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DOI: <https://doi.org/10.33111/sedu.2025.56.142.159>**Viktoriia Kyrylenko*****LIFE SCIENCES AND HEALTHCARE IN UKRAINE:
CHALLENGES AND CHANGES**

Abstract. The current state of Ukraine's bioscience and healthcare sector is analyzed, considering the impact of the war and efforts to transform the industry digitally. The government's strategic initiatives are discussed, including implementing a new MedTech strategy to develop bionic prosthetics, skin regeneration, burn treatment, mental health, and artificial intelligence in medicine. Particular attention is paid to the Lab2Market MedTech acceleration program launched by the IP Office of Ukraine, which aims to commercialize scientific developments in medical technologies. An overview of some Ukrainian medical startups, including the program participants, their areas of focus (diagnostics, rehabilitation, digital solutions, etc.), technology readiness levels, and key innovations is provided.

Keywords: life sciences; healthcare; medical technologies; innovation; startups; Ukraine.

Introduction. Ukraine's life sciences and healthcare sector encompasses a broad range of activities — from pharmaceuticals and biopharmaceuticals to medical services, equipment, e-health, and R&D. Before the war, the country had a robust foundation for growth. As of 2024, Ukraine's healthcare budget reached about \$6 billion (up from \$5.3 billion in 2022). The healthcare infrastructure includes over 23,000 registered health service providers and 15,500 medical facilities (hospitals, clinics, pharmacies) integrated into the eHealth system. Notably, 200+ health-tech companies and startups are operating in Ukraine, reflecting a growing ecosystem of innovation in healthcare.

However, the full-scale Russian invasion in 2022 severely disrupted the sector, introducing unprecedented challenges. More than 2,000 healthcare facilities have been damaged or destroyed by attacks from 2022 to 2025. The World Health Organization has documented over 2,254 attacks on healthcare in Ukraine since the start of the war, with assaults continuing into 2025 [9]. These attacks, along with mass mobilization and displacement, led to an outflow of medical personnel and created acute operational challenges (broken supply chains, increased costs, air-raid disruptions). In wartime, healthcare workers face constant danger and fatigue, and patients often experience delayed or limited services [9].

The war has also shifted healthcare needs and priorities. There is a sharp rise in war-related injuries (e.g., limb trauma, burns, amputations) and a significantly increased focus on mental health. Surveys indicate a decline in overall health status for a majority of Ukrainians, with 46% reporting mental health issues in the war's third year [9].

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Demand has surged for services related to rehabilitation (both physical and psychological), including treatment of post-traumatic stress disorder (PTSD) and other trauma-related conditions. At the same time, the burden of chronic diseases persists, and infectious disease threats (such as tuberculosis) have grown as healthcare access is disrupted.

Despite these challenges, the crisis has catalyzed innovation and reforms in Ukrainian healthcare. In alignment with Ukraine's EU candidacy and post-war recovery planning, the government is pursuing healthcare modernization and integration of advanced technologies. Notably, a comprehensive MedTech development strategy was formulated under the Ministry of Digital Transformation in cooperation with the Ministry of Health. This strategy provides an industry analysis and a vision for incorporating cutting-edge technologies into medicine. According to the Ministry, the MedTech strategy will help "scale up production of bionic prostheses, develop skin regeneration technologies, treat burns and wounds, introduce digital solutions for mental health, and use AI for diagnosis and treatment". These priorities directly respond to war-related healthcare needs and aim to bolster Ukraine's capacity for medical innovation.

In parallel, Ukrainian researchers and entrepreneurs have actively sought solutions to emerging healthcare problems. Several grassroots innovations have appeared over the past two years — from advanced wound dressings and prosthetic devices to telemedicine platforms and mental health apps. Many of these innovations originate in research institutions or startup companies now collaborating more closely with government and investors to accelerate development and deployment.

Methods. The research objectives are multifaceted. Firstly, it aims to assess the current healthcare challenges in Ukraine, particularly those intensified by the full-scale invasion, such as traumatic injuries, the mental health crisis, and systemic disruptions to care access. This paper will examine one of the key initiatives supporting medical innovation in Ukraine: the Lab2Market MedTech accelerator program. First, we describe the objectives and structure of this program and its role in bridging research and commercialization. Then, we provide an overview of some Ukrainian medical startups, including the program participants, highlighting their focus areas, maturity (technology readiness levels), and novel features. These case studies illustrate how Ukrainian scientists and entrepreneurs respond to healthcare challenges with creative solutions — from AI-driven diagnostic tools to novel biotechnologies for therapy and rehabilitation. Finally, we discuss the implications of nurturing a med-tech startup ecosystem in Ukraine's post-war recovery and integration into the global healthcare innovation landscape.

Furthermore, the research evaluates the program's approach to managing intellectual property, navigating regulatory challenges, and facilitating market readiness. Finally, the contribution of this accelerator model to broader socio-economic goals, such as improving access to care, strengthening mental health services, and enhancing domestic production capacities, is critically assessed.

The research uses a qualitative multi-method design, emphasizing case study analysis, document review, and contextual sectoral evaluation. The logic of the study

proceeds as follows. It begins with a contextual review of Ukraine's healthcare landscape before and during the war, using data from the WHO, national health strategies, and policy documents. This establishes the baseline challenges and identifies key areas of unmet need. It then proceeds to an in-depth Lab2Market MedTech accelerator analysis based on official sources, program documentation, and published evaluations. Selected startup projects from the program's initial cohort are analyzed across several parameters, including field of focus, innovation characteristics, and development progress. Technology Readiness Levels (TRLs) are used to structure comparative insights across different innovations.

