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COVID-19 AND HEALTHCARE MANAGEMENT: LESSONS FROM KAZAKHSTAN

The COVID-19 pandemic became one of the most significant challenges of the 21st century, significantly impacting healthcare systems and the socio-economic development of countries. The objective of this review is to analyze the effects of the COVID-19 pandemic on Kazakhstan's healthcare system and economy, in comparison with other countries, and to develop recommendations to improve healthcare management and strengthen resilience against future crises. In Kazakhstan, the pandemic highlighted systemic problems in healthcare, including workforce shortages, inadequate infrastructure, a high proportion of out-of-pocket expenditures, and limited preparedness for large-scale epidemics. At the same time, measures were implemented, including the construction of infectious disease hospitals, the introduction of digital solutions, collaboration with international organizations, and the rollout of vaccination programs. Global experience and lessons from the pandemic underscore the need for comprehensive reforms in Kazakhstan's healthcare system to enhance resilience against future epidemiological challenges. These findings highlight the importance of integrating evidence-based management strategies, enhancing intersectoral coordination, and investing in public health infrastructure to ensure a more effective and equitable response to future public health emergencies.

Keywords: COVID-19, Kazakhstan, healthcare system, healthcare management, pandemic.

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COVID-19 және денсаулық сақтауды басқару: Қазақстан сабақтары

COVID-19 пандемиясы денсаулық сақтау жүйелеріне және елдердің әлеуметтік-экономикалық дамуына айтарлықтай әсер етіп, 21-ші ғасырдың ең үлкен сын-қатерлерінің біріне айналды. Бұл шолудың мақсаты басқа елдермен салыстырғанда COVID-19 пандемиясының Қазақстанның денсаулық сақтау жүйесі мен экономикасына әсерін талдау және болашақ дағдарыстарға төзімділікті нығайту үшін денсаулық сақтауды басқаруды жақсарту бойынша ұсыныстар әзірлеу. Қазақстанда пандемия денсаулық сақтаудағы жүйелік проблемаларды атап көрсетті: жұмыс күшінің тапшылығы, инфрақұрылымның жеткіліксіздігі, өз қалтасынан түсетін шығындардың жоғары үлесі және ауқымды індеттерге дайындықтың шектеулілігі. Бұл ретте жұқпалы аурулар ауруханаларын салу, цифрлық шешімдерді енгізу, халықаралық ұйымдармен бірлесіп жұмыс істеу, вакцинация бағдарламаларын енгізу сияқты шаралар жүзеге асырылды. Дүниежүзілік тәжірибе мен пандемиядан алынған сабақтар болашақтағы эпидемиологиялық сын-қатерлерге төзімділікті арттыру үшін Қазақстанның денсаулық сақтау жүйесінде кешенді реформалар жүргізу қажеттілігін көрсетеді. Бұл тұжырымдар болашақтағы қоғамдық денсаулық сақтау саласындағы төтенше жағдайларға тиімдірек және әділ жауап беруді қамтамасыз ету үшін дәлелді басқару стратегияларын біріктірудің, салааралық үйлестіруді күшейтудің және қоғамдық денсаулық сақтау инфрақұрылымына инвестиция салудың маңыздылығын көрсетеді.

Түйін сөздер: COVID-19, Қазақстан, денсаулық сақтау жүйесі, денсаулық сақтауды басқару, пандемия.

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COVID-19 и управление здравоохранением: уроки Казахстана

Пандемия COVID-19 стала одним из самых серьёзных вызовов XXI века, оказав значительное влияние на системы здравоохранения и социально-экономическое развитие стран. Целью данного обзора является анализ воздействия пандемии COVID-19 на систему здравоохранения и экономику Казахстана в сравнении с другими странами и разработка рекомендаций по совершенствованию управления здравоохранением для повышения устойчивости к будущим кризисам. В Казахстане пандемия выявила системные проблемы здравоохранения: нехватку кадров, недостаточную инфраструктуру, высокую долю расходов из собственных средств населения и ограниченную готовность к масштабным эпидемиям. Одновременно были реализованы такие меры, как строительство инфекционных больниц, внедрение цифровых решений, сотрудничество с международными организациями и развертывание программ вакцинации. Международный опыт и уроки пандемии демонстрируют необходимость комплексных реформ в системе здравоохранения Казахстана для повышения устойчивости к будущим эпидемиологическим вызовам. Эти результаты подчеркивают важность интеграции стратегий управления, основанных на фактических данных, улучшения межсекторальной координации и инвестирования в инфраструктуру общественного здравоохранения для обеспечения более эффективного и справедливого реагирования на будущие чрезвычайные ситуации в области общественного здравоохранения.

