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Innovative activities in healthcare institutions of the future: models for overcoming dilemmas

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Abstract

Purpose: The Ukrainian population's insufficient protection from the prospect of high medical costs and the system's structural inefficiency, which is aggravated by an ineffective means of financing healthcare, continue to be the main problems facing the Ukrainian healthcare system. Rising rates of preventable mortality also highlight the shortcomings in the health system. Patients and medical professionals in Ukraine concur that the healthcare system needs significant reform; nevertheless, the current government's reform measures are not well embraced, and there is disturbingly high public mistrust of medical experts. Thus, in order to enable healthcare reformation, new methods, models, and activities need to be developed. However, it is not yet clear how well or how widely these initiatives have been initiated into practice.

Methodology: A literature search concerning articles looking at innovative health activities in Ukraine was conducted.

Results: In this aspect, only nine research papers were concerned with the topic. There were few studies that examined innovative practices at the institutional and governmental levels. Despite this, there were more innovative initiatives conducted on a national scale than at an institutional level. The implementation of several unique concepts has not yet been fully realised.

Implications: Ukraine is currently engaged in a number of innovative healthcare initiatives, especially at the national level. The quality of healthcare in the nation could be greatly improved by engaging in these activities. But there are still many obstacles that must be overcome. Despite these difficulties, several of the suggested models are not only original but also useful, and they might be adopted by other countries as models. Additional investigation is required to reveal all the varieties of innovative healthcare operations in Ukraine.

Keywords: Ukraine; innovation; health system; mHealth; eHealth; frameworks; invasion; USAID

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Introduction

Background

Innovative activities in healthcare refer to the development and implementation of new technologies, methods, and approaches for the improvement of the healthcare services delivery. Examples of such innovations include next-generation sequencing, 3D-printed devices, digital health tools like telemedicine and electronic health records, personalised and precision medicine, artificial intelligence, and nanotechnology (TABLE 1). These innovations are

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necessary to advance the healthcare and to provide a high-quality care by improving access to maintenance, making it more efficient and affordable and ultimately improving health outcomes for patients.

In Ukraine, some of these innovative activities are being conducted to varying degrees, but there are also significant barriers and dilemmas that are hindering progress. For example, telemedicine had become increasingly popular in Ukraine, especially during the COVID-19 pandemic when many people needed to access healthcare services from their homes [1, 2]. However, the availability and quality of internet connectivity can be a challenge in some areas, which can limit access to telemedicine services. Personalised medicine and precision medicine are still relatively new concepts in Ukraine, and there is a lack of infrastructure and funding to support these approaches [3]. Additionally, there is a need for more genetic testing facilities and trained personnel to interpret genetic data. This is all the more crucial because the accelerated pace of technological advancement necessitates the balancing of scientific-practical issues and ongoing legal issues pertaining to medicine; if to achieve it, it will allow for timely entry into unlocking the benefits of personalised medicine. The author Bezdieniezhykh et al states how this requires careful legislative regulation of activities being conducted in the field of medical practice [3]. This is why health policy makers should be up-to-date with the ground realities, especially those on the warfront.

Artificial intelligence and nanotechnology are also relatively new concepts in Ukraine, and there is a need for more research and development in these areas. Funding and resources are limited, and there is a shortage of trained personnel to work in these fields [4]. Moreover, other countries have already made strides in artificial intelligence models, so the gap to cover is significant; this might dissuade health authorities who would rather prefer tried and tested methods over novel approaches.

