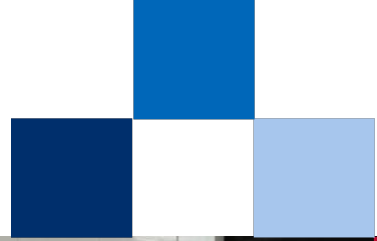




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Telemedicine in Ukraine During the War: Lessons Learned and Best Practices

Local Health System Sustainability Project

June 2024

Local Health System Sustainability Project

The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ helps low- and middle-income countries transition to sustainable, self-financed health systems as a means to support access to universal health coverage. The project works with partner countries and local stakeholders to reduce financial barriers to care and treatment, ensure equitable access to essential health services for all people, and improve the quality of health services. Led by Abt Global LLC, the five-year project will build local capacity to sustain strong health system performance, supporting countries on their journey to self-reliance and prosperity.

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In the first months of Russia's full-scale invasion of Ukraine, foreign private companies approached the Government of Ukraine offering to donate telemedicine solutions (devices and software) for remote delivery of health and rehabilitation services to Ukrainian patients. We would like to express our deepest gratitude to Teladoc (USA), WTI (USA), Eodyne (Spain), Engauge (USA), Polsat (Poland), NGO Help to Ukraine (Spain), BrainScan (Poland), as well as Charite and BG Kliniken (Germany) for providing innovative technologies and solutions free of charge and adapted them for use in Ukrainian context including countless staff hours of support.

The leadership and strategic guidance of the Ministry of Health of Ukraine (MOH) served as a foundation for the USAID-funded Local Health System Sustainability Project's (LHSS's) efforts in this area. LHSS would like to thank the MOH, represented by Deputy Minister Mariia Karchevych, who trusted in the capacity and expertise of the project and engaged the project to provide technical assistance in coordinating the introduction of telemedicine solutions provided to Ukraine as humanitarian aid during the period of martial law.

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LHSS also expresses deep gratitude to the health professionals who have mastered new technologies in extremely difficult conditions, ensuring access to much-needed services for patients and interacting with the project team to solve technical issues, train, report, and share success stories. We are grateful to the managers, IT personnel, and administrative staff who organized the work of telemedicine solutions in health facilities despite blackouts, staff shortages, and other challenges.

This report was prepared by LHSS specialists Artem Liashenko, Bohdan Kiziun, Oleksandr Hasych, and Iryna Teleshevska, who, together with consultants, organized all stages of delivering telemedicine services (communication, distribution, delivery, connection, technical support, staff training, etc.). This team ensured that the software and hardware worked as efficiently as possible and provided support for the users to adopt new technologies for the health and well-being of the people of Ukraine.

The report was prepared with the support of the United States Agency for International Development (USAID), which enabled the project to coordinate the use of telemedicine solutions, promote the overall development of telemedicine, help health professionals master innovative technologies, and ensure patients' access to health services in the time of war. The authors would like to thank Paola Pavlenko of USAID/Ukraine for her vision and unwavering support of the Ministry of Health and LHSS's efforts to expand and sustain telemedicine during Russia's war in Ukraine.

ABBREVIATIONS

CT	Computed tomography
CTG	Cardiotocography
eHealth	Electronic Health System of Ukraine
IT	Information technology
LHSS	Local Health System Sustainability Project
MIS	Medical information systems
MOH	Ministry of Health of Ukraine
NHSU	National Health Service of Ukraine
RGS	Rehabilitation Gaming System
SOE	State-Owned Enterprise
USAID	United States Agency for International Development

GLOSSARY

Cardiotocography is a diagnostic technique in obstetrics used to monitor fetal heartbeat and uterine contractions of a pregnant woman.

Electronic Health System of Ukraine (eHealth) is an information and communication system that automates accounting of health services and management of health care information, including medical information, by creating, posting, publishing, and sharing information, data, and documents in electronic form. eHealth includes a central database and electronic medical information systems that automatically exchange information, data, and documents through an open application programming interface (API) (Fundamentals of Ukrainian Legislation on Healthcare, Article 3). The term “eHealth” corresponds to an internationally recognized term “Electronic Health Record System (EHRS).

Individual rehabilitation plan is a document that is used to organize rehabilitative care. The plan is prepared according to the template provided and agreed upon by a multidisciplinary rehabilitation team after every member of the team examines the patient, considering their existing disorders, limitations of daily functioning, and needs. Then the plan is approved by the physical therapy and rehabilitation specialist at the general meeting of the entire team.

Integrated Information Security System is a system of technical and non-technical measures that prevent or complicate the possibility of access to information processed automatically in information and telecommunication systems.

Introduction of telemedicine solutions is a multi-step process aimed at organizing the effective use of telemedicine solutions (devices and software) in health facilities considering the current state of telemedicine in general. It includes analysis, preparation, deployment, use, monitoring, information support, and so forth.

A **medical information system** is an information and communication system that allows automating the work of business entities in the health care sector, i.e., creating, viewing, and exchanging information in electronic form, specifically with the eHealth central database (if connected).

Technical Protection of Information refers to activity aimed at ensuring confidentiality, integrity, and availability of information through engineering and technical measures.

Teleconsultation (televideo consultation) refers to communication (interaction) between two or more participants (health/pharmaceutical workers and/or rehabilitation specialists and patients) by means of information and communication technologies to provide patients with health and/or rehabilitation care and prevention (Fundamentals of Ukrainian Legislation on Healthcare, Article 3).

Telediagnosics is the process of performing diagnostic procedures using information and communication technologies to exchange medical information, including the transfer of images, test results, data from medical devices, and any documents related to health (Fundamentals of Ukrainian Legislation on Healthcare, Article 3).

Telemedicine solutions, in this report, are telemedicine devices and software provided to Ukraine as humanitarian aid during the period of martial law and implemented with the support of the project.

Telemedicine solution testing is a process of exploring and testing a software product on the basis of a comprehensive set of criteria aimed to check whether actual performance of the software corresponds to its expected behavior.

Telemetry is a set of technologies and tools that allow remote measurement of patient health indicators, as well as their processing and transmission (Fundamentals of Ukrainian Legislation on Healthcare, Article 3).

Teleradiology is a set of technologies and tools for processing images obtained during diagnostic procedures with the use of radiological equipment and/or providing access to such images through information and communication technologies for further analysis, interpretation, and preparing medical reports.

Telesurgery is a set of telecommunication technologies, methods, and telemedicine tools for remote consultation during surgical procedures.

Virtual and augmented reality tools are technological tools that create a simulated world that is transmitted to a person through their senses (sight, hearing, touch, etc.). These tools simulate both the impact and reactions to the impact and can be used to rehabilitate and restore physical, cognitive, or psychological functions in people with various types of disabilities or limitations.

EXECUTIVE SUMMARY

INTRODUCTION

Russia's full-scale military invasion of Ukraine has created unprecedented challenges for the country's health care system. Significant destruction of health care infrastructure has limited access to health services, and massive displacements of people have significantly complicated the process of providing and receiving health services. This context has given rise to an urgent need to provide health services, especially in remote and frontline areas where traditional in-person access to health services is severely limited or impossible. In response to these challenges, more than 10 actors across the globe began offering assistance to Ukraine in the form of telemedicine technologies. From these 10 offerings, 6 telemedicine solutions were selected to be installed and used in healthcare facilities free of charge. These were solutions from companies and organizations such as Teladoc (USA), WTI (USA), Eodyne (Spain), Engauge (USA), Polsat (Poland), NGO Help to Ukraine (Spain), BrainScan (Poland), as well as Charite and BG Kliniken (Germany). Following a request from the Ministry of Health of Ukraine (MOH), the USAID-funded Local Health System Sustainability Project (LHSS) has worked to provide comprehensive technical assistance with the introduction of telemedicine solutions in health facilities.

This report analyzes the experience of introducing telemedicine solutions with the technical assistance of LHSS in Ukraine. It highlights the results, analyzes the experience, and presents best practices, challenges, and lessons learned. Additionally, this report provides recommendations for further utilization of extant and future telemedicine solutions both during martial law and after its repeal. The information presented in the report is intended to be useful for central and local authorities, health facilities, and telemedicine solution providers. It will also be of interest to those who wish to start using telemedicine solutions in the delivery of health services. The objectives of the report are as follows:

1. Analyze the main stages of introducing telemedicine solutions.
2. Summarize the experiences, lessons learned, and best practices associated with introducing telemedicine solutions in a wartime environment.
3. Outline the prospects for introducing the telemedicine solutions provided to Ukraine as humanitarian aid under martial law and after its repeal.

METHODOLOGY

The report analyzes the introduction of telemedicine solutions provided to Ukraine as humanitarian aid during the period of martial law. It covers the period from April 2022 to March 2024. Throughout this period, the team used LHSS program monitoring data to measure the number of involved medical facilities, trained people, health services provided via telemedicine, and technical assistance interactions. The team also used results from a survey of telemedicine users conducted by the State-Owned Enterprise (SOE) eHealth from February to March 2024. The survey consisted of 185 questions and was distributed to 1,303 users (including physicians, nurses, technicians, and administrative staff) across 349 facilities in 22 regions. The response rate was 32 percent (411 out of 1,303 users responded). Additionally, results from 26 in-depth interviews with telemedicine solution providers, patients, medical and technical staff of the health facilities, and representatives of state and local authorities were included in the analysis. LHSS technical experts conducted the analysis of these data and included findings from their subjective experience during this period. An Abt Global digital health expert provided quality assurance review and the MOH validated the findings and recommendations of this report.

This report analyzed the implementation of the following telemedicine solutions:

Teladoc telemedicine platform for video consultations: a multifunctional telemedicine platform used for counseling interactions for doctors admitting patients with gunshot and explosion wounds at higher-level medical centers.

Rehabilitation Gaming System (RGS): a platform for neurosensory telerehabilitation. This evidence-based neurorehabilitation solution uses computers, gadgets, and augmented reality tools for treatment of deficiencies caused by brain damage or orthopedic injury.

Epiqar telemedicine platform: A software and hardware product which allows consulting surgeons to take part in online counseling during surgeries at healthcare facilities by connecting their devices to the source of video signal in the operating room.

Carebits telemedicine platform: A remote monitoring system for pregnancies which uses portable diagnostic complex.

HomeDoctor telemedicine remote diagnostic platform: A software and hardware product which allows doctors to perform basic examinations remotely while patients can undergo basic tests by themselves, such as: measuring body temperature, blood pressure, saturation, doing ECG, examining ears, throat, nose, and skin using telemedical boxes.

BrainScan telemedicine platform: An artificial intelligence telemedicine application for analysis of CT (computed tomography) studies and automatic detection of brain lesions.

RESULTS

As of March 31, 2024, **14,769 health services were provided via telemedicine**. The largest number of services (11,803, or 79.92 percent) were telediagnostic services provided via Carebits (10,601), HomeDoctor (386), and BrainScan (816) solutions. Teleconsultation services (Teladoc) accounted for 14.63 percent (2,160) of services, telerehabilitation services (RGS) for 5.41 percent (799) of services, and telesurgery services for 0.04 percent (7) of services.

Telemedicine solutions were introduced in **399 health facilities** (35 primary care facilities and 364 specialized care facilities). Some facilities use multiple telemedicine solutions - the total number of telemedicine solutions installed is 415.

1,902 people were trained (1,258 women and 644 men) to use telemedicine solutions, including 1,823 physicians (96 percent), 51 nurses (2 percent), 24 technicians (1 percent), and 4 administrative workers (1 percent). Among these, 1,820 persons (96 percent) are employed at specialized care facilities and 82 persons (4 percent) are employed at primary care facilities.¹

LHSS specialists had 3,314 technical assistance interactions, almost all of them (99 percent) online. During these interactions, experts demonstrated telemedicine solutions to facilities, described new functions or equipment for already installed solutions (3 percent), helped solve functional problems (61 percent), resolved operational issues (29 percent), and retrained staff (9 percent).

As of March 2024, LHSS provided **technical assistance to the MOH to establish six public-private partnerships**.² These partnerships make up the foundation for introducing relevant telemedicine solutions and addressing urgent health needs for vulnerable populations, such as pregnant women, and people with chronic diseases and traumatic injuries like burns and brain injuries. Additionally, these partnerships helped address gaps in facilities that are having difficulties providing medical care due to lack of physicians and patients living in remote locations.³

¹ The over-representation of specialized care employees can be explained by the fact that five out of six telemedicine solutions are used to provide specialized care; only the HomeDoctor device is used in primary care.

² The use of telemedicine solutions in the time of war / MOH. (In Ukrainian). <https://moz.gov.ua/article/news/vikoristannja-telemedichnih-rishen-v-umovah-vijni>.

³ Our physicians will be able to use telemedicine technologies to treat blast and gunshot wounds / MOH. (In Ukrainian). <https://moz.gov.ua/article/news/nashi-likari-zmozhut-vikoristovuvati-telemedichni-tehnologii-dlja-likuvannja-vibuhovo-vognepalnih-poranen>.

In analyzing the data, the LHSS team noticed several trends related to implementation and uptake:

- From April to September 2022, 992 services were delivered, while the number of services delivered between October 2023 and March 2024 rose to 7,679. The rapid uptick in service provision demonstrates the successful introduction and subsequent expansion of telemedicine.
- From April 2022 to December 2022, 296 medical facilities were involved. By March 2024, 399 facilities were using telemedicine solutions. Likewise, from April to December 2022 989 medical staff were trained, and by March 2024, this number had risen to 1,902 people trained. This indicates a prompt response of the facilities to the needs of patients with limited access to services, and the data indicates that this was especially the case in recently deoccupied territories. These data are evidence of telemedicine's contribution to the restoration of health services during the war.

Geographically, several more trends are notable:

- The areas with the most health facilities using telemedicine were Odesa (33), Dnipropetrovsk (28), and Chernihiv (28) regions.
- The areas with the largest number of physicians trained were Kyiv (151), Vinnytsia (147), and Kharkiv (131) regions.
- The areas with the largest numbers of services delivered via telemedicine were Odesa (1,988), Donetsk (1,140), Zaporizhzhia (1,063), and Poltava (1,009) regions and the city of Kyiv (2,399).

Although the data in this report end in March 2024, the introduction of telemedicine solutions with LHSS support is ongoing. We expect to maintain the positive trends in scaling up these solutions that were borne out by the data from January to March 2024. The key to the rapid scale-up of the number of facilities involved, personnel trained, and services provided during this time period has proved to be government counterparts' commitment and strategic stewardship, comprehensive information, training, and organizational activities. We have continued to engage in these key activities since March, and thus expect to see further expansion of telemedicine in Ukraine when the data become available.

CHALLENGES AND LESSONS LEARNED

Lesson #1. It is possible to build on a national eHealth vision while managing wartime constraints.

The small amount of global data that existed on telemedicine implementation in situations of war and other disasters pointed to short-term solutions that operated in parallel to national health systems and were designed to be phased out.⁴ These findings deviated from traditional and well-established practices such as the World Health Organization's *National eHealth Strategy Toolkit*, in which frameworks promote establishing governance mechanisms, engaging heavily with stakeholders, and aligning health system building blocks within the eHealth system. LHSS designed and implemented an approach that aligned with the World Health Organization's framework of holistic strategy development and found this to be a cornerstone of its success. LHSS helped the MOH establish a clear, shared vision for telemedicine that supported uptake of new telemedicine solutions. Its emphasis on clear governance and financing mechanisms eased introduction of the solutions at the facility level, and its highly participatory approach allowed the project to act with broad consensus and operate dynamically.

⁴ Lessons Learned from an International Review of Telemedicine. The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ. September 2022. Rockville, MD: Abt Associates.
<https://www.lhssproject.org/resource/telemedicina-v-ukraini-situaciyiny-analiz-rokvil-shtat-merilend>

Lesson #2. A proper legal framework is as essential as an information technology (IT) framework for the successful introduction and functioning of telemedicine, especially in extreme conditions such as martial law.

