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Organization of the specialized medical care in conditions of limited resources (military status) (on the example of the provision of nephrology aid in Ukraine)

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Abstract. The paper considers the features of the provision of pediatric and adult nephrology medical care during martial law in Ukraine from February 2022 to May 2023. The influence of military stages on the nephrology care are presented, territorial zones during the conflict are highlighted, event tracks are shown. Separately, the activity of the Ukrainian Association of Nephrologists/Ukrainian Association of Pediatric Nephrologists, new opportunities for integrating nephrology into the system of medical knowledge are considered. Along with the negative trends, positive results were revealed that made it possible to move forward in the system of specialized medical care, namely an increase in transplant activity, a wider use of "long" treatment regimens with rituximab, and the use of digital kidney biopsy. Statistical data, SWOT analysis at the stages of the military conflict are given, an analysis is presented for refugees who left for the European Union to receive kidney replacement therapy. The enormous role of humanitarian programs for maintaining the structure of nephrological care in Ukraine is emphasized. The accumulated experience is unique and can serve as material for the analysis of similar situations in the world in the future.

Keywords: martial law; military status; provision of nephrological care; nephrological care in Ukraine; experience of medical care in military zones

There are 24 administrative regions in Ukraine and Crimea. By the beginning of 2022, there were 7.5 million children under the age of 18 living in the country, which was just under 18 % of the total population [1, 2].

During the war, 4 regions were annexed, and about 40 % of children left the country, in some regions up to 60 %, in adults — 15–26 %. Up to 50 % of medical staff left the country in the first months of the war [3, 4]. As an example, in the city of Kyiv, the largest children's hospital I was completely closed. This hospital had a city children's nephrology centre. Six months later, the hospital resumed work, but the children's nephrology centre still wasn't opened.

The first 3 months were very difficult in Ukraine: a shortage of food, medicines, staff, difficulty in moving around the city. In Kyiv, all children receiving dialysis were concentrated in one hospital and were evacuated to western Ukraine and abroad within a month [5].

Let's analyse the structure of pediatric nephrology care in Ukraine in this time. In almost every region there is a pediatric nephrology department and in total there are 114 pediatric nephrologists in the country. We have approximately 65 thousand children and 25 children with CKD per one PN. During the war, all these figures decreased very significantly, but then levelled off. Currently, there is a shortage of both pediatric nephrologists and medical personnel in general across the country. Each region has a chief pediatric nephrologist, until 2017 there was a chief pediatric nephrologist of the Ministry of Health of Ukraine, and Prof. D. Ivanov has been occupying this duty for more than 10 years. During the war, the number of children's nephrology departments decreased in proportion to the annexed territories, but the number of dialysis departments was maintained (Fig. 1).

Most pediatric nephrologists are members of the Ukrainian Association of Pediatric Nephrologists (UAPN),

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whose members have an individual identification card in the form of a payment bank card. UAPN/UAN (Ukrainian Association of Nephrologists) has professional medical journal Kidneys, a website, and two regular CME annual training courses REENA (Renal Eastern Europe Nephrology Academy) and WKD CME course (Fig. 2). During the war the courses have been organized in hybrid mode [4].

World Kidney Day CME course 2023 “Kidney health for all. Focus on inclusion for disabled children and adults with CKD” was held in a hybrid format on the largest professional web platform for doctors Accemedin, which allowed to increase the number of views of our course to 14.5 thousand compared to the usual 500. This is a huge data for Ukraine. In September 2023, UAN/UAPN are going to organise 18th REENA course.

The world community has supported UAN/UAPN in its activity in the war time [6]. Almost every month Prof. Dmytro Ivanov, the President of UAN/UAPN has had a presentation at the largest international forums.

To facilitate the ongoing training of pediatric nephrologists and nephrologists, the nephrology week have been initiated on web platform Accemedin and received a huge number of views — almost 62 thousand. It turned out to be a top not only for nephrologists, but also for the medical audience in general. UAN/UAPN are in a burning trend. From May 2023 the new project Nephrology Wednesday with one lecture in nephrology every following week have been started for doctors. It became already successful with over 1,000 views for each lecture (Fig. 3).

