outbreak of the SARS-CoV-2 pandemic resulted in a significant limitation of patient's rights in medical facilities. Access to services, the ability to give birth with a loved one present, or access to medical records were all impeded. In many hospitals, the right to visits from a loved one during medical personnel procedures was suspended. Patients also reported that primary healthcare clinics (PHC) were closed, PHC employees did not answer their calls, and there was no information regarding the cancellation of scheduled appointments hung on the doors of the PHCs. Organizational issues in the provision of health services by PHCs, including the introduction of online medical consultations, contributed to a significant rise in the number of ERT calls, with the simultaneous in-

Table 2. Reports to the Patient's Rights Ombudsman regarding ERT conduct violations until the 31st of October 2021 [13].

No.	Scope of the reported violation	Number of reports
1.	Different problems related to patient's rights	186
2.	Refusal of qualification by the dispatcher	118
3.	Complaint filing stage	89
4.	Issues regarding the undertaken medical procedures	88
5.	Issues regarding the behavior of an ERT member	71
6.	Issues regarding the behavior of the dispatcher	52
7.	No transport to the nearest hospital offered	44
8.	ERT arrival waiting time	36
9.	No free ERTs	26
10.	Issues related to medical records content	19
11.	Healthcare for COVID-19 patients	13
12.	Refusal to grant access to a medical document or recording	10
13.	Inaction in relation to transferring the patient to a different hospital	10
14.	No conditions to provide services for a person with disability	8
15.	No conditions to ensure the respect for intimacy and dignity	7
16.	Discrimination	6
17.	Limited access to ERTs within the voivodeship (systemic)	5
18.	Compensation and damages	5
19.	Refusal to pronounce patient as dead	3
20.	Issues regarding direct coercion conditions	3
21.	Providing health service without consent	2
22.	Incident/adverse event with patient involvement	2
23.	Refusal to provide treatment due to the lack of vaccination	1
24.	Revealing confidential information about the patient	1
25.	Presence of unauthorized parties during health service administration	1
26.	Police/uniformed services intervention	1
27.	Issues regarding ambulance equipment	1
Total	**808**	**6**

crease in the number of patients reporting to EDs to consult with a doctor, despite their health not being in any immediate risk [5, 6].

The essence of SEMS functioning is ensuring the safety of citizens, not only in cases of singular events involving immediate risk to the life and health, but also in mass casualty events such as the SARS-CoV-2 coronavirus pandemic. The healthcare system, including SEMS, had to face the SARS-CoV-2 pandemic head on, revealing staff shortages, lack of necessary equipment, complete lack of coordination between ERTs and EDs, and above all, a lack of readiness of the SEMS for this kind of emergency [7]. In general terms, the work of a paramedic concerns stabilising rescue operations with the aim of saving the human life and health and preparation of a patient in health or life emergency for transport. A paramedic performs life-saving rescue operations in ambulances, hospital wards, and other healthcare system facilities [8-11]. The basis of

Table. 3. Participant age for both genders.

Gender	n	M	SD	Min	Max	p-value
Male	119	39.03	9.27	23.00	65.00	0.003*
Female	15	31.93	7.76	23.00	50.00	

*Mann-Whitney U Test, p<α, α=0.05

Table 4. Years of work experience of the participants for both genders.

Gender	n	M	SD	Min	Max	p-value
Male	119	12.62	9.41	0.50	41.00	0.000*
Female	15	5.36	7.04	0.50	28.00	

*Mann-Whitney U Test, p<α, α=0.05

Table 5. Level of education of the participants for both genders.

Level of Education	n (%)	Post-secondary education	Professional Higher Education	p-value
Male	119 (100.00)	38 (31.90)	81 (68.10)	0.109*
Female	15 (100.00)	6 (40.00)	9 (60.00)	
Total	**134 (100.00)**	**44 (32.80)**	**90 (67.20)**	

* Chi-squared test, p>α, α=0.05

emergency medical service functioning in Poland is regulated by the Act of September 8th, 2006 [4], as well as the Minister of Health's decree of December 16th, 2019 [12].

As indicated by the Patient Rights Ombudsman Office, reports addressed to the Patient's Rights Ombudsman (PRO) regarding the proper functioning of ERTs in 2020 and 2021 (929 and 808 reports respectively) were primarily concerned with the limited access to emergency medical services, manifesting as the extended waiting time for the emergency response team arrival and queues in hospital emergency departments. Table 1 shows the number of reports regarding ERT conduct to the Telephone Patient Information (TPI) services in 2020, meanwhile Table 2 demonstrates the most common issues reported to the Patient's Rights Ombudsman (PRO) regarding medical emergency services by the 31st of October, 2021 [13].

As demonstrated in the literature, the number of patients aware of their rights is continuously on the rise [5, 6], however medical personnel's knowledge of patient rights remains varied, incomplete and insufficient. The reason for this being the case should be attributed to the overload of professional duties during medical emergency service administration, as well as the unstable working conditions and environment experienced by ERT paramedics, such as constant contact with harmful, dangerous factors (harmful biological, chemical, physical and psychophysical factors) [8-10]. Work overload, aggression from patients and third parties, and undermining professional competences are not insignificant in the degree of compliance with patient's rights by ERT members. On the other hand, despite the factors above occurring quite frequently in ERT work [10, 11] they are not and cannot be treated as justifications and excuses for not respecting patient's rights by ERT members in their everyday work. The different level of awareness of medical personnel, including the knowledge of the rights of patients, may be due to the different forms of education and its quality, as well as the lack of compulsory classes on medical law, including patients' rights, in the training programs of the various medical professions [14, 15].

THE AIM

The aim of the study was the analysis of the attitudes exhibited by paramedics in the beginning of the SARS-CoV-2 pandemic in regards to the rights held by patients.

MATERIAL AND METHODS

The study involved a total of 150 paramedics, however the final analysis included data from 134 paramedics, who completed their questionnaires properly. The ERT paramedics were employed in the Voivodship Emergency and Transport Station as part of the "Meditrans" Independent Public Healthcare Centre in Warsaw in the period between June and October of 2021. The selection of the sample was purposeful due to the fact that Warsaw as the capital city possesses the most functioning mobile ERTS in the country. The participant sample will include people who meet the following criteria: employment as a paramedic in an ERT (regardless of the form of employment) and consenting to the participation in the research. The participation in the study was voluntary and anonymous. Every participant of the study was informed about the subject and aim of the research through a written information sheet attached to the questionnaire. Due to the sanitary restrictions, the questionnaires were laid out in the ERT work stations, and after they were filled in, they

Table 6. Knowledge and application of patient's rights in the everyday professional practice of the participants with regards to the level of education.

No.	Question	Answer	Level of education (w%) n=134 (100.00)		p-value*
			Post-secondary education 44 (32.84)	Professional Higher Education 90 (67.16)	
		Total	n=44 (100.00)	n=90 (100.00)	
1.	Where did you become familiar with patient's rights?	during education	9 (20.45)	21 (23.33)	0.707
		during work	35 (79.55)	69 (76.67)	
2.	How would you evaluate your knowledge of patient's rights?	unsatisfactory	15 (34.09)	23 (25.56)	0.303
		satisfactory	29 (65.91)	67 (74.44)	
3.	Please indicate the main legal act regulating patient's rights in Poland (single choice)	WHO Patient's Rights Charter			
		yes	3 (6.82)	8 (8.89)	0.682
		no	41 (93.18)	82 (91.11)	
		European Charter of Patients' Rights			
		yes	5 (11.36)	8 (8.89)	0.694
		no	39 (88.64)	82 (91.11)	
		Act on the Patient's Rights and the Patient's Rights Ombudsman			
		yes	18 (40.91)	48 (53.33)	0,177
		no	26 (59.09)	42 (46.67)	
		The Constitution of the Republic of Poland			
		yes	14 (31.82)	19 (21.11)	0,176
		no	30 (68.18)	71 (78.89)	
		I do not know any such document.			
		yes	4 (9.09)	7 (7.78)	0,795
		no	40 (90.91)	83 (92.22)	
4.	Are patients informed of their rights in your workplace?	yes	19 (43.18)	42 (46.67)	0,845
		no	25 (56.82)	48 (53.33)	
5.	How are patients informed of their rights in your medical facility?	sign on a notice board			
		yes	16 (36.36)	34 (37.78)	0.975
		no	28 (63.64)	56 (62.22)	
		verbally by medical staff			
		yes	4 (9.09)	8 (8.89)	0.777
		no	40 (90.91)	82 (91.11)	
6.	Please indicate whom the patient's rights requirements concern (more than one answer can be indicated)	medical facility management			
		yes	7 (15.91)	17 (18.89)	0.855
		no	37 (84.09)	73 (81.11)	
		doctors			
		yes	26 (59.09)	73 (81.11)	0.012**
		no	18 (40.91)	17 (19.89)	
		nurses			
		yes	20 (45.45)	64 (71.11)	0.007**
		no	24 (54.55)	26 (28.89)	
		paramedics			
		yes	37 (84.09)	77 (85.56)	0.972
		no	7 (15.91)	13 (14.44)	
		all healthcare professionals			
		yes	39 (88.64)	83 (92.22)	0.718
		no	5 (11.36)	7 (7.78)	

No.	Question	Answer	Level of education (w%) n=134 (100.00)		p-value*
			Post-secondary education 44 (32.84)	Professional Higher Education 90 (67.16)	
		Total	n=44 (100.00)	n=90 (100.00)	
7.	Who is responsible for the violation of a patient's rights?	medical facility management	24 (54.55)	43 (47.78)	0.462
		medical professional guilty of misconduct	20 (45.45)	47 (52.22)	
8.	Please indicate the patient rights you are familiar with (more than one answer can be indicated)	patient's right to health services			
		yes	41 (93.18)	85 (94.44)	0.792
		no	3 (6.82)	5 (5.56)	
		patient's right to information			
		yes	37 (84.09)	86 (95.56)	0.023**
		no	7 (15.91)	4 (4.44)	
		patient's right to report undesirable effects of medical products			
		yes	16 (36.36)	49 (54.44)	0.049**
		no	28 (63.64)	41 (45.56)	
		patient's right to confidentiality of personal information			
		yes	40 (90.91)	83 (92.22)	0.795
		no	4 (9.09)	7 (7.78)	
		patient's right to consent to being administered health services			
		yes	36 (81.82)	79 (87.78)	0.353
		no	8 (18.18)	11 (11.22)	
		patient's right of respect for their intimacy and dignity			
		yes	37 (84.09)	76 (84.44)	0.841
		no	7 (15.91)	14 (15.56)	
		patient's right to medical records			
		yes	38 (86.36)	72 (80.00)	0.367
		no	6 (13.64)	18 (20.00)	
		patient's right to objecting a doctor's opinion or judgment			
		yes	14 (31.82)	26 (28.89)	0.728
		no	30 (68.18)	64 (71.11)	
		patient's right of respect for their private and family life			
		yes	37 (84.09)	83 (92.22)	0.148
		no	7 (15.91)	7 (7.78)	
		patient's right to pastoral service			
		yes	14 (31.82)	24 (26.67)	0.534
		no	30 (68.18)	66 (73.33)	
		patient's right to store valuables in a depository			
		yes	18 (40.91)	35 (38.89)	0.822
		no	26 (59.09)	55 (61.11)	
9.	Do you comply with patient's rights?	always	16 (36.36)	38 (42.22)	0.644
		sometimes	28 (63.64)	52 (57.18)	
10.	Were you a witness of a patient's rights violation in your workplace?	yes	29 (65.91)	58 (64.44)	0.979
		no	15 (34.09)	32 (35.56)	

No.	Question	Answer	Level of education (w%) n=134 (100.00)		p-value*
			Post-secondary education 44 (32.84)	Professional Higher Education 90 (67.16)	
		Total	n=44 (100.00)	n=90 (100.00)	
11.	Do patient's rights violations by medical personnel take place in your work? If yes, please indicate the type of violation (more than one answer can be indicated)	patient's right to information			
		yes	16 (36.36)	18 (20.00)	0.041**
		no	28 (63.64)	72 (80.00)	
		patient's right to report undesirable effects of medical products			
		yes	14 (31.82)	13 (14.44)	0.018**
		no	30 (68.18)	77 (85.56)	
		patient's right to confidentiality of personal information			
		yes	21 (47.73)	38 (42.22)	0.547
		no	23 (52.27)	52 (57.78)	
		patient's right to consent to being administered health services			
		yes	12 (27.27)	21 (23.33)	0.179
		no	32 (72.73)	69 (76.67)	
		patient's right of respect for their intimacy and dignity			
		yes	37 (84.09)	73 (81.11)	0.673
		no	7 (15.91)	17 (18.89)	
		patient's right to medical records			
		yes	11 (25.00)	21 (23.33)	0.940
		no	33 (75.00)	69 (76.67)	
		patient's right to objecting a doctor's opinion or judgment			
		yes	6 (13.64)	11 (12.22)	0.817
		no	38 (86.36)	79 (87.78)	
		patient's right of respect for their private and family life			
		yes	28 (63.64)	58 (64.44)	0.970
		no	16 (36.36)	32 (35.56)	
		patient's right to health services – no indication			
		patient's right to pastoral service - no indication			
		patient's right to store valuables in a depository – no indication			

* Chi-squared test

** $p<\alpha$, statistical significance indicated

could be returned by folding the questionnaire into a box designed specifically for this purpose that simultaneously prevented the identification of the participant's data.

The present research employed the diagnostic survey methodology with the use of the questionnaire technique. Due to the fact that there is no standardized measurement tool, which could assess the level of knowledge and attitudes of the medical personnel in regards to patient's rights, the research tool used for the purpose of the present study was a self-developed questionnaire. The questionnaire consisted of 15 questions. The first part of the questionnaire included 4 questions and asked for sociodemographic data like gender, age, level of education, years of work experience. Meanwhile, the second part of the questionnaire included 11 questions (4 of which were multiple choice) gathering detailed data on the knowledge and application of patient's rights in everyday professional practice. The questionnaire had never been validated, because the research was initial and exploratory in nature. The study was conducted in compliance with the Helsinki Declaration [16].

The data obtained during the study was collected in a Microsoft Excel (Microsoft Office) sheet. The statistical analysis was conducted in the Statistica 13.1 PL statistical software (licensed for the Jan Kochanowski University in Kielce). For the analysis of the gathered quantitative data, differentiated with regards to the independent variable of education, the non-parametric Mann-Whitney U and the Chi2 test were used at a significance level of $\alpha=0.05$.

RESULTS

The final analysis included 134 people (100%), 129 of whom were males and 15 females. The mean age of the participating men was 39.03±9.27 years, while for women it was 31.93±7.76 years (Table 3.).

The difference between genders as far as the mean length of work experience among the paramedics is concerned was statistically significant (p=0.000). Men had an average of 12.62±9.41 years of work experience, while for women it was 5.36±7.04 years. In both of the studied paramedic groups, the minimum duration of work experience was around half a year (Table 4).

The participating paramedics declared both professional higher education (67.16%) and post-secondary education (32.84%). The level of education was not related to the gender of the participants (p=0.109) (Table 5). Due to the small representation of women in the participant sample, further analysis of the data did not involve the investigation of gender differences.

Detailed results regarding the knowledge and application of patient rights in daily professional practice and its relationship to the level of education of the participants were demonstrated in Table 6.

The analysis of the obtained results showed that only 22.40% of the participating paramedics became familiar with patient's rights during their education, with the remaining 71.60% doing so only during their work experience. A satisfactory level of knowledge regarding patient's rights was declared by 71.60% of the respondents, with the remaining 28.40% deeming it unsatisfactory. In the opinion of 45.50% of the participating paramedics, patients are informed of their rights, while the rest of the respondents (54.50%) had a different view on this issue. In the opinion of only 27.30% of the paramedics participating in the study, the requirements resulting from patient's rights laws concern all healthcare system workers, meanwhile 49.30% of all of the participants pointed towards the Act on the Patient's Rights and the Patient's Rights Ombudsman as the legal act governing patient's rights in Poland.

Only 40.30% of the participating paramedics stated that patient's rights are always complied with in their workplace, while according to the remaining 59.70%, that is the case only sometimes.

A vast majority of the respondents (82.00%) expressed the opinion that patient's rights are infringed upon in their workplace as far as patient intimacy and dignity are concerned. Meanwhile 23.90% of the paramedics were of the opinion that the patient's right to medical records is violated in the medical facility where they are employed.

