

Neurological Practice in the Time of War: Perspectives and Experiences from Ukraine

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Abstract

The full-scale Russian invasion of Ukraine has significantly impacted the country's health-care system. Insufficient infrastructure, destruction of medical facilities, and barriers to prevention and treatment efforts hinder the provision of timely, high-quality care to our patients. We aim to describe the impact of the war on neurological care across Ukraine. In this article, leading national experts in stroke, epilepsy, multiple sclerosis, and movement disorders describe their personal experience and efforts in organizing and providing care since the war started in February 2022. A neurologist who cared for patients in Mariupol recounts the first weeks of the war when the city was under constant attacks. An international stroke expert describes the role of Task Force for Ukraine, a European Stroke Organization initiative to support the Ukrainian stroke community. We discuss a series of critical challenges facing Ukraine's neurologists, patients, and healthcare delivery system, including shortages of personnel and medical supplies, disrupted logistics, and lack of funding. In addition, we highlight various interventions and strategies aimed at counteracting these challenges, including international support, collaborations within Ukraine, and initiatives enhancing the resilience of the Ukrainian neurology community. As the war is ongoing, this article emphasizes the pressing need for continuous support and investment in the Ukrainian healthcare system to preserve guaranteed access to high-quality health-care for the Ukrainian people during the war and in its aftermath. Insights from the essays can inform the development and implementation of effective strategies and interventions tailored to such extraordinary circumstances.

Keywords

- ▶ Ukraine
- ▶ war
- ▶ armed conflicts
- ▶ neurology
- ▶ stroke
- ▶ epilepsy
- ▶ multiple sclerosis
- ▶ movement disorders
- ▶ neurological practice

The Russian invasion of Ukraine is seen as one of the most devastating crises in recent history.¹ It has caused an execrable situation that represents the opposite of all that medicine and public health strive to achieve. Barbaric attacks affecting

civilians, destruction of residential areas and healthcare centers, devastation of public infrastructure and cities, and blocking of humanitarian corridors have resulted in substantial morbidity and mortality, and created a catastrophic health

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and humanitarian crisis.² According to the United Nations Office for Human Rights, 27,449 civilian casualties (9,701 killed and 17,748 injured) were reported between February 24, 2022, and September 24, 2023.³ Over 6 million Ukrainian residents became internally displaced persons, exposing them to poor, overcrowded living conditions and increased risk of infectious outbreaks.^{1,4} An estimated 17.6 million people in Ukraine require urgent humanitarian support, including more than 5 million people internally displaced by the war. As of December 2023, 6.3 million refugees from Ukraine were recorded globally, most of who (5.9 million) reside in Europe.⁴

The conflict in Ukraine has significantly impacted the healthcare system, exacerbating preexisting challenges and creating new ones.^{5,6} The WHO's Surveillance System for Attacks on Health Care has verified over 1,400 attacks on healthcare infrastructure in Ukraine in the first 20 months of the war, with 1,247 attacks directly impacting healthcare facilities, resulting in 112 deaths and 208 injuries.⁷ According to World Bank estimates, these damages led to losses exceeding USD 1 billion for the state's health sector.⁸ The situation is particularly dire in areas close to the frontline, or areas recently retaken by the Government of Ukraine. In these areas, most healthcare facilities are not functioning, and the people who stayed behind—including many elderly, persons with impaired mobility, and those with physical disabilities—have complex needs that the healthcare system is struggling to meet under the current circumstances.⁹ For individuals who require urgent hospital care, such as patients with acute stroke, emergent, time-sensitive interventions have become less accessible in many parts of the country.

The Ukrainian health service also faces significant staff shortages. More than 30,000 medical professionals have either joined the Ukrainian Armed Forces or become volunteers, while over 2,500 have left the country and 4,500 have been internally displaced.⁶ This displacement of healthcare workers has further exacerbated a staffing crisis in the health sector that preceded the war. Medications shortages due to disruptions in supply chains impact patients with chronic conditions, including many with neurological conditions. Initial attempts to arrange import of these medications were complicated by discrepancies in medication approvals in different countries, regulations on psychotropic medications crossing state borders, and requirements for hospitals to confirm sources of supplies to prevent illegal procurement.