Ключевые слова: COVID-19, Казахстан, система здравоохранения, управление здравоохранением, пандемия.

Introduction

The COVID-19 pandemic emerged as one of the most significant modern-day challenges, simultaneously impacting healthcare facilities and economic operations worldwide. The coronavirus pandemic reached global proportions in early 2020, exposing the inadequacy of worldwide healthcare systems to handle such a large-scale emergency (van Ginneken et al., 2022). The initial months of the pandemic led to hospital facilities reaching maximum capacity, while medical staff and vital medical supplies became insufficient (Mishra et al., 2021).

The pandemic had its most destructive impact on healthcare systems that were already operating at maximum capacity. The rapid spread of the virus across all regions during the first months of the pandemic resulted in significant disruptions to essential healthcare operations (Mishra et al., 2021). The pandemic created substantial challenges for healthcare staff management, facility resource allocation, and maintenance of the medicine and equipment supply chain (Charitos et al., 2020).

Literature review

Research indicates that the pandemic resulted in major disruptions to healthcare services, which affected developing nations the most (Menendez et al., 2020). The healthcare system faced dual challenges due to the direct effects of COVID-19 and the additional strain it imposed on medical facilities. The pandemic exposed fundamental weaknesses that impacted both disease prevention and treatment services for infectious and non-infectious diseases (World Health, 2020, 2021). The pandemic forced healthcare facilities to cancel their scheduled appointments (Papautsky & Hamlish, 2020; Park et al., 2020), while patients stayed away from medical facilities due to fear and worry during the peak infection periods (Passos et al., 2020). The COVID-19 pandemic resulted in two major health risks because it directly caused infections and created additional risks from preventable and treatable diseases that received delayed care.

Healthcare delivery disruptions stemmed primarily from three factors: the transfer of medical staff to COVID-19 duties, the termination of scheduled treatments, and reduced household spending power for medical expenses (Sochas et al., 2017; Wilhelm & Helleringer, 2019). The high number of illnesses and deaths among healthcare providers worsened the existing shortage of medical staff. The shortage of medicines, diagnostic equipment, and medical tools has become a primary cause of service interruptions, as multiple countries have documented (World Health Organization, 2021).

The research aims to examine how COVID-19 affected Kazakhstan's healthcare system and econo-

my through international comparisons, while developing strategies to enhance healthcare management for future crisis preparedness.

Methodology

This review employed a structured and systematic approach to examine the impact of the COVID-19 pandemic on Kazakhstan's healthcare system and economy, while situating these findings in an international context. Source selection followed predefined criteria focusing on scientific rigor and credibility. Only peer-reviewed publications, official government documents, reports from organizations such as the WHO and OECD, and datasets from internationally recognized statistical platforms were included. Eligible sources were required to contain empirical data or analytical assessments relevant to the healthcare, economic, or policy implications of COVID-19. Materials lacking methodological transparency, including commentaries, opinion pieces, non-verified online content, and anecdotal evidence, were excluded to ensure reliability and analytical robustness.

The analysis covered the period from January 2020 to December 2023, enabling an examination of the initial outbreak, the pandemic's peak phases, and the subsequent early post-pandemic recovery. This timeframe enabled capturing both acute disruptions and emerging long-term consequences for health systems and national economies. Data for the review were retrieved from PubMed, Scopus, Web of Science, the WHO COVID-19 Database, OECD Health Statistics, World Bank Open Data, and the Bureau of National Statistics of Kazakhstan. Additional relevant publications were identified through reference screening to ensure the comprehensiveness of the literature base.

The comparative analysis did not rely on exclusion criteria for selecting countries. Instead, the comparison was structured around several overarching thematic areas reflecting key dimensions of the pandemic response. These thematic areas covered health system governance and coordination, public health and clinical response, and system resilience and continuity of essential health services. Each country's experience was evaluated across these broad domains, enabling a consistent yet flexible analytical framework that accounted for heterogeneity in national strategies, resource availability, and health system maturity.