DISCUSSION

The SARS-CoV-2 pandemic forced the introduction of restrictions and limitations regarding the right to healthcare services, changes which were not without effect on the ability to comply with patient's rights during the treatment process. The risk of virus transmission affected, amongst others, the ability to visit patients in hospitals, or changes in the dates for planned medical procedures, or pre-scheduled consultations and appointments with doctors. The introduction of such legal regulations had the aim of limiting the spread of the SARS-CoV-2 coronavirus that causes COVID-19 as a medical condition. In many cases, the state of healthcare at the time limited access to health services, and was additionally related to the lack of direct contact with the medical personnel [17].

A relatively small percentage of the participating paramedics indicated their education at school or in university as their main source of knowledge regarding patient's rights. Similar results were obtained by Olejniczak et al. and Wdowiak [18, 19].

As revealed in the present study, paramedics with a higher level of education more readily evaluated their knowledge of patient rights as satisfactory than those with secondary education. The obtained results of the present research align with the results of Grochans and colleagues, who showed that nurses with professional higher education showed a broader knowledge of patient's rights [20].

There is a research gap in the literature when it comes to broad and contemporary findings relating directly to the issue of compliance with patient's rights by medical personnel. The patients are not fully aware of the course and methods of treatment, therefore executing patient's rights requires the dissemination of information about patient's rights among society and medical personnel. Patients do not always receive full information regarding their illness from the medical personnel, which could be understood as a violation of one of the most basic patient rights. The researchers also underline the fact that the medical personnel often neglect to inform patients about the effects that a given diagnostic method or medical treatment entails [14, 15, 21, 22].

Research by Gotlib et al. [14], which included 100 doctors and 100 nurses as participants with the aim of analyzing the knowledge and attitudes of medical personnel in regards to patient's rights, showed that 74% of the personnel would have a good, quite good or very good understanding, meanwhile the remaining 26% showed a level of knowledge that was unsatisfactory, low or average. A convergence between the results of that study and the present research was observed. Similarly, in the case of participants witnessing patient's rights violations in the workplace, the observed rates were almost identical (Gotlib et al. 64%, present study 64.90%). However, it is worrisome that there are observed significant differences in the knowledge of legal regulations regarding patient's rights. In the present research, 8.20% declared a knowledge of them in relation to the WHO Patient's Rights Charter, 9.70% pointed to the European Charter of Patients' Rights, 49.30% indicated the Act on the Patient's Rights and the Patient's Rights Ombudsman, 24.60% – the Constitution of the Republic of Poland, while 8.20% of the respondents admitted to not being familiar with any sort of legislation regulating patient rights. In the research by Gotlib et al., participants declared familiarity with the above at the

rates of 17%, 18%, 78%, 30%, and 1% respectively. Meanwhile, as far as the method of informing patients about their rights is presented in the cited research, we find a difference between the results obtained by Gotlib and in the present study. This discrepancy was likely to be a result of the different nature, location and circumstances of the medical procedures.

The primary aim of the research conducted by Czajkowska et al. [15] was the evaluation of the level of knowledge of patient's rights among medical personnel employed in healthcare facilities. The research was prospective in nature and involved 901 medical professionals, including 200 doctors, 493 nurses and 208 midwives. The research pointed to a broad knowledge (definitely good and rather good) of patient's rights by the participating doctors (83%), nurses (88%) and midwives (86%), which correlates with the results obtained in the present research on this matter. A similar correlation is found in relation to the knowledge of the components of a patient's rights in the participating sample of the cited research. As far as individual rights were concerned, the participants of Czajkowska et al.'s research indicated the knowledge of a patient's right to health services (85% doctors, 94.52% nurses, 80.77% midwives), patient's right to information (95%, 97.57%, and 80.77% respectively); patient's right to consent to medical services (95%, 97.57%, and 80.77% respectively), patient's right of respect for their intimacy and dignity (92.50%, 99.80%, and 96.15% respectively), patient's right to access to their medical records (93.50%, 95.54%, and 94.23% respectively), patient's right of respect for their private and family life (83%, 87.83%, and 88.46% respectively) [15].

CONCLUSIONS

1. Almost $^1/_3$ of the paramedics participating in the research possess an unsatisfactory level of knowledge regarding patient's rights. Simultaneously, more than half of them were of the opinion that the contemporary patient's rights are not respected in their workplace.
2. It was determined that education is the factor determining the level of knowledge and respect for a patient's rights, as well as the risk of their violation.
3. The obtained results indicate a need for educational measures to be undertaken in the paramedic professional group with regard to the rights of patients using medical services, which would contribute to the rise in the quality of the services administered during rescue operations.
4. In the process of educating paramedics, matters concerning patient's rights should be introduced as early as during professional higher education, as well as implement a system of obligatory recurring trainings throughout the entire duration of employment.

LIMITATIONS OF THE STUDY

While interpreting the results of the present study, it is important to take into account certain limitations primarily resulting from the period that the research was conducted. The sample participating in the study does not represent the broader population of ERT paramedics, which limits the possibility of generalizing the findings to apply to the entire profession. The data collected for the research was obtained only from a sample consisting of paramedics working for ERTs who agreed to take part in the study. The ERT paramedics participating in the study were employed in one medical facility carrying out EMS duties. The results of the study were obtained on the basis of the opinions of 134 respondents. To make up for this limitation, further research should involve a larger participating sample and include self-developed and standardized measurement tools. Replicating the study will allow for an investigation into the role of other variables which can affect patient-paramedic relations, adding depth to the understanding of the subject of the research.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest.

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Acronyms in medical education: Opinions and knowledge assessment among medical students

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ABSTRACT

Aim: The aim of the study was to test the knowledge and usefulness of acronyms among medical students.

Material and Methods: The study was conducted in the form of a 20-question survey, which were answered by 210 students. Students from fields such as medicine, dental medicine, dental techniques, physiotherapy, pharmacy, emergency medicine, laboratory medicine, cosmetology, public health, dietetics, midwifery and nursing participated.

Results: Among students, 83% were familiar with the acronym ABCDE, 74% with SAMPLE and 54% with FAST. Most of them were well aware of the practical use of a given abbreviation. The greatest knowledge of acronyms was demonstrated by students of medicine, emergency medical services and nursing. 85% respondents believe that they are useful in learning diagrams and 89% said that they reduce the risk of making mistakes during rescue procedures. Many students were also familiar with other abbreviations that are used in medical practice such as APGAR, 4H4T, PMS.

Conclusions: The medical students who took part in the survey showed a lot of knowledge about acronyms. They use abbreviations during internships, work and situations requiring medical intervention. Thanks to these mnemonics, they remember patterns more easily and are less likely to make mistakes when providing first aid to people in need.

KEY WORDS

abbreviation, emergency medicine, SAMPLE, ABCDE, FAST

INTRODUCTION

Acronym is an abbreviation formed from the initial letters of other words and pronounced as a word. They are shorter than the original sentences and commonly used in various fields, especially in medicine [1]. There is an acronym that sums up the qualities of a good clinician, and that is SOAP. The S stands for Systematic method, O for Observation, A for Accessing databases, P means Personal, emphatic attitude. Hence, it follows that abbreviations and acronyms can not only be used in science and practice, but also in self-improvement [2].

Acronyms such as ABCDE, SAMPLE and FAST have their application in emergency medicine.

ABCDE (AIRWAY, BREATHING, CIRCULATION, DISABILITY, EXPOSURE) stands for the initial assessment of the patient, it helps to determine whether there is a risk of life, without skipping important steps to check vital signs. SAMPLE (SYMPTOMS, ALLERGIES, MEDICATIONS, PAST MEDICAL HISTORY, LAST MEAL, EVENTS) is useful when conducting an effective interview with the patient, their family and eventually witnesses of the event so as not to miss out on key information [3,4]. FAST (FACE, ARM, SPEECH, TIME) is a scale used to assess the first signs of an acute stroke, especially in non-hospital settings [5].

The stress that accompanies medical students affects not only their private lives, but also the academic sphere therefore, abbreviations that are mnemonics can be more effective than the traditional form of learning [6, 7]. There are different types of mnemonics, many people use visual memory and better remember figures, diagrams, or colorful motives, while others prefer linguistic cognitive strategy and remember more by listening. The poems are characterized by their own melody, rhythm and that makes it easier to acquire knowledge faster, which is especially useful when learning the anatomy of the human body [7, 8].

The English media investigated the impact of a campaign promoting the acronym FAST on the possible recognition of early signs of stroke by population. Although the response from people has been positive, it has not been proven that popularizing this acronym has an impact on the possible quick and appropriate response to a probable stroke [9].

On the other hand, a drastically increasing number of acronyms can cause confusion among apprentices. Abbreviations can have many meanings depending on the field, as well as various meanings in different languages [1, 10].

From the other side James Gary, an author of medical books in the field of emergency medicine, admits in his works that despite many years of experience working in a hospital, he often uses the popular ABCDE scheme himself [11].

Table 1. Characteristics of respondents.

Variable	Subgroup	n	[%]
Gender	Male	63	30
	Female	147	70
Age	Mean ±SD	22.06 ±3.69	
Field of study	Medical	92	43.81
	Physiotherapy	42	20.00
	Emergency Medical Technician	29	13.81
	Dentistry	16	7.62
	Nursing	12	5.71
	Other	19	9.04

In medical school, the amount of material is overwhelming, which is why acronyms can make it easier to remember patterns and allow to consolidate the acquired knowledge.

Our research group decided to investigate the attitude of medical students towards acronyms used in emergency medicine. In addition, the study also tested the knowledge of the meaning of acronyms among the respondents.

THE AIM

The aim of the research was to investigate the attitudes of medical students to acronyms used in emergency medicine and to check how useful they are for the students. In addition, the study also tested the knowledge of the meaning of acronyms among the respondents.

MATERIAL AND METHODS

To conduct the study, a questionnaire consisting of 20 questions was used. 9 of them were single-choice questions. 4 of them were multiple-choice questions. The remaining 7 questions assessed opinions, attitudes or views towards acronyms using a 5-point Likert scale: 1-I disagree; 2-I somewhat disagree; 3-I neither agree nor disagree; 4-I somewhat agree; 5-I agree. The research was conducted from 12th December 2023 to 27th January 2024. The link to the questionnaire was sent to the students via online messengers. Participants could submit a reply only once. The survey enclosed questions about knowledge of acronyms and their meanings. Also, there were additional questions about the usage of acronyms in various life situations among students and their preferences towards a particular language. The process of creating the questionnaire included:

- review of literature and guidelines,
- preparation of a list of questions appropriate to the aims of the study,
- content assessment by an experienced subject-matter expert and minor modifications to the questions,
- preparation of the final form of the online survey using the Microsoft Forms application.

The survey was addressed to students of the Medical University of Lodz of all years. Medical students are forced to assimilate a large amount of knowledge, in addition, after graduation, they undertake highly responsible jobs, which is why they are exposed to a lot of stress. Acronyms can be helpful for the students in remembering certain procedures or minimizing the risk of making mistakes.

RESULTS

CHARACTERISTICS OF RESPONDENTS

A total of 210 subjects participated in the study, 70% (n=147) women and 30% (n=63) men. The average age of the respondents was 21,4. The research was led among students of Medical University of Lodz. Fields of study of respondents include: medicine, dental medicine, dental techniques, physiotherapy, pharmacy, emergency medicine, laboratory medicine, cosmetology, public health, dietetics, midwifery and nursing. Further characteristics of respondents are shown in Table 1.

ABCDE acronym

83% (n=175) of people were familiar with the acronym ABCDE, and each of them answered correctly when asked about the meaning of this acronym. 25% (n=66) of the respondents had never used this abbreviation, 51% (n=136) had used it in class, 13% (n=35) had used it during practice, and 5% (n=14) had used it when witnessing an accident, and 6% (n=16) had used it at work. According to 70% (n=147), the acronym was helpful in remembering the scheme to assess the victim's condition, 10% (n=21) did not have an opinion, the rest did not think it was helpful or did not know it.

SAMPLE acronym

Among the respondents, 74% (n=156) were familiar with the acronym SAMPLE, of which 97% (n=151) knew exactly what it was for. 25% (n=76) have never used SAM-

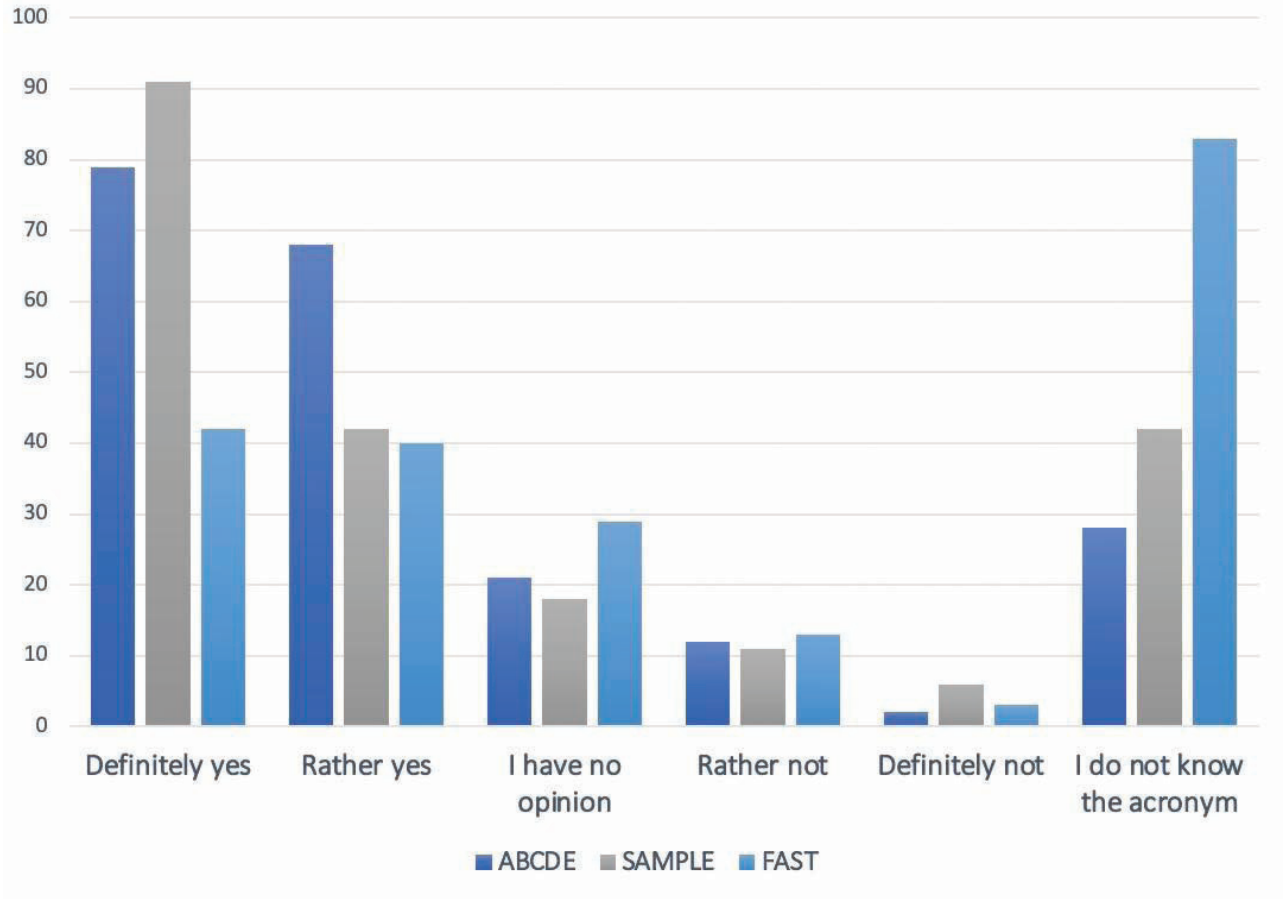

Fig. 1. Respondents' answers to the question: Does the acronyms ABCDE, SAMPLE and FAST help you with remembering various procedures?

PLE, 41% (n=124) have used it in class, 21% (n=63) have used it in practice, 6% (n=18) have used it as a witness to an accident, and 6% (n=19) have used it at work. The acronym SAMPLE was helpful in remembering the pattern of collecting the patient's medical history 63% (n=133), 8.5% (n=18) did not have an opinion, the remaining number did not know it or did not find it helpful.