However, the resilience and adaptability of the Ukrainian people and the healthcare system, along with international support, have been instrumental in navigating these challenges. Specifically, investing in skilled staff and prioritizing steady supplies of essential resources have helped ensure ongoing provision in medical care. As the war continues, the need for sustained and coordinated efforts to strengthen the healthcare system remains critical, with special focus on alternative funding sources, infrastructure development, and capacity building.⁵

Yes, we tried to reach out to pharmaceutical companies (e.g., Boehringer Ingelheim, Pfizer, and Sanofi) and medical device manufacturers (e.g., Medtronic) both in Ukraine and internationally. To be honest, these attempts were not very successful. The companies requested detailed information

about what was lacking in each of the hospitals which was not readily available. When we asked them to donate certain drugs, such as alteplase, direct oral anticoagulants, antihypertensives, and drugs for insomnia, anxiety, and depression, the reply usually was that there was no documented shortage of the drugs in the country. Our colleagues taking care of epilepsy patients could have received some drugs from international partners, though. Moreover, this matter was complicated by discrepancies in drugs approved in different countries, regulations on psychotropic medications crossing the border of the state, and the requirement for the hospitals to confirm the source of supplies to prevent illegal procurements among others.

Several articles in medical and scientific journals augment and chronicle the global response generated by the war.^{1,10,11} However, despite numerous recent conflicts worldwide, studies of the impact of military actions on healthcare systems and medical care to the population in modern history are scarce.^{5,12,13} In recent years, non-governmental organizations have noted an increasing non-communicable burden in conflicts.¹⁴ However, there is generally a lack of information on the care of patients with chronic illnesses, including neurological conditions, in the setting of war.^{15,16} In this article, we describe our experiences as seven practicing neurologists in Ukraine, discussing the impact of the war on various aspects of neurological care across the country. We also describe the extreme circumstances in a Mariupol hospital right before its destruction, and highlight initiatives to overcome some of the challenges providers and patients are facing.

Acute Stroke Care in Kharkiv

Eastern and Northern regions of Ukraine have suffered the most from constant shelling and bombing over the first months of the war. The constant threat to life has made it impossible for citizens to move around the city; public transportation has stopped, and the subway has been serving only as a shelter. Medical workers have had to remain in hospitals at all times to continue providing medical care. Such experiences have been described in several studies since World War II as a shared traumatic reality: the unusual situation in which healthcare workers and their patients are simultaneously exposed to the same collective traumatic event. Studies examining shared traumatic realities have documented subjective feelings of emotional and physical distress and compromised professional competence among healthcare workers.¹⁷ For clinicians treating patients, they experience the same collective traumatic event. This has been termed “double exposure” and usually occurs during traumatic events that have the potential to affect entire communities.^{18,19}

Since World War II, no European country has had experience in sustaining the healthcare system over many months of continuous combat. The Ukrainian healthcare system's efforts to continue providing medical care, including to patients with acute stroke, can be described using the example of Kharkiv, a large city at the center of the war

since its first days. Despite the fact that the population of Kharkiv was almost halved due to evacuations, up to 1 million people remained in the city. Emergency departments remained open and kept working 24/7, providing access to care for patients with acute stroke. However, the war severely affected transportation to the hospital, delaying access to diagnostic studies and time-sensitive treatments. Most patients could not reach the hospital until a few days after stroke onset because of shelling and limited access to safe transportation. In the first months of the war, almost no one could receive thrombolysis. Provision of this treatment became possible again only after de-occupation of the Kharkiv region when the threat of shelling decreased. In addition to delayed presentations to the hospital, lack of specialized personnel such as radiologists and technicians hindered access to critical components of acute stroke pathways, such as prompt neuroimaging. Mechanical thrombectomies can no longer be performed in Kharkiv since February 2022 due to a lack of interventional neuroradiologists and staff to operate angiography suites—because these healthcare workers had to escape to other regions. Access to rehabilitation has become more challenging. Many patients had no home to return to after the hospitalization, since their houses had been destroyed during the attacks.

