Innovative Development of the Health Care Sector of the Future in the Conditions of Modern Challenges of the Covid-19 Coronavirus Infection in Ukraine

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Abstract
This article focuses on innovative development of Health Care Sector of the future in terms of modern challenges of the Covid-19 Coronavirus Infection in Ukraine

Aims: To identify innovative healthcare delivery models that have been implemented in Ukraine as well as to evaluate their effectiveness in healthcare improvement of the access and delivery, availability and distribution of medical equipment and PPE, healthcare infrastructure, healthcare workforce development and retention, and development of healthcare information systems in Ukraine.

Study design: In this study a mixed-approach strategy that combines quantitative and qualitative research methodologies was utilised.

Place and Duration of Study: The study was conducted on patients, professionals' healthcare establishment and policy maker stakeholders in Ukraine. It is a mix of different evaluations on the topic.

Methodology: Surveys, interviews, and questionnaires were examples of data collecting tools. The research was conducted online, offline, or both means. Data analysis processes included both quantitative and qualitative methods.

Results: Most countries adopted Beveridge principle-based health care system, which were 90% efficient and 98% pandemic resistant. Masks, gloves, and PPE were globally limited, and hospitals had 73, 35% medical equipment and 57% personal protective equipment in April 2020, but 32, 9% and 67,5% in December 2020 due to COVID-19 instances. In December 2020, hospital personnel rose from 85, 56% (Chernihiv region) to 94% to serve new COVID-19 patients (Kherson area). Technology, data analytics, AI, and the block chain may fix the coronavirus. Facebook is the finest example of using digital technology. Another example is to produce digital maps of population. Government efficiency and resources have powered pandemic responses.

Conclusion: Ukraine must adopt new healthcare delivery methods and must stock and use medical and PPE. A strong, patient-centered healthcare system requires effective health finance. Healthcare professionals need ongoing training to stay. A hospital IT development initiative is needed to improve efficiency as Ukraine struggled with healthcare information systems during this pandemic.

Keywords: innovative development; healthcare sector; modern challenges.
Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) is a new coronavirus responsible for the continuing pandemic calamity, with the first confirmed case in Wuhan, China in December 2019. This outbreak is known as COVID-19. The WHO has declared this to be a worldwide pandemic after verifying the pandemic. Around 300 million individuals have been infected with the current pandemic, and over 3 million have perished. There have been different peaks in the present COVID-19 pandemic, but it has been devastating to public health worldwide. As of March 3, 2020, reports of the coronavirus COVID-19 started to emerge from previously unaffected regions. The first quarantine restrictions were implemented on March 12. The healthcare system in Ukraine, like others across the globe, has been severely tested by this pandemic [1]. The Healthcare system of Ukraine like other developing countries was under intense pressure due a lack of supplies, personnel, money, and technology in the medical and public health fields [2].

Ukraine’s government has implemented various measures to diminish the spread of the virus during the COVID-19 pandemic, such as lockdowns, social distancing, travel restrictions, and vaccination campaigns. All such measures have had significant economic and social impacts on Ukraine. They demanded the need for the adaptation of innovative approaches to healthcare delivery and management. Ukraine’s healthcare system was not able to combat this pandemic and left the country ill-prepared to detect the spread of COVID-19 and react effectively in the early phases of the pandemic. This was partly due to the insufficient hospital logistical equipment; the lack of qualified specialists in infectious diseases, virology, and epidemiology; the distribution of infectious departments throughout Ukraine’s regions; the surveillance and appropriate testing labs; and the lack of adequate personal protective equipment. In order to make the healthcare system able to fight against this pandemic the government has had to spend money on healthcare infrastructure, such as building new hospitals and renovating old ones, and buying medical equipment, medical and personal protective equipment. Most of these problems were overcome throughout the summer and autumn of 2020, but the harm had already been done, the adoption remained dispersed among clinical sites until 2021 [3].

During COVID-19 pandemic Ukraine’s healthcare information systems was unable to facilitate the exchange of patient data across different healthcare providers and organisations. To cope with this problem there were an urgent need for the development of healthcare information systems able to share with patients’ information across healthcare providers and institutions. This can facilitate more efficient and effective healthcare delivery, particularly in emergency situations. Because of this, emergency medical treatment, may be provided faster and more effectively [4]. The global spread of COVID-19 has hastened the introduction of cutting-edge tools and online medical advice in nations like Ukraine. Medical professionals may keep providing care to patients with the help of these innovations, which reduce the likelihood of infection for everyone involved. Several hospitals and clinics now use mobile clinics and other novel ways to the patient treatment [5-6].