Legal uncertainty about the possibilities and procedures for applying telemedicine solutions complicates their introduction, thereby limiting patients' access to services provided by telemedicine when the traditional form of service delivery is less available. The analysis and improvement of the regulatory framework, specifying requirements for the provision of health services through telemedicine, and the clarification/coordination of roles and responsibilities of all the participants allowed LHSS to adapt the use of telemedicine to the requirements of wartime. This experience emphasizes the importance of a proactive approach to legislative support for the development of innovative medical technologies for their successful integration and use.

Lesson #3. Solutions must be fit-for-purpose and adapted to end user needs.

LHSS and health sector partners faced technical and infrastructural constraints when introducing telemedicine solutions, especially in rural and remote areas with poor IT infrastructure and unstable internet connection. To overcome this problem, LHSS worked with providers to adapt telemedicine solutions so they could operate without consistent internet connection. Simultaneously, LHSS initiated dialog with key stakeholders to attract investments to upgrade the IT infrastructure of health facilities.

Another challenge was that tutorials on how to use telemedicine solutions were often only in English or had very limited multilanguage resources. The needs of end users in Ukraine could not be met because of this language barrier. To overcome this, health facilities engaged interpreters or English-speaking staff during teleconsultations, and LHSS created a technical support service whose specialists spoke both English and Ukrainian. LHSS also developed video tutorials in Ukrainian for each telemedicine solution, which users expressed were better than written instructions as video helped them assimilate the material more effectively and made the training process more accessible and interesting.

Lesson #4. Financial capacity of donators must be taken into consideration.

Telemedicine solution providers continue to support the solutions they have already provided free of charge, although their continued technical support may require additional human and financial resources. Companies lack the resources and have limited technical support capacity. This has led to interruptions in the operation of their telemedicine solutions or their complete shutdown. The GoU and MoH of Ukraine must consider the costs and assess the volume of resources needed to support the deployment of such telemedicine solutions when making decisions prior to their deployment.

Lesson #5. Health facility leadership plays a key role in the deployment and continued use of telemedicine solutions.

Health facility managers who are aware of the benefits of telemedicine and demonstrate a proactive and informed attitude toward it encourage physicians and patients to also look on it favorably, use it effectively, and help find the resources needed to support its continued functioning. To further motivate managers to incorporate telemedicine into the work of their facilities, LHSS regularly communicated with them, helping them develop internal procedures for the use of telemedicine solutions and thereby expand access to quality health services.

Lesson #6. Monitoring the use of telemedicine solutions, feedback, and responses to problems are required for health facilities' responsible use of telemedicine solutions.

Regular monitoring of facilities by LHSS has made the managers and medical staff of health facilities more systematic and organized in their use of telemedicine devices. LHSS prepared analytical reports when its monitoring detected inefficient use of devices, and the MOH used the reports to inform proposals for ways in which regional health departments and health facilities could

improve their use of the devices; alternatively, the MOH could decide to move the solutions to other facilities. Such feedback allows the MOH to see a comprehensive picture of the use of telemedicine solutions and to distribute them based on the changing needs and capabilities of health facilities.

Lesson #7. Proactive and participatory communication is critical to overcoming health providers' low motivation and skepticism to apply telemedicine in their routine.

As LHSS rolled out new solutions, the project noticed some health professionals demonstrating low motivation, skepticism, and resistance to the use of telemedicine solutions in their work. One reason for this may be the medical community's lack of awareness about the capabilities of modern technologies⁵. To overcome this challenge, LHSS launched a series of information and communication activities aimed at increasing knowledge and skills in the use of telemedicine technologies among health professionals and patients. Positive results of telemedicine use were disseminated through mass media, social media, and professional platforms, and the development of the *StoryMap* web resource⁶ significantly expanded of health professionals' trust in and motivation for using telemedicine.

Lesson #8. The use of modern communication technologies, such as chatbots, messengers, video channels, and communication platforms, facilitates the process of communication and decision-making.

Project specialists created groups on social networks to discuss current issues of using telemedicine solutions. Additionally, a chatbot was launched to provide technical assistance on RGS, and a YouTube channel with video tutorials was created. The MOH added QR codes and web links to relevant resources in their official letters to provide quick access to the necessary information for departments and health facilities. As a result, the project promptly received a large number of applications from facilities to install telemedicine solutions. These measures simplify user interaction and significantly improve the overall productivity of telemedicine solutions.

RECOMMENDATIONS

These recommendations aim to extend the work of telemedicine solutions after LHSS ends.

Recommendations for government authorities and decision-makers

While the MOH continues to provide strategic leadership in introducing telemedicine, in order to safeguard the sustainability of advances achieved in telemedicine, it is necessary to identify a government agency that can take over the current functions of LHSS after the project completion.

These functions include:

- **analyzing** the administrative and legal obstacles to the introduction of telemedicine and proposing ways to resolve them,
- **interacting** with telemedicine solution providers to support them in ensuring their smooth operation,
- **providing ongoing technical support** to health facilities that use telemedicine solutions. It is important to identify the agency that will exercise these responsibilities as well as the resources to ensure a prompt response to technical problems,

⁵ Landscape Assessment of Telemedicine in Ukraine. The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ. March 2023. Rockville, MD: Abt Associates.
https://www.lhssproject.org/sites/default/files/resource/2023-05/LHSS_UKRAINE_FY23_Landscape%20Assessment%20of%20Telemedicine%20in%20Ukraine_Ukr.pdf

⁶ Interactive StoryMap: Telemedicine in Ukraine / LHSS. URL: <https://www.lhssproject.org/news/interactive-storymap-telemedicine-ukraine>

- **promoting telemedicine** and maintaining regular communication with health facilities about the benefits of telemedicine, available solutions, and best practices, as well as regular communication and exchange of experience in the community of practitioners, and
- **monitoring and evaluating** the effectiveness of telemedicine solutions to identify problems in a timely manner and adjusting and improving processes to ensure the proper quality of telemedicine services.

The SOE eHealth is the most suitable candidate to perform these functions, provided it has sufficient financial and human resources. LHSS is now sharing its best practices with SOE eHealth to ensure a smooth transition and stable operation of solutions after the project's completion.

To ensure further development of telemedicine in Ukraine and improve the accessibility and quality of care, it is necessary to:

- **Account for experience gained during the war and the rapid development of telemedicine technologies.** Further development of telemedicine in Ukraine should be based on the experience gained during the war, on the improvement of telemedicine technologies, and on the needs of patients for care regardless of their location.
- **Develop teleconsultations and teliagnostics as priority areas.** These services are the most relevant, so it is important to ensure their priority development and support.
- **Create technical conditions for interaction with the eHealth.** Interaction of telemedicine solutions and devices with the eHealth of Ukraine will allow organizing a single medical information space and facilitate data exchange between health facilities.
- **Develop modern medical technologies while rebuilding the health care system.** Rebuilding the health care system in the post-war period will require significant and widespread investment, but priority should go to the development of modern medical technologies such as telemedicine, which are more cost effective and provide better quality and access to care than traditional means of providing health services.
- **Support and develop public-private partnerships** at the level of state policy. Public-private partnerships in the field of telemedicine have demonstrated their effectiveness during the war, and they can play a key role in the further development of telemedicine in the post-war period.
- **Engage international partners and learn their experience.** It is important to cooperate with international organizations to share experience and knowledge in the field of telemedicine.
- **Implement comprehensive information support and education programs.** Programs and events should be conducted to raise awareness of telemedicine among the public and health professionals. This will spread the word about its benefits.
- **Introduce telemedicine in educational programs.** Including telemedicine in the curricula of higher and postgraduate medical education facilities will prepare future health professionals to use telemedicine technologies effectively.

Recommendations for telemedicine solution providers

To ensure the effective and sustainable use of telemedicine solutions provided as humanitarian aid to a recipient country it is important to:

- **Provide clear and transparent communication** on the scope, terms, and conditions of humanitarian aid. This will allow recipient countries to effectively plan and use telemedicine solutions and minimize possible negative consequences in the event of termination of such aid.
- **Provide ongoing technical support for the implementation and use of telemedicine solutions.** It is important to ensure prompt response to technical problems, including regular software updates and bug fixes.

- **Provide training for medical and technical staff.** Regular training and access to training materials will help increase the effectiveness of telemedicine solutions and reduce the likelihood of technical errors.
- **Provide flexible customization of telemedicine solutions.** This will allow the adaptation of the solution to the needs of different health facilities and types of care.
- **Introduce a mechanism for collecting user feedback.** Feedback analysis will help optimize telemedicine solutions and increase user satisfaction.
- **Cooperate with local companies in the recipient country to provide technical support.** This will help to respond quickly to technical issues and provide effective local support.
- **Provide an interface in the language of the recipient country.** This will facilitate the use of telemedicine solutions by end users.
- **Provide resources for translation services** to effectively communicate with recipients of humanitarian aid and users of telemedicine solutions, especially when it comes to consultations with physicians from other countries.
- **Account for the legal requirements of the recipient country on the protection of personal and medical data.** This will enable secure storage, exchange, and use of sensitive data.
- **Create a system for continuous monitoring and analysis of telemedicine solutions** will help identify and correct shortcomings, streamline processes, and improve quality of services.

Recommendations for health facilities providing care by telemedicine methods and tools

To ensure the effective and sustainable use of telemedicine solutions provided as humanitarian aid, it is necessary to improve the quality and continuity of health services:

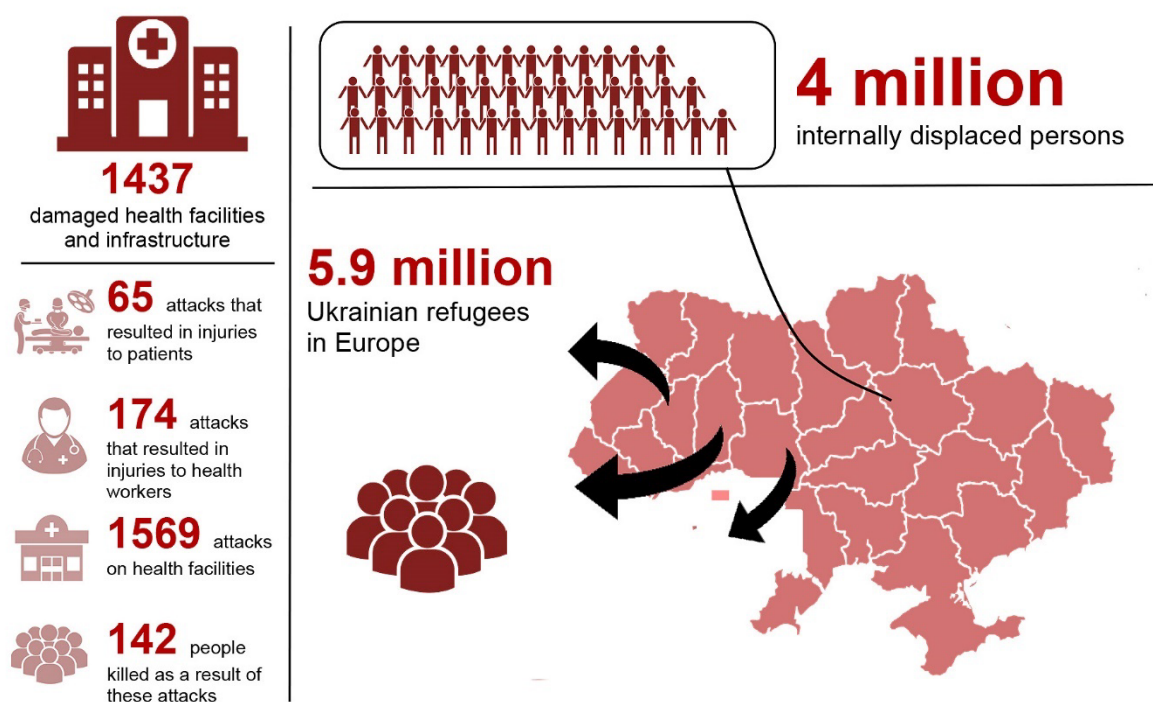
- **Accept humanitarian telemedicine solutions only if the facility has the necessary human and technical resources, as well as a plan for their immediate use.** Humanitarian aid in the form of telemedicine technologies is intended to provide care in the time of war, so they should be used immediately not postponing them to the future.
- **Transfer telemedicine solutions that are not used by the facility to other facilities in a timely manner.** If telemedicine solutions do not meet a facility's needs, or if the facility lacks the resources or capacity to use them effectively, transfer them to facilities that can introduce and use them.
- **Invest in technical infrastructure.** Develop the necessary technical infrastructure of health facilities to provide telemedicine services by ensuring the necessary equipment and stable internet connection.
- **Develop staff skills.** Organize training and continuing professional development of medical and technical staff on telemedicine to ensure an appropriate level of competence in this area.

Introduction

The war on the territory of Ukraine caused by Russia's full-scale military invasion has posed unprecedented challenges to the country's health care system. Significant destruction of health care infrastructure and facilities due to the hostilities has drastically limited the population's access to health services. The massive displacements of people, including health professionals, significantly complicates the process of providing and receiving health services due to geographical and logistical obstacles (Figure 1).

Amidst the war, Ukraine has faced an urgent need to provide health services for a wide range of patients, including people with explosive and burn injuries, pregnant women in need of specialized care, and people in need of physical rehabilitation. This need is especially large in remote and frontline areas where traditional, in-person access to health services are severely limited or impossible.

Figure 1. Consequences of Russia's full-scale armed aggression against Ukraine, February 2022–May 2024*.



*Source: WHO Surveillance System for Attacks on Health Care and the UN Office for the Coordination of Humanitarian Affairs

In response to these challenges, several actors across the globe began offering assistance to Ukraine in the form of telemedicine technologies (teleconsultation, telediagnosics [telemetry, teleradiology], telerehabilitation, and telesurgery) to be installed and used in health facilities free of charge⁷.

In response to the request from the Ministry of Health of Ukraine (MOH) and USAID, the Local Health System Sustainability Project (LHSS) adapted its objectives in early 2022 to provide comprehensive technical assistance for introduction of telemedicine solutions in health

⁷ Further in the text, these telemedicine technologies and devices, which were provided to Ukraine as humanitarian aid during the period of martial law and whose implementation was supported by the project, are referred to as 'telemedicine solutions.'

facilities. As of March 2024, the project has supported six solutions provided by American, German, Spanish, and Polish private companies totaling about US\$ 4 million.

This report analyzes the experience of introducing telemedicine solutions with the technical assistance of LHSS in Ukraine during the war. It highlights the results, analyses the experience, and presents best practices, challenges, and lessons learned. The report provides recommendations for further use of the existing and future telemedicine solutions during martial law and after its termination.

The information presented in the report is intended to be useful for central and local authorities, local governments, health facilities, and telemedicine solution providers. Also, it will be of interest to those who wish to start using telemedicine solutions in the delivery of health/rehabilitation services.

Goal and objectives

The goal of this report is to analyze and systematize the experience of introducing telemedicine solutions provided as humanitarian aid during the war in Ukraine in the context of relevant aspects of telemedicine in Ukraine.

The objectives of the report are as follows:

- Analyze the main stages of introducing telemedicine solutions.
- Summarize the experience, lessons learned, and best practices of introducing telemedicine solutions in the context of war.
- Outline the prospects for introducing the telemedicine solutions provided to Ukraine as humanitarian aid under martial law and after its termination, as well as in the context of further development of telemedicine in Ukraine.

Methodology

The report analyzes the introduction of telemedicine solutions provided to Ukraine as humanitarian aid for the period of martial law in the context of telemedicine in Ukraine and covers the period from April 2022 to March 2024. Throughout this period, the LHSS team used program monitoring data to measure the number of involved medical facilities, trained personnel, and health services that were provided via telemedicine and technical assistance interactions. The team also used results from a survey of telemedicine users conducted by the State-Owned Enterprise (SOE) eHealth from February to March 2024. The survey consisted of 185 questions (including specific questions for each solution), was distributed to 1,303 users (including physicians, nurses, technicians, and administrative workers) across 349 facilities representing 22 regions and had a 32 percent response rate (411 out of 1,303 users responded). It also used results from 26 in-depth interviews with telemedicine solution providers, patients, medical and technical staff of the health facilities, and representatives of regional and local authorities. This analysis has revealed several limitations, in particular: The results of introducing different telemedicine solutions are not analyzed in this report because they cannot be compared. The usefulness of these solutions in terms of the accessibility of medical services has been thoroughly analyzed in the appendices. The indicators associated with implementing the solutions vary widely. There are several reasons for this: telemedicine devices were provided in different quantities; solutions were implemented according to different schedules; and solutions were used to deliver health services in different areas. Additionally, technical problems such as poor Internet connection, power outages in facilities, and system failures as well as the interest of patients and physicians in using them likewise led to the differentiation of key indicators related to telemedicine service provision.