In 2022, compared with the previous year, the number of patients admitted to Kharkiv city hospitals with acute stroke (any type) decreased by 19.6%. According to data from three major city hospitals that provide acute stroke care (Regional Clinical Hospital, Kharkiv Municipal Clinical Emergency Immediate Care, and City Clinical Hospital No. 7), in 2021, a total of 5,584 patients were hospitalized, compared with 4,490 in 2022. At the same time, mortality from stroke decreased by 4.2% (from 35.6% in 2021 to 31.4% in 2022). Despite all the challenges during the first months, the overall number of alteplase treatments for acute ischemic stroke in the Kharkiv region increased from 294 to 327 procedures (3.8 and 4.8% of ischemic strokes, respectively). Although many healthcare workers were displaced, the majority remained at their workplaces. In the City Clinical Hospital No. 7, among 29 physicians employed at the hospital before the war, 25 continued at their posts and 4 fled the country, but physicians from other regions ultimately filled their positions.

According to the World Health Organization Health Resources and Services Availability Monitoring System (HeRAMS) assessment of the status of the healthcare system in Ukraine between November 2022 and May 2023, the main barriers that prevented provision of high-quality care to patients with stroke in the Kharkiv region were as follows: lack of medical equipment (47%), lack of staff (27%), lack of medical supplies (7%), and lack of other resources (7%).²⁰ Quality of stroke care has varied within the same city, based on availability of specialized medical professionals, resources, and structural integrity of hospitals. Since the beginning of the war, the supply chain of medicines and medical equipment has been disrupted. Instead, hospitals were stocked by donations from volunteers and non-governmental organizations (NGOs). However, international support, including medicine and medical supplies, first arrived in

western parts of Ukraine, and only later reached more severely affected regions near combat zones.

Currently, many aspects of medical care for patients in Kharkiv appear to have returned to the pre-war level. With the exception of mechanical thrombectomy, diagnostic and therapeutic interventions are largely available again.

The European Stroke Organization (ESO) has publicly supported stroke victims and healthcare workers in Ukraine during this time; specifically, ESO contributed funds to Médecins Sans Frontières, and organized a Task Force for Ukraine (TF4UKR) chaired by authors Dr. Francesca Romana Pezzella (Italy) and Dr. Yuriy Flomin (Ukraine),²¹ with the goal to address the needs of the Ukrainian stroke community through information channels and support groups. TF4UKR promoted a series of initiatives to support the Ukrainian stroke community: (1) waiving the annual societal and individual membership fees for ESO; (2) supporting Ukrainian stroke physicians to relocate to other European institutions; (3) offering ten grants to Ukrainian neurologists to visit stroke units in other European countries; (4) building educational forums, including weekly virtual lectures; (5) forming collaborations with WHO and other European institutions (such as the University of Oslo, the Danish Stroke Society, and Stroke Support Organization) to address gaps in stroke care, using mapping services and providing equipment.

Supporting Patients with Epilepsy

To preserve medical care and support of patients with epilepsy in these difficult times, the Ukrainian League against Epilepsy took immediate action. All regular events and conferences during the spring of 2022 were immediately canceled, and we quickly appealed for humanitarian aid from foreign and domestic authorities. Articles were published in high-profile journals, highlighting the needs of our patients and ways to support us.^{22,23} Many expressed a desire to help, but neither we nor our partners had experience in coordinating the logistical aspects. We understood that, first of all, we needed antiseizure medications (ASMs) and means by which to deliver them to our patients. A public organization certainly cannot replace the healthcare system either in peace or in wartime, because it has much fewer systemic reach, opportunities, and resources. But we also understood that epilepsy is not considered a main priority of a healthcare system in wartime.