In pre-war time there are 320 children with CKD per 1 million children, in our opi-

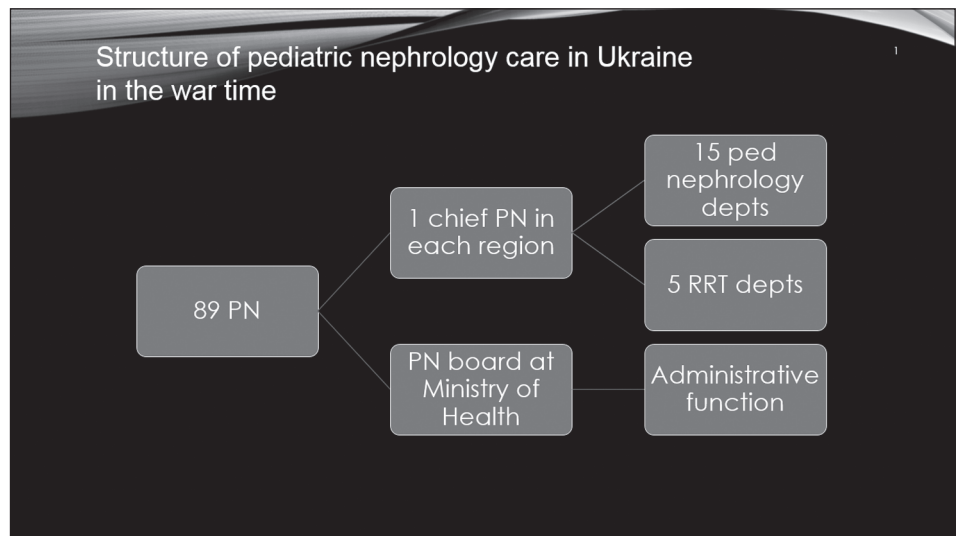


Figure 1

Ukrainian Association of Pediatric Nephrologists (UAPN) is affiliated with ESPN, Ukrainian Association of Nephrologists (UAN) is affiliated with ISN

UAN/UAPN annual activity

- World Kidney Day (March-April) since 2010
- REENA (Renal Eastern Europe Nephrology Academy; September) since 2005
- www.nephrology.kiev.ua since 2003
- Peer-review medical journal “KIDNEYS” since 2012

Figure 2

UAN/UAPN ACTIVITY IN 2023

- Peds Nephrology in Ukraine Dr. Dmytro D. Ivanov IPNA-ASP 3rd Annual Global Health Online Symposium February 8th, 2023
- 12 Congress of the International Pediatric Transplant Association, USA, Texas, Austin March 25-28, Ivanov D Transplantation of children: Stories from the warzone-Ukraine Sunday March 26, 2023 from 14:30 to 17:00
- 50th World Congress of Nephrology 31th of March 2023 (30.03.-2.04.2023) Bangkok, Thailand Oral WCN23-1027 Subject: DISTRIBUTION, PREPAREDNESS AND MANAGEMENT OF UKRAINIAN ADULT REFUGEES ON DIALYSIS— AN INTERNATIONAL SURVEY BY THE RENAL DISASTER RELIEF TASK FORCE OF THE EUROPEAN RENAL ASSOCIATION
- UKRAINIAN NEPHROLOGY WEEK 06-11 березня
- РЕЗУЛЬТАТИ станом на 14.03.2023
- Більше 61 800 переглядів за тиждень
- 6 лекцій
- 3 спікера
- 300 відгуків з подякою від лікарів
- №1235 accemedin
- 5,5 годин контенту
- ЩОСЕРЕДИ о 17:00 на accemedin
- НЕФРО WEDNESDAY
- ЛЕКЦІЇ ВІД НАЙКРАЩИХ ПРОФЕСІОНАЛІВ З НЕФРОЛОГІЇ

Figure 3

nion, many children are still outside our care. Over the past 5 years, the number of children with CKD 5 has had a clear downward trend. We tend to think that this is due to the active policy of renoprotection. Renin-angiotensin inhibitors have been used in children in Ukraine for almost 20 years, last years the use SGLT2 inhibitors has been started [4]. At the same time, the number of children with CKD 5 receiving RRT remains virtually unchanged. In recent years, these children practically do not die. The prevalence is much less in Ukraine, the incident is nearly the same compared to ESPN data. The average number of transplants is 12 per year, i.e. nearly half of the children with CKD 5 who are on dialysis receive transplants annually, 60 % have live kidney from their parents.