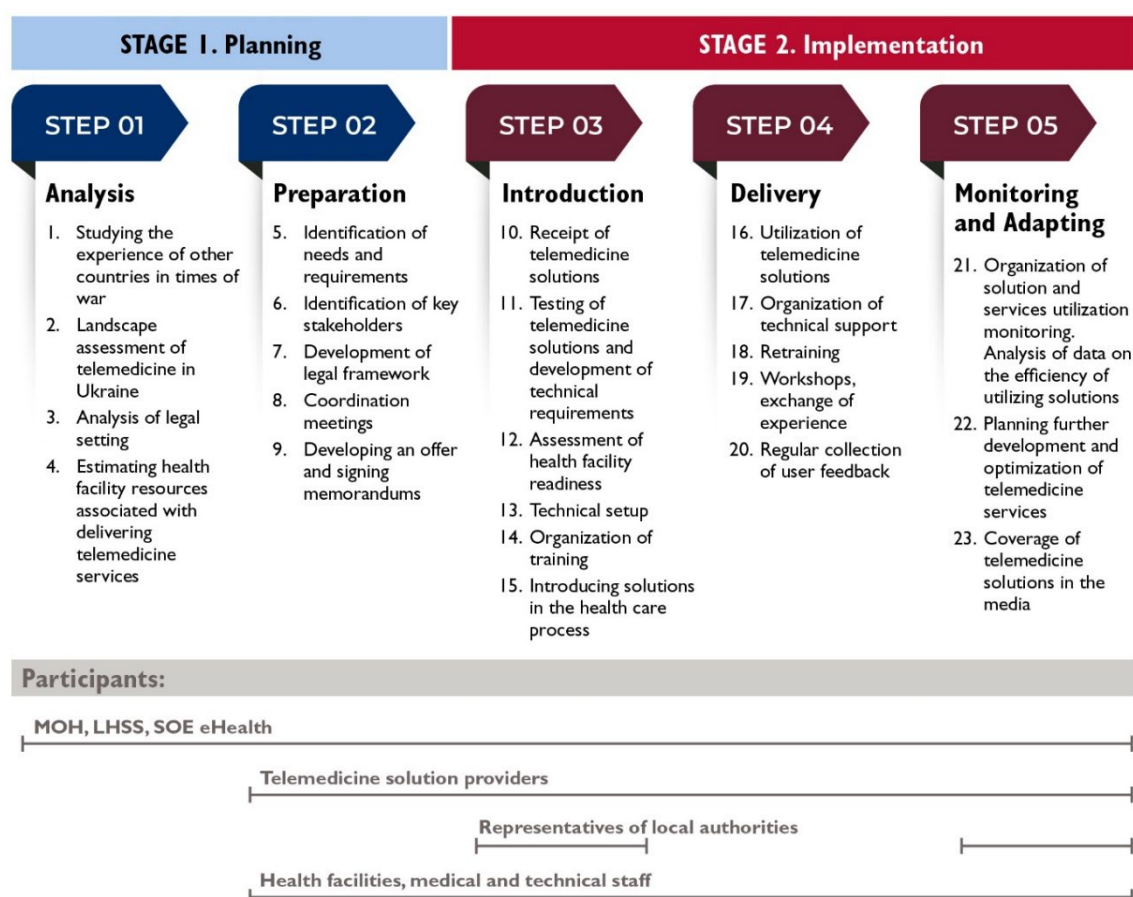
- The number of people receiving services via telemedicine cannot be measured. This is due to the fact that the donated telemedicine solutions do not process personalized patient data, as they lack the necessary data protection certification and integration with the

eHealth databases, which are critical for maintaining confidentiality and adhering to personal data processing regulations required by the Ukrainian legislation. The survey could not cover all health facilities that use telemedicine solutions, and some companies that provided these solutions were not interviewed, because participation in the survey and interviews was voluntary.

MAIN STAGES OF INTRODUCING TELEMEDICINE SOLUTIONS

LHSS supported the introduction of telemedicine to achieve three goals: (1) Support the MOH in rapidly reconnecting people to health services during the war, (2) Generate knowledge on the use of telemedicine to inform policy and improve effectiveness, and (3) Ensure private-public partnerships are conducted in a manner that supports the Ukrainian health system rather than operating in parallel. Before launching support, LHSS met with several stakeholders and outlined a plan to introduce telemedicine consisting of five steps across two stages. Figure 2 details this plan:

Figure 2. The main stages of introducing telemedicine solutions



Planning Stage

Analysis

LHSS's analysis of telemedicine began with studies of both relevant foreign experiences with telemedicine and the situation in Ukraine regarding the opportunities and risks of introducing telemedicine in general and in the context of war. This enabled the project team to adopt best practices and avoid established pitfalls. Analysis is relevant at all stages of implementation and was performed in parallel with other key processes. To this end, the project team carried out several critical analyses:

- A review of international experiences using telemedicine in war, disaster, and post-war environments,⁸ offering examples and practices from different countries that can inform implementation in Ukraine.
- A landscape assessment of telemedicine in Ukraine⁹, describing the extant resources, technical support, and the demands/needs of health professionals and patients using telemedicine.
- A review of the legal framework for telemedicine in Ukraine¹⁰, outlining opportunities and gaps in the legislation governing the use of telemedicine.
- An estimation of resources associated with delivering telemedicine services at the facility level in Ukraine, analyzing the costs of introducing and delivering telemedicine services in 30 Ukrainian health facilities.¹¹

Preparation

The aim of the preparation step was to establish the capacities, needs, further activities, and roles of all the participants when rolling out telemedicine solutions (Table 1).

Table 1. Participants in the process of introducing telemedicine solutions

Participants	Roles
Patients	<ul style="list-style-type: none"> • Receive health/rehabilitation services with the use of telemedicine solutions. • Share feedback on the ease of using telemedicine services.
Telemedicine solution providers	<ul style="list-style-type: none"> • Provide telemedicine solutions. • Provide technical support for the use of telemedicine solutions.
LHSS	<ul style="list-style-type: none"> • Organize the process of introducing telemedicine solutions. • Provide technical assistance in the deployment and utilization of telemedicine solutions.
MOH	<ul style="list-style-type: none"> • Provide leadership and decision-making. • Develop a regulatory framework and enabling environment.
SOE eHealth	<ul style="list-style-type: none"> • Coordinate the use of MISs. • Organize communication with telemedicine solution providers, health facilities, and MOH.
Representatives of local authorities	<ul style="list-style-type: none"> • Create an enabling environment for the deployment of telemedicine solutions, including political and financial support for equipping health care facilities with the necessary equipment, internet connection, power generators, and so forth.
Health facility managers	<ul style="list-style-type: none"> • Organize the process of using telemedicine solutions in their facilities.
Medical staff of the health facilities	<ul style="list-style-type: none"> • Provide health/rehabilitation care with the use of telemedicine solutions.
Technical specialists of health facilities	<ul style="list-style-type: none"> • Provide technical support and help users install and use telemedicine solutions.

⁸ Lessons Learned from an International Review of Telemedicine. The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ. September 2022. Rockville, MD: Abt Associates. <https://www.lhssproject.org/resource/telemedicina-v-ukraini-situaciyinyi-analiz-rokvil-shtat-merilend>

⁹ Landscape Assessment of Telemedicine in Ukraine. The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ. March 2023. Rockville, MD: Abt Associates. https://www.lhssproject.org/sites/default/files/resource/2023-05/LHSS_UKRAINE_FY23_Landscape%20Assessment%20of%20Telemedicine%20in%20Ukraine_Ukr.pdf

¹⁰ Analysis of the legal framework for telemedicine in Ukraine. The Local Health System Sustainability Project (LHSS) under the USAID Integrated Health Systems IDIQ. August 2023. <https://www.lhssproject.org/resource/analiz-normativno-pravovoi-bazi-schodo-telemedicini-v-ukraini>

¹¹ Estimating resources associated with delivering telemedicine services at facility level in Ukraine report. USAID Local Health System Sustainability Project. Kyiv. 2024. <https://www.lhssproject.org/resource/ocinka-resursiv-zakladiv-okhoroni-zdorovya-ukraini-povyazanikh-iz-nadannyam-telemedichnikh>

LHSS analyzed the needs, capabilities, and influence of the participants to appropriately coordinate responsibilities and improve cooperation. Additionally, the project supported the MOH in clarifying these roles in the regulatory framework (Annex C). During the preparation step, the team met with telemedicine solution providers, the MOH, and the SOE eHealth to agree on the organization of telemedicine solutions, focusing on the following aspects:

- Terms for the provision of humanitarian aid (scope, maintenance period, financial obligations, etc.)
- The legal framework for cooperation and procedural issues (memorandums, letters of offer, etc.)
- The scope of technical expertise and criteria for telemedicine solution testing (technical specifications, data security, requirements for the facility infrastructure, etc.)
- Options for distributing telemedicine solutions considering the capabilities of the provider as well as the needs of the facility and patients.

After reaching preliminary agreements, telemedicine solution providers sent offers to the MOH to provide telemedicine solutions as humanitarian aid. Based on these offers, memorandums of cooperation between the provider and the MOH were prepared. The memorandum outlines the legal framework for further cooperation between the parties and the process of introducing the provided telemedicine solutions and formalize the establishment of a public-private partnership.

“We couldn’t even imagine that Ukrainian physicians and the Ministry of Health could adopt a new technology and incorporate it into their work amidst all the other things going on. This truly impresses me.”

*Sharon Allen,
(Teladoc, WTI Chief Executive Officer)*

Implementation Stage

The implementation stage created a stable and controlled environment for the development and use of telemedicine solutions. It includes the following steps: (1) deployment of telemedicine solutions, (2) providing technical support for their operation, and (3) monitoring the process and analyzing the results of implementation. These steps developed by LHSS proved to be adaptive to the needs of users and technological innovations of telemedicine solution providers.

Deployment

The first part of deployment is telemedicine solution testing, outlined in Table 2. LHSS and the eHealth SOE conducted a comprehensive check of donated solutions’ technical specifications, functionality, compliance with MIS requirements, and ability to provide reliable protection of patient data in accordance with the Law of Ukraine on Personal Data Protection and anonymization mechanisms. Telemedicine solutions are evaluated during test teleconsultations and diagnostic procedures in real health facilities. This allows LHSS to assess their reliability, the convenience of the user interface, and overall user satisfaction.

Table 2. Key criteria and objectives of telemedicine solution testing

Objectives
<ol style="list-style-type: none">1. Assess the quality of the software2. Assess the need and demand for this solution in the process of health service delivery3. Assess the functional and technical capabilities4. Assess the information and data compatibility in the provision of health services5. Assess the degree of automation of the process of health service delivery with the use of the telemedicine solution6. Assess the user identification7. Assess the integrity of the data transmitted in the telemedicine network8. Assess the compliance with the Ukrainian legislation on personal data protection
Criteria
<ol style="list-style-type: none">1. The solution applies the right treatment protocol2. The model of telemedicine (doctor-to-patient, doctor-to-doctor, case conference, exchange of diagnostic data)3. Efficiency and shorter consultation times4. Interface language (availability of Ukrainian language UI)5. Location of the solution software (server hardware/cloud)6. Availability of TPI or IISS7. MIS integration readiness, exchange of medical records with MIS8. eHealth central database integration readiness9. Availability of software on different platforms (mobile version, PC version, etc.)10. Availability of technical support from the provider

Note: TPI=technical protection of information; IISS=integrated information security system; eHealth=electronic health record system of Ukraine

The tests performed by SOE eHealth and supported by LHSS were used to prepare detailed reports that assessed the functionality and security of each solution and offered recommendations on which solutions the MOH should move forward with. Recommendations were also given to the solution provider for improving and/or implementing telemedicine solutions. The report was submitted to the MOH Commission for Testing Telemedicine Platforms (Systems) under Martial Law in Ukraine that was established by the Order of the Ministry of Health of Ukraine No. 994 of June 09, 2022, and renewed by the Order of the Ministry of Health of Ukraine No. 109 of January 22, 2024. Concurrently with the testing, LHSS assessed the readiness of the designated facilities to implement the telemedicine solution according to the following criteria:

- Organizational capacity, which includes the support of the facility managers, qualifications of the staff and their willingness to train.
- Technical capacity and infrastructure, which includes analysis of the information technology (IT) infrastructure, available software, computer network, internet connection, and data protection systems.

This assessment also analyzed whether a facility needed specific telemedicine solutions and how this solution can improve access to care and its quality. After determining the health facilities where the telemedicine solutions would be implemented, LHSS specialists and the facility's IT staff conducted technical setup. This included configuring the telecommunications network, connecting the necessary telemedicine devices, installing the software at the physicians' workstations, and so forth. During this process, the quality of communication and data transmission was tested to identify and eliminate potential technical problems, ensuring reliable operation. Finally, the technical specialists adapted the interface and functionality of telemedicine solutions and personalized the workflows of the software to meet the needs of the facility and make them convenient for users.

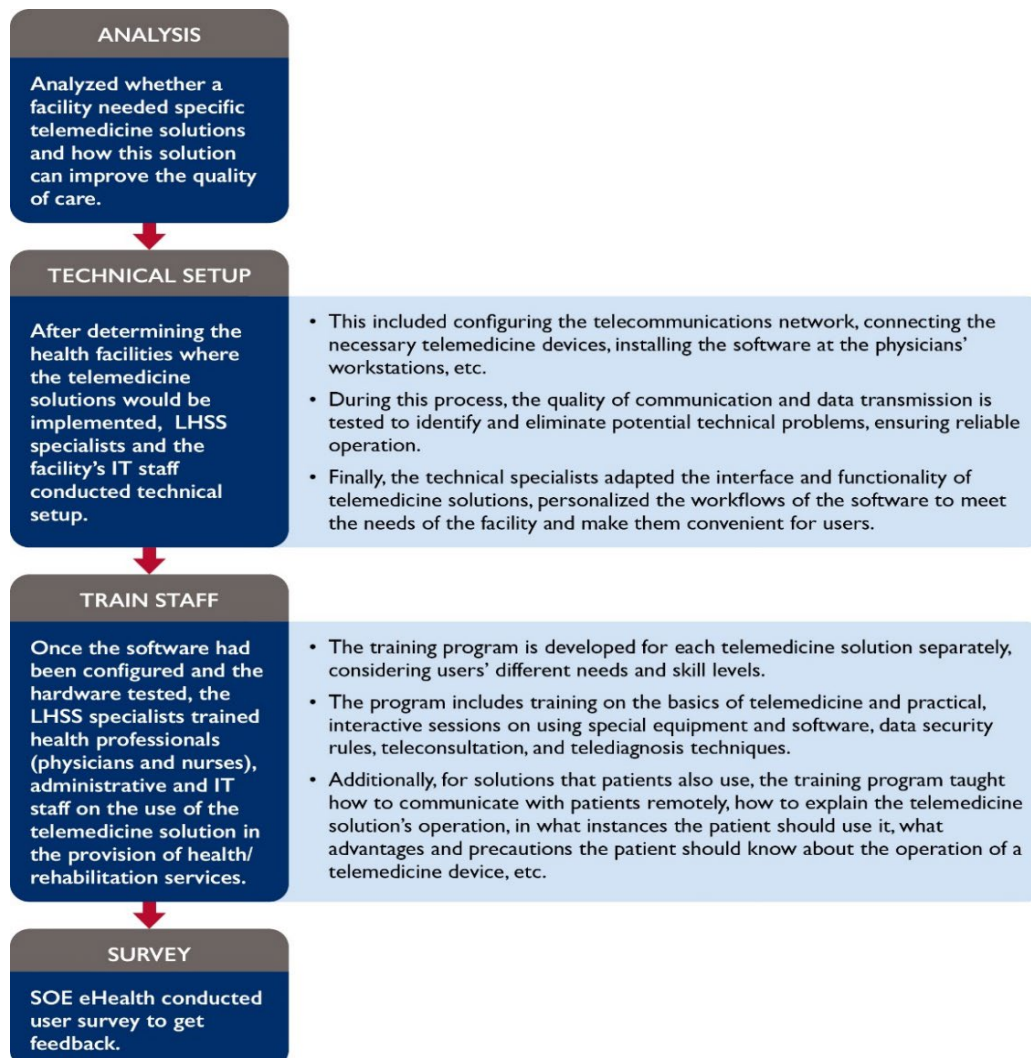
Once the software had been configured and the hardware tested, the LHSS specialists trained health professionals (physicians and nurses), administrative and IT staff on the use of the telemedicine solution in the provision of health/rehabilitation services. A training program was developed for each telemedicine solution separately, considering users' different needs and skill levels. The program included training on the

“After training, I knew how to use telemedicine, and also understood my legal obligations, which allowed me to effectively implement telemedicine technologies in my medical practice.”