An early research and a fast systematic reviews also revealed that health care workers in Asia were vulnerable to a variety of mental health issues during the pandemic, including fear, anxiety, depression, sleeplessness, traumatic stress, and exhaustion. Later researches verified a similar pattern developing from additional pandemic hotspots in Europe, including the United Kingdom. Health care workers of Ukraine were facing the same situation as a result of the pandemic [7]. Policies that encourage the retention of healthcare professionals, especially in rural and isolated locations, are necessary to guarantee the long-term viability of Ukraine’s healthcare workforce [8].

Following the unexpected breakout, the most of the global authorities turned to modern approaches of governance. A lockdown policy, which had a devastating effect on national economies, was the most extreme measure, which included the implementation of social and physical barriers to prevent the virus. These measures had to be reflected in suitable specific budgetary options for central governments, with a focus on balancing the deployment of financial resources to battle the virus with money to counteract the economic consequences of such lockdown policies [9].

Another concern was the decentralisation in all COVID-19 nations, and such reform has increased and democratised local government duties for health care at the most local level, as well as boosting regional and local government responsibility for public health. Decentralisation affects three major aspects of health-care reform: money, individual health care, and public health. Changes in decentralisation impacted the form, functions, and financing of local governments, which had a direct influence on the delivery of (individual) health care services. Central and local governments presently share the funding and delivery of public health services (which include sickness prevention, health promotion, and health protection). The novel coronavirus infection 2019-nCoV (COVID-19 virus) pandemic outbreak presents enormous public health challenges to national and local authorities, with changes now ongoing and incomplete [10].

In terms of the pandemic, it should be considered how the healthcare system can innovate and evolve to meet future challenges. The COVID-19 pandemic acts as a catalyst for change, hastening the implementation of medical reforms in Ukraine. The argument for this essay is based on Ukraine’s need to solve the present difficulties facing its healthcare sector. The Covid-19 outbreak has highlighted the importance of having a robust and efficient healthcare system capable of responding to sudden and unforeseen public health disasters. Additionally, the pandemic has highlighted flaws in the healthcare system that must be rectified, such as a lack of money, a shortage of medical workers, and insufficient infrastructure. It also plans to investigate innovative ways to improve Ukraine's healthcare system, such as the use of
digital technology, telemedicine, and the formation of public-private partnerships. These suggestions might help to alleviate some of the system's issues and improve the access to high-quality healthcare services.

**Research Problem**

The healthcare system in Ukraine can better adapt to future problems and enhance healthcare delivery and management for its population if the following research problem statements during COVID-19 pandemic in Ukraine are addressed.

- The effect of the COVID-19 pandemic on mental health and well-being, as well as the significance of telemedicine in mental health care [5].
- The availability and distribution of personal protective equipment (PPE) and medical equipment in the healthcare sector [12].
- The role of mobile healthcare units in providing medical care to individuals in remote and underserved areas [13].
- The need for investment in healthcare infrastructure, including the construction and renovation of healthcare facilities, and the procurement of medical equipment and PPE to enhance the sustainability of the healthcare system [14].
- The development of healthcare information systems to enable the sharing of patient information across healthcare providers and institutions [15].
- The effect of the COVID-19 pandemic on the healthcare workforce and the need for investment in training and development programs, as well as the provision of mental health support for healthcare professionals [16].
- The retention of healthcare professionals in rural and remote areas and the need for policies that promote their retention [17].

**Research Focus**

The study's emphasis on these areas attempts to find solutions and best practices that might improve the healthcare system's sustainability and resilience in the face of future problems.

- Innovative healthcare delivery models [18].
- Healthcare infrastructure and equipment [19].
- Healthcare workforce [20].
- Healthcare information systems [21].
- Health Governance.
- Health Financing.