All collected evidence was synthesized using a narrative approach. This method allowed for integrating findings from diverse data sources and highlighting patterns relevant to Kazakhstan. Special attention was given to cross-country differences, contextual factors, and structural determinants that shaped the effectiveness of national responses. Triangulation across multiple data sources was applied wherever possible to strengthen the validity of the conclusions. The methodological approach underlying this review thus ensured transparency, reproducibility, and coherence, enhancing the scientific rigor of the study.

Results and discussion

COVID-19 and Global Challenges to Healthcare Systems

The COVID-19 pandemic exposed multiple infrastructure weaknesses that affected medical logistics, healthcare management, workforce availability, and system operations (Torrentira, 2020). The rapid increase in patients during the pandemic caught numerous healthcare facilities off guard because they lacked sufficient equipment. The delayed implementation of COVID-19 prevention measures led to overwhelming conditions for health systems (Torrentira, 2020). The pandemic has demonstrated that both international data sharing among organizations and public transparency are essential for effective pandemic management (Khetrapal & Bhatia, 2020).

Multiple nations experienced interruptions in their delivery of medicines, and severe shortages of vital medications occurred primarily among individuals from socially disadvantaged groups (Bader et al., 2020). The personal protective equipment (PPE) included masks, gloves, protective suits, goggles, and respirators. The most parasitic drug, ivermectin, received widespread use in Latin America and Africa despite lacking scientific evidence for its effectiveness (Hellwig & Maia, 2021; Molento, 2021). European countries dedicated resources to SARS-CoV-2 genome sequencing, enabling rapid vaccine development and variant tracking (Bader et al., 2020; Ferrinho et al., 2020). The European Stability Mechanism enabled EU member states to provide financial support for their healthcare systems (Hufsky et al., 2021). The hospitals continued to face a shortage of vital resources despite all implemented measures.

The United States, India, Brazil, France, and the United Kingdom reported the highest numbers of COVID-19 cases and deaths in 2020 (Cucinotta & Vanelli, 2020). The United States and India maintained low mortality rates, ranging from 1.4% to

1.8%, but Romania and Bulgaria experienced nearly double the death rate (Cucinotta & Vanelli, 2020). The success of the implemented measures depended on both the quality of their design and the standard of their execution.

The combination of mask mandates (Galvin et al., 2020; Prather et al., 2020), vaccination programs (Orlowski & Goldsmith, 2020), travel restrictions, and remote work policies decreased emergency department workload by 25% (Benham et al., 2021; Nguyen et al., 2021). The pandemic continues to affect low-income nations because they face ongoing workforce deficits, insufficient intensive care capacity, and restricted access to medications (Pleyers, 2020). Multiple countries have shown that future epidemic preparedness requires medical solutions alongside comprehensive healthcare system transformations, including the development of telemedicine, resource stockpiling, and the establishment of vaccination trust (Bakhsh et al., 2021; Beste et al., 2021; Dascalu et al., 2021).

Socioeconomic Consequences and Health Inequalities

The pandemic created multiple socio-economic problems that widened existing social gaps between nations and their internal populations. The worldwide economic output decreased in 2020 due to lockdowns and trade disruptions, resulting in unemployment rates of up to 70% among workers with only a primary education (Kugler et al., 2023). The pandemic had its most severe economic impact on resource-based economies, including Kazakhstan, as falling oil prices and travel restrictions reduced government income while increasing people's vulnerability to social risks. The healthcare system had to contend with the current pandemic while maintaining vital medical services, despite financial limitations. The economic strain on families grew as they had to pay out of pocket for medical care, while rural areas struggled to access basic healthcare services. The pandemic affected people differently, as their health outcomes depended on their social status, living environment, and access to digital tools (Gupta et al., 2022; Raphael & Schneider, 2023).