In Ukraine, the healthcare system has faced challenges due to the ongoing conflict and its impact on infrastructure and access to care. According to a recent health needs assessment by the WHO Country Office in Ukraine, while the healthcare system overall is still robust, the access to key services becomes more difficult for an increasing number of civilians due to the rising costs, logistical challenges, and damaged infrastructure [5]. The cost, travel time to and from medical facilities, and the scarcity of transportation are the main obstacles to receiving healthcare that people in Ukraine cite [5]. The general public all over Ukraine complain that the expense of care is foremost among these. Moreover, one-third of people who reside in disputed areas and combat zones report having less access to resources and medications. This is compared to one-fifth of all people nationally who experience the same. The World Bank analyses that the war could push about 60% of the population below the poverty line, further compounding the scenario. Even according to WHO's evaluation, there are growing economic problems that could endanger the welfare of millions more people [5]

Table 1. Examples of innovative health activities [37]

Innovation	Description
Next-generation sequencing	The use of genetic sequencing to locate groups at risk or focus treatments on patients who will likely respond.
3D-printed devices	Products made with medical technology that are more affordable and may be fully customised to meet the physiological requirements of specific patients.
E-health	The use of telemedicine, electronic health records, and other digital tools to improve access to care and make it more efficient.
Telemedicine / mHealth	The use of telecommunications technology to provide clinical distance healthcare.
Personalized medicine	Medical care that is tailored to an individual's specific genetic makeup and medical history.
Precision medicine	An approach to patient care that takes into account individual variability in genes, environment, and lifestyle.
Artificial intelligence	The use of computer algorithms to analyse complex medical data and assist in clinical decision-making.
Nanotechnology	The use of materials and devices at the nanoscale to diagnose and treat disease.

Research Problem

The primary issues facing the Ukrainian healthcare system continue to be the population's insufficient protection from the threat of major medical bills and the system's structural inefficiency, which is exacerbated by an ineffective method of financing healthcare. Inadequacies in the health system are also emphasised by the rising incidence of preventable mortality. Both patients and medical professionals agree that the Ukrainian healthcare system needs substantial reform; nevertheless, current government reform initiatives are not well received, and public mistrust of medical professionals is alarmingly high [6]. Thus, in order to facilitate healthcare reformation, new strategies, models, and activities need to be implemented. However, it is currently unknown to what extent these initiatives have been implemented and how successful they are. This would require further investigations and surveys to be conducted within medical setups in the country, but this can prove to be difficult with the recent invasion.

Research Aim and Research Questions

The objective of this study is to conduct a search of the literature of innovative activities in healthcare within the setting of Ukraine. This will help to better understand the current state of healthcare in Ukraine, including advances already made and faced obstacles, as well as potential areas for innovation that could improve the access to care and its quality. The end goal is to satisfy the following research questions:

1. What are the current innovative activities being conducted within Ukraine, and how successful are these in changing the present situation of healthcare within the country?
2. What obstacles are being faced within the country (be it financial, logistics, legislative, etc.) that are preventing the implementation of further innovative activities?
3. What frameworks or models have been proposed, and how many of these are being emulated successfully?

Research Methodology

Background

A literature search on several databases, including MEDLINE, Cochrane reviews, and Pedro was conducted. Specific keywords with the conjunctions 'AND' and 'OR' were utilised, and these are displayed within TABLE 2. The time frame of the articles was kept between 2018 and 2022 so as to include only the latest data. The inclusion criteria included papers discussing innovative activities or models/frameworks with respect to healthcare in Ukraine. The exclusion criteria were papers published in a language other than English, but those published in Ukrainian that had a translated abstract were included. While this was not a systematic review, an ordered approach to the search strategy was warranted in order to ensure a maximum number of articles found.