**Research Aim and Research Questions**

**Research Aim**

The research aims are to:

1. To identify innovative healthcare delivery models that have been implemented in Ukraine during the COVID-19 pandemic and evaluate their effectiveness in improving healthcare access and delivery.
2. To assess the availability and distribution of medical equipment and PPE in the healthcare sector during the COVID-19 pandemic and examine the need for investment in healthcare infrastructure.
3. To evaluate the effect of the COVID-19 pandemic on the healthcare workforce in Ukraine and identify policies that promotes the retention of healthcare professionals in rural and remote areas.
4. To developed the healthcare information systems in Ukraine and their effectiveness in improving healthcare coordination and delivery.

**Research Questions**

1. What innovative healthcare delivery models have been implemented in Ukraine during the COVID-19 pandemic, and how effective have they been in improving healthcare access and delivery?
2. What are the challenges in the availability and distribution of medical equipment and PPE in the healthcare sector during the COVID-19 pandemic in Ukraine, and how can investment in healthcare infrastructure help address these challenges?

3. What is the impact of the COVID-19 pandemic on the healthcare workforce in Ukraine, particularly in rural and remote areas, and what policies can be implemented to promote the retention of healthcare professionals in these areas?

4. How effective have healthcare information systems been in improving healthcare coordination and delivery in Ukraine, and what are the barriers to their implementation and use?

5. Based on the findings, what recommendations can be made for the innovative development of the healthcare sector in Ukraine in the context of the COVID-19 pandemic and other future challenges?

Research Methodology

General Background

The research technique for this article is a mixed-approach strategy that combines quantitative and qualitative research methods. Some recent studies that used mixed-methods research in order to investigate healthcare systems and innovations support this approach [22-23]. The quantitative component of the research included a survey of healthcare professionals and patients in Ukraine. The qualitative component of the research included in-depth interviews with healthcare experts and important stakeholders in Ukraine [24-25]. Ukraine continues grappling with the pandemic, there is a need to develop innovative solutions to address the challenges faced by the healthcare sector [26].

Sample / Participants / Group

The following sample/participants/groups were involved in the research of the creative development of the future healthcare sector in the context of current difficulties of COVID-19 coronavirus infection in Ukraine:

2. Healthcare institutions.
3. Patients.
4. Key stakeholders (healthcare policymakers, healthcare professionals, and experts in digital healthcare solutions).

Instrument and Procedures

The instruments for data collection included.

- Surveys
- Interviews
- Questionnaires

The procedures for data collection involved.

- Online
- Offline methods
- Both methods

The procedures for data analysis involved.

- Quantitative methods
- Qualitative methods

The research findings are presented in the form of

- Research reports
- Academic papers
- Policy briefs.
Data Analysis

To summarise and characterise the data acquired through surveys and questionnaires, quantitative data analysis might use descriptive statistics such as frequency tables, mean, median, mode, standard deviation, and range. Correlation, regression, and ANOVA are examples of inferential statistics that may be used to investigate the relationships between variables [27]. Qualitative data analysis can involve thematic analysis, content analysis, and discourse analysis, among other methods. These methods involve identifying and analysing themes and patterns in the data collected from interviews, focus groups, and case studies [28]. Data analysis can be done using software such as SPSS, which can facilitate both quantitative and qualitative data analysis.

Research Results

Innovative healthcare delivery models and their effectiveness during the COVID-19 pandemic

There are always flaws in healthcare facility management, which during a crisis leads to the healthcare system’s failure to deal with difficulties and threats. To overcome such threats, quick decision-making processes are required. Without digitalisation it is difficult to be fast in decision making during crises situation. With the propagation of the coronavirus pandemic, one such vulnerability in 2020-2021 is the digitalisation of healthcare institutions and their management systems. Even in industrialised nations, the degree of digitisation has been inadequate and very slow due to economic crises all over the world [29].

The literature revealed that Beveridge principle-based health care system is having the 90% efficiency rate and 98% pandemic resistance rate, making it the best. The Bismarck principal system ranked next in quality, with 88% medical efficiency and 97% pandemic resistance. The national insurance concept placed third with 68% and 96%. Market model was 60% efficient and 93% pandemic resistant as shown in table no.1. This supports the idea that health care system effectiveness and epidemiological response speed are linked together. This comparison analysis helped nations reforming their health care systems. Beveridge model was shown to be the most successful [30].