Interestingly, the number of transplants has increased compared to the pre-war period due to the transfer of transplant activity from the center to western Ukraine, where humanitarian programs and support from abroad are most active [4]. Maybe this is my personal opinion, but now the possibilities of this region are higher than before the war,

both in terms of equipment and medicines. In the first three months of 2023, 90 kidney transplants were performed in adults and children at 19 centers (Fig. 4).

An interesting trend developed for children since 2023: thanks to very active transplantation, the number of children on the waiting list began to decrease. in Ukraine in 2022, 12 kidney transplants were performed on children. Of these, 8 are from living-related donors, and 4 are from deceased donors. Three children are being stayed on the waiting list, one of them is in Belgium.

After additional funding and the adoption of the law on transplantation, the number of transplants is increasing from 2021. Laparoscopic method to a donor, the use of robotics, a simultaneous kidney operation and donor preparation began to be applied in Ukraine. Careful selection of a donor, modern immunosuppression, a biopsy with a result within a day (this is a digital laboratory in nephrology clinic) allowed us to significantly improve the results compared to previous years, although the results of graft survival are even lower than in the world. The transplantology team from Lviv is being the most active in 2022–2023 (Fig. 4).

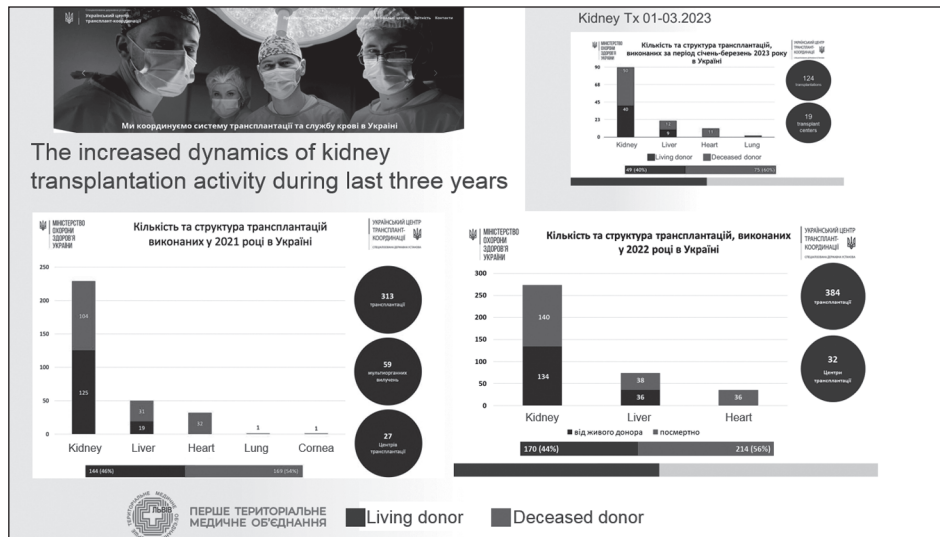


Figure 4

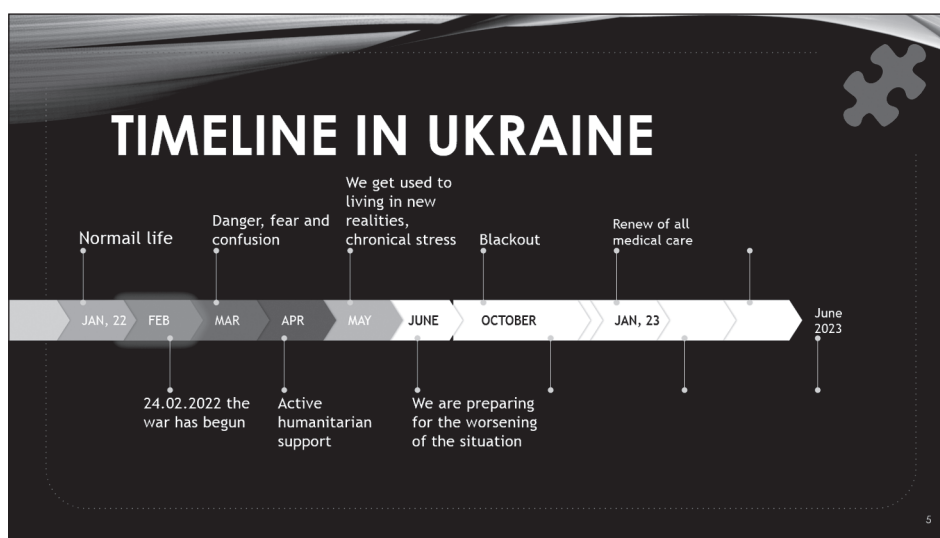


Figure 5

In general, comparing 2021 and 2022, the number of transplants in adults increased by 12 % and in children by 84 %. This is due to the state policy of financial stimulation for transplantation, the implementation of legal regulations that allow transplantation not only from relatives, but also from the deceased donors.

The Fig. 5 presents the history of the development of the military situation in Ukraine. The war began on February 24 and is now continuing for over 16 months. Four-time intervals should be singled out, which significantly changed the possibilities of renal replacement therapy. The first stage was the beginning of hostilities, which entailed all the existing changes. At first, there was confusion, and many people began to leave the country with their children. The supply of medicines was practically stopped, and the logistics chains of medical care were broken. The second period is characterized by renewing medical care, the third one which was characterized by the total limitation of electricity, and the fourth one — almost safe life in non-military zones with the presence of air attacks [4, 7].