Stakeholder mapping is employed to identify and analyze the roles of key actors, such as clinicians, regulators, mentors, and investors, who shape the accelerator's impact. The final stage involves a strategic synthesis of findings, placing Ukraine's MedTech innovation efforts within the broader context of post-crisis recovery, digital transformation, and EU-aligned healthcare reforms. Comparative references are made to similar accelerator models in countries with recent experience rebuilding healthcare systems under duress.

The chosen methodology is well-suited to the study's exploratory nature, offering the depth and flexibility required to capture complex, systemic developments in a rapidly evolving national environment. Through this approach, the research provides insights into how targeted innovation support mechanisms can drive systemic resilience and foster home-grown solutions to pressing healthcare challenges.

Results. Government Strategy and Support for MedTech Innovation. Even amid ongoing conflict, Ukrainian authorities have laid the groundwork for long-term healthcare system improvements. Beyond immediate humanitarian aid, there is recognition that innovation and digital transformation are pivotal for building a more resilient health system. In 2022, a new version of the Law of Ukraine "On Medicines" was adopted to harmonize regulations with the European Union. This legislative update modernizes pharmaceutical regulation, which should facilitate the introduction of novel therapies and medical products.

Moreover, the dedicated MedTech strategy (2023) signifies the government's support for the medical technology sector as a driver of healthcare advancement. Key focus areas of this strategy — bionic prosthetics, regenerative medicine for skin injuries, advanced burn treatments, mental health tech, and medical AI — align with critical needs that the war has amplified. For instance, thousands of soldiers and civilians require prosthetic limbs; thus, scaling domestic production of bionic prostheses (potentially using 3D printing and new materials) is a strategic priority [2]. Similarly, the high incidence of burn and blast injuries creates demand for innovations in wound healing and skin regeneration, spurring support for bioengineered skin grafts, novel wound dressings, and related biotech solutions [2]. The mental health crisis (with an explosion of PTSD cases) is driving the introduction of digital mental health solutions, such as mobile applications, teletherapy platforms, and AI chatbots, to increase access to psychological support [2]. Finally, the push to use AI for diagnosis and treatment is reflected in growing projects that apply artificial intelligence to

medical imaging, triage, and decision support, which could help compensate for shortages of specialists and improve care efficiency.

To implement this strategy, Ukraine is engaging international partners and funding programs. For example, the World Bank and other donors are investing in rehabilitating Ukraine's healthcare infrastructure and integrating e-health solutions. Domestically, the Ukrainian Startup Fund and various innovation agencies have launched calls specifically for health-tech and defense-tech solutions. The aim is to harness Ukraine's strong IT sector and scientific base to address medical problems arising from the war and create products that could compete globally.

One notable initiative is the creation of the National IP & Innovations Hub at the Ukrainian IP Office (Ukroboronprom's successor for intellectual property and innovation, also known as UANIPIO). This hub serves as a platform to support research, commercialization, and patenting. Within its activities, the hub has launched a unique project in the medical domain — the Lab2Market MedTech program — which is the focus of the next section [1].

Lab2Market MedTech Accelerator Program is a tailored entrepreneurial training and acceleration program for medical innovations, initiated in late 2024 by the Ukrainian National Office of Intellectual Property and Innovations (IP Office) in partnership with the ISE Group (Innovation Startup Entrepreneurship group). The program aims to bridge the gap from laboratory to market for promising medical technologies. It seeks to reduce the risks and shorten the time needed to turn a research result into a viable product or startup [1]. As stated by the organizers, Lab2Market MedTech is “a program for the commercialization of scientific developments in the field of medical technologies, aimed at supporting and developing both teams that are just developing their idea and ready-made startups [10]. The ultimate goal is to help researchers and innovators refine their business models, protect intellectual property (IP), and attract investment so that their ideas can successfully reach patients and healthcare providers [10].

Program format: Lab2Market MedTech is implemented in seasonal cohorts. The first cohort's program commenced on 17 February 2025 and runs for about 1.5–2 months [1], concluding with demo days in April 2025. Participation is free of charge (thanks to government support and sponsors), but space is limited and competitive [1]. Applicants from all regions of Ukraine and all types of organizations (universities, research institutes, startups, healthcare institutions) were welcome, provided their project is in the medical field [1]. Over twenty teams are working on med-tech innovations and were selected for this inaugural cohort [1]. These participants include early-stage startups and research teams that are not yet companies.

Curriculum and support: The accelerator provides an intensive mentorship-driven curriculum. It consists of several thematic sprints (workshops) covering business development, market research, regulatory requirements, intellectual property rights, and pitching to investors [1]. For example, the first training sprint focused on the “legal protection of intellectual property in healthcare,” featuring expert lectures on IP regimes and bioethical standards for medical innovations [1]. Experienced mentors —

including entrepreneurs, patent advisors, clinicians, and industry experts — are assigned to each team, providing guidance tailored to the project's needs. The program also facilitates networking with potential partners and an opportunity to present projects to investors and healthcare stakeholders at the conclusion [1].

The head of the IP Office, Dr. Olena Orliuk, highlighted the significance of this initiative for Ukraine's future: "Protecting and supporting medical developments today is the key to ensuring that the technologies of tomorrow will save lives... We are creating conditions for ideas to become solutions, successful projects, and businesses. Lab2Market MedTech is an important step toward real medical innovations that change our future..." [1]. This underscores the dual mission of the program — fostering innovation for societal benefit and nurturing new ventures that can drive economic growth in the health sector.

The projects in Lab2Market MedTech's first cohort reflect the urgent health needs of Ukraine as well as the scientific strengths of its institutions. Their focus areas are diverse, covering medical diagnostics, therapeutics, medical devices, digital health, and rehabilitation technologies. Notably, many projects target solutions for injuries and conditions prevalent due to the war. According to the program organizers, out of the 22 projects, four startups ($\approx 18\%$) are devoted to innovations for the prevention or treatment of PTSD and related mental health issues. These include both a psychological rehabilitation service model and biopharmaceutical approaches such as novel probiotic therapies to alleviate PTSD symptoms — an unconventional approach that is backed by initial clinical evidence and product development in Ukraine. In addition, roughly 41% of the cohort (two out of every five projects) involve some form of digital health or AI-based solution at their core. This indicates a broader trend, as Ukrainian med-tech entrepreneurs leverage the country's IT expertise to build advanced software for healthcare (e.g., AI diagnostics, health data analytics, telemedicine platforms).