<table>
<thead>
<tr>
<th>Health Care Model</th>
<th>Efficiency Rate</th>
<th>Pandemic Resistance Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beveridge</td>
<td>90%</td>
<td>98%</td>
</tr>
<tr>
<td>Bismarck</td>
<td>88%</td>
<td>97%</td>
</tr>
<tr>
<td>National Insurance</td>
<td>68%</td>
<td>96%</td>
</tr>
<tr>
<td>Market Based</td>
<td>60%</td>
<td>93%</td>
</tr>
</tbody>
</table>

WHO provided Ukraine with approximately 65,000 pieces of personal protective equipment for the COVID-19 pandemic. Turkey, Egypt, Ukraine, Kazakhstan, and Poland were working to improve healthcare availability and quality for their communities. Essential healthcare services and morbidity monitoring during the pandemic required an effective and efficient health care system. These five growing nations increased COVID-19 testing and treatment capacity over time. The five nations lacked healthcare workers and supplies. Among the other arrangements, shifting of work tasks, finances, social support, and professional incentives helped in retaining the healthcare personnel and increased their capacity to deal with this calamity. To address the shortfall, national and international medical supply production, stockpiling, and delivery were coordinated [12].

<table>
<thead>
<tr>
<th>Particular</th>
<th>Ukraine</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>2.6</td>
<td>3.7</td>
</tr>
<tr>
<td>Nurses</td>
<td>6.1</td>
<td>8.8</td>
</tr>
<tr>
<td>Hospital bed</td>
<td>7.5</td>
<td>4.6</td>
</tr>
<tr>
<td>GDP per capita in 2019</td>
<td>3,659</td>
<td>34,913</td>
</tr>
<tr>
<td>Health expenditure in 2019</td>
<td>7.72</td>
<td>9.85</td>
</tr>
</tbody>
</table>
WHO statistics showed that the total vaccination doses per 100 population were 44.18 in Ukraine as compared to 93.15 in Europe, while the vaccination dose-1 percentage was 28% in Ukraine as compared to 52% in Europe, and the second vaccination dose was 20% in Ukraine and 41 in Europe, as shown in table no.3 [31].

<table>
<thead>
<tr>
<th>Particular</th>
<th>Ukraine</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population in 2020</td>
<td>43,733,762</td>
<td>7,845,261,000</td>
</tr>
<tr>
<td>Percentage above 65 years</td>
<td>16.7%</td>
<td>9.09%</td>
</tr>
<tr>
<td>Cases</td>
<td>74.19</td>
<td>32.33</td>
</tr>
<tr>
<td>Deaths</td>
<td>1.78</td>
<td>0.65</td>
</tr>
<tr>
<td>Vaccine dose total</td>
<td>44.18</td>
<td>93.15</td>
</tr>
<tr>
<td>Vaccine dose 1</td>
<td>28%</td>
<td>52%</td>
</tr>
<tr>
<td>Vaccine dose 2</td>
<td>20%</td>
<td>41%</td>
</tr>
</tbody>
</table>

Infrastructure, medical equipment and availability and distribution of PPE

During the COVID-19 pandemic, there were shortages of masks, gloves, and PPE all around the globe. Other European nations like Poland, Turkey, and Egypt also experienced this shortage. According to the official information site of the Cabinet of Ministers of Ukraine, hospitals had 73.35% medical equipment and 57% personal protection equipment in April 2020, while in December 2020, hospitals had 32.9% equipment and 67.5% personal protection equipment, as shown in figure no.1 [32].

Healthcare workforce and COVID-19 pandemic

According to figures on Ukraine's Cabinet of Ministers' official information website, in April 2020 the supply of hospitals with medical professionals ranged from 58.13% (Luhansk region) to 92.45%. (Riverne area). Due to increase in pandemic case in December 2020, the supply of medical workers in hospitals ranged increased from 85.56% (Chernihiv area) to 94%. (Kherson area) as it is notices in figure no. 2 [31]. According to the data, labour migrants are heavily engaged in major EU vocations that battle coronavirus sickness, despite tight quarantine measures that led the partial return of migrants to their countries, the increase in unemployment, and sluggish economic development COVID-19. EU nations offer more resident permits to non-members every year, and Ukraine is the top in both residence permits and remittances [32].