Tamara N., physician

basics of telemedicine and practical, interactive sessions on using special equipment and software, data security rules, teleconsultation, and telediagnosis techniques. Additionally, for solutions that patients also use, the training program taught how to communicate with patients remotely, how to explain the telemedicine solution's operation, in what instances the patient should use it, what advantages and precautions the patient should know about the operation of a telemedicine device, and so forth. According to a survey conducted by the SOE eHealth from February to March 2024 (N=411), all respondents were highly pleased with the training process. Respondents mentioned increasing the number of practical sessions and expanding access to training materials through various information channels (e.g., social media, mass media) as possible improvements to the trainings. Figure 3 below details the process of deploying solutions.

Figure 3. Outline of deployment process



Additionally, LHSS sought media coverage of the project's outcomes. Media coverage of telemedicine solutions is important for the introduction and development of telemedicine, because it engenders awareness among the population. During the introductory stage of telemedicine solutions, more than 50 news reports were published in various media, which contributed significantly to the popularization of these technologies and development of new approaches to using them.

Support

The support stage was defined in response to technical problems of various origin. These included user errors, software failures, technical problems in the facility (e.g., poor internet connection or power outages, etc.). To quickly resolve these problems, the LHSS team established a technical support service that provided assistance around the clock and helped telemedicine solution providers to eliminate system failures and other technical issues. Support was provided through multiple modalities, including a hotline, a chat function, and online feedback forms. The technical support service performed the following functions:

- Received requests from telemedicine solution users
- Responded to technical failures of telemedicine solutions within one business day
- Prepared requests to solution providers with a description of the problems (if necessary)
- Provided users with technical advice and support
- Informed users about software updates
- Provided additional training for users on updates and modifications of telemedicine solutions

LHSS analyzed the needs and requests for help and provided additional training for users on frequently asked questions, needs, or updates and modifications of telemedicine solutions.

Solution providers were contacted in cases where the problem indicated the need to modify and update the software, customize the equipment to adapt it to medical needs, or eliminate errors in its operation.

Monitoring and Adapting

The monitoring and adapting step included collecting and analyzing data on the operation of the existing equipment, on the number and location of health facilities that had introduced telemedicine solutions, on health service providers using these solutions, and on the number and type of health services provided with the use of telemedicine (teleconsultation, teleradiology, telerehabilitation, etc.). LHSS specialists collected feedback from health professionals and patients and used it to analyze the results of introducing telemedicine solutions and further improve them.

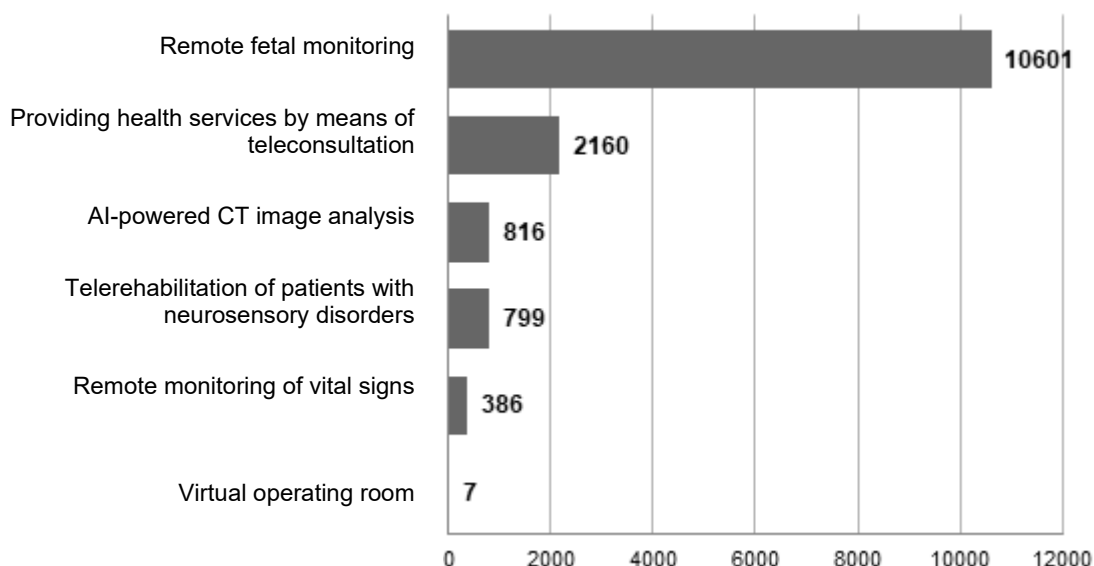
Monitoring Leads to Further Improvements

Implementation of a telemedicine solution in a small town revealed that the frequency of use of teleradiology was significantly lower than anticipated. Collected data indicated that medical staff had limited access to training, thus they were not fully confident in using these technologies. In response, the LHSS team organized additional training sessions that included hands-on equipment use and practical exercises with real clinical scenarios. This initiative increased the frequency and effectiveness of the teleradiology equipment usage, as evidenced by the increased number of teleconsultations and improved quality of medical services.

Results

As of March 31, 2024, **14,769 health services were provided via telemedicine** (Figure 4). The largest number of services (11,803, or 79.92 percent) were telediagnostic services provided via Carebits (10,601), HomeDoctor (386), and BrainScan (816) solutions. Teleconsultation services (Teladoc) accounted for 14.63 percent (2,160) of services, telerehabilitation services (RGS) for 5.41 percent (799) of services, and telesurgery services for 0.04 percent (7) of services.

Figure 4. Number of health/rehabilitation services provided with the use of telemedicine solutions, April 2022–March 2024. Source: LHSS program monitoring data



Source: (MOVE IN FROM ABOVE)

Note: AI=artificial intelligence, CT=computed tomography

Telemedicine solutions were introduced in **399 health facilities** (35 primary care facilities and 364 specialized care facilities). Some facilities use multiple telemedicine solutions the total number of telemedicine solutions installed is 415).

1,902 people were trained (1,258 women and 644 men) to use telemedicine solutions, including 1,823 physicians (96 percent), 51 nurses (2 percent), 24 technicians (1 percent), and 4 administrative workers (1 percent). Among these, 1,820 persons (96 percent) are employed at specialized care facilities and 82 persons (4 percent) are employed at primary care facilities.¹²

LHSS specialists had 3,314 technical assistance interactions, almost all of them (99 percent) online. During these interactions, experts demonstrated telemedicine solutions to facilities, described new functions or equipment for already installed solutions (3 percent), helped solve functional problems (61 percent), resolved operational issues (29 percent), and retrained staff (9 percent).

¹² The over-representation of specialized care employees can be explained by the fact that five out of six telemedicine solutions are used to provide specialized care – only the HomeDoctor device is used in primary care.

As of March 2024, LHSS provided **technical assistance to the MOH to establish six public-private partnerships**.¹³ These partnerships make up the foundation for introducing relevant telemedicine solutions and addressing urgent health needs for vulnerable populations, such as pregnant women and people with chronic diseases, brain injuries, burns, and other traumatic injuries. Additionally, partnerships helped address gaps in facilities with difficulty providing medical care due to lack of physicians and patients living in remote locations.¹⁴ Table 3 details the six public-private partnerships currently active in Ukraine and the telemedicine solutions received as humanitarian aid and introduced with the technical assistance of LHSS.

Table 3. Public-private partnerships in Ukraine

No.	Provider(s)/ Solution functionality	Type of humanitarian aid	Value (US\$)
1.	Teladoc (USA), WTI (USA), Charite (Germany), BG Kliniken (Germany)		
	Provision of care with the use of teleconsultations	<ul style="list-style-type: none"> • Teladoc telemedicine platform for video consultations • Teladoc Robot Lite v3/4, MINI devices – 40 pcs. • Surface Pro 7 tablets – 8 pcs. 	\$3,098,200
2.	Eodyne (Spain)		
	Telerehabilitation of patients with neurosensory disorders	<ul style="list-style-type: none"> • RGS telerehabilitation platform for patients and physicians • User licenses 	\$79,000
3.	Engauge (USA)		
	Virtual operating room	<ul style="list-style-type: none"> • Epiqar telemedicine platform • Set of equipment for the Epiqar platform – 1 pc. 	\$15,400
4.	POLSAT (Poland)		
	Remote fetal monitoring	<ul style="list-style-type: none"> • Carebits telemedicine platform • Sigmafon CTG device – 300 pcs. 	\$400,000
5.	NGO Help to Ukraine (Spain)		
	Remote monitoring of vital signs	<ul style="list-style-type: none"> • HomeDoctor telemedicine remote diagnostic platform • User licenses • Medical bot devices HomeDoctor – 27 pcs. 	\$24,300
6.	BrainScan (Poland)		
	AI-powered CT image analysis	<ul style="list-style-type: none"> • BrainScan telemedicine platform • User licenses 	\$60,000
	TOTAL		\$3,676,900

Note: CTG=cardiotocography

Analyzing the data produced by LHSS, two trends emerge which are outlined below and corroborated by Figure 5:

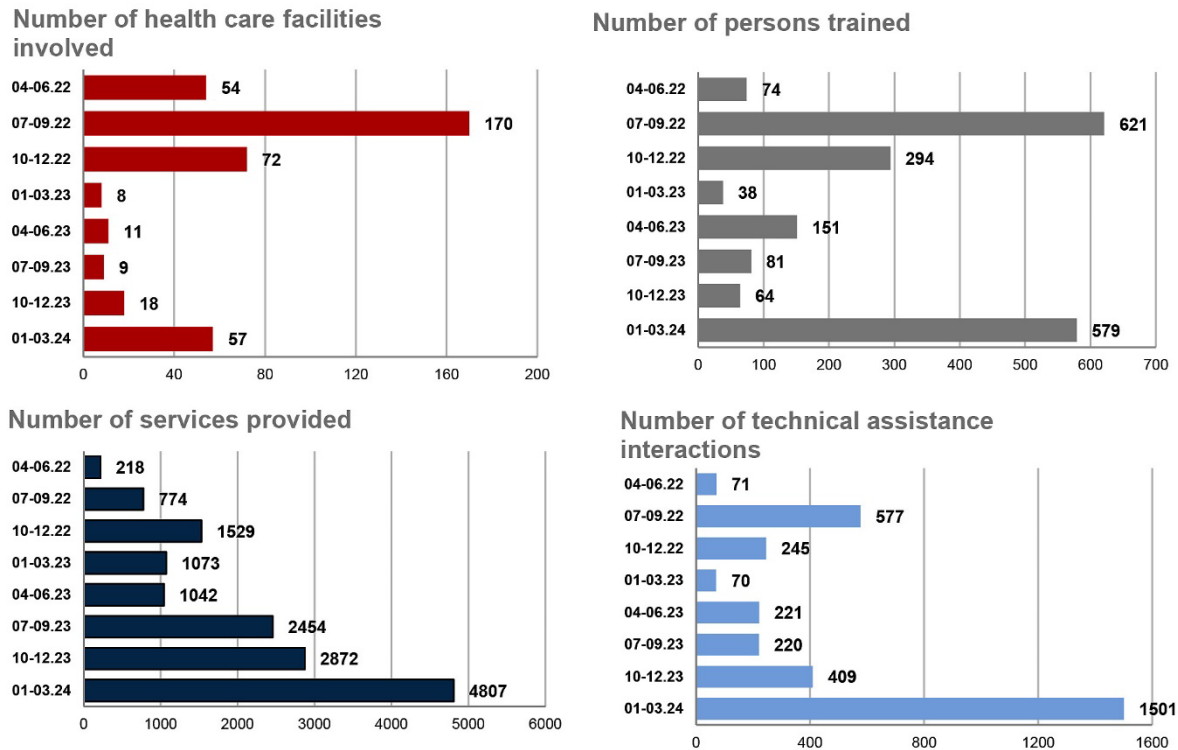
- The rapid uptick in service provision demonstrates the successful introduction and subsequent expansion of telemedicine. In the first two quarters of the analyzed period (April–September 2022), 992 services were delivered, while during the last two quarters (October 2023–March 2024), the number of services rose to 7,679.
- During the first three quarters of introduction (April–December 2022), 296 medical facilities were involved, while by the time this report was written (March 2024), 399 facilities were using telemedicine solutions. Also, during the April–December 2022 period, 989 medical staff were trained, whereas by March 2024, 1,902 people had been trained. This indicates

¹³ The use of telemedicine solutions in the time of war. MOH. (In Ukrainian) <https://moz.gov.ua/article/news/vikoristannja-telemedichnih-rishen-v-umovah-vijni> .

¹⁴ Our physicians will be able to use telemedicine technologies to treat blast and gunshot wounds. MOH. (In Ukrainian) <https://moz.gov.ua/article/news/nashi-likari-zmozhut-vikoristovuvati-telemedichni-tehnologii-dlja-likuvannja-vibuhovo-vognepalnih-poranen>.

a prompt response of the facilities to the needs of patients with limited physical access to continue accessing services, especially in the liberated territories. The data support the fact that telemedicine contributed to the restoration of health services during the war, as well as modernization of their delivery with the use of innovative telemedicine technologies.

Figure 5. Dynamics of introducing telemedicine solutions by quarters, April 2022–March 2024.

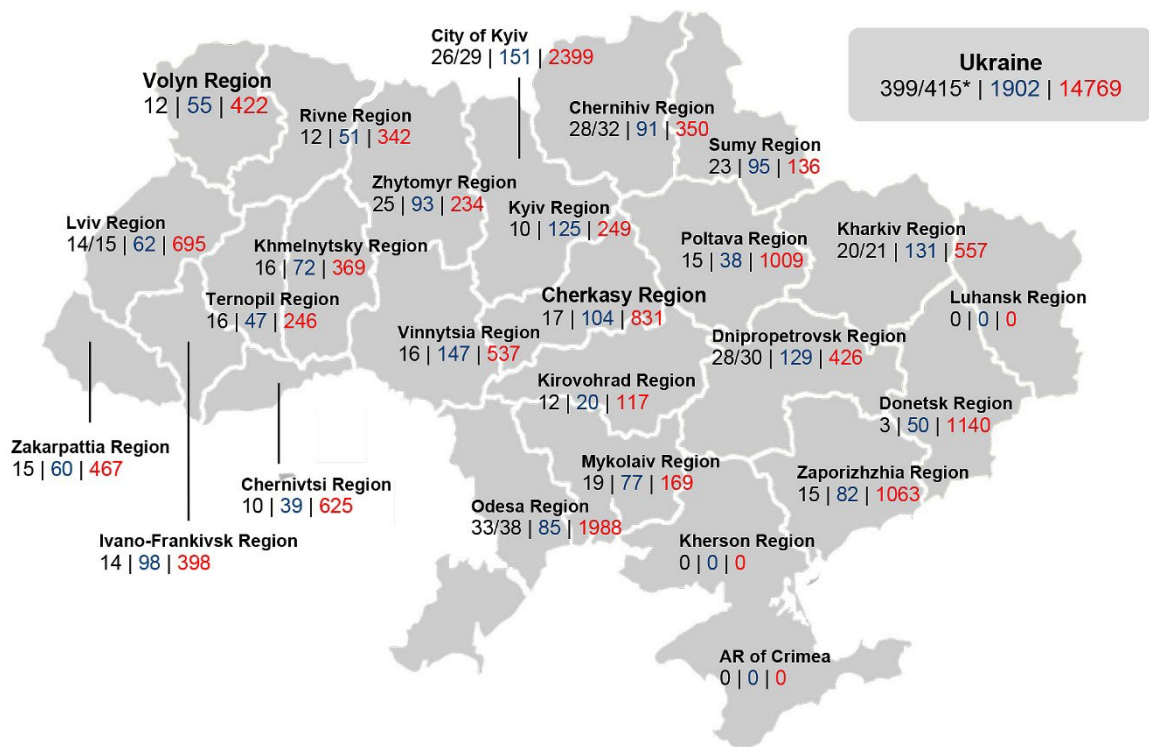


Source: LHSS program monitoring data (the data presented are not cumulative)

Figure 6 illustrates the geographical distribution of services provided, facilities equipped, and personnel trained.