Data analysis

Table 2. Search strategy on PubMed

#	Query	Filters	Search Details	Results	Time
1	Ukraine [Title/Abstract]	from 2018 - 2021	("Ukraine"[Title/Abstract]) AND (2018:2021[pdat])	1,568	01:55:51
2	telemedicine [MeSH Terms]	from 2018 - 2021	"telemedicine"[MeSH Terms]	43,793	01:56:55
3	ehealth[MeSH Terms]	from 2018 - 2021	"telemedicine"[MeSH Terms]	43,793	01:58:08
4	personalized medicine [MeSH Terms]	from 2018 - 2021	"Precision medicine"[MeSH Terms]	29,028	01:59:05
5	ai artificial intelligence [MeSH Terms]	from 2018 - 2021	"Artificial intelligence"[MeSH Terms]	168,360	01:59:39
6	nanotechnology [MeSH Terms]	from 2018 - 2021	"nanotechnology"[MeSH Terms]	49,676	02:00:29
7	innovations, organizational [MeSH Terms]	from 2018 - 2021	"Organizational innovation"[MeSH Terms]	27,733	02:02:32
8	(Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (telemedicine [MeSH Terms])	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "telemedicine"[MeSH Terms]	6	02:03:18
9	(Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (ehealth[MeSH Terms])	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "telemedicine"[MeSH Terms]	6	02:04:59
10	(Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (personalized medicine [MeSH Terms])	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "precision medicine"[MeSH Terms]	2	02:05:54
11	(Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (ai artificial intelligence [MeSH Terms])	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "artificial intelligence"[MeSH Terms]	4	02:06:37
12	(Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (nanotechnology [MeSH Terms]) - Schema: all	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "nanotechnology"[MeSH Terms]	0	02:07:39
13	(Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (nanotechnology [MeSH Terms])	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "nanotechnology"[MeSH Terms]	0	02:07:39
14	(Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (innovations, organizational [MeSH Terms])	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "organizational innovation"[MeSH Terms]	3	02:08:44
15	((Ukraine [Title/Abstract] AND (2018:2021[pdat])) AND (Model [Title/Abstract])) AND (Healthcare[Title/Abstract])	from 2018 - 2021	"Ukraine"[Title/Abstract] AND 2018/01/01:2021/12/31[Date - Publication] AND "Model"[Title/Abstract] AND "Healthcare"[Title/Abstract]	15	02:27:10

Literature Review

Overview of healthcare in Ukraine

The cost of healthcare in Ukraine is considerable. Patients and relatives, in 2012, paid about 40% of total healthcare expenditure out of pocket [6]. Informal payments and tips for workers, travel expenses for receiving medical attention, and prescription drug expenditures are examples of out-of-pocket expenses. Pharmaceuticals are by far the most expensive of these. Both wealthy and less wealthy households must pay out of pocket for medications and medical care, but without a doubt, the most vulnerable and impoverished households are disproportionately burdened. The cost of care is made more expensive by the requirement of spending out of pocket.

The mobilisation of sufficient resources in a way that ensures equity in access to essential health care is one of the greatest difficulties the Ukrainian health system faces. The system of healthcare finance in Ukraine may be viewed as regressive overall, as it does not meet the present requirements of being horizontally as well as vertically equal. The previously mentioned direct out-of-pocket payments undermine vertical equity. Research by the World Bank revealed that hospitals, specialty centres, and sanatoria receive about 3/4th of general government spending on health. Despite the fact that the poorest segments of the population use these facilities far less often than wealthy citizens [7]. The changes started in 2012 attempted to correct this disparity, but they have since been scaled back due to the crisis and ongoing violence.

The public's happiness with the healthcare system is low, and the Ukrainian population is extremely skeptical of the state of the healthcare system in their nation, despite the fact that data on customer satisfaction are not frequently gathered. According to Footman et al., only approximately 1/4th of the population reported to be content with their health system. While this is an increase from 2001, when only around 1/10th reported being satisfied, it is still relatively low by international standards [8]. A considerable number of service customers who responded to a survey expressed dissatisfaction with a certain component of their care [9]. The discontent is at least in part caused by the continuation of informal payments in the system, as patients choose to pay for their own care in order to receive higher quality care and minimise waiting times [10].

With regards to equity to access to healthcare, one survey revealed that only 36% of respondents believed that all individuals in their town or hamlet had access to healthcare [9]. The poorest demographics and rural populations are most deterred from obtaining medical care by the spread of informal payments. Patients with low incomes are more frequently denied care because they cannot afford services or medications [11]. People's ability to get health care in areas with varying levels of economic growth is another example of how access to care is unequally distributed. According to research, the more prosperous regions in eastern Ukraine have potentially greater financial access to health services than the poorest regions in western Ukraine [12].