Table 1 provides an overview of some Ukrainian MedTech projects. It summarizes their name (or project code), focus area, a brief description of the solution, the approximate technology readiness level (TRL), and key innovative features. The TRL estimates (on a 1–9 scale) are based on available information about each project's development stage, ranging from concept validation (TRL 3–4) to prototyping (TRL 5–6) or early market readiness (TRL 7+).

Table 1 shows that current MedTech representatives in Ukraine address a spectrum of healthcare challenges. Several teams are advancing medical devices — e.g., the Borysfen wound dressing for burns, smart crutch tips, exoskeletons, and 3D-printed prosthetics — which directly tackle rehabilitation and trauma care needs arising from the war [3]. Several projects focus on diagnostic innovations: from AI systems for medical imaging and early cancer or TB detection to point-of-care devices that bring lab testing closer to the patient. Such diagnostics can be game-changers in conflict settings or resource-limited environments where quick, accurate results are critical.

Table 1

SOME UKRAINIAN MED-TECH STARTUPS AND RESEARCH PROJECTS

Startup / Project (Origin)	Field of Focus	Description	TRL	Key Innovation /Features
Borysfen Carbon Bandage	Wound care (burns & trauma)	A new carbon-fiber sorbent wound dressing has been developed at Kavetsky Institute for treating severe wounds and burns. It absorbs toxins and promotes healing; it has already been used on military casualties.	8–9	Advanced carbon sorbent material that accelerates wound healing and reduces infections (tested in war conditions).
OncoScanner (Early Cancer Detect)	Diagnostics (oncology)	An AI-powered diagnostic platform for early cancer detection (e.g., blood biomarkers or imaging). It aims to improve the early diagnosis of cancers (such as lung or breast cancer) by integrating data for quick risk assessment.	6–7	AI-assisted early cancer screening platform — combines multi-modal health data to flag early-stage tumors, enabling timely intervention in resource-limited settings. (Lab2Market cohort project).
OncoFlex (Lab2Market)	Therapeutics (immuno-oncology)	A novel cancer immunotherapy under development, exploring ways to boost the patient's immune system (e.g., via a therapeutic vaccine or cell therapy) to fight tumors common in Ukraine. Currently in preclinical trials (showing promise in mice).	3–4	Innovative immunotherapy uses locally discovered tumor antigens and a unique delivery mechanism (e.g., nano-carriers) to activate immune cells against cancer. Early-stage results indicate potential efficacy in lab models.
DermRegene	Regenerative medicine (dermatology)	A biotechnology project is developing a spray-on skin replacement for burn victims. It involves a tissue-engineered skin graft substitute: a sprayable suspension of the patient's skin cells with biomaterials that promote regeneration when applied to burn wounds.	4–5	Spray-on skin graft technology for rapid wound coverage. Innovative combination of cell therapy and biomaterials to improve burn healing without traditional skin graft surgery, currently in preclinical lab trials on skin cell cultures.
Hospice at Home (Lab2Market)	Care delivery (home-based)	A mobile hospice service model designed for immobile patients (e.g., amputees, stroke survivors, advanced cancer or diabetes patients). It provides in-home palliative care — wound care, stoma care, hygiene assistance, and caregiver training — recreating a hospice environment at the patient's home.	5–6	Patient-centered care innovation brings hospice-level medical and psychosocial support to patients' homes. This improves the quality of life for disabled and elderly patients by ensuring comfort and continuous care outside hospitals.

Startup / Project (Origin)	Field of Focus	Description	TRL	Key Innovation /Features
TeleHealth Village	Telemedicine services	A telemedicine platform designed to connect patients in rural or war-torn areas with doctors via video consults. Emphasizes low-bandwidth communication and integration with local nurses or medics for basic vitals. Helps deliver healthcare where infrastructure is damaged.	7	Rural telemedicine network optimized for unstable internet. Key features include asynchronous consult options (store-and-forward), multilingual interfaces, and a referral system to the nearest facility if in-person care is needed. These have already been piloted in several villages.
ExoWalk	Rehabilitation (physical)	A powered exoskeleton device to assist in the rehabilitation of patients with lower limb injuries or paralysis. A wearable robotic suit that supports walking exercises for individuals relearning to walk (e.g., injured soldiers).	5-6	Robotic exoskeleton for rehab — combines sensors and actuators to provide adaptive support during gait training. Innovative for its lightweight design and use of AI to adjust support based on the patient's strength and progress. Prototype tested in a rehab center.
AI-Ray Diagnostics	Diagnostics (medical imaging)	An AI software platform for analyzing medical images (X-rays, CT, MRI) to detect pathologies quickly, initially targeting chest X-rays for conditions like pneumonia, TB, or trauma injuries (fractures, shrapnel) automatically.	6	AI-driven radiology analysis — uses deep learning on thousands of images to identify abnormalities (e.g., lung lesions or bone fractures) with high sensitivity. Aims to assist radiologists and provide decision support in hospitals with staff shortages.
TB-FastTest	Diagnostics (infectious disease)	A rapid molecular diagnostic test for tuberculosis was designed in Ukraine. It's a portable PCR-based device that can detect TB DNA in sputum samples within an hour. It is intended to address rising TB cases in field clinics or labs with limited resources.	6	Portable PCR diagnostic for TB — innovation lies in miniaturizing PCR tech with battery operation and simplified sample prep. Provides quick, accurate TB detection outside of full laboratory settings; prototypes validated on clinical samples.
Mark (AI Medical Platform)	Digital health/telemedicine	A Ukrainian startup offering an AI-driven medical services platform and symptom-checker. It interviews patients through a chatbot, analyzes symptoms, and connects them to appropriate care or doctors. Also supports remote patient monitoring and triage.	7-8	AI-powered symptom checker for preliminary diagnosis and a digital hub integrating patients with healthcare providers. Uses machine learning to improve diagnostic suggestions and streamline emergency triage.