- The largest numbers of health facilities using telemedicine were in Odesa (33), Dnipropetrovsk (28), and Chernihiv (28) regions.
- The largest numbers of physicians trained were in Kyiv (151), Vinnytsia (147), and Kharkiv (131) regions.
- The largest numbers of services were delivered with the use of telemedicine were in Odesa (1,988), Donetsk (1,140), Zaporizhzhia (1,063), and Poltava (1,009) regions, and the city of Kyiv (2,399).

Figure 6. Geography of telemedicine solution introduction, April 2022–March 2024.
Source: LHSS monitoring data



The map shows that there is no direct correlation between the number of involved facilities, trained medical staff and provided services. The reasons for this may include various factors; for example, different devices are used according to different schedules (the number of services depends not only on the initiative of the doctor but also on the specifics of the device), or a facility may have several devices of one telemedicine solution installed (e.g., several RGS platforms connected), with a corresponding number of doctors trained to work with them.

The geographical distribution of telemedicine solutions is also quite uneven and has been influenced by various factors, such as: the technical readiness of the facility to install a telemedicine solution; the motivation of the facility's management to acquire a telemedicine device and the interest of doctors in using it; or the profile of the facility's services that could be enhanced by the telemedicine solution (e.g., rehabilitation services, pregnancy monitoring, treatment of complex cases). This complexity awareness explains the impossibility of comparing telemedicine solutions with each other and is one of the limitations of this report (see "Methodology").

Although the data in this report end in March 2024, the introduction of telemedicine solutions with LHSS support is ongoing. We expect to maintain the positive trends in scaling up these solutions that were borne out by the data from January through March 2024. The key to the rapid scaling growth of the number of facilities involved, personnel trained, and services provided during this time period has proved to be comprehensive information, training, and organizational activities. We have continued to engage in these key activities since March, and thus expect to see further expansion of telemedicine in Ukraine.

Challenges and Lessons Learned

Ukraine's needs and operating environment changed dramatically with Russia's full-scale invasion in February 2022. As a result, the LHSS team had to navigate challenges to their work that ranged from operational and security to political, financial, or even behavioral. In overcoming these constraints, the team learned valuable lessons that are documented below. LHSS believes the lessons can be used by others when implementing new solutions in war-affected areas.

Lesson #1. It is possible to build on a national eHealth vision while managing wartime constraints.

During the Analysis step outlined above, the team found very few global best practices applicable to introducing telemedicine in wartime and disaster settings. The little that was documented pointed to short-term solutions that operated in parallel to national health systems and were designed to be phased out over time. These findings deviated from traditional and well-established practices such as the World Health Organization's *National eHealth Strategy Toolkit*, whose holistic framework promotes the importance of establishing governance mechanisms, engaging heavily with health and non-health stakeholders, and aligning health system building blocks within the eHealth system. Ultimately, after consultation with USAID, the MOH, the SOE eHealth, the National Health Service of Ukraine (NHSU), and other Ukrainian stakeholders, LHSS designed and implemented an approach aligned with the World Health Organization's strategic framework and found this to be a cornerstone of its success. LHSS helped the MOH establish a clear, shared vision for telemedicine through the national telemedicine strategy that later supported uptake of new telemedicine solutions; the strategy's emphasis on clear governance and financing mechanisms eased introduction of the solutions at the facility level, and its highly participatory approach (outlined in Table 1) allowed the project to act with broad consensus and operate relatively nimbly in a dynamic, highly politicized environment.

Lesson #2. A proper legal framework is as essential as an IT framework for the successful introduction and functioning of telemedicine, especially in difficult conditions such as martial law.

Legal uncertainty about the possibilities and procedures for applying telemedicine solutions complicates their introduction. This limits patients' timely and efficient access to telemedicine services when traditional service delivery is less available. Analysis and improvement of the regulatory framework should specify requirements for the provision of telemedicine services and clarify and coordinate roles and responsibilities of all the participants allowed to adapt the use of telemedicine to the requirements of wartime. The project team adopted a proactive approach to gaining legislative support for the development of innovative medical technologies which will help ensure their successful integration and use.

Lesson #3. Solutions must be fit-for-purpose and adapted to end user needs.

LHSS faced technical and infrastructural constraints when introducing telemedicine solutions, especially in rural and remote areas where poor IT infrastructure and unstable internet connections made access to telemedicine unreliable. To overcome this problem, LHSS, in cooperation with solution providers, adapted telemedicine solutions (e.g., RGS, Carebits, and HomeDoctor) so they could work without a reliable internet connection. Simultaneously, LHSS initiated dialog with the MOH, SOE eHealth, the NHSU, regional health departments, health facilities, and local authorities on attracting investments to upgrade health facility IT infrastructure, in particular, to expand access to high-speed internet, equip the facilities with satellite communications, and upgrade computer hardware.

LHSS also encountered a challenge in the form of language barriers when using telemedicine solutions donated by foreign companies: tutorials on how to use solutions were often only in

English or had very limited multilanguage resources. Despite the companies' good intentions, the initially designed solutions did not fulfill the needs of end users (Ukrainian doctors speaking Ukrainian). To overcome this, health facilities engaged English-speaking staff or outside interpreters during teleconsultations, and LHSS created a technical support service whose specialists spoke both English and Ukrainian. LHSS also developed video tutorials for each telemedicine solution, which users reported were better than written instructions as the videos helped the users assimilate the material more effectively and made the training process more accessible and interesting. The interactive, visual format of the training materials based on case study analysis was welcomed by health professionals and increased their motivation to master telemedicine solutions.

Lesson #4. Financial capacity of donors must be taken into consideration.

This risk was not evident initially, when people hoped the full-scale war would be of short duration. Since prospects for an end to the war are currently unknown, providers continue to support their telemedicine solutions free of charge. However, as time passes, such support (e.g., device maintenance, software troubleshooting, installing necessary updates) may require additional human and financial resources. Companies lack needed resources and have limited technical support capacity have led to operational interruptions or a complete shutdown of their telemedicine solutions. To solve this problem, both donor companies and the MOH and LHSS have stepped up their search for additional funding; they are also explaining to health facilities the mechanisms of commercial interaction with solution providers. The problem has not been fully resolved, and there remains a risk of termination of free use of telemedicine solutions in wartime.

Lesson #5. Health facility leadership plays a key role in the deployment and continued use of telemedicine solutions.

Health facility managers who are aware of the benefits of telemedicine solutions and support their use encourage physicians and patients to have a positive attitude toward telemedicine. It contributes to the effective use of the solutions and helps identify resources to support their functioning. To increase the motivation of managers to implement telemedicine in their facilities, LHSS regularly communicated with them to develop internal procedures for telemedicine use and thereby improve access to quality health services.

Lesson #6. Monitoring of the use of telemedicine solutions, feedback, and responses to identified problems are prerequisites for the responsible use of telemedicine solutions by health facilities.

Regular communication between LHSS and facilities which included collecting data on the frequency of telemedicine use, on organizational and technical obstacles, on facilities' needs for the telemedicine solution, and so forth helped facility managers and medical staff work more systematically with the solutions and realize that this humanitarian aid was provided at the expense and efforts of the provider for immediate use under martial law. When monitoring detected that a facility was using telemedicine devices inefficiently (e.g., a small number of services provided compared to other users of the same solution), LHSS documented this in analytical reports. The MOH used this evidence when communicating with regional health departments and health facilities, with proposals to improve the use of telemedicine solutions or move them to other facilities. The evidence allowed telemedicine solutions to be redistributed based on the changing needs and capabilities of health facilities. It must also be noted, however, that administrative and regulatory restrictions need to be considered when seeking to redistribute underused telemedicine solutions initially, local councils and health departments had to execute extensive documentation to effectuate a transfer. This slowed needed transfers until LHSS supported the MOH in simplifying the transfer procedures.

Lesson #7. Proactive and participatory communication is critical to overcoming health providers' low motivation and skepticism to apply telemedicine in their routine.

As LHSS rolled out new solutions, the project noticed some health professionals who demonstrated low motivation, skepticism, and resistance to the use of telemedicine solutions. This affected the efficiency of using the solutions, the number of services they provided, and thus the quality of and patient access to the health services they provided. The inefficient use of telemedicine solutions was sometimes due to the health provider's lack of awareness about the capabilities of modern technologies. In response, LHSS launched information and communication activities (publications, seminars, presentations, experience exchange) and training sessions (workshops) to increase knowledge of and skills in the use of telemedicine technologies among health professionals (physicians, nurses, and administrative and IT staff) and patients. Positive results of using telemedicine were disseminated through mass media, social media, and professional platforms, as well as the development of the StoryMap web resource,¹⁵ which described telemedicine solutions and use statistics. All these significantly contributed to the growth of trust and motivation for introducing telemedicine among health professionals and patients.

Lesson #8. The use of modern communication technologies, such as chatbots, messengers, video channels, and communication platforms, facilitates the process of communication and decision-making.

To discuss current issues of using telemedicine solutions, the project specialists created social network groups for employees of the facilities that had adopted the solutions. They launched a chatbot to provide technical assistance on RGS and a YouTube channel with video tutorials. The MOH added QR codes and web links to relevant resources in their official letters to provide quick access to the necessary information for departments and health facilities. As a result, the project promptly received a large number of applications from facilities to install telemedicine solutions. These measures simplified user interaction and significantly improved the overall productivity of telemedicine solutions.

¹⁵ Interactive StoryMap: Telemedicine in Ukraine / LHSS. <https://www.lhssproject.org/news/interactive-storymap-telemedicine-ukraine>

RECOMMENDATIONS

These recommendations aim to extend the work of telemedicine solutions after LHSS ends.

Leadership and administrative technical support

While the MOH continues to provide strategic leadership in introducing telemedicine, in order to effectively extend the work of the telemedicine solutions provided to Ukraine as humanitarian aid during the period of martial law, it is necessary to identify a government agency that can take over the current functions of LHSS after the project completion.

These functions include:

- **analyzing** the administrative and legal obstacles to the introduction of telemedicine and developing proposals to resolve them,
- **interacting** with telemedicine solution providers to support them in ensuring their smooth operation,
- **providing ongoing technical support** to health facilities that use telemedicine solutions. It is important to identify the agency that will exercise these responsibilities as well as the resources to ensure a prompt response to technical problems,
- **training health professionals** to maintain their qualifications, skills, and abilities to provide health/rehabilitation care with the use telemedicine methods and tools,
- **promoting telemedicine** and maintaining regular communication with health facilities about the benefits of telemedicine, available solutions, and best practices, as well as regular communication and exchange of experience among the community of practitioners, and
- **monitoring and evaluating** the effectiveness of telemedicine solutions to identify problems in a timely manner and adjust and improve processes to ensure the proper quality of telemedicine services.

SOE eHealth is the most suitable candidate to perform these functions, provided it has sufficient financial and human resources. LHSS is now sharing its best practices with SOE eHealth to ensure a smooth transition and stable operation of telemedicine solutions after project completion.

Recommendations for telemedicine solution providers

To ensure the effective and sustainable use of telemedicine solutions provided as humanitarian aid it is important to:

Provide clear and transparent communication on the scope, terms, and conditions of humanitarian aid. This will allow Ukraine to effectively plan and use telemedicine solutions and minimize possible negative consequences in the event of termination of such aid.

Provide ongoing technical support for the implementation and use of telemedicine solutions. It is important to ensure prompt response to technical problems, including regular software updates and bug fixes.

Provide training for medical and technical staff. Regular training and access to training materials will help increase the effectiveness of telemedicine solutions and reduce the likelihood of technical errors.

Provide flexible customization of telemedicine solutions. This will allow users to adapt the solution to the needs of different health facilities and types of care.

Introduce a mechanism for collecting user feedback. Feedback analysis will help optimize telemedicine solutions and increase user satisfaction.

Cooperate with local companies in the recipient country to provide technical support. This will help to respond quickly to technical issues and provide effective local support.

Provide an interface in the language of the recipient country. This will facilitate the use of telemedicine solutions by end users.

Provide resources for translation services to effectively communicate with recipients of humanitarian aid and users of telemedicine solutions, especially when it comes to consultations with physicians from other countries.

Take into account the legal requirements of the recipient country on the protection of personal and medical data. This will enable the secure storage, exchange, and use of sensitive data.

Create a system for continuous monitoring and analysis of the use of telemedicine solutions, which will help timely identify and correct shortcomings, streamline processes, and improve the quality of services.

Recommendations for health facilities providing care by telemedicine methods and tools

To ensure the effective and sustainable use of telemedicine solutions provided as humanitarian aid, it is necessary to improve the quality and continuity of health services:

Accept humanitarian telemedicine solutions only if the facility has the necessary human and technical resources, as well as a plan for their immediate use. Humanitarian aid in the form of telemedicine technologies is intended to provide care in the time of war, so the solutions should be used immediately without waiting until the war is over.

Transfer telemedicine solutions that are not used by the facility to other facilities in a timely manner. If a health facility finds that telemedicine solutions do not meet their needs, or if it lacks the resources or capacity to use them effectively, transfer them to facilities that can introduce and use them.

Invest in technical infrastructure. Develop the necessary technical infrastructure of health facilities to provide telemedicine services by ensuring the necessary equipment and stable internet connection.

Develop staff skills. Organize training and continuous professional development of medical and technical staff on telemedicine to ensure an appropriate level of competence in this area.

Recommendations for the relevant authorities for further development of telemedicine in Ukraine

To ensure further development of telemedicine in Ukraine and improve the accessibility and quality of care, it is necessary to:

Take into account the experience gained during the war and the rapid development of telemedicine technologies. Further development of telemedicine in Ukraine should be based on the experience gained during the war, on the improvement of telemedicine technologies, and on the needs of patients for care regardless of their location.

Develop teleconsultations and telediagnosics as priority areas. These services are the most relevant, so it is important to ensure their priority development and support.

Create technical conditions for interaction with the eHealth. Interaction of telemedicine solutions and devices with the eHealth of Ukraine will allow organizing a single medical information space and facilitate data exchange between health facilities.

Develop modern medical technologies while rebuilding the health care system. Rebuilding the health care system in the post-war period will require significant investments. Priority should go to the development of modern medical technologies, such as telemedicine,

which are more cost effective and provide better quality and access to care than traditional health care service provision.

Support and develop public-private partnerships at the level of state policy. Public-private partnerships in the field of telemedicine have demonstrated their effectiveness during the war and can play a key role in the development of telemedicine in the post-war period.

Engage international partners and learn their experience. It is important to develop cooperation with international organizations and experts to share experience and knowledge in the field of telemedicine.

Implement comprehensive information support and education programs. Programs and events should be conducted to raise awareness of telemedicine among the public and health professionals. This will help to spread the word about the benefits of telemedicine and facilitate access to health services.

Introduce telemedicine in educational programs. Including telemedicine in the curricula of higher and postgraduate medical education facilities will prepare future health professionals to use telemedicine technologies effectively.