FAST acronym

54% (n=114) knew the acronym FAST, of which 87% (n=99) knew its correct use. The majority of 61% (n=147) have never used this acronym, 23% (n=56) have used it in class, 9% (n=21) have used it in practice, 2% (n=5) have used it as a witness to an accident, and 6% (n=11) have used it at work. 39% (n=82) thought that FAST was helpful in remembering the first symptoms of a stroke, 14% (n=29) had no opinion, the rest of the people did not know the abbreviation or considered it unnecessary.

USEFULNESS OF ACRONYMS IN LEARNING AND LIFE

The vast majority of respondents, as many as 85% (n=178), believe that the acronyms ABCDE, SAMPLE, FAST accelerate the learning of patterns in emergency medicine and help in remembering them, 8% (n=17) had no opinion, the remaining number of respondents did not find them useful. When asked whether the use of acronyms in emergency medicine reduces the chance of skipping any of the stages of a given regimen, 89% (n=187) of the researchers answered in the affirmative, 4% (n=9) had no opinion, the rest answered in the negative. 81% (n=171) of people thought that acronyms reduce the risk of making a mistake, 9,5% (n=20) had no opinion. A comparison of the usefulness of ABCDE, SAMPLE and FAST acronyms are shown in Figure 1. A question was also asked about the language preferences of acronyms. 47% (n=98) prefer acronyms in Polish, 38% (n=79) do not have a sentence, and 16% (n=33) prefer them in a foreign language.

EXAMPLES OF OTHER ABBREVIATIONS

During the multiple-choice question, the largest number of respondents 75% (157) also knew the acronym APGAR (APPEARANCE, PULSE, GRIMACH, ACTIVITY, RESPIRATION), 50% (n=106) knew AVPU (ALERT, VERBAL, PAIN, UNRESPONSIVE), 48% (n=101) knew about the abbreviation 4H4T (HYPOXIA, HYPO/HYPERKALAEMIA, HYPO/HYPERTHERMIA, HYPOVOLAEMIA; TENSION PNEUMOTHORAX, TAMPONADE, THROMBOSIS, TOXINS) many respondents also knew acronyms such as: PMS (PULSE, MOTOR SKILLS, SENSORY), GCS (GALSGOW COMA SCALE). And MASS (MELBOURNE AMBULANCE STROKE SCALE).

GENDER AND FIELDS OF STUDY CORRELATION

According to the statistics, students of medical, paramedical and nursing majors distinguished themselves by their knowledge of ABCDE and SAMPLE acronyms. 92% (n=85) of medical students and 92% (n=11) of nursing students declared that they know the ABCDE acronym and all of them responded correctly to the question about its meaning. 89% (n=82) of medical students and 100% (n=12) of nursing students confirmed their knowledge of the acronym SAMPLE. 4% (n=4) students in the medical field of study and 17% (n=2) of nursing major answered incorrectly in the question about the meaning. 100% (n=29) of paramedical students had knowledge about ABCDE and SAMPLE abbreviations. In addition, nursing students demonstrated the highest level of proficiency in the acronym FAST- 92% (n=11) responded accurately when inquired about the significance of the acronym.

Outside of university classes - during internships, at work, or as a witness to an accident, men are about two times more likely to use the acronyms SAMPLE, ABCDE, and FAST compared to women.

DISCUSSION

Recalling the Cambridge Dictionary, the definition of an acronym is „an abbreviation consisting of the first letters of each word in the name of something, pronounced as a word" [12].

The professional work of people involved in health care is incredibly demanding, and there is no tolerance for mistakes. The regimens used by medics are highly intricate, and most often they have to be performed in a designated order. Due to this, it is highly important to remember their sequence correspondingly, in which acronyms proved to be fully beneficial [13].

The usefulness of acronyms in education was mentioned previously in 1981, when it was found that the use of special mnemonic devices, including acronyms, produced spectacular results in terms of improving memorization efficiency. It was also recognized that the introduction of mnemonic acronyms into the education system was a step forward in the development of the theory of mnemonic devices [14].

The aim of our study was to learn students' approach to the use of acronyms, analyze their usefulness, and verify students' knowledge of acronyms. The acronym ABCDE gained by far the greatest awareness among the respondents, which is consistent with its popularity among research materials. In our study, 83% (n=175) of respondents declared knowledge of the acronym, and all of them confirmed this in the test. This is slightly better result than that obtained at Radboud University Medical Center in the Netherlands, where knowledge of the acronym among hospital employees was 80.1%. 68.57% (n=144) of respondents use the ABCDE acronym during classes at the university, during internships, at work and in random situations, when they have to provide first aid. Moreover, 70% (n=147) of students declare that it helped them remember the scheme for assessing the injured person's condition, which indicates its great usefulness. This is also confirmed by the analysis conducted in the Netherlands, that the acronym is in constant use [15].

The acronym FAST presented to be the least popular among students. Only 54% (n=114) of respondents declared their knowledge of it, of which 87% (n=99) correctly stated its meaning. The majority of respondents, as many as 61% (n=147), had never used this acronym and only 39% (n=82) of respondents positively assessed its usefulness in remembering the symptoms of a stroke. However, research conducted by Shuangyue Tan et al showed, that the FAST acronym significantly shortens diagnostic time and speeds up treatment [16]. Nevertheless, this is in contradiction with the results of a social campaign conducted in the United Kingdom, where the conclusions were ambiguous, despite the positive opinion of clinicians. [9] Similar inferences to those resulting from our study were presented by researchers analyzing the knowledge of the FAST acronym among stroke patients and stroke incident witnesses [17]. Differences in the data presented by researchers from different research centers lead to the clear conclusion that research regarding the acronym FAST should be further conducted.

In our study, 85% (n=178) of respondents agreed with the statement that using the acronyms ABCDE, SAMPLE, FAST speeds up learning patterns in emergency medicine and helps in remembering them. 89% (n=187) of students admitted that they believe that the use of acronyms in emergency medicine reduces the risk of missing any stages of a given treatment regimen. Additionally, 81% (n=171) of students agreed that acronyms reduce the risk of making mistakes. This result should be given special attention because medicine is a field in which there is no room for error.

The results of previous research present data confirming our conclusions. Acronyms, especially the ABCDE acronym, are actively used by healthcare professionals, proving their utility [18]. The use of acronyms by medical professionals has a significant impact on another important issue in medicine – the time. Thanks to a study conducted in Australia on the benefits and drawbacks of the Ambulance Clinical Triage for Acute Stroke Treatment (ACT-FAST) algorithm, we know that the use of acronyms by medical specialists shortens the time needed for diagnosis and triage [19].

According to the newest research, acronyms help workers in Hospital Emergency Rooms and Intensive Care Units perform more procedures in the right order and do not prolong the patient assessment in advanced life support and peri-arrest care [20, 21]. However, other studies have shown that medics in some wards are reluctant to use acronyms in practice. Despite this, researchers agree that the ABCDE approach is well-known and widely used. Additionally, findings reported in other articles support the continued dissemination of acronyms

in medical education [22]. This statement is also strongly supported by our study. Therefore, acronyms should be introduced into the training schemes of health care workers and medical professionals should be encouraged to use them. It is also a good idea to provide people who have no contact with medicine with education on acronyms such as FAST, because public awareness of the first symptoms of a stroke is very low [17].

84.76% (n=178) of students reported knowledge of acronyms other than those covered by our study. Respondents declared knowledge of acronyms such as APGAR, PMS, AVPU, 4H4T. The presence of acronyms in medicine is a very extensive and still topical topic. Research on the use, utility and popularity of acronyms is still ongoing. Considerations are also being made regarding their usefulness in education [9,17], which was the main focus of our study. New acronyms appear constantly in the medical literature. Examples from recent studies include "CHOICES" determining various toxic etiologies of acute toxic leukoencephalopathy (ATL) and "REVISIONS" - the tool to distill the unique anatomical contributions of primary endoscopic sinus surgery [23, 24].

CONCLUSIONS

Our study showed that among the students of the Medical University of Łódź, knowledge of the acronyms ABCDE, SAMPLE and FAST is at a high level. Most of the respondents confirmed their declared knowledge of acronyms in a short test. The students actively use acronyms in practice as students. Respondents also agree that the acronyms mentioned helped them remember the medical procedures they refer to. Our study confirmed that acronyms accelerate the learning of emergency medicine patterns and help in remembering them. The data we presented also demonstrates that acronyms reduce the chance of making a mistake in the order in which a medical procedure is performed and decrease the risk of error.

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CONFLICT OF INTEREST

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Relation between age and difficult intravenous access among patients hospitalized in Internal Medicine Department

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ABSTRACT

Aim: Analysis of relation between Internal Medicine Department patients' age and difficult intravenous access based on A-DIVA scale.

Material and methods: Research was undertaken among 120 patients hospitalized in Internal Medicine Department of Szpital Czerniakowski sp. z o.o. hospital in Warsaw between May 10th, 2021 and May 19th, 2023. The Vascular Access and Infusion Team of the facility qualified patients for having indirect intravenous access by A-DIVA scale. The following statistical methods have been used to analyze nursing documentation of the research group: descriptive statistical analysis, frequency analysis, Spearman's rank correlation coefficient, Mann-Whitney test and Fisher's exact test.

Results: Research has proven significant correlation between increasing age and the increase in A-DIVA scale score. A-DIVA score is significantly lower among patients aged 18-60 than among patients over the age of 60. Along with increasing age the time of cannula keeping decreases significantly.

Conclusions: The use of A-DIVA scale in everyday clinical practice needs to be popularized as it is useful tool on early hospitalization stage. Age should be implemented as additional A-DIVA scale parameter.

KEY WORDS

age, internal ward, adult difficult intravenous access scale

INTRODUCTION

Over the last years an increase in elderly patients' admissions to Internal Medicine Department has been observed. This tendency is mainly related to circulatory system and digestive tract diseases [1]. The risk of prolonged hospitalization also increases with age. This calls for comprehensive drug therapy and fluid therapy in Internal Medicine Department, calling for adequate intravenous access [2-3]. The Adult Difficult Intravenous Access (A-DIVA) scale is used to assess difficult intravenous access on the basis of the following variables: history of difficult intravenous access, no palpable vein after tourniquet application, no visible vein after tourniquet application, vein diameter below 2mm after tourniquet application [4]. Moreover, the following variables have been listed as potential risk factors of difficult intravenous access: age, body mass index, blood vessel disease, Bartel scale independence degree [5]. Despite research confirming the influence of age on failed initial cannulation attempt, there is no research conclusively stating that age does influence the difficulty of intravenous access based on A-DIVA scale [6]. Korean research conducted in 2021 aimed at working out new tool for classifying patients of general departments on the basis of care intensity degree, underlined the need to intensify nursing care in the field of infection control (also while maintaining intravenous access) among the elderly patients [7]. Nurses have a tendency to notice symptoms of deteriorating clinical condition. Therefore the use of additional tools to classify difficult intravenous access is of special significance in everyday nursing practice [8]. In order to prevent risk factors endangering patient with difficult intravenous access (multiple cannulation attempts, pain, procedure-related stress) it is recommended to choose the cannulation site with the use of Dawson zones, frequently used while inserting central line. In order to obtain safe intravenous access, taking into account anatomical features and patient's health status, it is recommended to use ultrasound imaging [9].

THE AIM

Analysis of relation between Internal Medicine Department patients' age and difficult intravenous access based on A-DIVA scale.

MATERIAL AND METHODS

Bio-ethical Committee of Warsaw Medical University has given clearance to perform retrospective research. The management of Szpital Czerniakowski sp. z o.o. hospital in Warsaw (hereinafter referred to as Czerniakowski Hospital) has granted permission to analyze nursing

documentation of patients qualified for research. 120 patients have been included, all hospitalized in Internal Medicine Department of Czerniakowski Hospital in Warsaw between May 10th, 2021 and May 19th, 2023. The Vascular Access and Infusion Team of the facility have used A-DIVA scale while qualifying patients for indirect intravenous access. Patient inclusion criteria were as follows: patient's permission to have indirect intravenous line inserted by Czerniakowski Hospital Vascular Access and Infusion Team, age over 18, hospitalization in Internal Medicine Department of Czerniakowski Hospital between May 10th, 2021 and May 19th, 2023. Data from indirect intravenous line observation card has been analyzed between October and December 2023. Data was transferred to Microsoft Office Excel 2007 software. Data was anonymized by not including first name, family name, PESEL number and date of birth. Patients were given numbers (1-…) corresponding to intravenous line insertion order. The following statistical methods have been used to analyze nursing documentation of the research group: descriptive statistical analysis, frequency analysis, Spearman's rank correlation coefficient, Mann-Whitney test and Fisher's exact test. Statistical analysis researched the correlation between major variable ("Age") and the following variables: A-DIVA score, type of chosen vein, cannula length and size, presence of phlebitis, extravasation occurrence and cannula keeping time.

The relevance level was determined as $\alpha = 0.05$ (results of $p < 0.05$ are considered statistically significant).

RESULTS

RESEARCH GROUP CHARACTERISTICS

Number of individuals researched was n= 120.

Gender: 'female' (n = 86; 71.7%), 'male' (n = 34; 28.3%).

The average age in research group was M = 76.82 years (standard deviation SD = 15.065).

SURVEY RESULTS

The most frequent indication to perform medical procedure was the co-existence of both indicated factors – difficult intravenous access and predicted therapy longer than 6 days (n = 117; 97.5%). In case of 1.7% of researched individuals the only indication was difficult access (n = 2), in one case the only indication was therapy exceeding 6 days (n = 1; 0.8%).

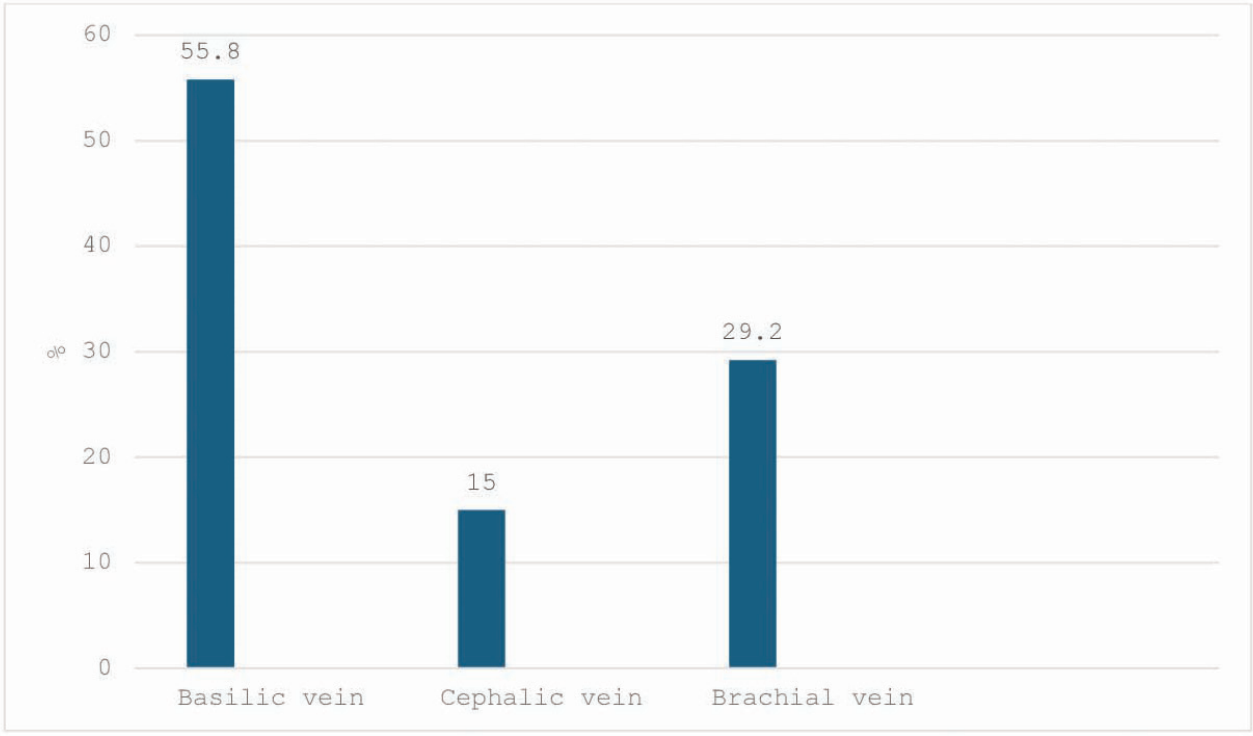

Fig. 1. Percentage distribution regarding „Vein" variable, (n=120).