Healthcare information systems and their effectiveness in improving healthcare coordination and delivery

New technologies such as information technology, data analytics tools, artificial intelligence, and block chain might be used to provide smart solutions to the coronavirus's current difficulties. Facebook is the clearest example of how artificial intelligence. Digital technology had been used to build maps that indicate patterns of population density, demography, and movement to assist select where to send supplies or how to avoid the spread [33].

Geographic information systems and information technologies, digital data acquired from sick individuals may help epidemiologists track down patient zero and identify infected patients' close relationships [34]. In Ukraine the health recommendation about hand hygiene and respiratory etiquette was made available on several social media and official health website. Television and official website played an important role on daily briefings on the COVID-19. COVID-19 scenario updates were handed out weekly through text message or video. Digital communication played an import role in mass communication during the outbreak. They had begun investing in digital health before to the crisis [35].

Governance and Finance

The COVID-19 pandemic has had a tremendous influence on nations all around the globe, and their reactions to the problem have been diverse. The efficacy of governance and financial allocation in delivering resources to healthcare systems and meeting people's demands has been a significant component of this response. Concerns have been made in Ukraine concerning the efficacy of resource allocation in response to the outbreak. Despite the country’s low GDP per capita of $3,659 in 2019, healthcare spending accounted for 7.72% of GDP in the same year as show in table no.2.

Yet, there are opinions that these resources were not exploited to their full potential in addressing the pandemic's difficulties. In contrast, the United States has committed substantial resources to combat the pandemic. The nation has committed more than $178 billion USD to the healthcare industry, including financing for tests, vaccines, and provider assistance.
This money has allowed the nation to enhance its healthcare capacity and give crucial services to individuals in need. Overall, government efficacy and financial allocation have been critical in nations’ responses to the pandemic. Although some nations, such as the United States, have been able to dedicate large resources to react to the crisis, others, like as Ukraine, have struggled to ensure that their resources are used properly to handle the pandemic's difficulties [12].

Discussion

Innovative healthcare delivery models and their effectiveness during the COVID-19 pandemic

During the sudden arise of pandemic, there are always problems with healthcare system to deal with problems and threats posed by that pandemic of, and quick management decisions are needed to deal with such dangers. Different models of health care were used in different parts of the world to deal with the COVID-19 pandemic. The health care system in Ukraine is based on the Beveridge model, which is a publicly funded and run system that gives everyone access to health care. Similarly among those countries that used the same model were the United Kingdom, Iceland, Ireland, Norway, Spain, Cuba, and New Zealand. Germany, Austria, Belgium, the Czech Republic, France, the Netherlands, and Switzerland used the Bismarck model. Canada, Australia, Italy, and Thailand used the national insurance model, while China, India, and Portugal used the market model [30].

If analysing the most efficient model, the literature showed high efficiency rating for the Beveridge model having 96.6%, efficiency and effectiveness. It was also revealed that out of the seven nations analysed for this purpose, four countries were Ireland, Iceland, New Zealand and Great Britain achieving the highest degree of efficiency of 100% while Norway having 84% had the lowest in the group, although this figure was higher than the average for all nations. Similarly those nations who used the health care system model based on the concept of national insurance ranked second in terms of economic efficiency, with a level of 95.5%. Those nations who used the market model of health care system, in which the majority of money spent on medical services come from the population’s own savings, had the lowest performance outcomes [30]. Total vaccination coverage in Ukraine indicated by WHO statistics were also low as compared to other countries in Europe showed poor and inefficiency of healthcare system of Ukraine [31]. During the pandemic, Ukraine expanded the Obligatory State Social Health Insurance Fund for hospitalization and intensive care for COVID-19 patients. It was also concluded that the Compulsory State Social Health Insurance Fund was also improved for healthcare delivery during the pandemic. A competitive market model is being studied for future healthcare.
improvements in Ukraine and for this purpose Lohinova and Marushchak examined the pros and cons of market-based healthcare in Ukraine [36]. While another study examined healthcare system in the United Kingdom where health care is entirely financed and provided by the government to all citizens. According to some evaluations, the country's National Health Service (NHS) ranks well in key health-care indicators, including preventative care, equality, and access. The NHS, which is mostly funded by taxes, offers complete coverage, including preventative care, hospital services, medications, and mental health care [37].