CONCLUSIONS

This report highlighted key aspects and lessons learned from the introduction of telemedicine solutions in the context of Russia's military aggression against Ukraine. Telemedicine has become critical in ensuring access to health services throughout Ukraine, especially in the regions with active hostilities, in the frontline regions, and in the liberated territories where traditional methods of care provision are limited or unavailable.

Successful implementation of telemedicine solutions requires a well-structured process that includes a set of activities at the planning and implementation stages. Experience has shown that effective communication between all stakeholders, support from health facility managers and local authorities, and leadership at the level of the MOH are important factors.

In response to a request from the MOH, LHSS has implemented six telemedicine projects aimed at improving the accessibility of health services during the war.

Over the course of two years (April 2022–March 2024), these telemedicine solutions went from negotiations between the MOH and the companies providing them, to utilization and maintenance of devices and software in health facilities by LHSS-trained medical, administrative, and IT staff.

During this period, telemedicine solutions were installed in 399 Ukrainian facilities, more than 1,900 health professionals were trained to use them, and more than 14,700 health and rehabilitation services were provided. The total value of the telemedicine solutions, according to the companies that have provided them is US\$ 3,676,900. The number of services provided depended on the specifications of the device/solution, when it was received by the facility, the motivation of physicians to work with the telemedicine solution, and patient requests.

Each telemedicine solution was used to restore access to services for relevant populations, such as pregnant women, people with chronic diseases, injuries and burns, brain damage, etc., as well as people in the areas and facilities that have difficulty accessing care due to various factors, including a shortage of physicians and the remoteness of patients' residence.

The introduction of telemedicine has been accompanied by certain challenges: some facilities were not sufficiently prepared in terms of technology and infrastructure, there were language barriers between facility staff and foreign specialists, and some solutions providers were not financially stable. The LHSS team created the technical support service that worked almost 24/7 and played an important role in overcoming the challenges, enabling medical staff to use telemedicine solutions more effectively and receive timely advice from colleagues, including those from abroad.

Key achievements of telemedicine during the war include the use of the latest technologies for teleconsultations, teleradiology, telerehabilitation, and telesurgery, the use of AI for CT brain image analysis, and the involvement of international experts to advise on complex medical cases. This has helped improve the quality and accessibility of health services.

However, given that telemedicine solutions have been provided by donor companies and supported by LHSS free of charge (as humanitarian aid), it is crucial to consider the likelihood of their use continuing if they must be paid for. Health facilities should be willing to use the solutions and be able to pay for continued technical and service support, infrastructure upgrades, and training of health professionals.

In general, the analysis of the use of telemedicine during the war in Ukraine has demonstrated that it plays an important role ensuring the availability of health services in crisis situations. Its further development requires reliable technical and financial support, as well as the readiness and motivation of health professionals to implement innovations. The knowledge and experience systematized in the report is a basis from which to develop the next steps in telemedicine in Ukraine; they also should be useful to other countries that face the challenges of war, natural or man-made disasters, or epidemic threats.

ANNEX A: RESULTS OF INTRODUCING TELEMEDICINE SOLUTIONS WITH LHSS TECHNICAL ASSISTANCE, APRIL 2022 – MARCH 2024

Table A1. Summary table on introducing and delivering telemedicine solutions

No.	Project name	Number of health facilities covered by the project		Number of project participants	Number of personnel trained		Number of training sessions	Number of telemedicine services provided to patients	Number of technical support interactions
		Primary care facilities	Specialized care facilities		Primary care facilities	Specialized care facilities			
1.	Provision of care with the use of teleconsultations	5	106	482	6	471	514	2,160	814
2.	Telerehabilitation of patients with neurosensory disorders	2	78	508	21	355	311	799	964
3.	Virtual operating room	0	2	24	0	5	15	7	36
4.	Remote monitoring of vital signs	30	0	61	55	2	173	386	156
5.	Remote fetal monitoring	0	182	972	0	969	243	10,601	1,196
6.	AI-powered image analysis	0	10	12	0	18	50	816	148
	TOTAL	399 (415)*		2,059	1,902		1,306	14,769	3,314

* The number of registered facilities where another telemedicine solution was installed in addition to the existing solution is given in brackets.

Table A2. Dynamics of telemedicine project implementation by month, April 2022–March 2024

Year	Month	Number of health facilities involved*	Number of personnel trained	Number of telemedicine services provided to patients	Number of technical support interactions
2022	May	54	18	110	0
	June	0	56	108	71
	July	0	92	372	163
	August	57	210	125	265
	September	113	319	277	149
	October	8	80	425	72
	November	19	86	448	62
	December	45	128	656	111
2023	January	0	14	227	14
	February	1	9	241	15
	March	7	15	605	41
	April	0	26	460	16
	May	4	50	289	65
	June	7	75	293	140
	July	2	1	789	25
	August	3	6	963	116
	September	4 (+1)	74	702	79
	October	0	0	1,108	217
	November	3 (+1)	11	815	112
	December	15 (+6)	53	949	80
2024	January	8 (+2)	134	1,515	249
	February	16 (+4)	277	1,793	556
	March	33 (+2)	168	1,499	696
	TOTAL	399 (+16)	1,902	14,769	3,314

* The number of registered facilities where another telemedicine solution was installed in addition to the existing solution is given in brackets.

ANNEX B: SUCCESSFUL PRACTICES IN THE APPLICATION OF TELEMEDICINE SOLUTIONS

The use of virtual and augmented reality technologies, especially in the context of treating children in wartime conditions, transforms the traditional rehabilitation process into an exciting game and makes it more effective, as children feel less psychological pressure during the sessions.

The Odesa Regional Children's Clinical Hospital, which serves more than 150,000 children annually, has become a leading institution in the implementation of these technologies in the Odesa region.

To use the RGS platform, the hospital has equipped a specialized room with safe furniture and information and communication equipment, including mobile phones, tablets, and computers (Photo 1).

The hospital's rehabilitation specialists assess each child/patient's condition using a set of criteria to determine the suitability of using RGS and develop an individual exercise plan. The rehabilitation therapists integrate the use of RGS into regular rehabilitation programs and involve psychologists to consider the child's mental state in their use.

The services are free for patients, as they are provided within the relevant rehabilitation service packages of the Medical Guarantees Program. All interventions performed using the RGS platform are recorded by doctors in the patient's individual rehabilitation plan and the hospital's MIS.

"We see significant improvements in the motor skills and overall mood of children undergoing game-based rehabilitation. It is important that the games allow children to forget about the pain and focus on fun and achieving goals, which greatly increases their activity and promotes rapid recovery."

Larysa V., rehabilitation doctor

In the first six months after the implementation of RGS in this health care facility, rehabilitation programs were created for more than 400 children¹⁶. The positive impact of RGS on the overall activity and mood of young patients is noted not only by doctors but also by parents: according to their observations, children are more willing to engage in rehabilitation sessions with RGS than by traditional means. Using telerehabilitation in a game format creates a safe and controlled environment effective for children's recovery. Solutions similar to RGS are used in various countries around the world, including the United States¹⁷, Canada¹⁸, and European Union countries¹⁹, where they help children and adults recover faster after injuries and surgeries²⁰.

¹⁶ Over 15,000 children in the Odesa region will have access to personalized rehabilitation. / Ministry of Health of Ukraine <https://moz.gov.ua/article/news/ponad-15-tisjach-ditej-odeschini-matimut-dostup-do-personalizovanoi-reabilitacii->.

¹⁷ Cameirão MS, Bermúdez I, Badía S, Duarte Oller E, Verschure PF. The rehabilitation gaming system: a review. *Stud Health Technol Inform*. 2009; 145:65-83. PMID: 19592787. <https://pubmed.ncbi.nlm.nih.gov/19592787/>.

¹⁸ Saposnik G, Levin M; Outcome Research Canada (SORCan) Working Group. Virtual reality in stroke rehabilitation: a meta-analysis and implications for clinicians. *Stroke*. 2011 May;42(5):1380-6. PMID: 21474804. <https://pubmed.ncbi.nlm.nih.gov/21474804/>.

¹⁹ Gaming Technology in Neurological Rehabilitation. https://www.physio-pedia.com/Gaming_Technology_in_Neurological_Rehabilitation.

²⁰ Burdea GC. Virtual rehabilitation--benefits and challenges. *Methods Inf Med*. 2003;42(5):519-23. PMID: 14654886. <https://pubmed.ncbi.nlm.nih.gov/14654886/>.

Practical Case with a Patient



Photo B1: The patient performs rehabilitation exercises on a computer connected to the telemedicine platform RGS

In November 2023, 12-year-old Serhiy suffered a traumatic brain injury after a fall from a height. He had serious motor function impairments (weakness in limbs, difficulty walking, and cognitive disorders), was entirely dependent on external assistance, and could not perform basic daily activities. To expedite recovery, he was assigned additional interventions using the rehabilitation gaming system RGS, alongside standard therapy sessions. Thanks to the use of RGS interventions, Serhiy's condition has improved significantly: his cognitive functions improved from 7 to 22 on the Montreal Cognitive Assessment, and his daily living activity index increased from 35 to 70 (level of partial independence).

The ability to have a teleconsultation with leading specialists from Ukraine and Germany under martial law is critically important because of the large number of complex injuries and wounds, including burns and explosive and gunshot injuries. The shortage of in-person specialized medical personnel and equipment, as well as the evacuation and displacement of large numbers of people, complicate the provision of necessary care. The project emphasizes the importance of international cooperation and the use of innovative telemedicine solutions to improve the accessibility and effectiveness of health care services (Photo 2). Teleconsultation allows doctors in remote areas or conflict zones to contact experienced colleagues in Ukraine and Germany for critical advice on treatment strategies and second opinions for complex cases.



Photo B2: A doctor consults with a colleague from Charité Clinic (Germany) using the telemedicine platform "Teladoc"

Practical Case with a Patient

A man with an explosive-gunshot eye injury that required urgent surgical intervention was admitted to a district hospital in the Kyiv region. Specialists at the hospital first thought to remove the injured eye but decided to consult with doctors at the regional hospital using the Teladoc device. The regional hospital doctors recommended performing certain manipulations on the eye before removing it. The consultation and recommendations from colleagues helped the district doctors save the patient's eye and preserve his full vision.

Remote monitoring of the fetal condition is often needed for women who cannot visit a medical facility in person. Thanks to mobile teams that conduct examinations in remote and hard-to-reach areas, doctors can analyze medical data remotely and provide timely recommendations. This allows for the effective identification of abnormalities and the prevention of complications during pregnancy (Photo 3)²¹.

The significant increase in the number of studies conducted in the first quarter of 2024, which reached nearly 4,000, indicates a high demand and relevance of such solutions for improving medical care for pregnant women, especially when access to health care facilities is limited.

Practical Case with a Patient

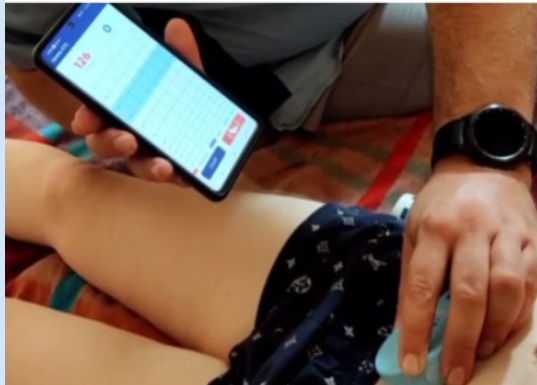


Photo B3: A medical worker monitors the fetal condition and transmits the data to an obstetrician-gynecologist via the Carebits platform on a mobile phone.

A pregnant woman from the city of Slavutych in the Kyiv region, which was in a combat zone and frequently experienced air raid alerts, used the Sigmafon CTG device for daily monitoring. During one of these sessions, the device recorded an unstable fetal heartbeat and automatically notified her doctor. A medical team immediately went to the pregnant woman, conducted additional examinations, and urgently evacuated her to the nearest medical center, where she successfully received the necessary care.

²¹ New Era in Pregnancy Diagnostics: Telemedicine Opens Up Advanced Opportunities / Ministry of Health of Ukraine. <https://moz.gov.ua/article/news/nova-viha-diaagnostiki-vagitnih-telemedicina-vidkrivae-peredovi-mozhivosti>.

ANNEX C: REVIEW OF TELEMEDICINE SOLUTIONS

Providing Care by Teleconsultation



Project launch: April 2022

Solution: Teladoc telemedicine hardware and software platform

Reach: 22 regions and the city of Kyiv

Facilities connected: 111

Personnel trained: 477

Services provided: 2,160

The Teladoc solution aims to create conditions for physicians to discuss clinical cases and patient treatment algorithms and share experience in the form of doctor-to-doctor teleconsultations.

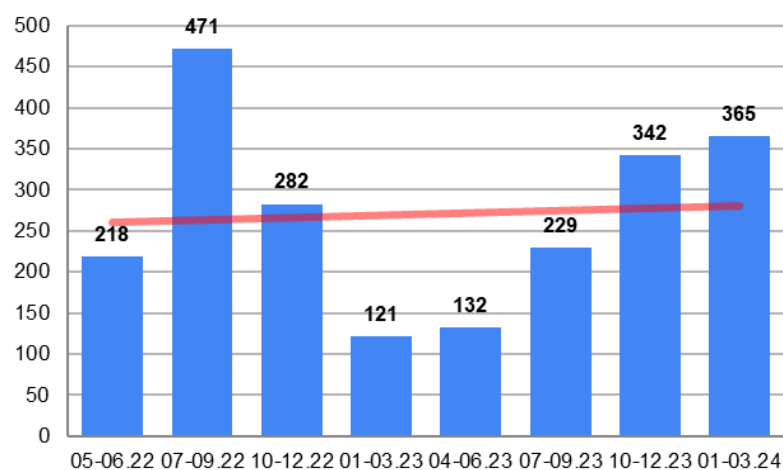
The solution is relevant because it meets the needs of physicians: it helps them organize timely and effective treatment, reduce risks, and improve care for patients with blast, gunshot, burn, and other traumatic injuries and other complex medical conditions in wartime.

How the solution works. Teleconsultations are conducted via web access to the Teladoc hardware and software platform. Its functionality enables the user to request a consultation, conduct a video session, exchange anonymized patient data, and make recommendations for further treatment or diagnosis of the patient, meanwhile ensuring data protection. Teladoc virtual presence devices can be installed, for example, in intensive care units for remote visual observation of a patient by a physician.

Progress and results of introduction. Physicians use the Teladoc platform to consult with colleagues in hospitals in Ukraine and elsewhere, such as Charite and BG Kliniken (Germany). Different versions of the solution were introduced where it was most needed. In particular, specialized networks were formed for oncologist and anesthesiologist teleconsultations.

This allowed regional and district health facilities to consult with highly specialized professionals to discuss complex clinical cases.

Figure C1. The number of services provided with the Teladoc telemedicine solution by quarter, from April 2022 to March 2024.



Source: LHSS monitoring data (the data presented are not cumulative)

The dynamics of teleconsultation delivery indicates the relevance of these services during the period of active hostilities and de-occupation of part of the territory²² of Ukraine from April to December 2022 (971 teleconsultations were provided) (see Figure C1). During this time, the hostilities²³ resulted in a large number of patients with severe injuries, and many consultations were conducted via the platform. As physicians gained experience in treating such injuries, the number of consultations decreased, and telemedicine devices were redistributed based on need. In the quarters following the redistribution of devices and the formation of oncologist and anesthesiologist teleconsultation networks, this number increased slightly.

In general, teleconsultations are used infrequently, and their number varies from facility to facility: on average, only about 25 facilities conducted more than 10 teleconsultations per month during the April to December 2022 period. According to interviews with users of this solution, one reason for the low number is that teleconsultations are used mainly for unique cases, when a physician needs an expert opinion of a more experienced colleague.

Technical assistance. Over the course of the project, 814 technical assistance interactions were conducted. The requests mostly concerned problems with internet connection, platform access (loss of login or password), and computer hardware. Some problems were particularly serious and required involvement of the providers/developers of the telemedicine solution.