It is impossible to list all those who helped Ukrainian patients with epilepsy, but we should especially mention our Polish colleagues from the Center for Neurology, Epilepsy, and Psychiatry as well as the Neurosfera and Emergen Foundations and Piotr Zwolinski, the general manager of these organizations. Thanks to this team for their work, the logistics of purchasing ASM and their delivery to Ukraine to the Lviv Hub were made possible.²⁴

At the very beginning of the war, the International League Against Epilepsy (ILAE) and its president, Helen Cross, created an ILAE Emergency Response (Ukraine) Task Force. Thanks to the efforts of this group, close collaborations between Ukraine and ILAE were established. To inform humanitarian

aid providing ASMs, we collected information via a phone survey to epileptologists across all regions in just 2 days to gauge the need for various ASMs. Based on this survey, the most commonly prescribed ASMs in adult patients were carbamazepine (30%), levetiracetam (30%), valproic acid (20%), and lamotrigine (5%). Another important focus was to provide medical assistance to patients with epilepsy who were forced to relocate from Ukraine to escape the war. A set of recommendations on first contacting a new doctor abroad were developed for those who had to change their place of residence. This information for refugee patients was coupled with detailed instructions, including pertinent information for their next physicians and important considerations for their follow-up appointment abroad, to support the transition of care for both patients and their relatives.

Also, a group of ILAE experts rapidly developed “treatment strategies in people with epilepsy during times of shortage of antiseizure medications.”²⁵ This document was quickly translated into Ukrainian. These strategies included changing medications to generic formulations and schemes to transition ASMs to those available based on humanitarian aid, including medications not previously registered in Ukraine. This guideline was especially helpful in the early months of the war, when medication shortages were most critical.

Many NGOs and individuals provided medical assistance to patients with epilepsy. Special mention should be made of the Brother's Brother Foundation and “Razom for Ukraine.” These two foundations were the most active in supporting patients with epilepsy by providing ASMs and provision of diagnostic equipment to hospitals.

In addition to efforts to provide ASMs to patient with epilepsy, the Ukrainian League Against Epilepsy offered online expert consultations with adult and pediatric epileptologists to facilitate access to epilepsy care. The schedule of consultations has been posted on the Web site of the Ukrainian League Against Epilepsy, and a single call center for clinicians in Ukraine was established (Vinnytsia “Neuromed”). It should be noted that this center has persevered even after the death of many employees. Due to challenges imposed by the war, we were often forced to communicate with patients by phone, messengers, and email rather than in person. At the beginning of the war, these lines of communication were absolutely necessary to ensure ongoing high-quality care for our patients. Unfortunately, an unexpected problem arose with the introduction of online counseling—while primarily intended as a resource for other physician colleagues who had to care for patients with epilepsy, patients often used this service to contact epileptologists directly.

Despite some improvements of the overall situation due to cessation of the war in many regions, patients with epilepsy in Ukraine continue to rely on humanitarian aid for ASM to ensure continuity of care. This help will be essential throughout the war and post-war periods.

Caring for Persons with Multiple Sclerosis

This devastating war has changed everything in the lives of the Ukrainian people. No one living in a peaceful country

could imagine the possibility of such a nightmare. Destroyed houses and infrastructure, burning cities, flooded fields and forests, and dead adults and children—this is only a small part of what the war brought to Ukraine. And there is also the additional suffering of patients living with pain and disability due to neurological disease.

There are more than 20,000 patients with multiple sclerosis (MS) in Ukraine. The destruction of hospitals and outpatient clinics in war zones resulted in reduced access to specialized medical care for patients with MS in the occupied territories, and state programs for providing disease-modifying treatments (DMTs) are no longer available. It is almost impossible to receive these treatments because patients are not citizens of the occupying country and are forced to obtain a Russian passport for a remote and unrealistic possibility of approval for these treatments.

During the war, and especially in recent months, all regions of Ukraine have been subjected to massive shelling by rockets and unmanned aerial vehicles. Constant shelling creates a risk for patients traveling to clinics to receive the necessary care. In the event of an MS exacerbation, patients in Ukraine are typically hospitalized to receive corticosteroids. Under the current conditions, this process is complicated. Most hospitals have been restructured to focus on military victims, resulting in limited capacity for civilian patients. Therefore, patients with MS exacerbations often had to carry out their treatments with oral or intravenous (IV) steroids at home, without medical supervision and evaluation of effectiveness or monitoring for side effects.