**Infrastructure, Medical equipment and PPE availability and distribution in the healthcare sector during the COVID-19 pandemic**

During the pandemic, it was hard for many countries to get enough medicines and PPE. This was also a problem for Ukraine. Due to the size of the outbreak, a number of hospitals and clinics did not have enough PPE and medical supplies. This put healthcare workers in contact with the virus, which led to a great amount of sick people [38]. All over the world, like in the US and Pakistan, people had the same kinds of problems. Doctors in both countries said they had to work without personal protective equipment (PPE). When it came to getting PPE, more doctors from Pakistan said they had been treated unfairly than in the US. Secondly due to this shortage 80.5% of doctors in the US and 60.3% of doctors in Pakistan said that they reused PPE [38].

The distribution of PPE was another problem discussed in many studies. Some hospitals and clinics were given extra supplies, but others were not. The Ukrainian government came up with a way to better get medical supplies and PPE to people who need them. The government put regional needs first when allocating supplies. A government hotline was established that can be used by healthcare workers to report shortages of supplies. Similar problems were encountered all around the globe, particularly in low-income nations. World Health Organization statistics showed that the medical PPE market was worth $8 billion in 2019 and was centralised and directed by the United States and Asia. Except for gloves, China and the United States accounted for 60% of worldwide output in most categories of PPE, while gloves were mostly manufactured in Malaysia and Thailand. Because of the widespread acceptance and continuous usage of surgical masks, consumer and non-healthcare workplace demand accounted for 60-70% of overall demand in 2020 and 2021. Due to the scale at which they can produce and their cost competitiveness, major, worldwide incumbent businesses may alter their production capacity to suit global demand and continue to grab the lion's share of future growth [39]. Another study showed that Bangladesh was also affected in the same manner regarding a severe lack of masks, hand gloves, and personal protective equipment (PPE). Unfortunately, domestically made PPEs, masks, and other kits have been noted to be of poor quality and incapable of protecting the medical workers from infection [40]. Ukraine like other countries was dependent significantly on imports for medical equipment and PPE. So procurement corruption was another issue that created further unavailability of PPE and other medical supplies. Medical equipment and PPE were overpriced in the market against the government orders. Lack of local manufacturing capability and procurement malfeasance concerns remained as such in spite of government full efforts in most of the countries around the world. Nonetheless, the government's efforts to priorities supply allocation and develop a more efficient distribution system helped minimise these issues [41].

The healthcare infrastructure was badly exposed by this pandemic showing Ukraine's inadequate healthcare system's inadequacies. Decentralization is not only beneficial. This decentralized structure has made pandemic response difficult in Ukraine. Hospital beds were few in Ukraine during the outbreak. Ukraine had 8.3 beds per 1,000 inhabitants before the pandemic, one of the lowest in Europe. The healthcare system was unprepared for COVID-19 cases. Medical personnel shortages exacerbated hospital bed shortages. Healthcare experts have left Ukraine for better prospects for years. The pandemic aggravated the doctor and nurse shortage [42].

**Healthcare workforce and COVID-19 pandemic**

The COVID-19 pandemic has affected healthcare systems globally, including Ukraine. Throughout the pandemic, Ukraine's healthcare system has struggled to find doctors, especially in rural regions. Ukraine has one of Europe's lowest physician and nurse per capita, and the COVID-19 pandemic has emphasized this lack. Ukraine has 2.6 doctors and 6.1 nurses per 1,000 populations to address covid pandemic while, compared to Ukraine it was 3.7 and 8.8 in Europe. This further augments the situation because of the lack of readiness for pandemic. It was worse in rural and distant locations, where healthcare services are few and quality is poor [12].

The retention of health care personal was also appeared as another major issue. The Ministry of Health announced plans for healthcare workers to complete online courses in the field of clinical management and prevention and control of infection. Ukraine has set aside medical students to be employed as replacements. WHO conducted online training programs at 200 authorized treatment centres and exchanged expertise on treatment procedures. Literature further revealed that other European countries also did similar arrangements. Turkey used the medical and dental residents as a replacement in case of burden on the doctor during pandemic. Poland utilised non-specialised personnel, retired personnel, and medical students. Another method utilized was to increase the salary by 100-300%, and the loss of income was compensated, overtime payments and time off duty were ensured. Doctors who were isolated and quarantined received 100% of their salary [12].
Literature also revealed that improving working environment for retention of healthcare worker in rural and distant healthcare is another option utilized by the world. This might involve boosting training, professional development, equipment, supplies, and support services like childcare and housing [43].