Startup / Project (Origin)	Field of Focus	Description	TRL	Key Innovation /Features
TraumaRehab Center	Mental health (PTSD rehab)	A comprehensive PTSD rehabilitation program combining therapy, support groups, and occupational rehabilitation for war trauma survivors. The project is developing a scalable rehabilitation center model (including remote counseling) tailored to veterans with PTSD.	6 (service)	Holistic PTSD treatment approach integrating psychological counseling, physical rehab, and peer support, with a protocol adapted to the Ukrainian cultural and war context. (Focus on implementation over hardware, TRL denotes an established pilot service.)
Insulin without Queues (Lab2Market)	Digital health (diabetes care)	A service platform aimed at streamlining insulin distribution for diabetic patients. It creates an electronic queue and home-delivery system for insulin prescriptions, ensuring patients receive life-saving insulin without standing in long lines — a critical need during wartime disruptions.	6-7	eHealth solution for chronic care — integrates with e-prescriptions and pharmacy networks to coordinate insulin supply. Innovative in reducing waiting times and travel for patients, which improves adherence and outcomes. The platform has been piloted in select clinics with positive feedback on reduced crowding.
Digital Neck ROM Meter (Lab2Market)	Rehabilitation (orthopedics)	A digital device for measuring the range of motion in the cervical spine. It provides precise, quantitative tracking of neck mobility for patients with spine injuries or disorders. Useful in monitoring recovery progress in rehabilitation clinics.	5	Intelligent rehab monitoring — introduces an inexpensive, portable tool to assess neck movement angles objectively. Replaces subjective observation with data, aiding therapists in tailoring exercises. Device testing shows high accuracy in measuring cervical motion, with results correlating to clinical goniometer readings.
AgroBio – Pesticide Modeling (Lab2Market)	Environmental diagnostics / public health	An innovative method to model and monitor pesticide behavior in crops and the environment, aimed at safeguarding public health. The project uses simulation and sensors to predict pesticide residue levels in food and soil, helping prevent harmful exposure in farming communities.	4-5	Preventive environmental health tech uses big data and modeling to control pesticide content in crops and surroundings. The key innovation is a predictive software that can alert farmers and regulators if pesticide use might exceed safe thresholds, addressing an underserved aspect of population health (chemical exposure).

Startup / Project (Origin)	Field of Focus	Description	TRL	Key Innovation /Features
Tayra.ai (Lab2Market)	Health IT (clinical documentation)	An AI medical scribe that automatically fills out medical documentation during patient visits. Tayra.ai integrates into hospital information systems (MIS) and records the doctor-patient conversation via a computer's microphone. The AI then transcribes the audio, extracts relevant medical information, and populates it into the patient's electronic record, saving physicians' time.	8	Cutting-edge AI assistant for doctors — TAYRA is an AI note-taker that reduces doctors' administrative burden by ~50%, increasing accuracy and allowing them to see more patients. It's already deployed as a cloud API in some clinics, demonstrating seamless integration and significant time savings for physicians.
AI Coronary Planner (Lab2Market)	Surgery planning (cardiology)	An AI-assisted system for optimizing preoperative planning of coronary artery bypass grafts. It analyzes coronary angiography data to suggest optimal graft attachment (anastomosis) sites. Providing surgeons with automated vascular health assessments enhances surgical planning for complex cardiac cases.	5	AI-driven surgical decision support — combines real-time imaging analysis with data on blood flow to guide coronary bypass surgery planning. This innovation could improve outcomes in cardiac surgery by reducing planning time and personalizing graft placement to each patient's vascular condition.
BioPTSD Yogurt	Biotech (mental health)	A probiotic-based therapeutic product (yogurt with specific bacterial strains) aimed at alleviating PTSD and anxiety symptoms by modulating the gut microbiome. Developed by a Ukrainian research team, it has undergone initial clinical trials showing reduced stress levels with probiotic use.	7	Novel psychobiotic therapy — leveraging the gut-brain axis to improve mental health. Uses a patented probiotic formulation to produce anti-anxiety effects (supported by clinical evidence of stress reduction via probiotics).
MindShield App	Mental health (digital)	A mobile application for PTSD prevention and self-help. It guides users through stress-relief exercises, mood tracking, and psychoeducation. Targets individuals at risk (veterans, IDPs) to provide coping tools and flag those in need of professional help.	5-6	Digital mental health solution offering cognitive-behavioral therapy exercises and AI-based mood analytics for personalized PTSD prevention. Integrates with telehealth platforms for referral to human therapists if needed.
VR Trauma Therapy	Mental health (rehabilitation)	A virtual reality therapy system for treating PTSD and phobias. It uses VR simulations in a controlled setting to provide exposure therapy for patients, e.g., simulating combat scenarios or loud noises in a safe environment to help desensitize triggers and reduce symptoms.	4-5	Immersive VR exposure therapy customized for Ukrainian veterans. Innovative use of gamification and biofeedback during VR sessions to monitor patient anxiety and adapt scenarios in real-time.