In the years prior to the war, a state program to improve access to DMT was successfully implemented in Ukraine, providing first- and second-line medications to patients with relapsing-remitting MS. Large-scale military operations across all regions have complicated the logistics of medication supplies, including the timeliness of delivery to hospitals, clinics, and directly to patients. This resulted in disruptions of medication schedules for patients with MS. Additionally, our patients with MS have reported deterioration in their condition due to exacerbations related to the extreme stress and psychological trauma of facing ongoing death and destruction. Another significant problem that has arisen is the lack of doctors with experience and expertise in treating MS, since many medical workers have been mobilized to assist the military on the front lines, or have left Ukraine for safer areas, particularly those with young children. As a result, MS centers are now overcrowded and understaffed, and cannot provide high-quality, specialized patient care.

In summary, the attacks on Ukraine have led to significant changes in the system of care for patients with MS. However, despite all the difficulties, physicians across Ukraine continue to collaborate to provide MS care. We hope for a quick resolution of the war, which will allow us to restore the whole of Ukraine, including our medical system.

Treating Patients with Movement Disorders

Since the very first days of the war, patients with Parkinson's disease (PD), their relatives, and their doctors have

experienced profound emotional distress. This was most severe in occupied parts of Ukraine. Our neurologists from Kherson wrote that levodopa was running out and there was nowhere to acquire it. The local doctors subsequently sent out calls to all of their contacts, including patients who had supplies to share with others, at least for a while. It is hard to imagine what patients in Mariupol went through, sitting in basements for weeks. Unfortunately, the fate of many of them will remain unknown.

In Kyiv, most of the pharmacies were closed, and some pharmaceutical companies took on the mission of organizing hubs (e.g., at the Institute of Gerontology) that relatives of patients with PD and dementia could come twice a week to receive prescribed medications for free. Individual employees of pharmaceutical companies, using their own connections, brought humanitarian aid from hospitals in European countries, including medications for the treatment of PD and dementia, as well as antianxiety medication and neuroleptics. Thanks to them, we could continue to treat our patients who remained in Kyiv.

However, the stress experienced by patients with PD significantly affected their condition. This especially affected elderly patients and those with cognitive disorders. Because of worries and sleep disturbances, their condition was destabilized with increased appearance of hallucinations, psychotic behavior, and impaired motor function, often necessitating immediate changes to their therapy. One morning we received a phone call from the relatives of an elderly patient with PD who had previously been well compensated on stable doses of levodopa. They reported terrible psychosis that he had developed on an evacuation train while moving to western Ukraine. From that time until now, the patient has been taking an antipsychotic medication, and attempts to discontinue it have failed.

More than ever, the medical community treating patients with movement disorders has been united by the common goal of helping our patients. We gave our patients contacts of colleagues from the western regions of Ukraine, where many were evacuated to, and literally passed them on from hand to hand so that they would not be left without proper, reliable, high-quality care. This reduced the anxiety among patients and their relatives and allowed them to be more in peace about being far away from their homes.

Patients with concomitant anxiety disorders remain the most difficult to manage. Constantly waiting for an alarm signal leaves them in a continued state of anxiety, which affects blood pressure and disrupts the response to antiparkinsonian medications, worsening their already severe and disabling condition.

But one cannot say enough about the positive changes taking place in Ukrainian medicine, in neurology in particular. Rehabilitation, which was primarily focused on the recovery of patients with stroke, is now gaining momentum in helping patients with movement disorders, especially those with impaired balance, when medications do not work. Even in continued situations of uncertainty and danger, our cohesion and hope help us to overcome horrible times.

Practicing Neurology under Attack: Mariupol Experience

This section describes the experience of Mariupol City Hospital No. 4 in the period from February 24, 2022, to April 05, 2022, amidst conditions of intensive military conflict.