Innovative activities in healthcare institutions

With regards to which innovative activities were more emphasised within healthcare, one study sought to track how Ukrainian higher education institutions for medicine and research institutions working under the Ministry of Health and Science of Ukraine supported innovation in Ukrainian healthcare institutions in 2016. More than 600 research papers on novel breakthroughs were analysed retrospectively. The work involves the application of statistical, systemic, structural-logical, cluster analysis, and expert evaluation techniques. According to the report, the specialties "Pharmacology, Pharmacy," "Surgery, Thoracic surgery, Transplantology," and "Pediatrics" saw the greatest amount of innovation in 2016 from scientific institutes. Within these, the majority were new treatment methods, followed by new diagnostic methods, and lastly, new medical devices [13].

Under new treatments, the telemedicine has made strides in improving patient outcomes [14]. The development of telemedicine has made it possible to give patients continuity of care while lowering the risk of infection from diseases, especially when it comes to pandemics, such as COVID-19, which overwhelms healthcare systems. This event particularly restricted access to supportive and palliative treatment for people with advanced cancer. Thus, this target population would potentially benefit from a strategy utilising telemedicine. This is why the research was conducted in order to determine whether telemedicine was feasible in a low-resource setting (Dnipro city). Fifty patients received one hundred sixty-five telemedicine interventions, with nutritional counselling, pain, and symptom management, and psychiatric care being the most frequently used interventions. Video conferencing was used for half of the interventions. The results showed how employing telemedicine to deliver supportive and palliative care interventions in settings with low resources was indeed feasible [1].

Many healthcare systems place a strong emphasis on creating efficient drug reimbursement processes that will lower healthcare costs and increase access to high-quality medical care [15]. Since April 1, 2017, the government of Ukraine has offered individuals with diabetes, asthma, and cardiovascular disease access to affordable medications. Moreover, the National Health Service of Ukraine (NHSU) has been using an electronic prescription system for multiple critical medications since April 1, 2019. This is substantial due to the fact that the majority of patients are

unable to afford drugs. This is reinforced by findings of one research that revealed that the majority of pharmacists had 'good' awareness levels, and they reported that the majority of patients were unwilling to pay for their medications. Overall the reimbursement program's adoption of an e-prescription system has improved patients with diabetes, asthma, and cardiovascular disease access to essential drugs [16]. This is one form of activity that Ukraine stands to benefit from being emulated by other countries. This would act as an encouragement to further invest effort and resources in similar systems that serve as a model for others to follow.

In the last example, it is visible how e-health was effectively used to improve drug delivery. Another use of e-health is in the formation of databases by compiling big medical data. Big medical data refers to the integration of many datasets and includes enormous collections of information about demographic characteristics, risks, diagnostic or predictive models, healthcare provider evaluation, etc. [17]. Since health data resources are becoming more accessible, the process of digital transformation in healthcare has been actively developing over the past ten years all over the world. E-health became a focus for Ukrainian health policymakers in 2017 [18]. Big data was given emphasis in 2018 and is now in progress, with over 50% of the country's total population now covered by the national public health database [19]. This database reflects the application of eHealth, and the data can be useful for health economics and outcomes research. The use of big data in Ukraine, however, has a number of drawbacks and poses some severe ethical questions. The most significant is a quality problem brought on by a lack of strict scientific methodology employed in such research and technical challenges encountered when extracting data, organising datasets, and ensuring data accuracy and completeness. In addition, there are numerous ethical dilemmas raised by the disclosure of private information, a lack of transparency, and security problems. Given that the majority of data are traceable and some of them may come from numerous sources, such as financial information, administrative data, and social media profiles, it is unclear how the idea of informed consent should be used [19].