We could divide the entire Ukrainian territory into 4 zones from the red zone [3], where active clashes are taking place and there are civilians, to the green zone, where there have been no hostilities, but this zone takes on refugees from the red zone. The allocation of these 4 zones, in our opinion, is very important, as it allows us to understand the logistics of organizing patient care. The greatest load falls on the red zone, where it is extremely difficult to continue dialysis. It is carried out in bomb shelters, and basements, it is difficult for patients to get to the dialysis centre, they stay there overnight and, sometimes, live there with their parents. Some adult people do not receive dialysis, hide in basements, die from underdialysis, exacerbations of chronic processes, primarily CKD 4–5. The red zone is also characterized by an increase in the number of patients, both military and civilian, with acute kidney injury. This also places an additional burden on dialysis departments. The third zone is green. It is under a heavy burden in helping refugees, the number of patients has increased, and consumables are needed in greater quantities. And everywhere there is a problem of personnel: someone wants to work in the areas subjected to bombing, and in the areas where it is calm, the staff worked in 3–4 work shifts. Currently, there are 2 principal zones in Ukraine: where it is calm and where there are active hostilities. In quiet areas, departments work there, the number of patients is restored and people arrive from internal evacuation zones, the number of personnel is increasing. But there is a violation of the logistics chains for the supply of medicines and supplies [8].

These two negative factors determined the situation in the country and in the provision of medical care. The first is the physical blocking of territories by the enemy's army, which led to a shortage of food, medicine and movement. The second, which has been going on for 6 months, is damage to the country's energy structure, which continuously disrupted communication and electrically dependent processes [9]. The state provided dialysis departments with electricity and water as elements of critical infrastructure. For outpatient cyclic PD, we received humanitarian assistance in the form of charging stations and batteries.

The first period of war is presented here using SWOT (Fig. 6). In state units and departments there was an outflow of medical workers, but not to the same extent as in private facilities [4]. The patients were confused. Movement around the city and some areas was practically stopped due to the bombing. So, in war time be prepared to move patients to other departments nearby, be prepared to supply patients with individual dialysis machines, have a double supply of dialysis and immunosuppressive therapy consumables to quickly respond to a changed

situation, and be ready to attract health workers to replace those who have left their working places.