Mariupol City Hospital No. 4 was located in the left-bank district of Mariupol, 800 m from the Azovstal metallurgical plant. Before the war, the hospital had three pediatric infectious disease departments, and provided medical and surgical care to the city's adult population. Its geographical location largely determined the extreme working conditions—the first patients arrived on February 24, 2022; as of February 28, there was no electricity supply and limited communication—cell phones, land lines, and the Internet no longer worked. As of March 2, 2022, just 1 week after the full-scale invasion began, the hospital was under a complete blockade—it became impossible to deliver medicines and basic supplies, including blood products, water, and food. At the same time, there was a massive influx of civilians with mine-explosive injuries, and wounds from bullets and shrapnel.

Faced with limited resources (all X-rays and laboratory equipment failed on February 26) and shortage of medical staff, but with a sufficient stock of medicines purchased during the COVID-19 pandemic (mainly antibiotics, disinfectants, infusion solutions, etc.), the hospital provided medical care under such conditions for 35 days, until its destruction on April 5, 2022.

Organizational measures were taken in the emergency department for medical triage and outpatient care. The so-called blood bank was created for the purpose of direct blood transfusion—a census of blood groups was performed among medical personnel and persons who accompanied patients. However, we did not have testing systems to determine or confirm blood groups and Rhesus factor. Unfortunately, during the hostilities, the hospital did not keep statistics on patient admissions, mortality rates, and the outpatient and hospital care provided. All documentation of hospitalized patients was destroyed during combat clashes that occurred directly in the hospital.

From the first days of the war, we faced the following critical challenges, and share some lessons learned based on these hardships:

1. Lack of emergency physicians. This specialty emerged in the United States in the 1970s—physicians who have the skills and knowledge to assess, manage, and triage acute emergencies. At our hospital, every physician and surgeon helped where needed (e.g., neurologists assisted in the operating rooms), but many practiced outside their specialties and expertise. Trained emergency physicians or more healthcare workers familiar with emergency care pathways would have been extremely valuable under the circumstances we faced.
2. Acute water shortages (the daily volume of liquid during the final 14 days was 300 mL per person) contributed to

the mortality of our patients. Hospitals should have a well for water, technical water, and chemical reagents to improve the quality of rainwater.

3. The lack of electricity and the shortage of diesel fuel for the generator only allowed the generator to be turned on periodically, but this made it impossible to carry out device-based monitoring (including blood pressure, heart rates, oxygen saturation, temperature); mechanical ventilation was not feasible, which resulted in many avoidable deaths. Hospitals should have several alternative energy sources—wind energy, solar panels, and solid fuel generators.
4. The lack of laboratory and instrumental equipment posed a substantial challenge to patient care. Critical equipment, including CT/MRI, ultrasound, X-ray machines, and laboratory equipment, should be located underground for such settings.
5. Another challenge of working amidst such extreme circumstances was the need to adapt to constantly changing working conditions and learning to be flexible. In the first weeks of the war, a functioning generator was sporadically available in the hospital and during mass admissions of wounded patients it was possible to carry out diagnostics, including laboratory tests, monitoring, and charge the batteries of the hospital's medical equipment. In addition, meals were prepared on electric ovens once a day for the patients.

The neurological department itself, which included a stroke unit and an early rehabilitation department at the time of the hostilities, became engaged in the treatment of traumatic brain and spinal cord injuries. Management was often based on adherence to Fever, Sugar, Swallowing (FeSS)—a protocol that has demonstrated high efficiency in these conditions.^{26,27} In the absence of neuroimaging, the diagnosis of craniocerebral injury was performed using examination of lumbar puncture data (assessing open pressure to evaluate intracranial pressure, and visual inspection of cerebrospinal fluid to differentiate hemorrhagic from non-hemorrhagic injury) and exploratory burr holes for all patients with decreased level of consciousness and many with unexplained acute focal neurological deficits (the neurologists in our department learned this and assisted the traumatologists of the hospital).