Table 1. Basic descriptive statistics.

Variable	N	M	SD	Me	Min.	Max.	Skewness	Kurtosis
Cannula length (cm)	120	14.52	2.980	15.00	8.50	20.00	0.39	-0.27
FR cannula size	118	3.14	0.494	3.00	2.00	4.00	0.30	0.55
A-DIVA score	120	4.67	0.663	5.00	2.00	5.00	-2.11	4.00

n – number of relevant observations, M – mean, SD – standard deviation, Me – median, Min. – minimum value, Max. – maximum value

In most cases cannulation was on upper right extremity (n= 66; 55%).

In other cases cannulation was on the left extremity (n = 54; 45%).

Results regarding „Vein" variable are presented in figure 1.

Procedure was most frequently on basilic vein (n = 67; 55.8%), followed by brachial vein (n = 35; 29.2%) and cephalic vein (n = 18; 15%).

Basic descriptive statistics regarding selected variables are presented in table 1.

In research group the mean values of respective variables were as follows: „Cannula length in cm" M = 14.52 (SD = 2.980), „FR cannula size" M = 3.14 (SD = 0.494), „A-DIVA score" M = 4.68 (SD = 0.663).

In researching correlation between age and FR cannula size n=118 is caused by lack of information about cannula type in nursing documentation regarding 2 patients.

Results obtained regarding DAWSON zone are as follows: „green" (n = 118; 98.3%), „yellow" (n = 1; 0.8%), „red" (n = 1; 0.8%).

Result regarding „Removal cause" variable are presented in figure 2.

The most frequent removal cause was patient's death (n = 38; 31.7%).

In case of 30% of researched patients the cause of cannula being removed was the end of therapy (n = 36). The percentage of remaining reasons of removal was as follows: „Removed by patient" (n = 23; 19.2%), „cannula

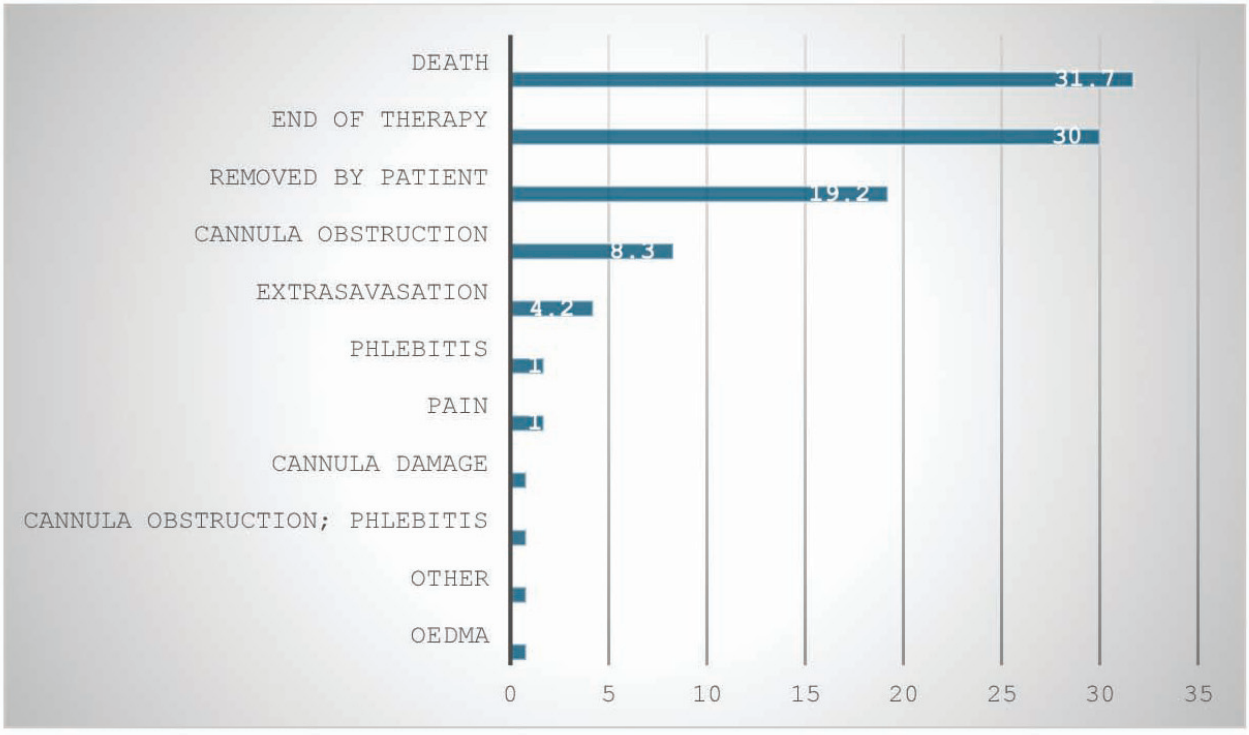

Fig. 2. Percentage distribution regarding „Removal cause" variable, (n = 120).

Table 2. Basic descriptive statistics.

Variable	N	M	SD	Me	Min.	Max.	Skewness	Kurtosis
Keeping time (days)	120	10.32	8.474	8.00	1.00	50.00	2.08	5.81
Aspiration time until the first pause (days)	120	4.83	4.166	4.00	1.00	25.00	2.24	6.77
Aspiration time (total, days)	120	6.58	5.614	5.00	1.00	41.00	2.59	11.15

n – number of relevant observations, M – mean, SD – standard deviation, Me – median, Min. – minimum value, Max. – maximum value

Table 3. Basic descriptive statistics – division by „Age" variable.

	Age range (years)	N	M	SD	Me	Min.	Max.	IQR
A-DIVA score	18-60 years	15	4.27	0.961	5.00	2.00	5.00	1.00
	over 60 years	105	4.73	0.593	5.00	2.00	5.00	0.00

n – number of relevant observations, M – mean, SD – standard deviation, Me – median, Min. – minimum value, Max. – maximum value, IQR – interquartile range

obstruction" (n = 10; 8.3%), „extravasation" (n = 5; 4.2%), „pain" (n = 2; 1.7%), „phlebitis" (n = 2; 1.7%), „edema" (n = 1; 0.8%), „other" (n = 1; 0.8%), „cannula obstruction; phlebitis" (n = 1; 0.8%), „cannula damage" (n = 1; 0.8%).

Basic descriptive statistics regarding selected variables are presented in table 2.

In research group the mean values of respective variables were as follows: „Keeping time (days)" M = 10.32 (SD = 8.474), „Aspiration time until the first pause (days)" M = 4.82 (SD = 4.166), „Aspiration time (total, days)" M = 6.58 (SD = 5.614).

STATISTICAL TEST RESULTS

SPEARMAN'S RANK CORRELATION COEFFICIENT RESULTS

In order to determine the strength and direction of dependence between „Age (years)" and „A-DIVA score" variables, Spearman's rank correlation coefficient was used.

Results of analyzing Spearman's rank correlation coefficient indicate the presence of significant correlation between „Age (years)" and „A-DIVA score" variables, rho = 0.19*, 95% CI [0.01,0.36], p = 0.035, n = 120 – strength of correlation turned out weak, direction of dependence

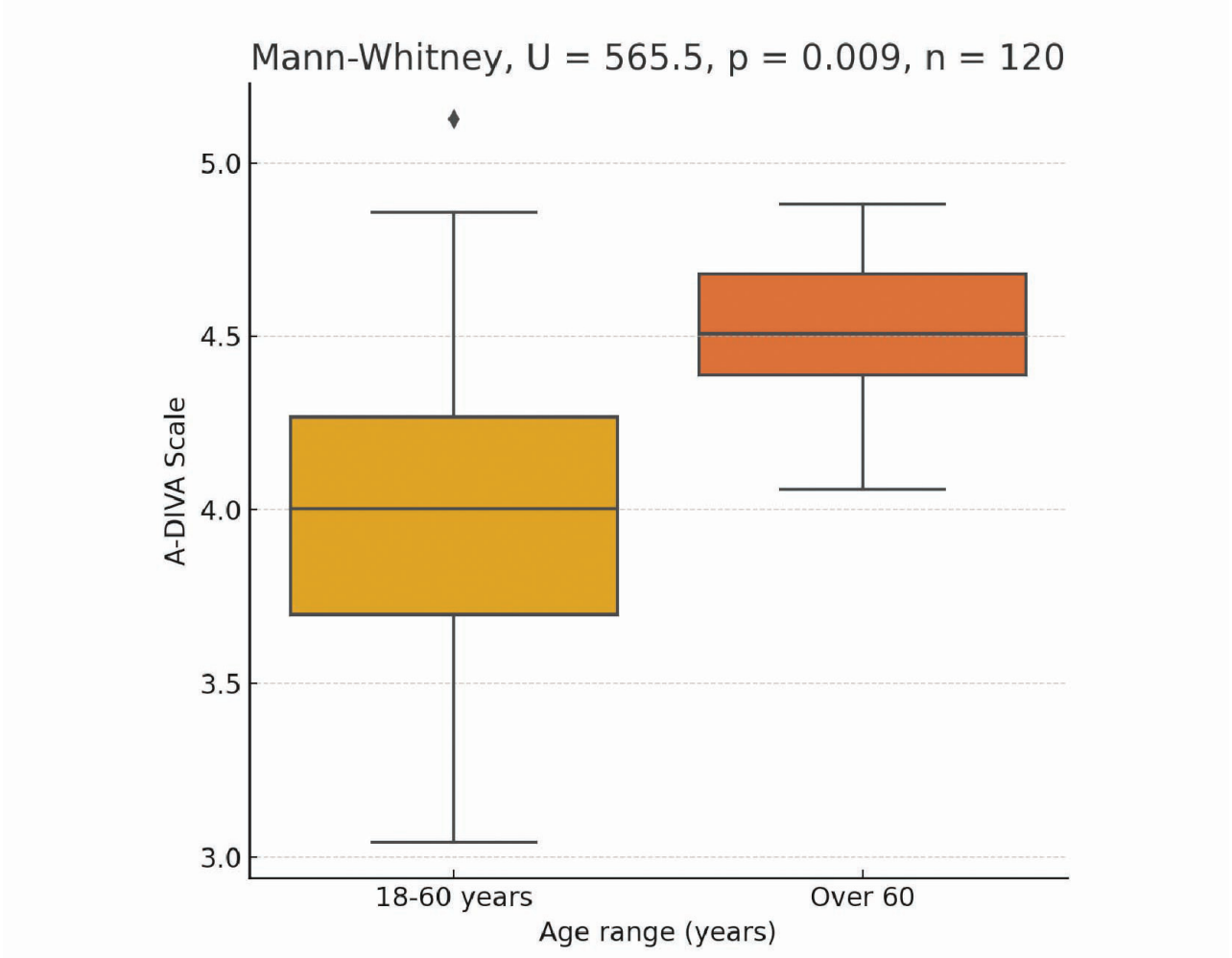

Fig. 3. Difference between groups regarding „A-DIVA score" variable – division by „Age" variable.

H1: 18-60 years < over 60 years

Table 4. Percentage spread of answers – division by „Age range (years)" variable.

Vein	n	Age range (years)	
	120	18-60 years, N = 15	Over 60 years, n= 105
Basilic vein		9 (60.0%)	58 (55.2%)
Cephalic vein		3 (20.0%)	15 (14.3%)
Brachial vein		3 (20.0%)	32 (30.5%)

Table 5. Result of Fisher's exact test – relation between "Age range (years)" and "Vein" variables.

				95% CI	
	N	P	Cramer's V	Lower	Upper
Vein	120	0.597	0.00	0.00	0.19

Table 6. Spearman's rank correlation coefficient results.

				95% CI		
Variable 1	Variable 2	N	rho	Lower	Upper	P
Age	Cannula length (cm)	120	0.00	-0.19	0.18	0.969
Age	FR cannula size	118	-0.03	-0.22	0.15	0.707

turned out positive – „A-DIVA" score would significantly increase with age increase. Among patients aged 18-60 A-DIVA score is lower than among patients over the age of 60.

DESCRIPTIVE STATISTIC'S RESULTS

Basic descriptive statistics regarding relation between „A-DIVA score" and „Age" variables divided into „18-60 years" and „Over 60 years" age ranges are presented in table 3.

MANN-WHITNEY TEST RESULT

In order to determine the significance of differences between the two groups („A-DIVA" score and „Age") the Mann-Whitney test was used.

Results of Mann-Whitney test regarding „A-DIVA score" variable indicate presence of significantly lower values among „18-60 years" category (M = 4.27, SD = 0.961, Me = 5, IQR = 1), when compared to „Over 60 years" category (M = 4.73, SD = 0.593, Me = 5, IQR = 0), U = 565.5**, p = 0.009, rrb = -0.28, 95% CI [-0.54; 0.02], n = 120. Strength of the effect observed (rrb) turned out high.

The results obtained are presented in figure 3.

RESULTS OF NOMINAL VARIABLE DEPENDENCE ANALYSIS (DIVISION BY „AGE RANGE (YEARS)" VARIABLE)

Frequency analysis results considering division by „Age" variable are presented in table 4.

FISHER'S EXACT TEST RESULTS

In order to determine the correlation between "Age" ranges "18-60 years" and "Over 60 years", Fisher's exact test was used. Results are presented in table 5.

The result of Fisher's exact test does not indicate significant relation between age and type of vein.

SPEARMAN'S RANK CORRELATION COEFFICIENT RESULTS

In order to determine the strength and direction of dependence between „Age (years)" and remaining selected variables, Spearman's rank correlation coefficient was used. The obtained results are presented in table 6.

Results of Spearman's rank correlation coefficient analysis do not indicate the presence of significant correlation between age and remaining variables analyzed.

In order to determine the strength and direction of dependence between „Age (years)" and „Keeping time (days)" variables, Spearman's rank correlation coefficient was used.

Results of Spearman's rank correlation coefficient indicate the presence of significant correlation between „Age (years)" and „Keeping time (days)" variables, rho= -0.39***, 95% CI [-0.54,-0.23], p <0.001, n=120 – dependence strength turned out high, dependence direction turned out negative – „Keeping time (days) variable value significantly decreases with age increase.

DISCUSSION

This retrospective correlation research aimed at analyzing dependence between age and difficult intravenous access based on A-DIVA scale among Internal Medicine Department patients. Negative influence of age on A-DIVA score has been proven. This is the first research which shows conclusive, not potential, correlation between age and A-DIVA score.[4-5]. This means that the higher patient's age is a factor influencing the success of initial vein cannulation attempt. Therefore one should pay special attention to individual approach in terms of nursing care in order to ensure the best possible intravenous access care [6]. The need to utilize tools enhancing the correct choice of cannula type is also related to selecting proper methods, such as ultrasound imaging which becomes increasingly popular within nursing environment [10]. Education of nurses in the field of using ultrasound imaging is key, given the confirmed effectiveness of such procedure while obtaining difficult intravenous access among patients [11].

LIMITATIONS

Research undertaken in single facility, small research group n=120.

Strengths of the research: so far there was lack of correlation between patient's age and difficult intravenous access based on A-DIVA score.

CONCLUSIONS

1. The use of A-DIVA scale should be promoted in everyday clinical practice as a tool useful for identifying patients with difficult intravenous access at early hospitalization stage.
2. Nursing action should be optimized in order to prolong the time of keeping the cannula within the blood vessel and maintaining its patency.
3. Further analysis should be undertaken in order to examine the reasons of cannula keeping being tolerated for shorter time among patients above the age of 60 than among patients aged 18-60.
4. Detailed analysis of patient's condition and specific anatomical features should be made before inserting cannula, irrespective of patient's age, in order to select cannulation site, length and size of cannula.
5. Patient's age should be implemented as additional parameter in A-DIVA scale as a tool identifying difficult intravenous access.

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CONFLICT OF INTEREST

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Identification of factors causing dyspnea among children reported to the Emergency Department

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ABSTRACT

Aim: Dyspnea turns out to be one of the most common symptoms prompting parents to seek medical help for their children. Our aim is to determine the potential factors causing difficulty in breathing among pediatric patients. It will help to speed up the diagnostic process and allow treatment to be implemented as quickly as possible, which will translate into a better patient prognosis.