Models that can be applied

Several models have been shown to be effective in improving patient outcomes in the setting of Ukraine [20–24]. One which requires a spotlight is the public-private partnership (PPP). PPPs can be a helpful tool for providing high-quality infrastructure services to more people. When correctly planned and implemented, PPPs have the potential to increase the efficiency and sustainability of the supply of essential services like transportation, energy, communications, water, healthcare, and education [25]. An analysis of the public-private partnership as an innovative type of creative and financial strategy in the Ukrainian healthcare sector was done in a study. According to the results, the Ukrainian healthcare industry can definitely benefit from the deployment of PPP models [24]. Effective public-private partnerships can be challenging to create, though. In the past, the two industries have prioritised providing value to very different stakeholders, aligned around various goals, operated at various speeds, and frequently spoke quite different languages. That said public sector would benefit from emulating the private sector. This can be achieved by creating value for all potential stakeholders instead of just a select few. Prioritising societal objectives like cutting carbon emissions, upskilling workforce, and fostering more equitable workplaces are some of the ways this can be accomplished [26].

Research results

Salient findings

The given article is the first to conduct a review on the research done covering innovative activities in healthcare within Ukraine. Only nine studies that covered the subject matter were found. There was a dearth of studies that covered innovative activities at the institutional and national levels. Despite this, the number of innovative activities at the national level outnumbered those at the institutional level. Several new models have been proposed but their implementation has not been fully realised. Many obstacles are present in the implementation of these activities. While major reforms have been agreed upon by health authorities to counter the deficiencies in the health sector, these have been confounded by the recent invasion.

Synthesis of studies

All 9 studies that were synthesised are summarised in TABLE 3 which shows the institution where the innovative activity takes place, along with notable findings from each study. Some activities were not confined to a specific institution but were applied in all medical facilities in a city or were widespread in application.

Table 3. Studies showing innovative health activities within healthcare institutions in Ukraine

Author	Institution	Innovative activity/model	Findings
Khomenko et al., 2021 [20]	National Research Centre for Radiation Medicine (NRCRM)	1. Unique product development and implementation	1. The NRCRM engages in high-level innovation activities, resulting in the creation of 15

		2. Innovative consultancy	to 30 novel items each year.
Fuzaylov et al., 2021 [22]	Burn Care Clinic	Burn Outreach Program (Telemedicine)	2. The production of novel products, implementation, and innovative consulting are the key foci of innovation activity.
		Formation of Burn database (eHealth)	Significant decrease in complication rates for burn victims. These include wound infection, pneumonia, sepsis, UTI, and cellulitis.
Chopchik and Kaniura, 2020[21] Geliukh et al., 2019[23]	University Stomatological Clinic Primary healthcare facility	Proposed model based on public-private partnership Result-based financing model (RBF) for the treatment of tuberculosis	Will provide high-quality dental services Significant increase in favourable outcomes in new or relapse cases with the RBF model
Borsch et al., 2019[24]	Applicable to all medical facilities	Public-private partnership (PPP) model	The study discusses the prospective of the PPP model in the Ukrainian healthcare sector
Bogodistov et al., 2019[28]	Medical facilities from 2 Ukrainian cities	Job-Demands Resource model	Organizational job demand is associated with psychological effects. The latter decreases physician cooperation, leading to reduced patient satisfaction.
Mykytenkov and Gruzieva, 2019[29]	Applicable to facilities offering genetic-based services	Genetic monitoring model	The study discusses the potential benefits of the model
Romaniuk et al., 2018[30]	Conducted on a national level	Healthcare synthetic outcome measure (HSOM)	The convenience of assessment of the effectiveness of health systems
Romach and Rutka, 2018[31]	Six Ukrainian hospitals	Ukraine Paediatric fellowship program (UPFP)	Increase in physician capacity for improved paediatric care

Notable country-wide activities

There are a number of country-wide activities that have been initiated within Ukraine. A great number of these began as early as 2017 and were completed in 2022, with some still ongoing; all of the ones mentioned below were sponsored by USAID.