The first humanitarian aid to the central and eastern regions of Ukraine, to Kyiv began to arrive 3 weeks after the beginning of the war [4]. German Society for Nephrologists and for paediatric nephrologists, IPNA, Task Force Relief offered their assistance first and most actively and significantly [9]. From the first weeks of the war, our colleagues actively offered their help.

The first three months of hostilities are characterized by limited opportunities for renal replacement therapy. There is a dramatic decrease in the number of healthcare workers, in direct proportion to the decrease of the population. This leads to a limitation of the completeness and quality of renal replacement therapy. There was a shortage of supplies, which made it difficult to provide assistance to the remaining patients and those who have arrived through internal migration. The result of these processes requires the creation of a reserve of medical personnel, optimization of the work of the remaining personnel, the involvement of medical personnel from other sources, and the accumulation of a reserve of consumables for dialysis, medicines, mobile dialysis machines and immunosuppressants [10].

The next problem was the violation of logistic chains for the supply of necessary consumables and medicines. We were faced with a paradoxical situation. On the one hand, a number of pharmaceutical companies simply distributed medicines, including very expensive ones, in order to free their warehouses and help the population. On the other hand, some warehouses for medicines were closed and many of them, finally, were simply destroyed. As a result, there was an imbalance between need and consumption in the direction, as a rule, of a shortage of consumables and medicines. Disruption of transport chains, passenger traffic, subway stops, and road travel difficulties due to numerous checkpoints and military controls worsened the delivery of both treatment products and the availability for patients to arrive at dialysis centres, receive medicines for maintenance treatment, and perform the necessary tests.

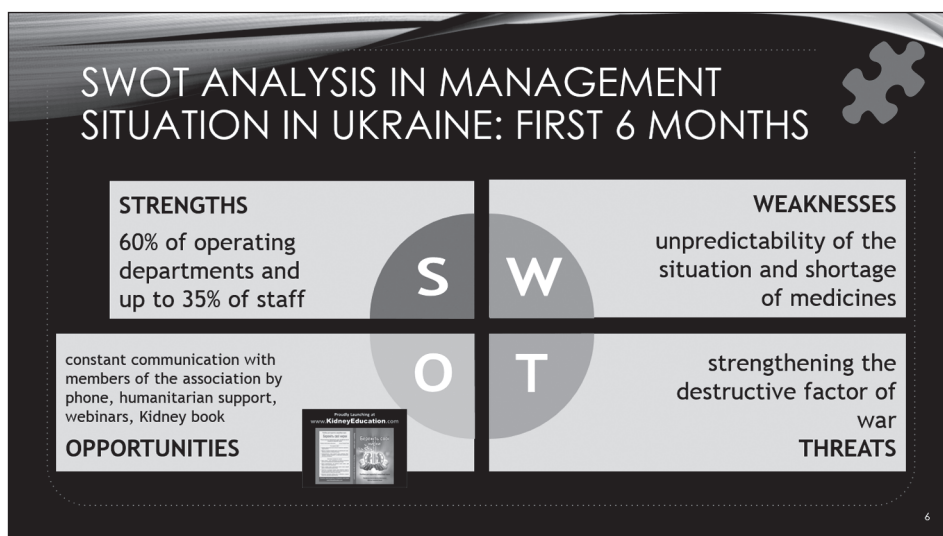


Figure 6

Table 1. The number of patients treated with RRT and the possibility of receiving new patients in the regions of Ukraine from 01/01/2023

Date	All regions	The number of patients treated			Additionally, it can be accepted for treatment		
		HD/HDF	PD	with a transplanted kidney	HD/HDF	PD	with a transplanted kidney
01/01/2023	Total	5061	483	1413	1545	58	212
01/02/2023	Total	6501	502	1410	2044	78	212
01/04/2023	Total	6523	523	1425	1709	78	217
01/05/2023	Total	6604	492	1423	1696	77	217

How to solve such problems? We consider it necessary to have a 3-month supply of consumables and medicines, additional dialysis units or machines, additional transport in medical facilities, fuel for cars, food and water for patients and staff. Very important is the availability of equipped bomb shelters, in which it would be possible to carry out procedures, stay overnight or live for short periods of time for both patients

and medical personnel. At the same time, it is extremely important to have sources of communication with the outside world, family, and employees through mobile communications, instant messengers and the Internet [11, 12].