Methods: Analysis of medical history of pediatric patients to the Emergency Department of the Children's Clinical Hospital of the University Clinical Center of the Medical University of Warsaw from January 1, 2021 to December 31, 2021. Specification of patients whose main symptom was dyspnea and identification of factors causing shortness of breath due to age.

Results: Out of 36,591 pediatric patients, 980 were reported with dyspnea. Factors causing difficulty in breathing were classified into six groups: infection of lower respiratory tract (80,51%), exacerbation of chronic disease (8,98%), infection of upper respiratory tract (7,14%), foreign body (0,92%), injury (0%), others (6,02%) and unknown cause (3,78%). Most common age group was 2-5 years old (45,92%). 57.35% of children were hospitalized mainly aged 2-12 months (43,24%).

Conclusions: The main cause of difficulty in breathing in each age group was infection of the lower respiratory tract. Despite symptomatic treatment, more than half of the patients required hospitalization. Some patients had more than one cause of dyspnea. Active searching for them and recognition is the key to managing breathing difficulties among children.

KEY WORDS

pediatric emergency medicine, pediatrics, dyspnea, respiratory tract infections, emergency department, Emergency Medical Services

INTRODUCTION

Dyspnea is a subjective feeling of not being able to take a breath [1]. Difficulty breathing is one of the most common symptoms that directly cause anxiety among parents and prompt them to seek medical help for their children [2, 3].

Among pediatric patients, due to age-related difficulties in communication, determining the subjective feeling of dyspnea may be unreliable. Therefore, it is necessary to objectively assess shortness of breath during a physical examination and additional tests, such as: tachypnea, work of additional muscles, changes in breathing rhythm, change in the length of breathing phases, additional breath sounds, cyanosis, and decreased oxygen saturation [4, 5].

The range of causes of shortness of breath includes respiratory diseases, cardiovascular diseases, neurological diseases, anaphylaxis, trauma, foreign body in the respiratory tract, as well as psychogenic causes [5-13]. An important element of the diagnosis should be a thorough interview including the duration of shortness of breath, the circumstances of its occurrence, additional symptoms and the presence of chronic diseases [5].

Additionally, due to the structure of the airways in children, they become obstructed much more easily than in adults, which may pose a direct threat to life [14, 15]. This increases the need for quick diagnosis and implementation of appropriate actions.

Based on thorough literature review, inability to breathe proves to be one of the leading symptoms of disease entities. However, this study examines dyspnea as the primary cause of a pediatric patient's presentation to the Emergency Department (ED). The frequency and severity of the problem of a child presenting with breathing difficulties suggest a clear need to know the statistics regarding the clinical problem. This is especially important for medical units that are not primarily dedicated to pediatric patients. Undoubtedly, data on this subject can speed up the diagnostic and treatment process, as well as improve the patient's prognosis.

THE AIM

This study focused on the analysis of data of pediatric patients who presented with dyspnea to the Emergency Department (ED) of the Pediatric Teaching Clinical Hospital University Clinical Center of the Medical University of Warsaw in 2021. The aim of this study is to identify

the most common causes of shortness of breath among children in particular age groups. The collected database will help identify the age range of pediatric patients who are particularly vulnerable to an episode of dyspnea. We believe that the presence of such data may help to shorten the diagnostic process of breathing difficulties among children, especially in emergency situations and in facilities that do not have contact with pediatric patients on a daily basis. However, data from one hospital, which included only some patients with dyspnea, may make it difficult to draw general conclusions. To be able to determine more detailed data, a larger study scope is needed, covering a larger and more diverse population.

MATERIAL AND METHODS

The study includes a retrospective analysis of data from patients admitted to the Emergency Department of the Pediatric Teaching Clinical Hospital University Clinical Center of the Medical University of Warsaw from January 1, 2021 to December 31, 2021. The patients arrived both by their own transport and by Emergency Medical Service. The included data came from the Hospital Emergency Department and, if necessary, from internal hospital departments in order to determine further diagnostics and the final diagnosis. In 2021, the number of patients admitted to the Pediatric Teaching Clinical Hospital University Clinical Center of the Medical University of Warsaw was 36,591 and there were 980 patients with dyspnea. Patients were divided into 6 groups according to age categories with modified Polish National Health Fund classification (additionally specifying newborns) and gender. Symptoms during the patient's history that were analyzed: fever, cough, chest pain, history of trauma and the presence of chronic diseases. The physical examination detailed the presence of objective symptoms of shortness of breath, such as: tachypnea, work of accessory respiratory muscles, groaning, orthopnea, moving the nasal alea, interrupted speech, and cyanosis. Diagnostics in the Hospital Emergency Department included: chest X-ray, computed tomography, microbiological tests and referral to the internal ward for diagnostic and therapeutic bronchoscopy. The analysis of symptomatic treatment provided by the Hospital Emergency Department included: oxygen therapy, fluid therapy, steroid therapy (other than inhalation), as well as inhalations, including inhalation with saline, adrenaline, inhaled steroid, β2-agonist and a combined preparation of long-acting β2-agonist and short-acting anticholinergic drug. The number of patients requiring hospitalization, the type of ward (surgical, pediatric or intensive care) and the number of days spent in the ward were determined. An important element was the final diagnosis according to the ICD-10 classification. The identified causes of shortness of breath were classified into 6 categories: infections of the upper respiratory tract (according to the anatomical division, including part of the respiratory tract to the larynx; URTI), infections of the lower respiratory tract (including the larynx; LRTI), presence of a foreign body in the respiratory tract, trauma, exacerbation of a chronic disease and others [16]. There were also patients whose cause of shortness of breath could not be determined despite diagnostic tests.

The analysis was carried out using the STATISTICA program. The ANOVA test was used for parametric data, and for non-parametric data, the Chi-squared test was used, adding the Tukey test for unequal groups. A p-value less than 0.05 was set as statistically significant. The owner of the medical documentation is the Pediatric Teaching Clinical Hospital University Clinical Center of the Medical University of Warsaw. Consent from the hospital director was obtained for access to the data, their analysis and publication of the results. Permission was also received from the Bioethics Committee of the Medical University of Warsaw to conduct the study - decision number: AKBE/199/2022. In accordance with the Declaration of Helsinki, the anonymity of the patients was preserved, and the results of the data analysis and the content included in the article below do not enable their identification.

RESULTS

This study analyzed the data of 36,591 patients presenting to the Emergency Department of the Medical University of Warsaw between January and December 2021, of which 980 (2.68%) children with symptoms of dyspnea were identified. More than half of the patients were admitted between September and October (495 patients; 50.51%). The children included 601 (61.33%) males and 379 (38.67%) females (Fig. 1).

The age distribution was presented based on the modified age division of the National Health Fund (additionally specifying newborns). The largest age group were children aged 2-5 (45.92%). Patients under 5 years of age constituted as many as 86.73% of all patients (Table 1, Fig. 2).

PATIENT'S HISTORY

During taking patients' history, cough was reported by 403 (41.12%), fever by 170 (17.35%), chest pain by 16 (1.63%), hemoptysis by 3 (0.31%), and chronic diseases by 166 (16,94%) patients. There was no history of trauma reported. Children with fever were statistically more often hospitalized (85.29%; p=0.00000). The presence of cough was statistically more common in lower respiratory tract infections (86.85%; p=0.00002) and was associated with more frequent admission to hospital (76.43%; p=0.00000). Patients with chronic diseases were also admitted to hospital more often (75.90%; p=0.00000).

PHYSICAL EXAMINATION

During the physical examination, wheezing was detected in 414 (42.24%) pediatric patients, work of accessory respiratory muscles in 317 (32.35%), tachypnea in 272 (27.76%), other signs of shortness of breath (including grunting, movements of the nasal wings, in-

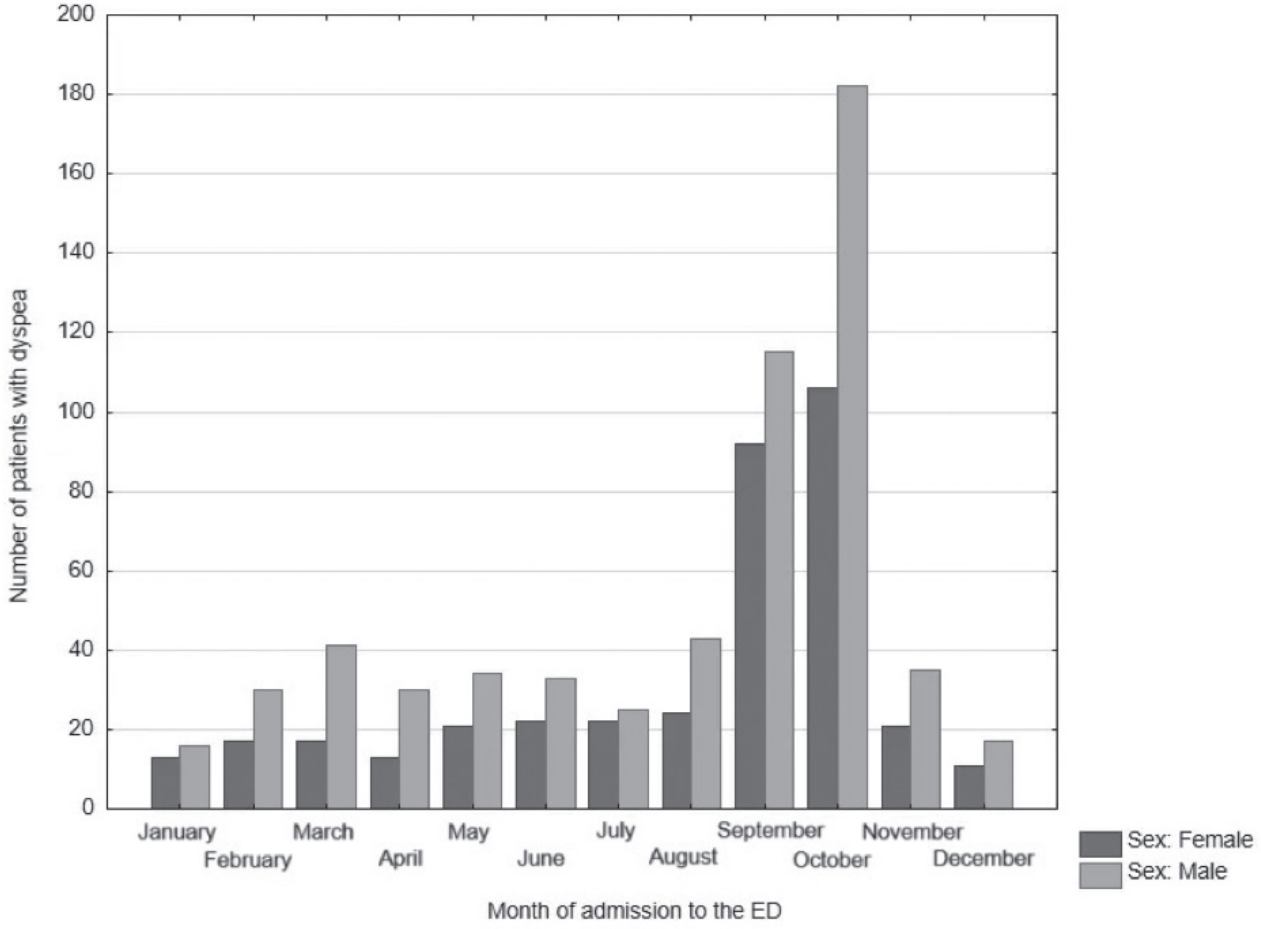

Fig. 1. Division of patients by gender and time of presentation to the ED.

Table 1. Age distribution of patients with dyspnea.

Modified NFZ Group	Age	Patients with dyspnea
Newborns	1-28 days	42
I	2-12 months	358
II	2-5 years old	450
III	6-12 years old	85
IV	>12 years old	45
Total		980

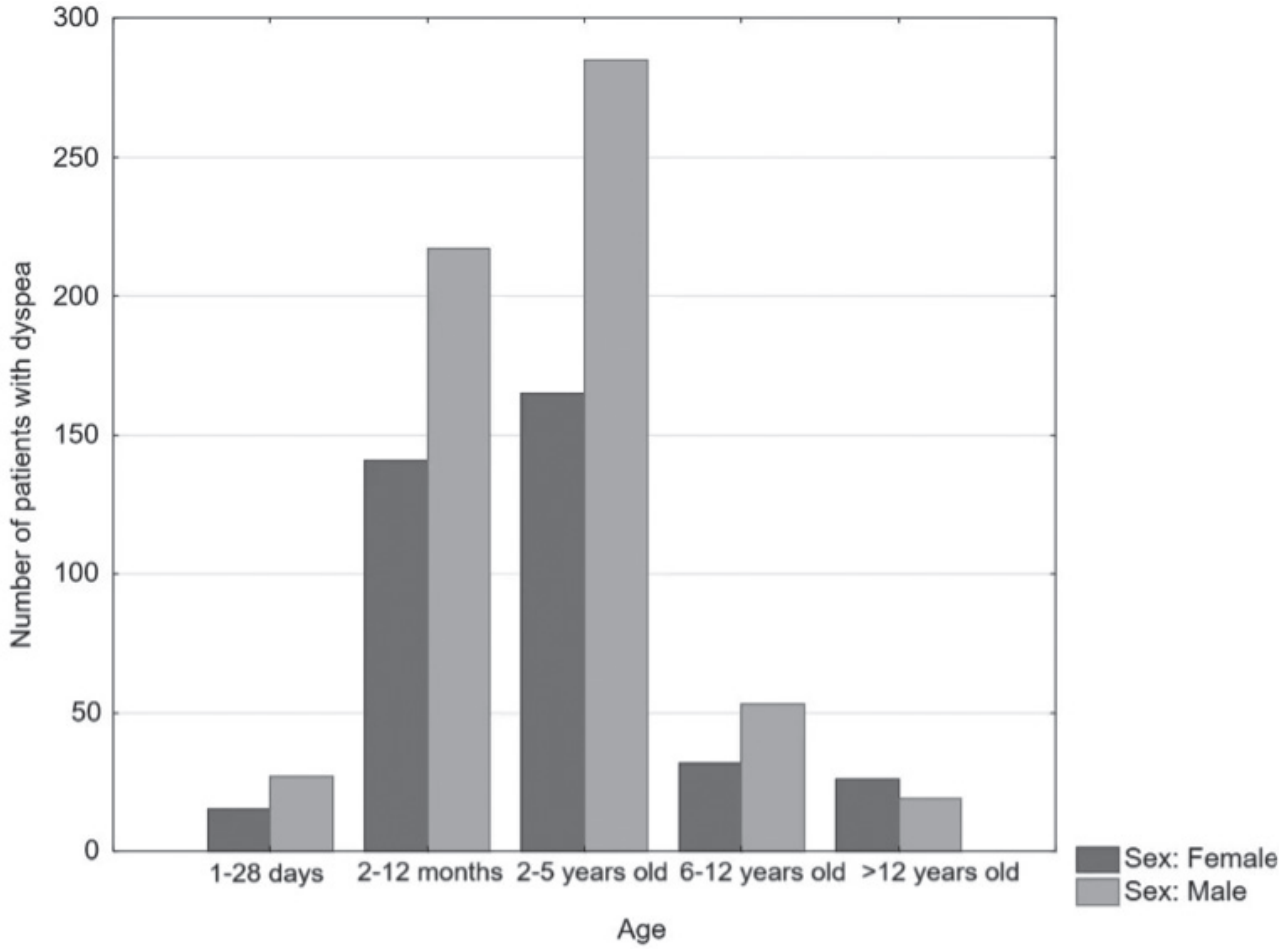

Fig. 2. Division of patients by age and gender.

terrupted speech, heavy breathing) and unspecified in medical records 745 (76,02%), cyanosis 18 (1.84%). The presence of wheezing and tachypnea were statistically more frequent in lower respiratory tract infections (appropriately 87.44%; p=0.00000; 83.82%; p=0.04810) and was associated with more frequent admission to hospital (appropriately 53.38%; p=0.03193; 62.50%; p=0.00291). Wheezing occurred much less frequently in URTI (4.59%; p=0.00657). Tachypnea was also a significant symptom of exacerbation of a chronic disease (70.59%; p=0.00431). The work of accessory respiratory muscles also occurred mainly in lower respiratory tract infections (84.23%; p=0.03934). The appearance of cyanosis showed a strong correlation with admission to hospital (100%; p=0.00001).