Feedback. According to the results of the user survey (N=83):

- About 96 percent of respondents positively assessed their experience with the Teladoc telemedicine solution.
- Almost 91 percent of respondents pointed out the benefits of teleconsultations with colleagues when they need to make a decision in complex medical cases during wartime.
- About 77 percent of respondents noted that the telemedicine system is not difficult to use.
- About 89 percent of respondents were satisfied with the quality of technical assistance received from LHSS.

The advantages of the Teladoc hardware and software platform and suggestions for its improvement are presented in Table C1.

Table C1. Advantages of the Teladoc hardware and software platform and suggestions for its improvement. Source: survey and user interview results

Advantages	Suggestions for improvement
<ul style="list-style-type: none"> • Consultation delivery speed • Possibility of consulting with foreign specialists and leading specialists of the country • Data protection, reliability, and security 	<ul style="list-style-type: none"> • Provide mechanisms for the exchange of diagnostic data via the telemedicine platform

Outcomes. The *Provision of Care with the Use of Teleconsultations* project was relevant and necessary during hostilities²⁴ because it provided health care personnel to remotely consult with colleagues to share experiences and find effective medical solutions²⁵.

When the war ends, this telemedicine solution can be adapted for wider use in routine medical practice and contribute to increased accessibility and quality of health services, especially in

²² The Teladoc Health system is used to conduct teleconsultations during the treatment of the wounded / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/za-dopomogouju-sistemi-teledoc-health-provodjat-telemedichni-konsultaci-pid-chas-likuvannja-poranenih>

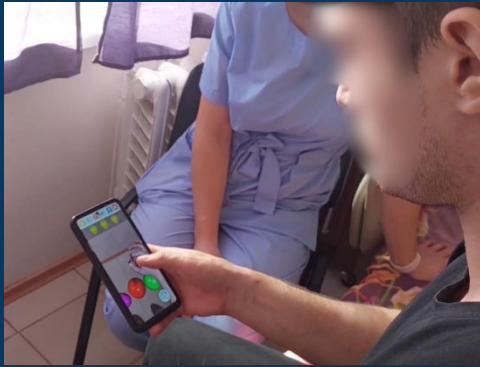
²³ Patients from the frontline areas of Donetsk region consult specialists remotely / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/pacienti-z-prifrontovih-teritorij-donechchini-otrimujut-konsultacii-likariv-specialistiv-distancijno>.

²⁴ Hospitals in Chernihiv region are actively connecting to the system of teleconsultations / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/likarni-chernigivschini-aktivno-pidkljuchajutsja-do-telemedichnogo-konsultuvannja>.

²⁵ Charite physicians provide teleconsultations to colleagues from Ivano-Frankivsk region / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/fahivci-kliniki-sharite-nadajut-telemedichni-konsultacii-kolegam-z-ivano-frankivschini>.

facilities that are short of physicians. It opens up opportunities for the development of telemedicine technologies and their integration into the care process and the eHealth of Ukraine.

Telerehabilitation of Patients with Neurosensory Disorders



Project launch: June 2022

Solution: Rehabilitation Gaming System telerehabilitation platform

Reach: 22 regions and the city of Kyiv

Facilities connected: 80

Personnel trained: 376

Services provided: 799

The solution aims to facilitate the rehabilitation of patients with cognitive disorders (including those caused by damage to the brain, spine, musculoskeletal system, etc.) through a set of exercises in the form of games prepared in accordance with the rehabilitation needs of a specific patient.

The solution is relevant as it works to restore the cognitive and motor functions of patients with neurosensory disorders, some of whom have other disabilities (in September 2023, 3 million people with disabilities were registered in Ukraine²⁶) and help improve their quality of life²⁷.

“The RGS platform turned my rehabilitation into an exciting game, with my every move affecting the virtual environment. It added an element of competition and challenge, making the process of my recovery more interesting.”

Andriy P., patient

How the solution works. Digital devices (such as a mobile phone, PC, laptop, tablet) and/or virtual and augmented reality devices are connected to the RGS telerehabilitation platform. The platform software is based on interactive game elements, and patients can do telerehabilitation exercises in a facility under the supervision of a physician or at home using the RGS app on their device.

The platform ensures a high level of data

protection and provides the functionality to customize and adjust the telerehabilitation plan according to the needs of each patient, do various physical and mental exercises, adjust their duration and complexity, monitor the patient’s progress remotely, and provide teleconsultations (if necessary).

Progress and results of introduction. The analysis of the use and introduction of the telemedicine solution-project elicited great interest among physicians and patients. The MOH, with the support of the Association of Rehabilitation Specialists of Ukraine, initiated use of the RGS solution in five health facilities that provide rehabilitation services. After the first positive results and feedback, other facilities contacted the MOH and LHSS with requests to install the RGS telemedicine solution. By the end of 2023, 70 pre-trained physicians from 28 health facilities from different regions of the country were using this solution.

²⁶ There are three million individuals with disabilities in Ukraine / Ministry of Reintegration of the Temporarily Occupied Territories of Ukraine. <https://minre.gov.ua/en/2023/09/25/there-are-three-million-individuals-with-disabilities-in-ukraine/>.

²⁷ It is much more effective to ensure financial independence of people with disabilities than to give them social benefits and leave them alone with their problems. (In Ukrainian) <https://www.ukrinform.ua/rubric-society/3780599-zolnovic-zavdannazabezpeciti-ekonomichnu-samostijnist-ludej-z-invalidnistu.html>

Given the high demand for rehabilitation services, the MOH and SOE eHealth approached LHSS with a request to scale up the project among health facilities starting on January 1, 2024. As part of scaling up, the following was done:

- More rehabilitation specialists were involved in the project.
- The technical support service was expanded.
- Telerehabilitation was promoted among health professionals and patients; this included:
 - preparation and publication of information materials on the MOH website and other resources (25 publications),
 - preparation of video presentations and video instructions for users,
 - building and launching a chatbot²⁸ for quick access to the user manual,
 - launching an information channel on telerehabilitation on YouTube²⁹, and
 - running a series of workshops for rehabilitation specialists.

As a result of the scaling efforts, in January–March 2024, the telemedicine solution introduction rates increased rapidly, exceeding the rates of the previous quarters combined (the dynamics of the number of services provided is slightly lower than the number of facilities involved and personnel trained):

- The number of health facilities involved increased from 28 to 80 (52 facilities were added).
- The number of personnel trained increased from 70 to 376 (306 people were trained during the quarter).
- The number of services provided (individual rehabilitation plans with RGS exercises) increased from 415 to 799 (384 new individual rehabilitation plans were created).

Feedback. According to the results of the survey of physicians who used RGS in their work (N=46):

- Over 93 percent of rehabilitation specialists noted the effectiveness of the telemedicine solution.
- More than 80 percent of respondents stated that it was easy to use, although during the training a third of respondents (31 percent) found the system difficult to master.
- Almost 83 percent of respondents indicated that patients highly appreciated the platform usability during rehabilitation.

The advantages of the RGS telemedicine solution and suggestions for its improvement are presented in Table C2.

Table C2. Advantages of the RGS telemedicine solution and suggestions for its improvement. Source: survey and user interview results

Advantages	Suggestions for improvement
<ul style="list-style-type: none"> • The use of augmented and virtual reality technologies creates a controlled, safe, and adaptive environment for patients. • It enables a physician to monitor the process and correctness of the patient’s exercises using a modern analytics system that identifies errors and provides a timely correction. • The RGS app works on IOS and Android. • Interactive games make the rehabilitation process more attractive to patients, especially children. 	<ul style="list-style-type: none"> • Expand additional game elements and exercises for virtual and augmented reality glasses. • Develop and add video communication functionality for teleconsultations and video monitoring of exercises


²⁸ https://t.me/rqs_support_bot

²⁹ <https://youtube.com/@serhii-qh4lw?si=tvkflf4q77ac3blm>

Outcomes. The introduction of the RGS telerehabilitation platform expands rehabilitation approaches for the patients who need to improve their motor and cognitive functions, thereby facilitating their rapid recovery from injuries and damages and improving their quality of life³⁰.

³⁰ The RGS telemedicine system is used in patient rehabilitation in 20 Ukrainian hospitals. Ukrainian Medical Journal. October 2023. (In Ukrainian) <https://umj.com.ua/uk/novyna-247483-telemedichna-sistema-rgs-vikoristovuyetsya-u-reabilitatsiyi-patsiyentiv-u-20-likarnyah-ukrayini>.

Virtual Operating Room



Project launch: July 2022
Solution: Epiqar telemedicine platform
Reach: Health facilities of Cherkasy region
Facilities connected: 2
Personnel trained: 5
Services provided: 7

The solution aims to enable colleagues to consult during surgery and its live online broadcast.

The solution is relevant as many surgeons need to consult more experienced colleagues during complex surgical interventions, especially with the current shortage of highly qualified health professionals.

How the solution works. The Epiqar telemedicine platform has a set of telecommunication tools that allow broadcasting of surgical interventions and teleconsultation. It is possible to connect a variety of medical equipment and diagnostic devices (endoscopic cameras, patient monitoring devices, electrocardiograph, ultrasound device, and other devices used in the operating room), log surgical procedures, generate invitations for consulting physicians, and create web links. During the operation, the consultant physician can join the team of surgeons online from anywhere in the world, monitor the progress of the surgery and the readings of diagnostic devices, and make any needed recommendations in real time.

Progress and results of introduction. LHSS analysis showed one health facility's limited use of this telemedicine solution (in only 7 of approximately 700 surgical interventions performed in this facility over two years³¹), indicating the facility's minimal need for this technology and/or poor choice of the facility for its implementation, despite the facility asking to participate. LHSS recommended that the MOH transfer the solution to another facility with greater need of it, but regulatory restrictions complicated the transfer the device had been put on the balance sheet of the first facility and removing it required a set of lengthy administrative procedures and decisions.

Despite the successful deployment of the telemedicine solution³², staff training, and the readiness of LHSS to provide technical assistance, the facility had qualified specialists who do not need external support during surgical interventions. This indicates the need for a thorough analysis of the requesting facility and better planning for the introduction of telemedicine solutions to achieve the best possible results.

The advantages of the Epiqar telemedicine platform and suggestions for its improvement are presented in Table C3.

³¹ NHSU dashboards. Review of the practice of issuing electronic referrals by primary and specialized care physicians. (In Ukrainian) <https://edata.e-health.gov.ua/e-data/dashboard/service-requests>.

³² In Cherkasy region, a surgery was performed with the use of the Epiqar virtual operating room / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/na-cherkaschini-proveli-operaciju-za-dopomogou-virtualnoi-operacijnoi-epiqar>.

Table C3. Advantages of the Epiqar telemedicine platform and suggestions for its improvement. Source: survey and user interview results

Advantages	Suggestions for improvement
<ul style="list-style-type: none"> • It is able to combine multiple imaging sources to obtain a comprehensive understanding of the anatomy, functions, and pathologies of the human body. • It is able to quickly consult physicians via teleconsultations during surgical interventions. • It is a quality tool for improving knowledge and skills in surgery. 	<ul style="list-style-type: none"> • Ability to record surgery visualization without internet connection

Conclusion. The Epiqar telemedicine platform visualizes surgical procedures, and thus opens up opportunities for the development of professional knowledge and skills of surgeons, providing them with access to the knowledge and experience of experts in this field. In this way, it is fit for purpose and can be effectively used in telesurgery if necessary. At the same time, it was rarely used in Ukrainian facilities, which necessitates (1) reviewing the needs of the facility when distributing telemedicine solutions, (2) overcoming regulatory restrictions that delay transferring the platform to another facility that needed it.

Remote Fetal Monitoring



Project launch: July 2022

Solution: Carebits telemedicine hardware and software platform for cardiotocography

Reach: 22 regions and the city of Kyiv

Facilities connected: 182

Personnel trained: 969

Services provided: 10,601

The solution aims to improve prenatal care for pregnant women through the use of remote monitoring technologies for women and their fetuses in clinical and home settings.

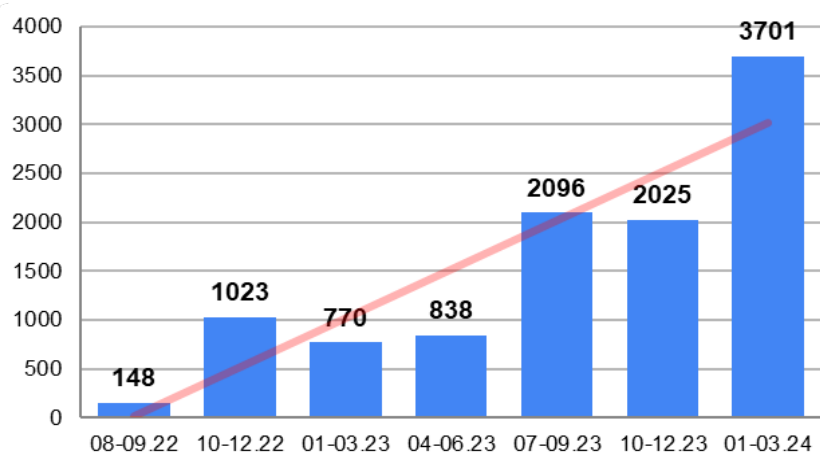
The solution is relevant because when war limits access to health services, the solution enables remote management of pregnancy through detection of congenital malformations and other fetal pathologies. It thereby significantly reduces the risk of perinatal diseases and mortality³³.

How the solution works. Telediagnosics of pregnant women are provided with the help of the Carebits telemedicine hardware and software platform and the Sigmafon CTG device with the use of digital devices (such as a mobile phone, PC, laptop, or tablet). The Sigmafon CTG device has the functionality to record the fetal heart rate and uterine contractions and monitor 40 other health indicators of the pregnant woman and her child. The telemedicine platform stores, processes, and shares diagnostic data with the physician for real-time or delayed data analysis.

A pregnant woman can use this device at home independently via mobile app. This will enable her to receive test results and consult with a doctor remotely, and immediately identify any abnormalities and take the necessary actions to help her or her child.

Progress and results of introduction. The analysis of service provision over two years shows a positive trend in the use of the devices (Figure C2). Over the period, 10,601 telediagnostic services were provided, and 969 physicians were involved.

Figure C2. The number of services provided with the Carebits telemedicine solution by quarter, April 2022–March 2024.



Source: LHSS monitoring data (the data presented are not cumulative)

³³ Pregnancy during the war: What you should know about your safety / NGO Docudays. (In Ukrainian) <https://bezpechnopolohy.org.ua/news/vagitnist-pid-chas-viynu-sho-varto-znaty>.

However, monitoring revealed that use of the devices varied by facility. Given the relevance of this project³⁴, the MOH and SOE eHealth decided to strengthen it by redistributing Carebits devices to hospitals that would use them. To facilitate redistribution, LHSS engaged additional staff to communicate with physicians, train them, and provide prompt technical support.

As a result of these efforts, the rates of introducing the telemedicine solution rose in January–March 2024 from the previous quarters of 2022–2023. In particular:

- The number of personnel trained increased from 730 to 969 (239 persons were trained in January–March 2024 quarter).
- The number of services provided increased from 6,900 to 10,601 (3,701 services were provided during the same quarter).

“The cardiocograph turned out to be very useful, I can diagnose the condition of the fetus from a distance. It’s really very convenient. I use my cell phone to save test results and send them to my doctor.”

Larysa K., patient

Feedback. Interviews with users revealed that physicians mostly use cardiocographs in outpatient settings. The high quality of test result interpretation sometimes helped them make more accurate decisions about correcting the condition of the pregnant woman and her fetus³⁵.

According to the survey of physicians and patients who used the Carebits telemedicine solution (N=251):

- Almost 95 percent of respondents recognized the Carebits platform as an effective tool for perinatal care.
- Over 83 percent of respondents noted the platform’s usefulness during the war.
- From the proposed list of advantages, respondents most often chose the following:
 - easy access to the fetal monitoring platform from a mobile phone (almost 75 percent),
 - high-quality and fast remote monitoring of the fetal condition in real time (over 57 percent), and
 - the quality of cardiocography (over 56 percent).
- 88 percent of respondents confirmed their interest in further use of the solution, including 59 percent of respondents who reported their willingness to cover the financial costs associated with the use of this solution after the free trial period.