Healthcare information systems and their effectiveness in improving healthcare coordination and delivery

COVID-19 pandemic has nevertheless created new needs and changed motivation for the digital health tools utilisation for healthcare delivery. In this way emphasised the value of healthcare information systems in assisting, coordinating, and delivering healthcare services. For some years, Ukraine has been developing healthcare information systems with the goal of enhancing healthcare delivery and patient outcomes while Europe was utilising it more effectively [44]. Digital health tools have been used to deal with COVID-19 in four main areas: communication and information, monitoring and surveillance, helping to provide health services, and vaccination. In the early 2000s, the use of electronic medical records in some hospitals helped healthcare information systems in Ukraine to grow. The goal was to improve the quality of healthcare services by making it easy for healthcare workers to get information about patients quickly and timely. The government created the Unified State Health Information System so that health information from all over the country could be combined and made easier to find. During the COVID crisis, different countries around the world used different information technology methods to meet the needs of a tough time. Countries like Austria, Bulgaria, and Italy made Digital Apps to connect with the public, tell them about the virus, and help them recognise symptoms, get in touch with health services, or report symptoms. In the same way, France created national health data gateways in response to the crisis by funding COVID-related research projects like the Health Data Hub, which was a single way to access health data [45]. Most of the literature talked about how important it is for healthcare to become more digitalised, including changes related to the internet and digital technologies and how they affect new treatments and best practices for better health management. It also made it possible to keep track of cases, hospital beds, and medical supplies in real time, which helped medical staff deal with the crisis better. The system also had telemedicine features, which let patients talk to doctors and nurses from a distance. This made it less likely that a virus would spread [46].

Another study revealed that some governments restricted the use of digital technology in health care to maintain accountability, ethical medical practice, and patient data protection. Before the COVID-19 pandemic, these constraints and insurance coverage were major impediments to telemedicine advancement in many nations around the world. Telehealth services helped competent health care organisations manage patient load, protect patients, and staff, and assure continuity of treatment. In this regard some nations also eased telehealth legislation. During the COVID-19 outbreak, insurance companies have begun reimbursing telemedicine patient treatment is another example of technology used for social service [47].

Governance and Finance

The efficacy of governance and financial allocation in delivering resources to healthcare systems and meeting people's demands has been a significant component of the healthcare response. Efficacy of resource allocation in response to the outbreak in Ukraine remained a major concern. Despite the country's low GDP per capita of $3,659 in 2019, healthcare spending accounted for 7.72% of GDP in Ukraine while it was 34,913 GDP per capita and 9.85 health care spending on average in Europe. This revealed poor funding situation for health care in Ukraine. While the United States has committed substantial resources to combating the pandemic was more than $178 billion USD to the healthcare industry, including financing for tests, vaccines, and provider assistance. This money has allowed the nation to enhance its healthcare capacity and give crucial services to individuals in need. Finances for the health care were 3.9 million USD for Kazakhstan and 2.0 billion USD for Poland during 2020 and 2021. Overall, government efficacy and financial allocation have been critical in nations' responses to the pandemic. Although some nations, such as the United States, have been able to dedicate large resources to react to the crisis, others, like as Ukraine, have struggled to ensure that their resources are used properly to handle the pandemic's difficulties. Health financing remained a big challenge in whole developing world [12].

While another study looked at how different countries, like China and Pakistan, used e-governance systems in healthcare. This type of governance made these countries able to the focus on sustainable development goals (SDGs) event in the period of pandemic. This study also showed how these nations meet the both current and future challenges, such as the effects of COVID-19 now and in the future [48].

Decentralisation doesn't work effectively and efficiently everywhere since federal and decentralized institutions handle the situations different ways. Numerous federations and decentralized states have tried different methods to achieve different success. So, to thoroughly analyse the pandemic, a rigorous, empirical, and comparative analytic framework must be built and updated on regular basis [49].