ADDITIONAL EXAMINATIONS

Diagnostics of the causes of dyspnea in the (ED) included: chest X-ray examination in 588 (60%) patients, computed tomography in 2 (0.2%), bronchoscopy in 7 (0.71%), COVID-19 test in 193 (19.69%), RSV test in 103 (10.51%), ECG in 14 (1.43%). Chest X-ray examination was performed statistically more often in patients with lower respiratory tract infection (85.37%; p=0.00000) and admitted to hospital (65.84%; p=0.00002). Bronchoscopy was performed more often in patients with a foreign body in the respiratory tract (85.71%; p=0.00000) and required admission to hospital (100%; p=0.00516).

SYMPTOMATIC TREATMENT

The analysis of symptomatic treatment within the ED included: oxygen therapy in 63 (6.43%) patients, fluid therapy in 22 (2.24%), systemic steroid therapy (intramuscular, intravenous, oral and rectal) in 119 (12.14%), inhalations in 407 (41.53%). The nebulization included: β2-agonist (69.78%), corticosteroids (50,61%), adrenaline (8.35%), combined preparation of long-acting β2-agonist and short-acting anticholinergic drug (8.35%), physiological saline (4.91%). However, 152 (37,35%) patients required the administration of at least two different drugs by nebulization.

Patients who had oxygen therapy were statistically more often hospitalized (92.06%; p=0.00000). Children with URTI statistically less often required oxygen therapy (1,43%; p=0.03604), as did those diagnosed with an exacerbation of a chronic disease (19.32%; p=0.00001). Nebulization was most often used in lower respiratory tract infections (87.96%; p=0.00000), and statistically the

most frequently used drugs were β2-agonists in monotherapy (20.28%; p=0.00053). Children with shortness of breath caused by the presence of a foreign body in the respiratory tract were statistically less likely to receive nebulization (11,11%; p=0.04296). Patients who did not receive systemic steroid therapy in the ED were more likely to be admitted to hospital (522 vs. 40; p=0.00000), and the same was for inhalation (369 vs. 193; p=0.00000).

HOSPITALIZATION

Despite the above symptomatic treatment, 562 (57.35%) children required hospitalization, most of them in pediatric wards - 97.86%, and in surgical wards – 1,25%. Care in the Intensive Care Unit was necessary in 5 (0,51%) patients. The average length of hospitalization was 6.76 days. Statistically, patients aged 2-12 months were most frequently hospitalized (43.24% of hospitalized patients; p=0.00000). Almost twice as long hospitalization time for children who had a history of chronic diseases (10.70 *vs.* 5.53 days; p=0.00000) and were treated symptomatically with oxygen therapy (12.18 *vs.* 6.09 days; p=000005) and more than twice as long among children treated with fluid therapy (14.53 *vs.* 6.53 days; p=001346). Additionally, patients hospitalized due to exacerbation of a chronic disease also had a slightly longer hospital stay (9.73 *vs.* 6.35 days; p=0.008388). Due to the lack of places in pediatric wards, 34 (3.47%) children had to be transported to another hospital.

CAUSE OF DYSPNEA

The final diagnosis was classified into 6 groups: upper respiratory tract infection, lower respiratory tract infection, presence of a foreign body in the respiratory tract, trauma, exacerbation of a chronic disease and others. Despite the diagnostics used, the cause of shortness of breath could not be determined in 37 (3.78%) pediatric patients. The results are presented below (Table 2-3).

The most common cause of dyspnea in each age group is lower respiratory tract infection, with 18 (2.28%)

Table 2. Causes of dyspnea among children.

Cause of dyspnea	Number of patients	Most common age
Infection of lower respiratory tract (LRTI)	789 (80,51%)	2-5 years old (48,67%)
Exacerbation of a chronic disease	88 (8,98%)	2-5 years old (53,41%)
Infection of upper respiratory tract (URTI)	70 (7,14%)	2-5 years old (54,29%)
Foreign body in respiratory tract	9 (0,92%)	2-5 years old (44,44%)
Injury	0	-
Others	59 (6,02%)	2-12 months (47,46%)
Unknown	37 (3,78%)	2-5 years old (35,14%)

Table 3. Causes of dyspnea in particular age groups.

Cause of dyspnea	Age group				
	Newborns	2-12 months	2-5 years old	6-12 years old	>12 years old
Infection of lower respiratory tract	27 (64,29%)	304 (84,92%)	384 (85,33%)	55 (64,71%)	19 (42,22%)
Exacerbation of a chronic disease	0 (0%)	16 (4,47%)	47 (10,44%)	19 (22,35%)	6 (13,33%)
Infection of upper respiratory tract	7 (16,67%)	16 (4,47%)	38 (8,84%)	7 (8,24%)	2 (4,44%)
Foreign body in respiratory tract	2 (4,76%)	2 (0,56%)	4 (0,89%)	1 (1,18%)	0 (0%)
Injury	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Others	4 (9,52%)	28 (7,82%)	11 (2,44%)	4 (4,71%)	12 (26,67%)
Unknown	2 (4,76%)	5 (1,40%)	13 (2,89%)	7 (8,24%)	10 (22,22%)

pediatric patients also having URTI and 2 having a foreign body in the respiratory tract (0.25%). In 57 (64.77%) patients, the disease that worsened patient's condition was asthma. In some cases, the cause of exacerbation of a chronic disease was an infection of the upper or lower respiratory tract, in 5 children (5.68%) and 44 children (50%), respectively, and both URTI and LRTI in 3 children (3.41%).

DISCUSSION

There is no doubt that dyspnea among children is a serious medical problem. The study by K.Armon et al. indicates that up to 31% of non-traumatic pediatric patients may present to the Emergency Department with breathing problems [2]. An analysis of the reasons for children's reports to the ED performed 10 years later by R. Sands et al. shows that 85% of the reasons for the reports can be included in the 10 most common medical problems, with shortness of breath being the most common - 20.1% [3]. Despite this downward trend, shortness of breath still remains one of the most common problems among children in hospital emergency departments.

According to S.Y.C. Yoong, among the most common non-traumatic diagnoses in pediatric patients in both pediatric and general hospital emergency departments, URTI ranks first [17]. In our analysis, this is the third most common cause of shortness of breath. Therefore, the risk of a patient presenting with difficulty breathing in the ED is significant.

Our study focused not only on identifying factors causing shortness of breath among reporting pediatric patients, but also on their characteristics and actions taken during their stay in the Emergency Department. The percentage and age of patients with breathing problems differs from the study by D. Borensztajn et al., where they constituted as much as 11.4% of patients, mainly under 2 years of age [18]. A possible cause could be the COVID-19 pandemic, which contributed to an overall decline in patients seeking medical help [19]. The period with the highest number of patients with shortness of breath turned out to be autumn, while winter turned out to be the time when the fewest patients were reported, inconsistent with the seasonality of respiratory tract infections described in the study by Schrijver T. V, et al. possibly related to reduced patient volume in the ED due to fear of exposure to COVID-19 [19, 20].

Regarding the most common abnormalities in the patient's admission examination, the situation was similar to the multicenter study by D. Borensztajn et al. and they included: fever, tachpnea and accessory respiratory muscles.[20] The most frequently performed diagnostic test in the ED was chest radiography, performed mainly in patients with suspected pneumonia. A Finnish study showed that approximately $^{1}/_{3}$ of hospitalized patients diagnosed with pneumonia had no radiological changes on chest X-ray [21]. This type of problem is caused by the difficulty in interpreting radiographs in children and may be associated with misdiagnosis or abuse of this kind of diagnostic tests [21, 22].

Differences in the diagnosis and treatment applied, as well as in the decision to hospitalize, may result from the different guidelines in each country, or from the preferences or practices adopted in distinct hospitals.[18]

According to Jankowska-Folusiak H. et al. lower respiratory tract diseases were the main cause of hospitalization in the pediatric ward [23]. In our study, this diagnosis was the most common factor for dyspnea among children in each age group. That is why quick diagnosis of shortness of breath is so important and can potentially reduce the risk of health deterioration and hospitalization. At the same time, it is worth noting that Stachurski et al. pointed out that determining the child's body weight by the parent is a reliable source of knowledge and allows for the quick implementation of the correct dosage in the Emergency Department [24].

CONCLUSIONS

This study shows that the most common cause of shortness of breath in pediatric patients presenting to the Emergency Department were lower respiratory tract infections. The patients were mainly boys, aged 2-5. Only in the group >12 years did girls predominate. The same cause was also the most common in all other age groups. The most cases recorded in 2021 occurred in the autumn period: September-October.

Children with dyspnea who also presented infectious symptoms, i.e. fever and cough, were hospitalized more often. Similarly to those who reported the presence of a chronic disease in the interview.

The most common findings during physical examination were wheezing, tachypnea, activity of accessory respiratory muscles and other symptoms of shortness of breath. Patients with LRTI more often showed tachypnea, cough, wheezing, and work of accessory respiratory muscles. The first three also contributed to an increased frequency of hospitalizations. Additionally, the presence of cyanosis correlated positively with hospital admission.

The most frequently used diagnostic tests were chest X-ray, COVID test and RSV test. Chest X-ray was performed mainly in patients with LRTI, and bronchoscopy was performed when a foreign body was suspected. Both diagnostic procedures were associated with more frequent hospitalization.

The most frequently used symptomatic treatment in ED was nebulization, and the most frequently used drugs were β2-agonists in monotherapy, mainly in LRTI. Patients requiring oxygen therapy were more likely to require admission to hospital, unlike those who received general steroid therapy or inhalations. Patients with URTI and exacerbation of chronic disease were less likely to require oxygen therapy. Patients with a foreign body in the airway required inhalation less often.

Most patients with difficulty in breathing required hospitalization, mostly in pediatric wards. The most common age group was 2-12 months. Factors prolonging hospitalization: presence of chronic diseases in the history, use of oxygen therapy or fluid therapy in the ED. An

additional factor affecting length of the hospital stay was the diagnosis of an exacerbation of a chronic disease as the cause of shortness of breath.

Some patients had more than one cause of dyspnea. Active searching for them and recognition is the key to managing breathing difficulties among children.

LIMITATIONS

The collected data came from only one hospital, covering a mainly limited population. Additionally, the Pediatric Teaching Clinical Hospital University Clinical Center of the Medical University of Warsaw is a unit with the third level of reference, which means that it becomes a target facility for children requiring multi-specialized care. The period covered by this study is included in the duration of the COVID-19 pandemic, which could translate into the number of patients reporting to the Hospital Emergency Department, as well as the diagnosis and treatment. Additionally, depending on the source, the authors provide different boundaries between the upper and lower respiratory tract, which makes it difficult to compare results in the literature. The above aspects make it difficult to translate the results to a general scale. They should be treated as a tool that can only help estimate the probability of specific causes of dyspnea.

The data collection process was hampered by the hospital's insufficient supply of free places in internal departments, which meant that some pediatric patients had to be sent to other nearby hospitals for hospitalization. It resulted in a lack of information about diagnostics, symptomatic treatment and final diagnosis of some patients. Additionally, the diagnosis was not verified retrospectively, and the lack of standardization of descriptions in the medical records completed by various medical workers resulted in the inability to obtain the same information about each patient.

Establishing more accurate data requires further research based on a broader and more diverse population.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest.

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ORIGINAL ARTICLE

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Evaluation of rescue management in incidents with a high casualty rate – results of own research

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ABSTRACT

Aim: Analysis of emergency management during a medical triage involving a large number of patients.

Material and methods: The triage of thirty injured patients carried out by paramedics and advanced first aid rescuers was subject to evaluation. The actors posing as patients were instructed regarding their role and their symptoms, with each of them additionally given makeup and styled.

Results: In the primary triage, 17 victims were assessed by members of the National Fire Services, 2 of whom were given the wrong priority rating. The remaining 13 patients were triaged by paramedics, with 2 mistakes in priority assessment — 5 patients were marked as black. In the second stage, triage was administered to 25 patients, in majority by paramedics (17 patients), who gave an incorrect priority rating to 2 of them. The retriage was conducted only by paramedics (25 patients) – in case of a single patient, the triage rating was incorrect, and in two cases, the color rating was not given whatsoever. No statistically significant differences were found between paramedics and Advanced First Aid-graduate rescuers representing National Fire Services

Conclusions: The conclusions of the study point towards a good level of knowledge and skills exhibited by paramedics and Advanced First Aid graduates representing the National Fire Services. However, the analysis of the course of the training exercise has also revealed the necessity of continuously polishing your skills through training and incident simulations as far as proceeding during mass casualty incidents is concerned.

KEY WORDS

Emergency Medical Team, Emergency Medical Services Emergency, Multiple Event, Response Efficiency

INTRODUCTION

Simulation is one of the best methods of educating medical professionals. Periodic educational training sessions are recommended to maintain competences that are rarely used and are susceptible to deterioration overtime [1]. An incident which involved a high number of affected parties involves adhering to procedures that are not used by ERTs in daily practice. Putting together a medical simulation of an incident where a large number of parties is affected requires a large investment of time and labor from its organizers. However, it gives training participants the opportunity to assess their abilities in practice, as well as draw conclusions from the resulting experience and the distinctness of the situation. Paramedics and Advanced First Aid (AFA) professionals representing the National Fire Service (NFS) participating in the exercises have the possibility to gain new experience and practical skills.

The present article is the second part of the compilation studying the training exercise of a situation with a high number of victims organized in Jaworzno by the Sosnowiec District Emergency Service (SDES) and cooperating parties. The research is primarily focused on the evaluation of the patient procedure that took place as per the START medical triage standard for adults, and JUMP START for children. A detailed account of the event, its progress, and the analysis of the capacity of the local emergency service system and cooperating parties was discussed in the first part of the article [2].

The procedure of conduct in cases of incidents with high rate of victimhood has been present in the Polish emergency medical system since 2015. The last update to the procedure was implemented in 2020, however its scope has remained the same since 2015 [3]. It defines the roles, specific tasks and priorities for all Emergency Medical Service units in Poland. It defines the roles, specific tasks priorities and introduced standards and document templates for all Emergency Medical Service units in Poland. Registering and analyzing data during the incident will allow for drawing subsequent conclusions

that will have an impact on the safety improvements for patients and paramedics alike [4].

The term incident with a high number of casualties was very imprecise and vague before the 2020 legislation came into force. According to the contemporary definition included in the aforementioned procedure, an incident with a high number of casualties is an event as a result of which the potential number of casualties is estimated at 10 or more on the basis of the information gathered during the dispatch screening interview [3, 5]. Referring to the literature, the authors define a multiple-victim event as an event with multiple victims in which available resources can provide the necessary care, and a mass casualty event as an event in which resources are insufficient, stressing that the best way to describe an event is the ratio between available resources and the number of victims requiring immediate medical emergency response (MRO) [3, 5, 6].

One of the first procedures that the ERT must implement on site is a quick evaluation of the scale of the incident and passing the relevant information to the Medical Dispatcher (MD). Once the Chief Medical Dispatcher (CMD) is briefed by the on-site ERTs, they implement the mass casualty protocol and appoint the Incident Commander (IC). It is usually the leader of the first ERT that arrived on the scene of the incident, however the CMD can decide to change the person playing the role of IC at any point of the operation.

The person responsible for coordinating the units taking part in the rescue operation is referred to as the Head of Rescue Operations (HRO). An NFS officer or the leader of another fire service unit is usually appointed for this role. It is important to highlight here that the HRO has the right to give orders to the units taking part in the operation, including the emergency response team, as well as control the way in which they are followed [3]. HOR and IC should be involved in a tight cooperation and coordinate procedures in a way that creates an area for triage with designated sites where victims of a given severity and priority rating may be gathered and an area where the victims can be transferred to emergency response teams or medical air rescue. The IC additionally appoints a medical professional who will coordinate the triage of the casualties [6, 7].