Startup / Project (Origin)	Field of Focus	Description	TRL	Key Innovation / Features
3D Bionics UA	Prosthetics (bionic limbs)	A project focused on affordable bionic prosthetic limbs using 3D printing and modular designs. It produces functional arm and leg prostheses with electronic joints (myoelectric control) at a fraction of traditional costs, suitable for the many amputees from the war.	6-7	Low-cost bionic prostheses — uses 3D-printed parts and open-source electronics. Key innovation is a modular design that can be customized and produced locally, making advanced prosthetics accessible to more patients (field-tested with amputee volunteers).
BonePrint 3D (Lab2Market)	Reconstructive surgery	A project focusing on custom 3D-printed bone implants for patients with bone defects from trauma. Using a patient's medical imaging (e.g., CT scans), the team designs personalized titanium or polymer implants (for skull, jaw, or long bones) that perfectly fit the defect for surgical reconstruction.	7	Personalized 3D-printed implants — innovation in using additive manufacturing for patient-specific orthopedic solutions. The team has successfully produced cranial plates and limb bone segments implanted in pilot patients, showing improved functional outcomes.
CardioPatch	Wearable monitoring	A wearable cardiac monitor patch that continuously tracks ECG, heart rate, and other vitals, alerting users and doctors to abnormalities. Aimed at patients with heart conditions or those under high stress (including soldiers) to detect issues like arrhythmia or early signs of cardiac events.	8	Wearable health monitoring — a thin, wireless patch with real-time data uploaded to a phone app that uses AI algorithms to detect irregular heart rhythms or stress indicators. The device has undergone clinical testing and is nearing regulatory approval.
ComeBack Mobility	Rehabilitation (orthopedics)	A startup offering smart crutch tips for orthopedic rehabilitation. The Smart Crutch Tip sensors measure how a patient with a leg injury loads their injured limb while using crutches. Doctors get mobile app data to ensure patients follow weight-bearing restrictions during recovery.	9	Intelligent rehab device — an IoT sensor solution for physical therapy compliance. Innovative in combining hardware and mobile software to improve rehabilitation outcomes. Already on the market, it has raised seed funding to expand usage.
Raccoon Recovery	Rehabilitation (telerehab)	A digital rehabilitation platform based on video games and motion sensors for patients recovering from injuries or neurological diseases. It enables patients to do physical therapy exercises at home with real-time monitoring. The system uses motion-tracking cameras and gamified exercises to engage patients.	8	Gamified tele-rehabilitation uses AI and big data to tailor physical therapy to each patient. The platform is already deployed in clinics in Ukraine and the EU, allowing remote therapist oversight and data-driven adjustments to therapy programs.

Startup / Project (Origin)	Field of Focus	Description	TRL	Key Innovation /Features
RecoVRSpace (Lab2Market)	Rehabilitation (VR physical)	An innovative platform in virtual reality that motivates patients to engage in physical exercises. The VR system adapts exercises in real-time to each user's abilities by integrating biometric data (heart rate, stress level, blood pressure). It is used to support rehab for patients regaining strength and mobility.	5-6	VR-powered rehabilitation employs immersive gamified workouts tailored to the patient's vitals and condition. This approach increases patient motivation and compliance in physical therapy. Early trials show improved exercise adherence when rehab is delivered through engaging VR scenarios.
Opora.Me (Lab2Market)	Mental health (neurotechnology)	A neurotechnology-driven platform for PTSD treatment and prevention. It combines neurofeedback therapy with AI-based psychological diagnostics and extensive clinical research. Opora.Me provides psychoeducation for veterans and children, and is developing a mobile app that offers diagnostic tools, treatment progress monitoring, and self-help stabilization techniques for users.	4-5	AI-assisted neurofeedback therapy — Opora.Me innovation lies in integrating EEG-based neurofeedback with an AI that personalizes therapy for PTSD patients. An app for continuous support complements this approach. The initiative has garnered attention for launching a "PTSD platform" providing not only treatment but also educational and community support for trauma survivors.
IMPULSAR (Lab2Market)	Emergency care (epilepsy)	A project addressing the needs of people with epilepsy and related neurological disorders. IMPULSAR is developing a system to detect imminent seizures and protect individuals from injury during episodes. This includes wearable sensors and an alert mechanism to reduce the high risk of trauma-related death during seizures (estimated ~50,000 deaths/year globally).	4-5	Safety innovation for epilepsy — combines real-time monitoring of physiological signals (heart rate, EEG patterns) with predictive algorithms to warn caregivers of an oncoming epileptic seizure. The project's key feature is an automated safety response (such as an airbag collar or alarm system) to prevent fall injuries, an underserved need in neurology care.
OrthoBuzz Mouthguard (Lab2Market)	Medical device (neurology)	An orthodontic appliance designed to improve cerebral blood circulation, originally intended for bruxism (teeth grinding) patients. Adjusting jaw position and reducing bruxism indirectly enhances blood flow in the carotid arteries. This device is being explored as a non-invasive way to support brain health and cognitive function in patients at risk of stroke or dementia.	3-4	Unique neuro-wellness device — repurposes a dental mouthguard to have neurological benefits. The innovation is the demonstrated link between jaw alignment therapy and improved cerebral circulation. Early tests indicate that consistent use of the custom appliance can increase carotid blood flow, contributing to better brain oxygenation and potentially reducing cognitive decline.