An extremely important outcome of all these restrictions is the deterioration in the provision of medical care to patients, namely: a decrease in the number of dialysis procedures from 3 to 2 per week, a decrease in the number of fillings during peritoneal dialysis, an increase in complications during the course of the disease, and an increase in the number of graft rejections. Moreover, due to the practical stoppage of kidney transplantation in the red zone and its decrease even in relatively prosperous zones, the number of people requiring dialysis care has artificially increased [13].

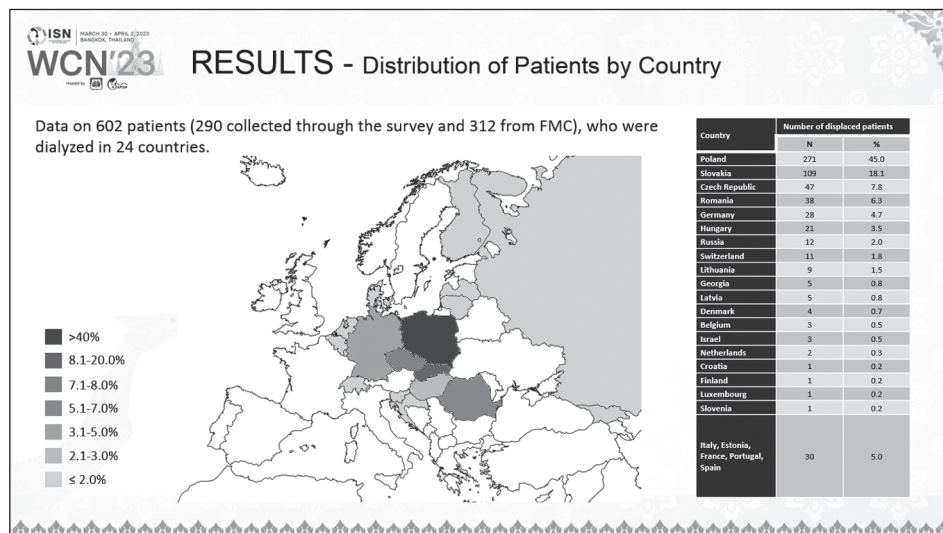


Figure 7



Figure 8

A recent SWOT analysis of the last months demonstrates the increasing risks for critical infrastructure, interruption of dialysis and procedures and operational activities. All our hospitals are objects of critical infrastructure; therefore, electricity and water are available almost without interruption. There was a next wave of emigration. As a result, there were free dialysis places in Ukraine with 602 patients who were taking care in EU (data from ERA Tack Force Ukraine and WCN'23 report) (Table 1, Fig. 7). It's documented, that up to the end of August 2022, less than 10 % of Ukrainian dialysis patients decided to flee their country since the start of the Russian-Ukrainian conflict and the majority of them chose as their place for dialysis a country neighboring Ukraine [14].

Let's put the above in a nutshell. The first three months of hostilities are characterized by limited opportunities for renal replacement therapy. The second phase is characterized by the restoration of the work of dialysis departments, and the restoration of the supply of medicines, primarily through humanitarian assistance. The third unfavourable phase — a drastic disruption of the continuous supply of electricity. According to official data, about 45 % of energy supply capacities have been destroyed. Electricity is out for intervals of 4–8 hours, and the power blackout schedule is subject to emergency adjustments and, therefore, is not always followed, which requires generators for ambulatory dialysis. We got some charging station from abroad as humanitarian support, so gave the possibility for continuous ambulatory PD with cyclers. There are no interruptions in the supply of water and electricity in hospitals, but we need to organize these facilities for home dialysis.