The USAID Health Reform Support aims of creating a healthcare system that is open, accountable, and capable of providing for the needs of the Ukrainian people. In order to promote access to healthcare and the provision of high-quality healthcare services for Ukrainians, it collaborates with several prominent health bodies, including the ministry of health (MOH), to advance health sector reforms, combat pervasive corruption, and increase transparency. One of the target objectives is to develop the professional workforce to increase efficiency of healthcare provided. Besides this the openness, accountability, and responsiveness of the healthcare system is also in need of further attention. All of the aforementioned serve to enhance service delivery systems across the board. Lastly it also supports the reform of the healthcare funding model. This is crucial because, as mentioned previously, the current system is the private model, with over half of payments being out-of-pocket. An alternative preferred is the insurance model due to its potential to increase availability of high-quality health service [27].

By enhancing the pharmaceutical system to guarantee transparency and efficiency, SafeMed helps to develop Ukraine's healthcare system to satisfy the demands of its people. The activity is enhancing public procurement of health commodities, including medication-assisted treatment for managing substance abuse, HIV, tuberculosis, and HCV medications, at the best prices, and it is helping to develop a longer-term strategy for sustaining pharmaceutical funding and reinforce sound pharmaceutical administration and the pharmaceutical supply chain [27].

Through assistance for the national eHealth system, the 'Supporting eHealth Infrastructure Development in Ukraine' activity strengthens Ukraine's eHealth system and helps to prevent corruption. The program supports the management and oversight of financial expenditures made in the development and modernisation of Ukraine's eHealth system by the MOH. The eHealth system in Ukraine is a key factor in the health sector reform, improving administration, financing, and service delivery while also making the system more open and effective [27].

By concentrating on people living with HIV and other important populations, HealthLink will speed up Ukraine's efforts to eliminate HIV as an issue of public health by 2030. This will be done by raising the demand for and accessibility to HIV services, expanding the number of people living with HIV who are aware of their status and connected to care, improving the delivery of HIV services, and lowering stigma and discrimination [27]. It should be noted that HIV is not entirely because of unsafe sex practices or prostitution; the recent war can lead to a number of

rape cases, and some victims are likely to contract the virus. These patients deserve to be managed with all due health support.

By improving the diagnosis, care, and management of individuals suffering from HIV, T.B., and HCV in pre-trial custody facilities, jails, and post-prison settings in Ukraine, Serving Life will lower HIV, tuberculosis, and HCV transmission. This activity is implemented in 12 regions with the highest rates of the aforementioned diseases [27].

Through an early detection, an adequate care, and prevention for those who are living with T.B., Drug Resistant T.B., and HIV, the Support T.B. Control Efforts in Ukraine initiative is possible to reduce the T.B. pandemic in Ukraine. The initiative collaborates with medical training schools across the country and T.B. centres in 12 of Ukraine's regions with the highest incidence of co-infection. The effort is enhancing diagnoses, treatment, and care for patients with the aforementioned co-infection as well as boosting case detection. The Ukrainian MOH is closely collaborating with this activity [27].

The Strengthening Rehabilitation Services in Health Systems activity educates physical therapists in Ukraine about the most recent techniques and theories, supports the creation and application of national rehabilitation policies, rules, and protocols, and increases community demand for rehabilitation services. The activity assists the MOH in executing rehabilitation reform and closely collaborates with the WHO to develop an approach for rehabilitation services. In order to convey the function and significance of rehab services at the primary healthcare level, it is also designing an information campaign [27].

The 'Fighting misinformation against vaccines' is another activity run by USAID in Ukraine. Enhancing efficient communication at the grassroots level, it aims to enhance the supply and demand for immunisations. Through targeted, evidence-based communication and outreach to the community, the activity is fostering stronger lobbying and public discourse on immunisation at the background of the ongoing health reform. It is also improving the capacity of health authorities to organise, predict, and handle vaccines at the regional and community levels [27].

Another activity that caters to immunisation is the 'Immunisation strengthening support to Ukraine Activity'. Raising the demand for and use of immunisation services are the main objectives of this activity, along with better cooperation between healthcare institutions and organisations and the activities of national advisory bodies. The Centre for Disease Control is supplying stakeholders with the required technical expertise on efficient immunisation procedures and vaccine-preventable diseases in order to achieve these goals and enhance surveillance systems [27].