Triage involves the classification of victims on the basis of priority norms and administering basic procedures which can significantly improve their ability to survive [3]. It is a process of giving medical and transport priority ratings conducted in incidents with a large number of casualties. For this purpose, different triage systems were created, such as START, Careflight triage, SIEVE, SALT or others [8, 9]. The most widespread of them on a global scale is the START system (Simple triage and rapid treatment) and its pediatric version, JUMP START [9,10]. Despite the fact that the START triage system is the most commonly used worldwide, research by McKee and colleagues on a group of 125 patients above the age of 18 showed that SALT had a higher accuracy rate [11]. Research by Heller and colleagues suggest that the available triage systems possess an acceptable quality of diagnosis, allowing the identification of seriously injured patients, while simultaneously pointing towards a diagnostic weakness regarding non-injured patients [12].

The Polish term that translates to medical segregation is often referred to in literature as triage. The father of contemporary medical triage is the French surgeon Dominique Jean Larrey, who during the Napoleonic Wars, treated "those who are the most severely injured or must be cared for first, regardless of their rank or their nationality" [13].

Many systems of patient triage exist, and it is difficult to point to one which is infallible. It is important that the triage system be well suited to the possibility for emergency medical services to respond and the culture of the given country [8, 13, 14]. In Poland, the most commonly used triage system is START (Simple Triage and Rapid Treatment). It is used ubiquitously in both national emergency medical services (NEMS), as well as parties cooperating with NEMS, e.g. the National Fire Services (NFS)/ Volunteer Fire Departments (VFD)/Volunteer Mountain Rescue Services (VMRS). By definition, it is supposed to categorize the victims of an incident with a high number of casualties into four groups with color ratings: red, yellow, green and black, and the rating procedure for one patient should not exceed 30-60s [3, 7].

The START system involves a rapid examination of four parameters: walking, respiration, peripheral perfusion and reacting to instructions. The person conducting the triage is able to give the adequate color rating to the victim based on these information. Research involving START has been present in the literature [2].

JUMP START is a modification of the START system. It is directed to children below the age of 8. It is worth noting that the proper examination of small children involves difficulties (crying, fear, inability to communicate, etc.), therefore in case of any doubts, a higher priority rating should be given to a child in comparison to the one emerging from the protocol [7].

The medical triage system is by design a system that is on-going and iterative due to the possibility of the patient's physical state to change. Therefore, the procedure of operation in case of incidents with a high number of casualties assumes and requires of the IC to implement both primary and secondary triage. Primary triage is the segregation of victims carried out upon the rescue unit's arrival to the site of the incident as part of the initial assessment [3]. In practice, it is most often administered by NFS or VFD professionals who inform the IC about its results once the ERTs arrive, or continue the process with the ERT triage team if necessary. Secondary triage is the segregation of casualties carried out after the implementation of medical rescue operations for victims of highest priority [3]. The IC is obliged to report the result of every triage procedure back to the CMD.

Procedures conducted by ERTs on the site of an incident with a high number of casualties differ from

those applied in normal situations, where efforts and resources are sufficient. The CMD is the deciding party in regards to the administration of the procedure for incidents with a high number of casualties. From that moment, ERTs do not carry out standard MROs, instead focusing on the procedures that aim to rescue the highest possible number of victims, who have a chance to survive. Critical activities to be undertaken on the site of the incident include: medical triage, clearing the airways, hemorrhage control, pneumothorax decompression and the transport of patients in accordance with the priority status determined during the triage. The most striking difference from standard ERT procedures is not conducting cardiopulmonary resuscitation (CPR) on site, because casualties suffering from cardiopulmonary arrest (CPA) in the context of a mass casualty incidents are treated as unrecoverable.

THE AIM

The aim of the study was to evaluate the cooperation between ERT paramedics and AFA paramedics from the NFS during a simulated mass casualty incident and to assess their ability to correctly implement procedures during patient treatment.

MATERIAL AND METHODS

DISIGN AND SETINGS OF MEDICAL SIMULATIONS

The study was designed as a realistic medical simulation exercise to evaluate the effectiveness and cooperation between ERTs and AFA paramedics from the NFS.

The simulation took place on December 3, 2022, in Jaworzno. The site of the simulated incident involved a staged traffic accident with multiple vehicles, including a bus and passenger cars.

CHARACTERISTICS OF PARTICIPANTS AND PATIENTS

The participants included:

- 12 ERT paramedics from the Sosnowiec District Emergency Services (SDES).
- 13 AFA paramedics from the NFS, including both professional and volunteer firemen.
- Final-year undergraduate medical emergency program students acting as casualties.

Dispatchers coordinated the emergency response but did not participate directly in the simulations. They were only able to contact each other through indirect communications

Characteristics of the patients: the script included 30 casualties, with 3 people in the black group who could not be saved, 2 patients who, depending on whether appropriate procedure was administered by the participants (carrying out the critical activity in the primary triage phase), were either red or, in case it was not administered, black. Another group consisted of 6 patients flagged as red, 11 flagged as yellow and 8 as green. The administration of triage by NFS and EMS ERT paramedics is presented in Table 1.

OUTCOMES, DATA COLLECTIONS AND ANALYSIS

The primary outcomes measured were: The accuracy of triage decisions, effectiveness of critical life-saving procedures and the overall cooperation between NFS and ERT teams. Data were collected through observations by trained evaluators and feedback from the student actors. Triage decisions, the administration of critical activities, and the effectiveness of patient preparation for transport were recorded. The Chi-squared test was used for statistical analysis of the triage accuracy between NFS and ERT paramedics.

Table 1. Evaluation of the procedures during the primary medical triage for NFS and ERT separately.

Procedure administered	Primary Triage					
	National Fire Service			Emergency Response Teams		
	Administered well	Administered poorly	Not administered	Administered well	Administered poorly	Not administered
Giving priority	15	2	0	11	2	0
Moving	17	0	0	13	0	0
Checking breathing	16	0	1	13	0	0
Checking Pulse, Capillary Refill	12	4	1	8	4	1
AVPU	15	1	1	10	2	1
Total	17			13		
	30					

Pearson's Chi^2 equal to - 0.6892, p-value- 0.7085

DEFINITIONS

- Primary Triage: Initial assessment and categorization of casualties based on the severity of their injuries using START and JUMP START.
- Secondary Triage: Reassessment of casualties after initial medical interventions.
- Critical Activities: Procedures like hemorrhage control and airway management necessary to stabilize patients.

RESULTS

The organization of the incident as part of the training had the additional aim of evaluating the cooperation between the NFS and ERT, which is why groups of patients subjected to medical triage by the different services are not equal. The AFA rescuers from the NFS administered triage to 17 casualties, including two cases of patients where the inappropriate decision was made regarding the priority assessment. The ERT paramedics administered triage 13 times, also making two mistakes in assessing the priority. The most difficult task turned out to be measuring the capillary refill and checking the pulse. In case of both NFS and ERTs, it was administered wrongly in 4 patients and was not carried out as all for 1 patient.

Some of the casualties taking part in the exercise required the administration of a critical activity in the first stage of the medical triage. Those included people posing as patients who exhibited massive bleeding during the primary triage that required the use of a tourniquet (patients were bleeding fake blood). The script assumed that the group of patients for whom the critical activity will be administered improperly or not at all, will not be able to be saved in the later stages of the exercise. Table 2 presents the data regarding the administration of critical activity. Among the seven patients requiring such a procedure, help was administered properly for 5 of them. For two patients, the critical activity was not administered at all, once by the NFS and once by the ERT.

In cases where a decision was made regarding the necessity of administering the critical activity in the ini-

Table 2. Critical activity necessary to administer during the first medical triage .

	Critical activity	
Quality of administration	**National Fire Service**	**Emergency Response Teams**
Administered	4	1
Not administered	1	1
Administered poorly	0	0
Total	5	2
	7	
Pearson's Chi^2 equal to -0.63, p-value- 0.427355		

Table 3. Evaluation of the procedures during the second medical triage for NFS and ERT separately.

	Triage 2					
Procedure administered	**National Fire Service**			**Emergency Response Teams**		
	Administered well	**Administered poorly**	**Not administered**	**Administered well**	**Administered poorly**	**Not administered**
Giving priority	6	1	1	15	2	0
Moving	7	0	1	17	0	0
Checking breathing	7	0	1	17	0	0
Checking Pulse, Capillary Refill	6	0	2	17	0	0
AVPU	7	0	1	15	2	0
Total	8-32%			17-68%		
	25-100%*					

Pearson's Chi^2 equal to -10.1398, p-value- 0.0628

* 25 victims took part in the retriage which constituted 100% of the casualties

Table 4. Triage in medical checkpoints.

Procedure administered	Triage in medical checkpoints Emergency Response Teams		
	Administered well	Administered poorly	Not administered
Giving priority	22	1	2
Moving	23	0	2
Checking breathing	23	0	2
Checking Pulse, Capillary Refill	23	0	2
AVPU	23	0	2
Necessary activities	20	2	3
Preparing for transport	16	3	6
Total	25		

Table 5. Procedure administered by ERT in the ambulance.

Procedure administered by ERT in the ambulance			
Type of procedure	Administered well	Administered poorly	Not administered
SpO_2	16	0	2
RR	18	0	0
HR	18	0	0
Temperature	4	0	14
Glycemia	11	0	5
NRS Scale	10	5	3
SAMPLE Interview	12	4	2
Trauma panel	15	3	0
AVPU	15	0	0

tial phase, no mistake was noted in its implementation. In the primary medical triage stage, two patients received the black color assessment due to the lack of administration of the critical activity. The comments from the evaluators and patients suggested a long duration of the triage procedure and the delayed administration of the critical activity.

Table 3 shows data regarding the retriage procedure that was administered to a group of 25 casualties, as 5 patients were marked as black due to the inability to rescue them in the circumstances of the incident. More paramedics arrived on the scene, which made it so that the triage was administered to 68% of the patients by ERT members. Table 3 shows the range of procedures administered by the ERTs and NFS during the retriage. The quality of the conducted procedures improved from the primary triage. During the primary triage, 15 procedures were found to be administered wrongly and 5 to not have been administered at all, meanwhile during the retriage, only 5 procedures were administered poorly and 6 were omitted.

Medical checkpoints created on the site of the incident where patients were moved after receiving initial care were single-handedly operated by ERT paramedics. Table 4 shows the results of the medical triage conducted in those checkpoints. The additional 2 procedures in-

volved appropriately securing the injuries sustained by the patient and properly preparing them for transport. The procedure that caused the greatest difficulty to the paramedics taking part in the exercises was properly preparing the patient for hospital transfer. However, it has to be noted that procedures undertaken on site always carry the risk of a certain disproportion of efforts and resources. Consequently, some procedures may be difficult to implement or suffer significant delays. However, the errors in administration or a lack thereof did not significantly impact on the health condition of the victims.

Procedures administered by paramedics during the transport of the patient to the appropriate medical facility were presented in Table 5. Eighteen out of the total casualties in the accident were transported to hospitals by ERTs. The evaluation of the administered procedures aimed at assessing whether or not emergency response teams reevaluate the health of the patient transferred from the site of the incident. In the majority of the cases, the teams reassessed the patients, carrying out all of the elements of the examination once again. Among ERT patients, as many as 8 patients were not reexamined on the NRS scale or were assessed incorrectly. In the case of 6 patients, the SAMPLE interview was conducted incorrectly or omitted entirely. The patient transferred to emergency response teams from the site of an incident should be treated as a "new patient", and thus the interview and all of the measurements should be conducted once again. The SAMPLE interview and the pain assessment with the use of NRS are incredibly crucial elements. In cases of a mass casualty incident, where there is a significant discrepancy between the number of casualties and the number of paramedics, omitting those procedures does not classify as a mistake. However, in ERT ambulance conditions that take in a patient that has only received preliminary care, elements of patient assessment of such significance should not be neglected.

The statistical analysis did not reveal any statistically significant differences between the medical triage carried out by AFA firemen-paramedics from the NFS and the ERT paramedics ($CH2 = 1.859$; p-value = 0.1727).

DISCUSSION

An incident with a high number of casualties is a significant challenge to the emergency medical services and cooperating parties [8]. The procedures undertaken on site of the incident should be focused on the patient [4]. It has to be noted that the victims of any incident are subject to strong emotions, therefore the rescuers conducting medical triage may encounter significant difficulties. ERT paramedics and AFA paramedics from NFS should attend vocational training that teaches them how to function in such difficult conditions. However, theoretical knowledge does not always directly translate to the procedures undertaken during real mass casualty incidents [1]. The method of delivering knowledge that most aptly reflects the conditions of such an incident are exercises, with appropriate acting from people posing as patients and realistic set preparation improving being of great worth for the participants of the training. First of all, they have the ability to apply their theoretical knowledge regarding the subject of implementing triage procedures. Secondly, they can learn to cooperate with other services and to function under the influence of strong emotions. The START medical triage procedure is addressed to patients who suffered mechanical injuries and involves the grouping of the incident participants on the basis of the severity of their injuries, assigning them the appropriate transport priority. The START and JUMP START protocol procedure involved carrying out simple activities with the aim of giving an appropriate color rating depending on the physical state of the patient. It also has to be noted that some patients are evaluated as black, which means that they are unlikely to be rescued during incident conditions [15]. It is another difficulty that the paramedics operating on site of the incident, regardless of the clarity of the procedure instructions. The people taking part in the exercise demonstrated a large knowledge regarding medical triage, with a majority of the patients (26 out of 30 casualties) receiving an adequate priority rating based on their physical state and the severity of the suffered injuries during the primary triage carried out by paramedics and NFS rescuers. A group of 7 patients required a critical activity to be administered, e.g. controlling a large hemorrhage, with 2 of them not receiving the necessary help, which significantly worsened their physical health. Both rescue groups are recommended to continue honing their skills in order to minimize the occurrence of such mistakes during real-life incident conditions. Overall, the paramedics carried out 55 medical triages of the patients, with 5 members of this group receiving the wrong rating and 2 not receiving a rating at all. In case of NFS rescuers, 25 priority ratings were given, 3 of which were incorrect. One rating was omitted. The evaluation of the procedures undertaken by ERTs during the transport of patients to the appointed medical facilities uncovered certain shortcomings. The results show that the knowledge and skills of the paramedics and NFS rescuers are on a good level. They also point towards the necessity to continuously hone your abilities of proceeding in mass casualty incidents through training exercises or accident simulations.

CONCLUSIONS

1. The paramedics and AFA rescuers from NFS taking part in the study showed a good level of knowledge and skills in the practical use of START and JUMP START triage tools in case of an incident with a high number of casualties.
2. For the paramedics conducting the primary triage, the most significant difficulty turned out to be working with patients requiring immediate implementation of critical activities aimed at saving a life.
3. The cooperation between NFS and ERT units was

professional. Radio connection issues between the collaborating parties was observed.
4. The preparation of the ERT and the NFS to collaborate as part of an incident with a high number of casualties requires continuous improvements. The best method of gaining practical skills is simulation exercises, such as the one described for the purpose of this paper.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest.

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REVIEW ARTICLE

Pneumonia and Asthma - diagnosing and treatment in pediatric medicine

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ABSTRACT

Pediatric respiratory emergencies, notably asthma and pneumonia, require specialized care due to the distinct anatomical and physiological characteristics of children. Effective management hinges on early and accurate assessment, along with tailored treatment strategies. For pneumonia, the diagnosis involves monitoring respiratory rates and using diagnostic tools like chest radiographs and procalcitonin levels to guide antibiotic use. Vaccination has significantly reduced bacterial pneumonia rates. Asthma management includes rapid assessment and the use of short-acting β-agonists, corticosteroids, and second-line treatments for severe cases. Updated guidelines stress personalized treatment plans, incorporating inhaled corticosteroids and careful monitoring. Avoiding routine antibiotic use unless there's a clear bacterial infection is recommended. By providing healthcare providers with comprehensive knowledge and appropriate tools, outcomes for pediatric patients experiencing these respiratory emergencies can be significantly improved, reducing the risk of long-term complications and hospitalizations. The emphasis on prompt, precise interventions and adherence to updated guidelines ensures that the care delivered to young patients is both effective and efficient, ultimately enhancing their recovery and overall health.