The presented data are quite well described and discussed in modern literature [15–18]. At the same time, they are dynamically changing, which requires a quick response from the doctors providing care [20, 21].

The Fig. 8 shows a summary SWOT analysis.

All these approaches to assessing situations and the analysis of our experience are summarized, evaluated and embodied in recommendations for patients and doctors. Such documents become open to doctors, the purpose of this work is to improve the quality of care for our patients, to draw conclusions from the experience and mistakes, the desire to create the most convenient and effective methods of providing medical care during military operations.

References

1. European Commission. *The war exacerbates Ukraine's population decline new report shows*. Available from: https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/war-exacerbates-ukraines-population-decline-new-report-shows-2023-03-08_en.
2. UN Office of the High Commissioner for Human Rights (OHCHR). *Civilian casualties in Ukraine from 24 February 2022 to 15 February 2023*. Geneva, Switzerland: OHCHR; 2023. 13 p.
3. Denova LD, Ivanov DD, Andrunovich RR, Korzh OM, Krasnyuk EK. *Nephrological care in the conditions of martial law in Ukraine*. *Počki*. 2022;11(3):122–135. doi:10.22141/2307-1257.11.3.2022.372.
4. Ivanov DD. *Professor D Ivanov's report at the KfH-Symposium Nephrologie & Rezertifizierung für Hypertensiologeninnen DHL® 19 (November, 2022, online-seminar)*. *Počki*. 2022;11(3):41–46 doi:10.22141/2307-1257.11.4.2022.385.
5. Zaliska O, Oleshchuk O, Forman R, Mossialos E. *Health impacts of the Russian invasion in Ukraine: need for global health action*. *Lancet*. 2022 Apr 16;399(10334):1450–1452. doi:10.1016/S0140-6736(22)00615-8.
6. Vanholder R, De Weggheleire A, Ivanov DD, et al. *Continuing kidney care in conflicts*. *Nat Rev Nephrol*. 2022 Aug;18(8):479–480. doi:10.1038/s41581-022-00588-7.
7. Curchoe CL, Chang TA, Trolice MP, et al. *Protecting life in a time of war*. *J Assist Reprod Genet*. 2022 Mar;39(3):555–557. doi:10.1007/s10815-022-02463-7.
8. Fontanarosa PB, Flanagan A, Golub RM. *Catastrophic Health Consequences of the War in Ukraine*. *JAMA*. 2022 Apr 26;327(16):1549–1550. doi:10.1001/jama.2022.6046.
9. Sever MS, Vanholder R, Luyckx V, et al. *Armed conflicts and kidney patients: a consensus statement from the Renal Disaster Relief Task Force of the ERA*. *Nephrol Dial Transplant*. 2023 Jan 23;38(1):56–65. doi:10.1093/ndt/gfac247.
10. Sever L, Pehlivan G, Canpolat N, et al. *Management of pediatric dialysis and kidney transplant patients after natural or man-made disasters*. *Pediatr Nephrol*. 2023 Feb;38(2):315–325. doi:10.1007/s00467-022-05734-8.
11. Ociepa-Kicińska E, Gorzałczyńska-Koczkodaj M. *Forms of Aid Provided to Refugees of the 2022 Russia-Ukraine War: The Case of Poland*. *Int J Environ Res Public Health*. 2022 Jun 9;19(12):7085. doi:10.3390/ijerph19127085.
12. Tuğlular S, Luyckx V, Vanholder R, et al. *Lessons learnt during the war in Ukraine: a report from The Renal Disaster Relief Task force of ERA*. *Nephrol Dial Transplant*. 2023 Mar 17;gfad053. doi:10.1093/ndt/gfad053.
13. Jain N, Prasad S, Bordeniuc A, et al. *European Countries Step-up Humanitarian and Medical Assistance to Ukraine as the Conflict Continues*. *J Prim Care Community Health*. 2022 Jan-Dec;13:21501319221095358. doi:10.1177/21501319221095358.
14. Sever MS, Vanholder R, Luyckx V, et al. *Armed conflicts and kidney patients: a consensus statement from the Renal Disaster Relief Task Force of the ERA*. *Nephrol Dial Transplant*. 2023 Jan 23;38(1):56–65. doi:10.1093/ndt/gfac247.
15. Pawłowicz-Szlarska E, Eckardt KU, Gallego D, et al. *WCN23-1027 Distribution, preparedness and management of ukrainian adult refugees on dialysis - an international survey by the Renal Disaster Relief Task Force of the European Renal Association*. *Kidney International Reports*, 2023 March;8(3):S299. doi:10.1016/j.ekir.2023.02.670.
16. Greenaway C, Fabreau G, Pottie K. *The war in Ukraine and refugee health care: considerations for health care providers in Canada*. *CMAJ*. 2022 Jul 11;194(26):E911–E915. doi:10.1503/cmaj.220675.
17. Southall DP, MacDonald R, Kostiuk O, Shcherbakov V, Deierl A. *The UN must provide secure medical and humanitarian assistance in Ukraine*. *Lancet*. 2022 Apr 2;399(10332):1301–1302. doi:10.1016/S0140-6736(22)00526-8.
18. Bielka K, Kotfis K, Poropatich R, Pinsky MR. *Act now! Critical care roles and obligations during an urban war*. *Crit Care*. 2022 Mar 21;26(1):65. doi:10.1186/s13054-022-03951-z.
19. Wandschneider L, Namer Y, Davidovitch N, et al. *The Role of Europe's Schools of Public Health in Times of War: ASPHER Statement on the War Against Ukraine*. *Public Health Rev*. 2022 Mar 16;43:1604880. doi:10.3389/phrs.2022.1604880.