In terms of the global picture, Governments worldwide addressed COVID-19 and faced its health and economic impacts. Health expenditure on Covid pandemic reached a record $9 trillion, or 11% of global GDP. Government health care expenditure increased rapidly at all income levels due to rise in utilisation and cost. The outbreak forced the government to spend more on healthcare and less on other areas. High- and upper-middle-income nations increased social protection expenditures to mitigate the COVID-19 economic impact. Countries must pay for health care and other social services despite worsening macroeconomic circumstances and rising debt. For poverty reduction, health care, and pandemic preparedness, low-income nations need international financing [50].
Finally, this worldwide COVID-19 pandemic experience has shown that we need new ways to deliver healthcare, better infrastructure, and better distribution of medical equipment and personal protective equipment. The healthcare workers have been very important in dealing with the pandemic, and we must keep trying to help and protect them. Healthcare information systems have been very important in improving how care is coordinated and given, but more needs to be done to make sure they work well. Lastly, governance and finance have been very important in Ukraine's response to COVID-19, and more work needs to be done to make sure that the healthcare sector has sustainable financing and good governance. As the world continues to deal with the pandemic, it is clear that a coordinated and collaborative approach to the health care is essential for success.

**Conclusions and Implications**

Conclusion and implication are.

1. The pandemic of COVID-19 has underlined the significance of having proper medical equipment and personal protective equipment (PPE) to protect healthcare workers and deliver effective healthcare services. To achieve this Governments must:
   - stockpile enough medical equipment and personal protective equipment (PPE);
   - improve supply chains and distribution channels for medical equipment and personal protective equipment, especially in rural and underserved populations;
   - boost manufacturing and delivery system during times of crisis;
   - Prioritise the safety of healthcare workers.

2. The pandemic of COVID-19 has underlined the significance of having established a more resilient, patient-centred healthcare system that can better handle pandemics and other healthcare issues. For this government of Ukraine must develop:
   - sustainable and efficient healthcare infrastructure;
   - intersectoral coordination between government, healthcare providers, and private sector partners to work together;
   - Educate and develop healthcare personnel so they have the skills and tools to offer high-quality care.

3. The COVID-19 pandemic has highlighted the challenges faced by healthcare personnel, especially those working in rural and distant areas, leading to burnout and stress:
   - addressing healthcare professional shortages in rural and distant places requires retention strategies that include financial incentives, housing subsidies, and training and professional development opportunities;
   - improving the healthcare infrastructure in rural and distant areas by funding modern facilities, increasing access to medical equipment and supplies, and investing in telemedicine and other technology can enhance healthcare delivery;
   - legislative interventions, such as increasing healthcare worker pay, improving working conditions, and providing career progression and professional development opportunities, can help address healthcare labour shortages.
   - Improved coordination, communication, and real-time data are essential for healthcare practitioners to make informed decisions and allocate resources effectively.

4. Ukraine have also struggled with the use of healthcare information systems during the COVID-19 pandemic for achieving healthcare system efficiency, provider communication, and facility burden and has responded to the COVID-19 pandemic by developing a:
   - national electronic health record system;
   - telemedicine, and other digital health technologies;
   - the healthcare information systems involve extensive technology, infrastructure, and provider training and raise data privacy and security issues Ukraine must continue to invest in healthcare information systems to solve difficulties and provide fair access for patients and healthcare professionals.

5. Ukraine had the lowest pandemic readiness and integrated economic efficiency indices. To deal with pandemic:
   - Ukraine has to introduced various innovative healthcare delivery approaches like the Beveridge, Bismarck, market, and insurance-based healthcare approaches to improve access and decrease the spread of COVID-19;
   - Ukraine expanded its National Health Service and Obligatory State Social Health Insurance Fund to offer free COVID-19 testing, treatment, and hospitalization for everybody;
Governments can also use taxes to fund healthcare systems, which can help to ensure access to healthcare for all.

The private healthcare providers’ involvement can further improve healthcare access and delivery.

In conclusion, the pandemic has shown the global healthcare system flaws, and nations must implement new healthcare delivery methods to increase pandemic preparation. During pandemics, governments should invest in healthcare infrastructure and experts to deliver high-quality treatment. All international institutions and governments should help Ukraine overcome economic issues, the war with Russia, and such pandemic.

**Data Availability Statement**

Data sharing not applicable: No new data were created or analysed in this article. Data sharing is not applicable to this article.

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**References**