The incessant shelling of the hospital with heavy artillery led to the death of many of the hospital's medical staff, resulting in the need to teach principles of patient care and first aid to the relatives of patients. In the end, during one of the shelling of the hospital, the generator was destroyed and food for patients was subsequently cooked on fire, all monitoring was replaced with the so-called “eye-balling observation”—the general condition of a patient was examined; blood pressure, pulse, and oxygen saturation were checked when able. Twice a day, dressings were performed for severely injured patients, and adequate antibiotic therapy was given.

On April 5, after 3 days of constant fighting, the hospital was captured by troops of the Russian Federation, and the

patients and medical staff who were remaining in the hospital were taken to the territory of Russia. This was the end of the hospital duty under war conditions, which lasted for 35 days. The medical staff was not ready for such working conditions, but they made every effort to save their patients.

During the first 6 weeks of hostilities in Mariupol, 14 physicians and surgeons of the City Hospital No. 4 died—14 medical doctors who fought until their last day for the lives of their patients. Eternal memory to them and the hope that this will never happen again.

Conclusions and Suggestions

We record and reflect the effects of the war on neurologic care providers and neurological patients in Ukraine. This information could be used to plan worldwide responses to the short- and long-term health effects of conflict and function as a potent deterrent to subsequent acts of aggression.

The difficulties that Ukraine's neurological care is currently facing are numerous and complex. These challenges have uncovered additional obstacles that are specific to the current war, particularly in the eastern and southern parts of the country. Understanding these obstacles can help multi-agency assessments and provide information for future crisis management plans. We believe that preparedness to manage stroke and other neurologic disorders should be part of the Emergency Medical Teams 2030 Strategy.²⁸ Furthermore, we find it crucial that healthcare workers (physicians, surgeons, nurses, and allied health professionals) are supported with educational programs online and offline (with dedicated grants to travel within the country and outside) offering high-quality supervision, peer supervision as a means of protecting the clinician from vicarious traumatization, and preserving their ability to continue to work in the trauma field.²⁹ Mental health support should be prioritized to help healthcare workers cope with the traumatic exposures, and legal protections under rules of war are critical to protect the core principles of our profession in these circumstances.

In addition, the following suggestions for potential remedies are made in light of the difficulties we have faced:

- Medical care delivery is greatly hampered by the damage to the healthcare infrastructure, which frequently results from deliberate attacks. International agreements and provisions to protect medical facilities during wars need to be strengthened. Potential alternative care facilities should be included in all contingency plans as part of mitigation efforts.
- Critical medical equipment, medications, and resources are highly limited as a result of supply chain disruption, a common side effect of modern combat. Alternative supply chains and distribution channels should be established through cooperation between governments and assistance organizations.
- Healthcare workers frequently leave areas affected by armed conflicts, resulting in a scarcity of essential personnel to face the challenges and ensure continuity

of care for people in the regions. Civilians could learn first aid management skills through adaptable community education programs, and enabling policies and educational initiatives should be put in place to recruit, train, and deploy new healthcare workers.

- Stress and treatment interruptions brought on by medicine shortages might worsen chronic conditions. Early detection of treatment gaps and developing a system to ensure continuity of care for these illnesses should be a top priority for healthcare workers.
- To ensure that vulnerable populations, including neurological patients, have access to healthcare services both during and after a conflict, outreach programs, mobile clinics, and transportation assistance should be established, along with policies for accessible healthcare facilities.

Due to their profound impact, these difficulties and challenges have provided a roadmap for coordinated and cooperative efforts to reconstruct Ukraine's healthcare system. Strong relationships, collaboration, advocacy, funding, and adaptable contingency plans are necessary for overcoming these challenges and putting the suggested ideas into action. The restoration of the entire infrastructure, including the healthcare system, will be successful only if governments and local, national, and international relief organizations join these efforts. Coordinated methodical strategies may offer solutions to lessen the healthcare crises brought on by the current conflict and strengthen the ability of Ukraine's healthcare system to withstand setbacks in the future.

We would like to dedicate this article to honor the memory of our colleagues who gave everything to help their patients and were killed in this war.

Conflict of Interest

None declared.

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