The World Bank conducted the COVID-19 Impact Surveys to measure how the pandemic affected private-sector operations through economic changes during the first period of lockdowns and movement controls (Olczyk & Kuc-Czarnecka, 2021). This research uses Round I survey data collected between April and September 2020 (Table 1). The data shows how businesses reacted to the 2020 containment measures and economic instability through their immediate response strategies (World Bank Group, 2023). The research compared Kazakhstan to Azerbaijan, Russia, and Poland for assessment. The research focuses on these nations because they share economic, structural, and institutional characteristics that enable effective analysis. Kazakhstan and Azerbaijan are resource-based economies that depend heavily on energy exports (Azretbergenova & Syzdykova, 2020; Huseynli, 2022), and they face similar risks from global commodity price fluctuations during the pandemic. The post-Soviet economy of Russia operates as a major nation that maintains a wide range of industrial activities and possesses robust state institutions. This research included Poland, a middle-income European Union member state with developed digital infrastructure and strong connections to the European market.

Table 1 – Impact of the COVID-19 pandemic on operations and financing in Azerbaijan, Kazakhstan, Russia, and Poland in 2020

Operations and financing	Azerbaijan	Kazakhstan	Russia	Poland
% of firms confirmed permanently closed since COVID-19 pandemic declared	1,5	1,7	0,7	2,2
% of firms that have ever temporarily closed during the COVID-19 outbreak	62,4	53	68,2	24,3
% of firms discontinued product or service in response to COVID-19 outbreak	24,5	13,2	NA	NA
% of firms ever experienced increased liquidity or cash flow availability since COVID-19 began	2,6	6,2	3,9	3,5
% of firms ever experienced a decrease in liquidity or cash flow availability since COVID-19 began	81,3	54,6	67,7	50,6
% of firms ever used loans from commercial banks as the main source since COVID-19 start	17,7	9,1	16,8	4,1

Continuation of the table

Operations and financing	Azerbaijan	Kazakhstan	Russia	Poland
% of firms ever used loans from non-bank financial institutions as main source since COVID-19 began	13,7	5,2	0,9	1,4
% of firms ever delayed payments to suppliers, landlords, and tax authorities since COVID-19 began	51,6	25,4	42,1	27,5
% of firms that applied for a loan since COVID-19 began	29,9	15,5	NA	NA
Note – compiled by the authors based on the source (World Bank Group, 2023)				

In 2020, during the acute phase of the pandemic, all the above-mentioned countries experienced minimal permanent business closures, with closure rates below 3%, indicating that most businesses avoided permanent market exit. The temporary closure of businesses occurred throughout Russia, Azerbaijan, and Kazakhstan at rates of 68.2%, 62.4%, and 53%, respectively. The Polish economy experienced lower temporary business shutdowns at 24.3% because businesses maintained operations through various means, which might be attributed to effective institutional support and digital business preparedness.

The most significant problem that arose during this period was liquidity constraints. The cash flow of most businesses decreased substantially, with Azerbaijan (81.3%) and Russia (67.7%) showing the largest decreases. The financial situation of enterprises remained severe, as more than half of businesses in Kazakhstan and Poland operated with less than 50% market share. The survey results showed that only a few companies achieved better liquidity. Still, Kazakhstan led the way with 6.2% of firms, which might be due to specific state-backed relief programs and their ability to obtain urgent funding.

Financial coping strategies followed distinct patterns that varied between different nations. The two countries, Azerbaijan and Russia, relied primarily on commercial bank loans, whereas Kazakhstan and Poland used them significantly less. The data shows different credit availability levels, government support structures, and business recovery forecasts between these two groups. The most frequent payment delays occurred in Azerbaijan and Russia, where severe immediate cash flow problems threatened the stability of their supply networks.

The findings demonstrate that businesses across different nations experienced different levels of economic stability when the pandemic first hit. The COVID-19 pandemic caused complete disruption of business operations throughout all four nations. Still, Kazakhstani and Polish businesses showed a stronger ability to handle the initial effects of the pandemic better than businesses in Azerbaijan and Russia.

Kazakhstan and the COVID-19 Pandemic

The first COVID-19 cases in Kazakhstan triggered a nationwide outbreak. The government responded to the outbreak by establishing quarantine measures, declaring a state of emergency, and shutting down schools and businesses while imposing travel restrictions. The first lockdown occurred in spring 2020, but the government implemented successive quarantine restrictions that it gradually relaxed. The essential measures created significant social and economic problems for the population. The lockdown measures primarily harmed two groups that sustain employment and generate tax income: vulnerable populations and small to medium-sized businesses (Mergenova et al., 2023).