Discussion

While one only found a few articles covering innovative activities at the institutional level, by no means does this imply that there is a shortage of effort towards innovation. It just means that there is a lack of coverage, and this can be attributed to the recent war. The question does arise, that if the level of innovation was indeed optimal enough to positively influence the health sector, then wouldn't the Ukrainian health system would be still be functioning even during the war. There appear to be a variety of viewpoints in regards to this. According to one source [32], more than a month after Russia's illegitimate invasion of Ukraine started; the tragic human suffering and death toll are obvious. More people die, suffer injuries, and have to battle for their lives every day. Due to this, the Ukrainian health industry is facing tremendous pressures and demands as a result of the war, and collapse of the system is only prevented due to external aid. In contrast to this, a different article mentions how the health system is as strong as ever, but admits the rising costs, logistical difficulties, and damaged infrastructure, which are making access to essential services all the more difficult for an increasing number of civilians [33; 34].

Regarding the external aid, it is interesting to note how USAID sponsored many of the innovative activities being run in the country prior to the invasion. With the turn of events, it is not unknown whether the allocation of funds towards these activities has shifted instead towards repair and salvage of the infrastructure and rescue work towards civilians. What is known is the amount of financial support being given. USAID has given the Government of Ukraine \$13 billion in direct budget support to help support basic public services like healthcare, education, and crisis response; \$1.4 billion in emergency aid to save lives and meet the immediate needs of the Ukrainian people; and more than \$800 million in development assistance to strengthen Ukraine's energy grid, governance institutions, agricultural sector, and infrastructure [35].

Finally the question arises, what lays for the health system of Ukraine in the future. In light of the ongoing Russian Federation invasion, a discussion paper released jointly by the WHO, USAID/Ukraine, the World Bank, and the EU identifies key objectives for recuperation of the health system in Ukraine throughout the next two years. The document analyses the primary goals for the health sector, these being: service delivery, expenditure on capital, health financing and institutional strengthening. This shows that there is indeed a steady effort in bringing the health system of Ukraine up to international standards. And this is reinforced by the fact that the National Health Service of Ukraine (NHSU) was established for the very purpose of strengthening primary care. This reform serves as another initiative in innovation, as it allows ease of contracting and payment arrangements with healthcare providers as well as new pooling and purchasing policies [36].

Regardless of the prevalence of innovation activity, the funding towards it, or the expected prospect, innovation in healthcare as a whole needs to be boosted within Ukraine. There are numerous ways this can be achieved. These include increasing financing for research and development, offering grants or tax breaks as incentives for innovation, and setting up regulatory environments that support innovation. By combining the resources and skills of both sectors, partnership between the public and private sectors can also foster innovation greatly. Additionally, fostering an innovative mind-set within healthcare organisations can support the growth of novel concepts and methods.

Conclusion

1. There are a number of innovative activities being conducted in healthcare in Ukraine.
2. Most of these are conducted primarily at the national level.
3. Few articles cover the ones conducted at the institutional level.
4. It has been acknowledged by the health sector how these activities hold great potential for enhancing the quality of healthcare in the country.
5. However, there are still multiple barriers that need to be addressed, including funding, logistics, infrastructure, policy, as well as public's attitudes.
6. Despite the challenges and the recent invasion, initiatives are still being made in Ukraine in order to suggest and put into place new healthcare methods to aid in the system's recovery.
7. Some of the proposed models are not only novel but also effective and could serve as examples for other nations to follow.
8. Further research is needed to conduct a more thorough and systematic search to identify all types of innovative activities in healthcare in Ukraine.

Declarations

Author contributions

All authors have sufficiently contributed to the study and agreed with the results and conclusions.

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Ethical statement

This study does not require IRB approval as it does not involve human subjects/data.

Declaration of interest

No conflict of interest is declared by authors.

Data sharing statement

Data supporting the findings and conclusions are available upon request from the corresponding author

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