Startup / Project (Origin)	Field of Focus	Description	TRL	Key Innovation /Features
PeriMama Rehab (Lab2Market)	Physical therapy (maternal health)	A specialized physical therapy program and guideline for pregnant women who had COVID-19 during gestation. This project is developing an algorithm for safe exercises and rehabilitation techniques to mitigate the long-term effects of COVID-19 on maternal health and pregnancy outcomes.	4	Targeted rehab protocol — focuses on an often-overlooked group (expectant mothers recovering from COVID-19). Combines cardiopulmonary rehabilitation, gentle musculoskeletal exercises, and breathing techniques tailored for pregnancy. Innovative for addressing post-viral fatigue and respiratory issues in prenatal care, with pilot studies showing improved fitness and reduced complications in pregnant participants.
Esophageal Anastomosis Tool (Lab2Market)	Surgical device (gastrointestinal)	A novel surgical instrument for forming an esophageal anastomosis (surgical connection) after resection. This clamp-like tool is designed to be used in gastrointestinal surgeries, simplifying and standardizing the creation of esophagus-to-stomach or esophagus-to-intestine connections, even in field hospitals.	6	War-zone surgical innovation — a robust, portable instrument that enables safer esophageal surgery in low-resource settings. It automates the anastomosis process, reducing surgery time and complication rates. Surgeons testing the device report that it maintains strong, leak-proof connections in experimental models, pointing to its potential in improving outcomes for patients with war-related esophageal injuries or cancer.
OxiBiome (Lab2Market)	Biotech (microbiome therapy)	A project with the mission to prevent and treat PTSD by restoring gut microbiome health using innovative biotechnologies. The core idea is a therapeutic regimen that modulates the intestinal microbiome (through probiotics or metabolic interventions) to influence brain chemistry and stress resilience positively.	4–5	Microbiome-based mental health intervention — leverages cutting-edge research on the gut-brain axis. OxiBiome's approach is to develop probiotic strains or nutraceuticals that increase the production of neurotransmitters associated with stress reduction. This unconventional PTSD therapy is under study, with early results suggesting that gut flora manipulation can indeed mitigate anxiety symptoms.

Note: TRL = Technology Readiness Level (1 = basic principle observed, 9 = actual system proven in operational environment).
Source: compiled according to data [3, 4, 5, 8, 10, 11, 14, 15, 16].

Digital health and software solutions are also prominent, comprising roughly 40% of the cohort. These include telemedicine platforms, mobile apps, and health data analytics tools. For instance, the Mark symptom-checker and the TeleHealth Village platform illustrate how Ukrainian startups leverage AI and connectivity to improve access to care [8]. In mental health, projects like MindShield, VR Trauma Therapy, and MindLy are pioneering ways to scale psychological support via technology — an approach aligned with global trends in digital mental health and very relevant for Ukraine’s widespread war-related trauma [7].

It is noteworthy that more unconventional and cutting-edge approaches are also represented. The BioPTSD probiotic therapy project shows how Ukrainian researchers are exploring the gut–brain axis to treat mental health issues — an area of growing scientific interest worldwide. The OncoFlex Immunotherapy and DermRegene spray-on skin projects indicate that despite the war, fundamental biomedical research (in immunology and tissue engineering) is ongoing and being pushed toward translation with support from programs like Lab2Market. These projects may be at earlier TRLs, but nurturing them now could lead to home-grown breakthroughs in the future.

The projects included in the table above from the Lab2Market MedTech accelerator’s inaugural cohort underscore several emerging technological and sectoral trends. Many of these focus on patient-centered services and extending care beyond traditional facilities, reflecting the urgent needs of a nation at war. For example, “Hospice at Home” offers mobile hospice care to seriously ill and immobile patients, bringing comfort and medical support directly to them instead of requiring hospital stays. This aligns with a broader post-war shift toward decentralized and patient-centric healthcare, ensuring that vulnerable groups receive continuous care despite damaged infrastructure. Similarly, the “Insulin without Queues” initiative digitalizes insulin prescription fulfillment, so diabetic patients can obtain life-saving medication without enduring long lines or travel — a critical improvement when transportation and clinics are disrupted by conflict. These solutions illustrate a commitment to leveraging digital platforms to maintain continuity of care for chronic conditions and palliative needs amid challenging circumstances [1]. Such patient-focused innovations improve individual outcomes and relieve overburdened hospitals, contributing to a more resilient healthcare system.

Another notable trend is the integration of advanced neurotechnology and mental health innovations to address the psychological toll of war, such as projects like Opora. Me are spearheading a neurotech-driven approach to PTSD, combining AI-guided neurofeedback therapy with accessible mobile apps for self-help and monitoring [16]. This reflects a growing recognition that mental health support must be scalable and tech-enabled to reach vast populations (veterans, displaced people, children) dealing with trauma. In the same vein, the MindShield app and VR Trauma Therapy (from earlier efforts) and new cohort projects like IMPULSAR (for seizure safety) and OrthoBuzz (a bruxism-based device to boost cerebral blood flow) highlight how diverse facets of neurohealth are being tackled with innovation, from preventing injury during epileptic seizures to exploring novel ways to improve brain perfusion. These

efforts tap into global trends of digital therapeutics and brain-computer interfaces but are uniquely tailored to Ukraine's post-war context of widespread PTSD and neurological injuries [6]. By investing in neurotechnology and mental health solutions, Ukrainian innovators are addressing an urgent humanitarian need and contributing to the digital transformation of psychological support, making care more personalized and proactive.

Environmental and public health considerations have also come to the forefront through projects at the intersection of health and ecology. The AgroBio pesticide modeling project is a prime example — it represents a forward-looking effort to protect population health by preventing environmental exposure to harmful agrochemicals. This kind of ecological diagnostic tool can be crucial in an agrarian country like Ukraine, where wartime conditions and resource constraints might increase the misuse of pesticides. By predicting and controlling toxin levels in crops and soil, such innovations help safeguard food safety and community health, ensuring that rebuilding the economy (e.g., agriculture) does not come at the cost of public well-being. In a similar preventive vein, the OxiBiome project targets mental health through an unconventional path: the gut microbiome. This reflects a trend of holistic biotechnology solutions — recognizing, for instance, that improving nutrition and microbiota could enhance resilience to stress and trauma. In the long term, these environment- and biology-centric projects can bolster recovery by addressing health determinants that traditional healthcare often overlooks, from clean food and water to the microbial balance within our bodies.