The advantages of the Carebits telemedicine hardware and software platform and suggestions for its improvement are presented in Table C4.

Table C4. Advantages of the Carebits telemedicine hardware and software platform and suggestions for its improvement. Source: survey and user interview results

Advantages	Suggestions for improvement
<ul style="list-style-type: none"> • Online CTG with a portable device, including at home. • Early detection of maternal and child health problems • Use of AI for data interpretation 	<ul style="list-style-type: none"> • Expand the service of automated test interpretation or involve more physicians to interpret tests. • Develop notification functionality for mobile devices and improve the experience on Android devices

³⁴ Carebits telemedicine platform allows remote monitoring of pregnancy / SOE eHealth. (In Ukrainian) <https://ehealth.gov.ua/2023/02/20/telemedychna-platforma-system-carebits-dozvolayaye-viddaleno-stezhyty-za-perebigom-vagitnosti/>.

³⁵ Remote pregnancy monitoring: Ukrainian hospitals implement telemedicine solutions / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/monitoring-vagitnosti-viddaleno-ukrainski-likarni-vprovadzhuut-telemedichni-rishennja->

Conclusion. The Carebits telemedicine solution provides round-the-clock fetal monitoring, facilitates early detection of problems in pregnant women, and thus increases safety of the perinatal period³⁶. This remote monitoring tool has proven to be especially useful in wartime settings, and particularly in rural areas, where access to health services is limited.

³⁶ Carebits telecardiotocography. A new milestone in diagnostics for pregnant women: Telemedicine offers advanced capabilities (2024). (In Ukrainian) <https://moz.gov.ua/article/news/nova-viha-diaagnostiki-vagitnih-telemedicina-vidkrivae-peredovi-mozhlivosti>

Remote Monitoring of Vital Signs



Project launch: April 2022

Solution: HomeDoctor telemedicine hardware and software platform

Reach: Poltava, Sumy, Zhytomyr, Chernihiv regions

Facilities connected: 30

Personnel trained: 57

Services provided: 386

The solution aims to increase the availability of diagnostic services in primary care facilities.

The solution is relevant since it helps to restore patients' access to services and to replenish primary care facilities with medical equipment, especially in the de-occupied territories³⁷, and rural and remote areas where traditional access to quality medicine is limited or complicated.

How the solution works. Telemedicine consultations are provided via a telemedicine hardware and software platform and the HomeDoctor mobile diagnostic kit (which contains a thermometer, a cardiograph, a pulse oximeter, a tonometer, an examination camera, scales, and a stethoscope). These allow the physician to conduct basic examinations of health indicators remotely³⁸, and the patient to examine him/herself: they can measure temperature, blood pressure, and blood oxygen; take a cardiogram; listen to breathing and heartbeat; and get images of the skin, ears, throat, and nose. If necessary, the physician provides a teleconsultation.

Progress and results of introduction. Twenty-seven HomeDoctor kits were provided to Ukraine (in several stages). The MOH distributed them to primary care facilities in the regions with the greatest need³⁹ Chernihiv (11 primary care facilities), Sumy (10 facilities), and Zhytomyr (6 facilities) regions⁴⁰. Fifty-seven health professionals were trained to use the telemedicine solution and provided 386 telediagnostic consultations. However, in September 2023, the project was suspended when the telemedicine solution provider terminated its technical support due to the end of funding. This shows that it is important to ensure stable funding for telemedicine solutions, especially those provided on preferential terms (free of charge, as humanitarian aid).

Feedback. According to a survey of telemedicine solution users family doctors and paramedics (N=21):

- 91 percent of respondents noted the benefits of providing teleconsultations to patients with the use of HomeDoctor telediagnostic devices during the war.

³⁷ Medicine during the war: what obstacles must the healthcare system overcome? / NGO ANTS — National Interests Advocacy Network. <https://ants.org.ua/en/medicine-during-the-war-what-obstacles-must-the-health-care-system-overcome/>

³⁸ Spanish doctors can directly consult Ukrainian patients via the HomeDoctor telemedicine system / Department of Health of Poltava Regional State Administration. (In Ukrainian)

<http://uoz.gov.ua/2023/03/03/%D1%82%D0%B5%D0%BB%D0%B5%D0%BC%D0%B5%D0%B4%D0%B8%D1%87%D0%BD%D0%B0-%D1%81%D0%B8%D1%81%D1%82%D0%B5%D0%BC%D0%B0-homedoctor-%D0%B4%D0%B0%D1%94-%D0%B7%D0%BC%D0%BE%D0%B3%D1%83-%D1%96%D1%81%D0%BF%D0%B0/>

³⁹ Spain donated 20 medical robots to Ukraine / MOH. (In Ukrainian) <https://suspilne.media/313442-ispania-peredala-ukraini-20-medicnih-robotiv-moz/>

⁴⁰ Three health facilities in Zhytomyr region received HomeDoctor telemedicine systems. (In Ukrainian) <https://suspilne.media/485977-tri-medicni-zakladi-zitomirskini-otrimali-telemedicni-sistemi-homedoctor/>

- 36 percent of respondents were not satisfied with this solution because of problems with its use (the most important ones being the lack of internet connection and software failures due to the termination of service support by the provider).

“With telemedicine, my patients can receive care at home. For me as a family doctor, it is important that this has helped immensely people with limited mobility and those living in remote areas.”

Andriy Ts., family doctor

The results of an interview with a family doctor (project participant) confirmed that he and most of his colleagues’ support and recognize the benefits of using teleconsultations in their professional activities. At the same time, the doctor emphasized the challenges, including problems with the internet and mobile communication in paramedic and obstetric stations and outpatient clinics; this is

especially relevant for remote areas and areas with a high risk of shelling. Although the telemedicine project has been suspended, the doctor expressed the hope that it will resume, as he believes that telemedicine is necessary and convenient for both physicians and their patients. At the time this report was written, the solution provider did not give any information on its further support in Ukraine.

The advantages of the HomeDoctor telemedicine hardware and software platform and suggestions for its improvement are presented in Table C5.

Table C5. Advantages of the HomeDoctor telemedicine hardware and software platform and suggestions for its improvement. Source: survey and user interview results

Advantages	Suggestions for improvement
<ul style="list-style-type: none"> • Diagnosing the patient’s condition at home or at the patient’s place of stay. • Equipping primary care facilities with diagnostic equipment 	<ul style="list-style-type: none"> • Add a built-in screen and a webcam for telemedicine consultations without the use of personal mobile devices

Conclusion. The HomeDoctor telemedicine solution project was halted after a year and a half because the solution provider terminated service support. Despite this, users left numerous positive reviews of the solution, emphasizing its relevance and importance in improving the accessibility and quality of health care, especially at the primary level of care.

AI-Powered CT Image Analysis



Project launch: June 2023

Solution: BrainScan telemedicine platform

Reach: Odesa, Donetsk, Zhytomyr regions

Facilities connected: 10

Personnel trained: 14

Services provided: 698

The solution aims to provide diagnosticians with an additional AI-powered tool to obtain a “second opinion” when interpreting CT brain images.

The solution is relevant because the problem of stroke is pressing for Ukraine: The annual number of strokes and brain injuries in the country is estimated in the range of 100,000 to 110,000 per year⁴¹ with an upward trend (by 16 percent in 2023⁴²), and within the first 30 days after onset, 30–40 percent of patients die. The need for remote response is especially great against the background of a decreasing number of qualified diagnosticians and an increasing proportion of less experienced medical staff⁴³.

How the solution works. The automated analysis of CT brain images is based on the BrainScan telemedicine platform with AI algorithms. The platform automatically recognizes radiological images, interprets images with high accuracy using a training set of more than 250,000 brain CT scans, and identifies pathologies (structural features of the brain, vascular changes, potential neoplasms, strokes, and other injuries) in the form of a heat map. The entire process of automated image analysis takes no more than five minutes and includes the generation of results with visualization, which the diagnostician uses to prepare a conclusion.

Progress and results of introduction. Given the technical complexity of the BrainScan platform, health facilities must meet high technological requirements if they are to adapt and implement it successfully. Therefore, the LHSS team analyzed the existing technical infrastructure of potential participants to identify the facilities best prepared to do so.

Odesa Regional Clinical Hospital was the first health facility⁴⁴ to implement the BrainScan platform integrated with a CT scanner in the emergency department⁴⁵. Later, the platform was installed in nine more health facilities. The project team helped deploy and configure the server infrastructure at the facilities, organized training sessions for technical and medical staff, and provided ongoing technical support. As of the end of March 2024, 698 telediagnostic services had been provided using the BrainScan telemedicine solution.

Feedback. According to the surveys of four facilities where BrainScan was implemented (N=9):

- Seven respondents noted that it is easy to learn the platform.
- Eight respondents noted its usability.

⁴¹ World Stroke Day / Public Health Center of the Ministry of Health of Ukraine. <https://phc.org.ua/news/29-zhovtnya-vseshvitiy-den-borotbi-z-insultom>.

⁴² The number of patients with strokes has increased in Ukraine: Why? <https://tsn.ua/ukrayina/v-ukrayini-zroslo-kilkist-hvorih-z-insultami-u-chomu-prichina-2388115.html>.

⁴³ Ukraine lacks physicians: The healthcare labor market is full of vacancies with no one to fill them. <https://www.work.ua/articles/analytics/3178/>.

⁴⁴ In Odesa, artificial intelligence is involved in brain diagnostics / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/v-odesi-shtuchnij-intelekt-doluchili-do-diaagnostiki-golovnogo-mozku>.

⁴⁵ MOH and the BrainScan telemedicine project signed a memorandum of cooperation / MOH. (In Ukrainian) <https://moz.gov.ua/article/news/moz-i-telemedichnij-proekt-brainscan-pidpisali-memorandum-pro-spivpracu>.

- Six respondents rated the system as highly effective, two identified its effectiveness as medium, and one rated it as low.

Different assessments of BrainScan’s effectiveness may be due to subjective factors (different expectations regarding the use of the system, level of technical training) and objective factors (specifics of its use in different facilities). In addition, the platform has limitations (it processes CT images without contrast enhancement and can only process brain images), which could also affect assessment.

“The future lies in AI technologies that can serve as an independent expert ‘second opinion’ for physicians to make quick decisions and respond to situations. This is extremely important as it can improve the quality of diagnostics and treatment.”

*Anastasia M.,
radiologist of the highest qualification category*

According to interview results, the respondents expressed the opinion that the system is highly relevant and useful, especially in the context of wartime needs and prospects for its use in the future: such systems have great potential to optimize the working time of health professionals and improve the overall quality of care, which, in turn, may facilitate their wider implementation after the war is over.

The advantages of the BrainScan telemedicine platform and suggestions for its improvement are presented in Table C6.

Table C6. Advantages of the BrainScan telemedicine platform and suggestions for its improvement. Source: survey and user interview results

Advantages	Suggestions for improvement
<ul style="list-style-type: none"> • Speed of image analysis and generation of description results • Improved diagnostic process and reduced human error 	<ul style="list-style-type: none"> • Create AI functionality to describe and analyze CT images with injected contrast agent

Conclusion. The BrainScan platform is a relevant tool that ensures quality diagnostics. In particular in Ukraine, it helps health professionals to quickly and accurately identify pathologies and make diagnoses amid the annual increase in the number of brain injuries. It also serves as a harbinger of the future of medicine, which physicians are actively preparing to embrace⁴⁶.

⁴⁶ The European Congress of Radiology — #ECR2024. <https://brainscan.ai/the-european-congress-of-radiology-ecr2024.html>.

ANNEX D: LEGAL FRAMEWORK FOR TELEMEDICINE UNDER MARTIAL LAW

Document title	What does it regulate?	Status
Order of the Ministry of Health of Ukraine No. 994 of June 09, 2022, <i>On Test Operation of Telemedicine Platforms (Systems) under Martial Law in Ukraine</i> ⁴⁷	<ul style="list-style-type: none"> • Receipt and introduction of telemedicine solutions provided as humanitarian aid • The composition and duties of the Telemedicine Solution Testing Commission • The participants in the process, their tasks and duties 	Effective (to be repealed due to the adoption of the Order of the Ministry of Health of Ukraine No.109 of January 22, 2024).
Order of the Ministry of Health No. 1062 of June 20, 2022, <i>On the Organization of Healthcare Provision with the Use of Telemedicine under Martial Law</i> ⁴⁸	<ul style="list-style-type: none"> • The list of injuries, wounds, and other medical conditions for which telemedicine can be used during martial law • The procedure for determining health facilities and engaging specialists to provide telemedicine care 	Repealed by the Order of the Ministry of Health of Ukraine No. 77 of January 15, 2024.
Order of the Ministry of Health of Ukraine No. 1695 of September 17, 2022, <i>On Approval of the Procedure for Providing Health Services with the Use of Telemedicine and Rehabilitation Services with the Use of Telerehabilitation for the Period of Martial Law in Ukraine or Its Territories</i> ⁴⁹	<ul style="list-style-type: none"> • The rules for the provision of health services with the use of telemedicine and telerehabilitation 	Effective as amended by the Order of the Ministry of Health of Ukraine No. 77 dated January 15, 2024.
Order of the Cabinet of Ministers of Ukraine No. 625-p of June 14, 2023, <i>On Approval of the Strategy for Telemedicine Development in Ukraine</i>	<ul style="list-style-type: none"> • The main directions and principles of telemedicine development in Ukraine, objectives and measures in this area for 2023–2025 • The use of telemedicine solutions provided to Ukraine as humanitarian aid during the period of martial law and 6 months after its termination or cancellation, with their subsequent integration into a single medical space 	Effective
Law of Ukraine of August 09, 2023, <i>On Amendments to Certain Legislative Acts of Ukraine on the Functioning of Telemedicine</i>	<ul style="list-style-type: none"> • The use of telemedicine to deliver all types of health and rehabilitation services, under martial law in particular 	Effective
Order of the Ministry of Health of Ukraine No. 77 of January 15, 2024, <i>On Amendments to the Order of the Ministry of Health of Ukraine No. 1695 of 17 September 2023 and Approval of Amendments to the Procedure for Providing Health Services with the Use of Telemedicine and Rehabilitation Services with the Use of</i>	<ul style="list-style-type: none"> • The possibility of using telemedicine apart from the list of injuries, wounds, and other medical conditions (cancels the Order of the Ministry of Health of Ukraine No. 1062 of June 20, 2022) • The possibility of using remote monitoring for all patients (not only for patients with chronic diseases) • Functions of rehabilitation specialists in the use of telemedicine 	Effective

⁴⁷ <https://moz.gov.ua/article/ministry-mandates/nakaz-moz-ukraini-vid-09062022--994-pro-provedennja-testovoi-ekspluatacij-telemedichnih-platform-sistem-v-umovah-voennogo-stanu-v-ukraini>

⁴⁸ <https://zakon.rada.gov.ua/laws/show/z0728-22#Text>

⁴⁹ <https://zakon.rada.gov.ua/laws/show/z1155-22#Text>

Document title	What does it regulate?	Status
<i>Telerehabilitation for the Period of Martial Law in Ukraine or on Its Territories</i> ⁵⁰		
Order of the Ministry of Health of Ukraine No. 109 of January 22, 2024, <i>On Trial Operation of Telemedicine Solutions under Martial Law in Ukraine</i> ⁵¹	<ul style="list-style-type: none"> • The duties of the Telemedicine Solution Testing Commission during the war in Ukraine • The use of telemedicine devices after martial law • The methodology for telemedicine solution testing and the procedure for its approval 	Effective

⁵⁰ <https://zakon.rada.gov.ua/laws/show/z0350-24#n11>

⁵¹ <https://moz.gov.ua/en/article/ministry-mandates/nakaz-moz-ukraini-vid-22012024--109-pro-provedennja-testovoi-ekspluatacii-zasobiv-telemedicini-v-umovah-voennogo-stanu-v-ukraini>