KEY WORDS

asthma, pneumonia, respiratory distress

INTRODUCTION

Pediatric emergencies present unique challenges that demand specialized knowledge and skills from healthcare providers. Unlike adults, children have distinct anatomical and physiological characteristics, which require tailored approaches for effective management. Among the most common emergencies encountered in pediatric patients are respiratory distresses. Respiratory distress is a frequent and critical issue in pediatric medicine, often leading to emergency department and hospital admissions for oxygen therapy and supportive care. These conditions not only necessitate immediate attention but also precise and informed interventions to ensure the best possible outcomes. Respiratory distress often arises from conditions such as asthma exacerbations, infections (both viral and bacterial) leading to pneumonia, allergic reactions, and foreign body aspirations [1-3]. According to Challands et al., main causes of respiratory distress in children include bronchiolitis, asthma, pneumonia, and chronic lung diseases. Bronchiolitis is the most common lower respiratory tract infection in infants, particularly those under one year old [3] According to the studies by Choi J et al the four most prevalent respiratory conditions in children are asthma, croup, bronchiolitis, and pneumonia [4]. Children with respiratory distress may present with many different symptoms such as rapid breathing, wheezing, and difficulty speaking or crying. Although immediate management typically involves oxygen therapy and, in severe cases, the use of respiratory support devices are necessary to stabilize the patient [4]. Early recognition and appropriate management of respiratory distress in pediatric patients are crucial to prevent deterioration and improve outcomes. Understanding and effectively managing common pediatric respiratory emergencies are critical for reducing the risk of long-term complications. This article explores two of many common pediatric respiratory issues that can lead to hospitalization: Pneumonia and Asthma in detail, providing insights into their causes, symptoms, and essential emergency interventions, based on medical literature. By equipping healthcare providers with the knowledge and tools necessary to address these emergencies, we can enhance the quality of care delivered to our youngest and most vulnerable patients.

THE AIM

The aim of this article is to present and describe two of respiratory emergencies among pediatric patients: Pneumonia and Asthma, their symptoms, and outline treatment strategies.

REVIEW AND DISCUSSION

PNEUMONIA

Pneumonia in children can be viral, bacterial, or mixed. Although it is quite common (14.4 per 10.0000) in all age groups, with viral causes is more common in

those under two years old [3]. Community-acquired pneumonia (CAP) is a prevalent disease in children, presenting significant diagnostic challenges for physicians in both private practice and hospital settings. [5] It ranks among the leading causes of hospitalization in children in developed nations [5, 6].

The World Health Organization (WHO) guidelines emphasize measuring respiratory rate as a key initial indicator for suspecting pneumonia. They recommend specific thresholds: a respiratory rate (RR) above 60 in infants under 2 months, above 50 in infants aged 2 to 12 months, above 40 in children aged 1 to 5 years, and above 30 in children older than 5 years. This tool may help detect 50% to 80% of pneumonia cases. It's important to count the respiratory rate for a full minute when the child is calm [4]. Clinically, symptoms and signs of CAP vary widely with age and individual cases. CAP should be suspected in children who exhibit fever and tachypnea, even after fever reduction with antipyretics. In addition to tachypnea, other signs of respiratory distress in children with CAP may include chest indrawing (suprasternal, intercostal, or subcostal), nasal flaring, and grunting. Additional clinical symptoms and signs indicative of CAP are cough, chest or abdominal pain, and focal chest signs. Tachypnea is considered the most crucial clinical sign as it is closely associated with hypoxemia, pulmonary infiltrates on chest radiographs, and the overall severity of CAP [5]. Routine chest radiographs are not required to confirm suspected CAP in patients who are stable enough to be managed as outpatients following assessment in an office, clinic, or emergency department setting. However, posteroanterior and lateral views of chest radiographs should be performed for all patients hospitalized with CAP to confirm the presence, size, and nature of parenchymal infiltrates. This imaging is also essential for identifying complications of pneumonia that might necessitate interventions beyond antimicrobial therapy and supportive medical care [7]. Chest ultrasonography is frequently used to assess local complications such as parapneumonic effusion or empyema and can also detect lung consolidation, offering potential time and cost savings. Studies have shown that both novice and expert physician-sonologists have been able to reduce the use of chest radiography in emergency departments without missing cases of pneumonia or increasing adverse events. While complete blood counts and acute-phase reactants like erythrocyte sedimentation rate and C-reactive protein are not typically used in outpatient settings, they may be useful for decision-making in more severely ill children in hospitals, as recommended by the Infectious Diseases Society of America (IDSA). However, measuring C-reactive protein in general practice for children with nonsevere acute infections has not been shown to reduce antibiotic prescriptions and is not recommended. Procalcitonin can be used alongside other clinical indicators to guide the treatment of pneumonia in children. Levels below 0.25 ng/mL can help identify children who are at a lower risk for bacterial CAP and for whom antibiotics may not be necessary [8].

The introduction of conjugate vaccines targeting Haemophilus influenzae type b and Streptococcus pneumoniae (pneumococcus) has significantly altered the incidence and etiological landscape of community-acquired pneumonia [5]. Recent extensive studies have undertaken comprehensive microbiological analyses to explore the causes of CAP in children with radiological confirmation. These investigations found that 81–99% of the children had viral and/or bacterial pathogens in their upper respiratory tract (URT). Viruses were the predominant pathogens identified, especially in young children, accounting for more than 90% of the cases [3, 5, 6, 9]. In a study of 2,638 U.S. patients under 18 years hospitalized with CAP, viral pathogens were detected more frequently than bacterial pathogens, with viruses present in 66% of cases compared to bacteria in 8%. Additionally, 7% of patients had both viral and bacterial infections, while no pathogens were identified in 19% of the cases [6, 8].

Respiratory syncytial virus (RSV) is the most prevalent pathogen, especially in children under two years old. Other frequently observed respiratory viruses include influenza virus, various coronaviruses (such as SARS-CoV-2, which causes COVID-19), human rhinovirus, human metapneumovirus, and adenovirus [6, 8]. Bradley JS, et al. [7] describe the decision-making framework regarding symptoms that necessitate the hospitalization of a pediatric patient involves assessing several key clinical symptoms and conditions. A children and infants require hospitalization when:

- cannot be adequately monitored at home or are unable to adhere to treatment protocols, or cannot have consistent follow-up care;
- the age is under 3–6 months with suspected bacterial CAP;
- CAP caused by highly virulent pathogens, such as community-associated methicillin-resistant Staphylococcus aureus (CA-MRSA)is suspected or confirmed;
- exhibiting moderate to severe CAP, characterized by factors such as respiratory distress and hypoxemia (with peripheral oxygen saturation [SpO2] below 90% at sea level) [7].

Despite generally good outcomes in high-income countries, pneumonia remains a leading cause of pediatric mortality worldwide [3], thats why it's important to recognize criteria for admitting a child with CAP to an Intensive Care Unit (ICU) or a Unit with Continuous Cardiorespiratory Monitoring. The same group of scientists, Bradley JS, et al. [7] claim that it is necessary when:

- there is a requirement of invasive ventilation through a temporary artificial airway, such as an endotracheal tube;
- there is a requirement of acute noninvasive positive pressure ventilation, such as continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP);

- there are signs of impending respiratory failure;
- sustained tachycardia or inadequate blood pressure are exibited;
- there is a requirement of pharmacological support to maintain blood pressure or perfusion;
- pulse oximetry reading is below 92% while receiving 50% inspired oxygen;
- an altered mental status due to hypercarbia or hypoxemia resulting from pneumonia is exhibited.

The group also report that Severity of illness scores should not be the only criteria for ICU admission; they need to be considered alongside other clinical, laboratory, and radiologic findings. [7].

Outpatient care for CAP is suitable for patients who do not exhibit respiratory distress and are able to take oral antibiotics effectively. Empiric outpatient treatment based on IDSA Guidelines depends on the age of a patient and the cause of pneumonia. Initial antibiotic treatment is generally not recommended for preschool-aged children with pneumonia since viral infections are the primary cause in this age group. The IDSA suggests using macrolide antibiotics for treating atypical pneumonia in children, though evidence is mixed, and the potential for increased resistance in S. pneumoniae and M. pneumoniae must be considered [8].

According to IDSA Guidelines [7, 8, 10], (outpatient treatment) children under 5 years old:

- with presumed bacterial cause should be treaten in the first-line with amoxicillin, alternatively amoxicillin/ clavulanate
- with presumed atypical cause in the first-line with azithromycin, alternatively clarithromycin
- with presumed influenza pneumonia- Oseltamivir

According to IDSA Guidelines [7, 8, 10] (outpatient treatment) children who are 5 years old or more:

- with presumed bacterial cause - first-line with amoxicillin alternatively amoxicillin/ clavulanate
- with presumed atypical cause - in the first-line they should be treated with azithromycin alternatively clarithromycin or erythromycin. Doxycycline can also be considered for children older than 7 years
- with presumed influenza pneumonia - oseltamivir or zanamivir is recomended.

Children who do not show improvement within 48 to 72 hours of starting therapy should undergo a clinical reevaluation the severity of their illness and to decide on the appropriate level of care. Empiric parenteral antibiotic therapy should be tailored based on the patient's vaccination history against S. pneumoniae and H. influenzae type b. When bacterial pathogens are identified in blood or pleural fluid cultures, antibiotic treatment should be guided by the sensitivity of the pathogens [8].

According to IDSA Guidelines children under 5 years old:

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- with presumed atypical cause- in the first-line they should be treated with azithromycin alternatively clarithromycin or erythromycin. Doxycycline can also be considered for children older than 7 years;
- with presumed influenza pneumonia- oseltamivir or zanamivir is recomended.

ASTHMA

Asthma affects a significant number of children and is a leading cause of pediatric emergency admissions. It involves variable airflow obstruction and airway hyper-reactivity, often triggered by viral infections or allergens [3].

According to American Lung Association, Epidemiology and Statistics Unit asthma is a prevalent condition, particularly among children aged 5 to 17 years. In 2008, approximately 7.0 million children in this age group in the United States were affected by asthma. In 2006, asthma accounted for 1.7 million emergency department visits, with children under 15 years old representing 33% of these visits, despite this age group constituting only 20% of the overall population. It is the leading condition that limits activity in children, resulting in 14.4 million missed school days annually. The financial impact of asthma is significant, with annual costs amounting to $20.7 billion - $15.6 billion in direct healthcare expenses and $5.1 billion in indirect costs and lost productivity.

Research through epidemiology [12] has pinpointed several risk factors linked to the onset of asthma. These include sensitization to airborne allergens, maternal diet during pregnancy and lactation, exposure to pollutants (especially environmental tobacco smoke), microbes and their by-products, and psychosocial factors. However, there is insufficient evidence supporting preventive measures to avoid asthma in many of these cases.

Atopic sensitization to common aeroallergens, particularly perennial inhalant allergens, is a significant risk factor for asthma. Early life sensitization to local allergens, especially when associated with frequent lower respiratory illnesses, increases the risk of developing asthma. Several aeroallergens play a crucial role in this process:

- House Dust Mites: A Cochrane review questioned the effectiveness of avoiding house dust mites for treating established asthma, and there is no evidence that such measures prevent asthma onset;
- Companion Animal Allergens: The relationship between exposure to pet allergens and sensitization is unclear, making it difficult to recommend for or against having pets unless the child is sensitized;

- Cockroaches: Exposure to cockroach allergens is linked to sensitization and a higher risk of developing asthma.
- Fungi: Sensitization to Alternaria is a major risk factor for both asthma development and severity. This fungus, typically an outdoor aeroallergen, can have similar concentrations indoors and outdoors [12].

Current data do not support a protective effect of any dietary interventions during pregnancy or lactation against asthma or atopic disease. Although breastfeeding reduces early childhood wheezing associated with respiratory infections, it has not been shown to prevent persistent asthma. Maternal smoking during pregnancy and early life exposure to tobacco smoke increase the risk of childhood wheezing and reduced lung function. Biomass fuel use is linked to higher asthma risk and severity. Traffic-related outdoor air pollution can trigger early-life wheezing. Early childhood wheezing is often associated with viral infections such as rhinovirus and RSV. The "hygiene hypothesis" suggests that early exposure to farming environments and their microbial components may reduce asthma and allergy risks. Probiotics have not shown an impact on asthma development, though they benefit atopic dermatitis prevention. The use of antibiotics, particularly broad-spectrum ones, should be cautious in young children due to their controversial impact on asthma development. A child's social environment, including caregiver stress during the first year of life, is associated with an atopic profile, wheezing, and asthma. Prolonged maternal distress may also contribute to childhood asthma development [12].

According to Birgham, et al., although the initial diagnosis of asthma relies on a healthcare provider's suspicion and evaluation of symptoms, several objective tests are available to confirm airway obstruction and its variability. Current recommendations for these tests are detailed in the Global Initiative for Asthma (GINA) Guidelines and the National Institute for Health and Care Excellence (NICE) Quality Standard [13]. In 2024 GINA updated the diagnostic flowchart for adults, adolescents, and children aged 6 to 11 with chronic or recurrent respiratory symptoms. The flowchart includes guidance on using peak expiratory flow (PEF) for asthma diagnosis, considering many healthcare providers lack access to spirometry. GINA recommends using the best of three PEF measurements each time and the same meter for follow-ups, as different meters can vary by up to 20%. They also emphasize documenting evidence of asthma before starting inhaled corticosteroid (ICS) treatment [14]. Peak expiratory flow (PEF) is an objective measure for assessing airway obstruction severity. However, obtaining reliable PEF measurements in children under 6 years is challenging, and even in cooperative children, these measurements may not be dependable during an acute exacerbation. Suggested PEF categories are: mild (PEF >80% of predicted), moderate (PEF 60–80% of predicted), and severe (PEF <60% of predicted). These values can vary across different guidelines [4].

In childhood asthma, key predictors of remission include fewer and milder symptoms, improving lung function, and reduced airway hyper-responsiveness. Persistent asthma in children is associated with factors like atopy, parental asthma or allergies, later symptom onset, wheezing without a cold, and exposure to tobacco smoke. For adults with severe asthma, remission with biologic therapy is predicted by better short-term symptom control, improved lung function, fewer comorbidities, earlier onset, and minimal use of oral corticosteroids. Factors indicating persistent asthma in adults off treatment include moderate-to-severe airway hyperresponsiveness and nasal polyps [14].

According to Choi, et al. children experiencing acute asthma exacerbations should be quickly evaluated and placed in an area where they can be frequently reassessed by medical and nursing staff. Monitoring oxygen saturation is crucial, as hypoxemia can develop rapidly in children, especially infants. Oxygen should be administered to maintain saturation above 92-94%. First line treatment includes Short-acting β-agonist (SABA), Levosalbutamol [(R)-salbutamol, also known as levalbuterol], Systemic corticosteroids (SCS), Ipratropium bromide. Second line treatment, when there is severe or life- threating asthma is based on medicines such as magnesium sulfate, oral leukotriene receptor antagonists (LTRA) such as montelukast, heliox - a blend of helium and oxygen. The scientists claim that Routine use of antibiotics, mucolytics and sedatives is not advised unless there is a suspicion of pneumonia, indicated by symptoms such as fever and purulent sputum, or bacterial sinusitis [4].

The updated in 2024 GINA initial asthma treatment recommendations for children aged 6 to 11 years align symptom levels and lung function criteria with those for adults and adolescents. GINA provides detailed study results for this age group. For children with well-controlled symptoms on low-dose ICS or those using SABA alone with symptoms less than twice a week, GINA recommends using ICS whenever SABA is taken. Infrequent symptoms (1-2 days per week or less) should be treated with low-dose ICS whenever SABA is taken. For symptoms 2-5 days per week, use low-dose ICS plus as-needed SABA. Daily symptoms, night awakenings, and low lung function warrant medium-dose ICS-LABA plus as-needed SABA, or low-dose ICS-formoterol MART. For acute exacerbations, treat the exacerbation (possibly including a short course of OCS for severe cases) and arrange follow-up [14].

CONCLUSSIONS

Asthma and pneumonia, demand prompt and specialized care due to children's unique physiological traits. Early and accurate assessment, along with tailored treatment strategies, are crucial for effective management.

Proper diagnosis of Pneumonia involves monitoring respiratory rates and using diagnostic tools like chest radiographs. Vaccines have reduced bacterial pneumonia

rates, and procalcitonin levels can guide antibiotic use. Effective management with asthmatic patients includes rapid assessment, use of β-agonists, corticosteroids, and second-line treatments for severe cases. Updated guidelines recommend personalized treatment plans, emphasizing the use of inhaled corticosteroids and careful monitoring. Providing healthcare providers with the necessary knowledge and tools ensures improved outcomes for pediatric patients experiencing these respiratory emergencies.

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CONFLICT OF INTEREST

The Author declares no conflict of interest.

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