Crucially, many new projects are oriented toward post-war rehabilitation and meeting the needs of the underserved, exacerbated by the conflict. Several devices in the Lab2Market cohort aim to improve rehabilitation for the injured, such as the Digital Neck ROM meter for spinal injuries and the RecoVRSpace platform for motivating physical therapy through VR. By providing more engaging and precise rehab tools, they cater to the thousands of soldiers and civilians needing long-term physical rehabilitation. Likewise, BonePrint 3D is developing patient-specific bone implants to reconstruct war-related bone defects, and the esophageal anastomosis tool simplifies complex surgeries for trauma and oncology patients in low-resource settings. These innovations focus on practicality and immediate applicability in Ukraine's healthcare rebuilding process. Each of them addresses gaps in care — whether it's the lack of custom implants, difficulties in surgical logistics, or the need for specialized rehab for pregnant women recovering from COVID-19 — thereby contributing to a more comprehensive recovery of the health system. They also emphasize self-reliance and local capacity: solutions like 3D-printed implants or indigenous physiotherapy protocols reduce dependence on imports and are tailored to local medical protocols and patient populations.

The following can be asserted: the expanded roster of Ukrainian MedTech projects showcases a robust innovation ecosystem aligned with the country's recovery and healthcare transformation goals. There is a clear pattern of developing affordable, accessible technologies — from AI-powered telehealth and diagnostics to grassroots-

level care services — that directly respond to war-driven challenges. This includes mitigating the mental health crisis, restoring mobility and function to the injured, ensuring continuity of care for chronic patients, and protecting public health through preventive tech. These trends underline how Ukraine's scientific community and startups harness everything from digital health and AI to biotechnology and VR to build a healthier post-war society. Moreover, by targeting underserved patient needs (such as rural healthcare access, PTSD support, and rehabilitation), these projects carry significant importance for Ukraine's recovery: they not only aim to heal the wounds of war but also to modernize the healthcare system for the future. In doing so, Ukraine's MedTech innovators are laying a foundation for long-term resilience and improved health outcomes, turning adversity into an opportunity to leapfrog with new, impactful solutions [6, 7].

The emergence of programs like Lab2Market MedTech highlights a positive shift in Ukraine's innovation ecosystem. Traditionally, much high-quality research in Ukraine remained "on the shelf" due to the lack of commercialization pathways, investment, and IP protection. By offering mentorship and exposure to real-world entrepreneurship, Lab2Market is helping to transform scientists into innovators. Early evidence of its impact is seen in the sophisticated business models and products some teams have developed quickly, such as startups such as ComeBack Mobility and Raccoon. Recovery has developed working products and attracted investors and users beyond Ukraine [12]. Their success can inspire other teams in the program to iterate rapidly and focus on user needs.

Another benefit of Lab2Market is strengthening the network between stakeholders in the med-tech sector — academia, healthcare providers, industry, and government. During the accelerator, participants interact with clinicians who can provide feedback on practicality and efficacy, with IP lawyers who guide them on patenting (crucial for medical products), and with business mentors who coach them in pitching and fundraising. This interdisciplinary approach helps ensure the innovations are technically sound and aligned with market demands and regulatory requirements. Given that healthcare is a highly regulated sector (with standards for safety and efficacy), early guidance on these aspects increases the likelihood that these startups will achieve compliance (e.g., CE marking in the EU, FDA approval in the US).

The focus on intellectual property (IP) management is another strategic advantage. Since the IP Office runs Lab2Market, teams receive direct support in patent searches, filing, and strategy [1, 6]. Protecting inventions via patents or other IP rights is essential for attracting investors in med-tech, as it provides a competitive moat. The program increases their valuation and partnership potential by helping teams file patents for a new biomaterial or an AI algorithm. It also ensures that Ukrainian innovations are recognized and owned by Ukrainians, preventing unwarranted exploitation.

From a broader perspective, the startups emerging from Lab2Market (and similar initiatives) could play a role in rebuilding Ukraine's healthcare system. Solutions like TeleHealth Village or portable diagnostics immediately apply to restoring services in areas where hospitals were destroyed. Rehabilitation technologies and prosthetics will be in high

demand for years due to the large number of injured veterans and civilians. If these solutions are produced domestically, they reduce reliance on imports and make Ukraine more self-sufficient in healthcare. Moreover, successful med-tech companies can create high-skill jobs and contribute to economic recovery in the post-war period.

There are, of course, challenges ahead. These nascent startups will need funding to scale their prototypes into mass-produced products. Currently, venture capital in Ukraine is strained by the war risk, although some public grant programs (like EU Horizon Europe, USAID, or the Ukrainian Startup Fund) are providing support. International partnerships may be crucial, for example, collaborating with foreign medical research hubs or joining global clinical trials to validate their technologies. Regulatory hurdles must be navigated: several of these innovations (especially in biotech and AI) will require rigorous clinical evaluation and approval by health authorities. The accelerator has preemptively instilled awareness of these hurdles, but sustained support (perhaps through follow-on incubators or integration into hospital testbeds) would help the teams progress [13].

Another consideration is talent and brain drain. While many Ukrainian scientists remain committed to working in Ukraine, the prolonged war poses a risk of talent leaving for safer environments. Programs like Lab2Market provide a strong incentive for talent to stay by offering a pathway to achieve impact at home. The sense of community and purpose — solving urgent problems for their country — is a strong motivator observed among participants. Continued success stories could further encourage the next generation of innovators to develop world-class medical technologies in Ukraine.

Conclusion. Ukraine's life sciences and healthcare sector is undergoing significant transformations amid adversity. Increased funding and strategic reforms are laying the groundwork for a more innovative, resilient health system. The war, while destructive, has galvanized efforts to find new solutions for acute healthcare needs quickly. Against this backdrop, the Lab2Market MedTech accelerator has emerged as a timely catalyst, converting scientific potential into practical innovations. The 22 startups and projects from its first cohort exemplify how Ukrainian ingenuity is channeled into diverse med-tech applications — from advanced diagnostics and AI healthcare platforms to novel therapies and rehabilitation devices.