20. Capasso A, Skipalska H, Nadal J, et al. Lessons from the field: Recommendations for gender-based violence prevention and treatment for displaced women in conflict-affected Ukraine. *Lancet Reg Health Eur.* 2022 May 7;17:100408. doi:10.1016/j.lanep.2022.100408.

21. Jones-Schenk J. Courageous Leadership. *J Contin Educ Nurs.* 2022 May;53(5):198-199. doi:10.3928/00220124-20220407-02.

22. Zimba O, Gasparyan AY, Ahmed S. Sustainable Development Goals in the Time of Crisis. *J Korean Med Sci.* 2022 May 16;37(19):e152. doi:10.3346/jkms.2022.37.e152.

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Conflicts of interests. Author declares the absence of any conflicts of interests and own financial interest that might be construed to influence the results or interpretation of the manuscript.

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Організація спеціалізованої медичної допомоги в умовах обмежених ресурсів (військовий стан) (на прикладі надання нефрологічної допомоги в Україні)

Резюме. У роботі розглянуто особливості надання спеціалізованої медичної допомоги в період військового стану в Україні з лютого 2022 р. до травня 2023 р. Подано етапи розвитку подій, що впливали на надання медичної допомоги нефрологічним пацієнтам, виділено територіальні зони в період військового конфлікту, показано перебіг подій. Окремо розглянуто активність Української асоціації нефрологів/Української асоціації дитячих нефрологів, нові можливості інтеграції нефрології в систему медичних знань. Поряд із негативними тенденціями виявлено позитивні результати, що дозволили просунутися вперед у системі надання медичної спеціалізованої допомоги, а саме збільшення трансплантаційної активності, ширше

використання «довгих» схем лікування за допомогою ритуксимабу, застосування цифрової нефробіопсії. Наведено статистичні дані, SWOT-аналіз на етапах військового конфлікту, представлений аналіз біженців, які виїхали в Євросоюз для отримання нирковозамісної терапії. Наголошено на величезній ролі гуманітарних програм для збереження структури надання нефрологічної допомоги в Україні. Накопичений досвід є унікальним і може стати в майбутньому матеріалом для аналізу подібних ситуацій у світі.

Ключові слова: військовий стан; надання нефрологічної допомоги; нефрологічна допомога в Україні; досвід медичної допомоги у військових зонах