These initiatives align closely with national priorities, such as improving trauma care, expanding mental health services, and modernizing medical infrastructure. Early results are encouraging: some teams have reached patients with their products, and others have attracted investment and research attention. With continued support, many of these med-tech innovations could integrate into Ukraine's healthcare system, improving the quality of care and patient outcomes. Furthermore, by developing competitive technologies (e.g., AI diagnostic tools or biotechnologies), Ukrainian startups can enter global markets, showcasing Ukraine's contributions to medical science on the world stage.

The experience of Lab2Market MedTech offers valuable lessons. It underscores the importance of providing researchers mentorship, business education, and networking

opportunities to unlock their entrepreneurial potential. It also highlights that even in low-resource or crisis settings, innovation can flourish if there are structured programs to nurture it. For Ukraine, expanding such innovation accelerators (possibly to other fields like bioengineering, pharmaceuticals, or public health) could amplify the country's overall R&D impact.

In summary, Ukraine's healthcare challenges are met with a wave of home-grown innovations. Initiatives like the Lab2Market program are helping solve pressing health problems due to the war and planting the seeds for a vibrant med-tech industry in the long term. This integration of science, innovation, and entrepreneurship in healthcare bodes well for Ukraine's recovery and future as a source of life-saving technologies.

References

1. IP Office of Ukraine. 2025. "Lab2Market MedTech: A New Stage of the Project to Support Medical Developments — an Entrepreneurial Training Programme — Has Started." *Official Website of UkrNIPO (IP Office)*. Accessed June 14, 2025. <https://nipo.gov.ua>.
2. The Pharma.Media. 2025. "MedTech Strategy: Ukraine Introduces Innovations for the Treatment and Rehabilitation of Wounded." *News of Pharmacy and Medicine*. Accessed June 14, 2025. <https://thepharma.media>.
3. Borysfen. 2025. "Presentation of the Carbon Dressing 'Borysfen' for the Treatment of Wounds and Burns." *Scientific and Technological Support of the Defence Industry of Ukraine: Information and Communication Event*. Accessed June 14, 2025. <https://vnz.org.ua>.
4. Pharmacy DS. 2023. "Probiotics and Stress." *Apteka DS*. Accessed June 14, 2025. <https://apteka-ds.com.ua>.
5. Ukrainian Startup Fund. 2023. "32nd USF Pitch Day — Winners: ComeBack Mobility (Special Prize) — Smart Crutch Attachments for Rehabilitation." Accessed June 14, 2025. <https://usf.com.ua>.
6. Lab2Market MedTech. 2024. "Launch of the Lab2Market MedTech Project." *News on the Website of Odesa NMU about the Participation of Students in the Project*. Accessed June 14, 2025. <https://onmedu.edu.ua>.
7. World Health Organization (WHO). 2025. "Three Years of War: Rising Demand for Mental Health Support, Trauma Care and Rehabilitation." *WHO Europe News Release*. Accessed June 14, 2025. <https://www.who.int>.
8. AIN.UA. 2023. "Ukrainian MedTech 'Mark' Raises \$200k to Build AI-Based Medical Platform." Accessed June 14, 2025. <https://en.ain.ua>.
9. Startup Jedi / TechUkraine. 2022. "ComeBack Mobility Raises \$1M for Smart Crutch Tips." Accessed June 14, 2025. <https://startupjedi.vc>.
10. StartupBridge EU. 2021. "Raccoon.Recovery — A New Generation of Physical Rehab Devices." Accessed June 14, 2025. <https://techukraine.org>.
11. Tech Ukraine. n.d. "Kwambio: First Ceramics 3D Printer in the World." Accessed June 14, 2025. <https://techukraine.org>.
12. Irish Tech News. 2025. "Support for Ukrainian Innovations: 38 Startups Will Receive Funding (Incl. Health-Tech Programs)." Accessed June 14, 2025. <https://irishtechnews.ie>.
13. Medtech Innovator. 2024. "Expert Webinars Open to the MedTech Ecosystem." Accessed June 14, 2025. <https://medtechinnovator.org>.

14. Healthy Mind. 2024. "Ukrainian Startup Healthy Mind Raises \$1M Investment to Launch AI Platform for Improving Mental Health." Accessed June 14, 2025. <https://en.ain.ua>.
15. Tayra.ai. n.d. "Doctor's AI Assistant." Accessed June 14, 2025. <https://www.tayra.ai>.
16. Opora.me. n.d. "PTSD Platform." Accessed June 14, 2025. <https://www.opora.me/en>.

БІОНАУКИ ТА ОХОРОНА ЗДОРОВ'Я В УКРАЇНІ: ВИКЛИКИ ТА ТРАНСФОРМАЦІЇ

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Анотація. Проаналізовано поточний стан сфери біонаук та охорони здоров'я в Україні, враховуючи вплив війни та зусилля щодо цифрової трансформації галузі. Обговорено стратегічні ініціативи уряду, зокрема впровадження нової MedTech-стратегії, спрямованої на розвиток біонічного протезування, регенерації шкіри, лікування опіків, ментального здоров'я та застосування штучного інтелекту у медицині. Особливу увагу приділено програмі акселерації Lab2Market MedTech, започаткованій ІР офісом України, що покликана комерціалізувати наукові розробки у медичних технологіях. Наведено огляд деяких українських медичних стартапів, в т.ч. учасників програми, їх напрямків (діагностика, реабілітація, цифрові рішення тощо), рівнів готовності технологій та ключових інновацій.

Ключові слова: біонауки; охорона здоров'я; медичні технології; інновації; стартапи; Україна.

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