The mobile system Ashyq became operational in 2021 through integration with the Ministry of Health database. The system utilized QR codes to assess infection risk levels (red, yellow, blue, green), allowing businesses to operate partially while minimizing the spread of disease. The pandemic revealed multiple weaknesses in Kazakhstan's healthcare system, including insufficient medical staff and medicine supply chains, inadequate access to care, and inadequate preparedness for large-scale outbreaks. The government collaborated with the WHO Country Office in Kazakhstan to enhance healthcare resources, train medical staff, and improve population outreach, while also developing national clinical treatment protocols (Coates et al., 2022).

The beginning of 2022 witnessed massive protests throughout Kazakhstan, driven by rising costs and widespread public dissatisfaction (Kantchev, 2022; Lillis, 2022; Satubaldina, 2022). The government declared another state of emergency because vaccination rates dropped (Kassabekova et al., 2025) while new cases rose during this time period.

The education sector encountered significant difficulties that extended beyond healthcare operations. School closures affected more than 90%

of students worldwide during the quarantine, and Kazakhstan experienced a similar situation (Bozkurt et al., 2022; Pokhrel & Chhetri, 2021). The shift to remote education revealed two major problems stemming from unequal student-device access and insufficient teacher-student readiness (Bektursynova & Sarsengaliyeva, 2020; Pokhrel & Chhetri, 2021). The educational environment faced three main problems: student absences, cheating incidents, and declining academic performance. The Ministry of Science and Higher Education of Kazakhstan, in collaboration with UNICEF and UNESCO, launched joint programs that provided teacher training through online courses and distributed thermometers and sanitizers to rural educational facilities (Coates et al., 2022).

The healthcare system in Kazakhstan revealed its ongoing problems during the pandemic, primarily due to insufficient funding, widespread non-communicable diseases, and inadequate drug availability (Central Asian Bureau for Analytical Reporting, 2020; Vanderveen, 2020). The construction of an infectious disease hospital in the capital city center took only 13 days to complete, enabling rapid expansion of healthcare capacity (Radosavljevic, 2020). The country received substantial humanitarian support, including medical supplies, protective equipment, and medical devices, from both EU organizations and UNICEF (Yausheva, 2020).

Kazakhstan's Healthcare System Response

The national healthcare system of Kazakhstan underwent various stages of pandemic response, demonstrating flexibility, yet faced multiple operational constraints. The government established new infectious disease hospitals while transforming existing medical facilities into COVID-19 treatment centers during the initial phase of the pandemic. The Ministry of Health utilized centralized procurement systems to address supply shortages; however, delivery problems persisted. The healthcare system achieved success through the expansion of telemedicine and the implementation of a digital health monitoring system, which enabled remote patient care and continuous disease tracking (Battakova et al., 2023). The World Health Organization and World Bank supported Kazakhstan through their partnership to build healthcare capabilities, acquire diagnostic equipment, and establish vaccination programs (Panajyan & Ibragimov, 2025). The implementation of these measures faced ongoing obstacles due to insufficient medical personnel, healthcare worker exhaustion, and unequal access to healthcare resources between urban and rural areas. The pandemic experience demonstrated that health authorities require better coordination between national and regional levels, as well as permanent funding for healthcare workforce development.

The Impact of COVID-19 on the Economy

The COVID-19 pandemic triggered the worst global economic downturn in recent decades. The pandemic disrupted supply chains, leading to decreased production levels and a drop in trade volumes; tourism, service industries, and transportation systems suffered significant impacts. Hospitals across numerous countries ran out of resources and space to treat the overwhelming number of patients (Cutler & Summers, 2020).

The economic situation in Kazakhstan deteriorated due to the concurrent pandemic and the decline in global oil prices. The pandemic led to the closure of 300,000 small and medium-sized enterprises, resulting in the loss of 1.5 million jobs or unpaid leave for workers (Haruna et al., 2022). The country experienced a 2.8% decrease in its gross domestic product (GDP) (Haruna et al., 2022). The government used $10 billion to reduce taxes and provide financial support through loans and direct aid to citizens during the crisis (Haruna et al., 2022).

The healthcare system of Kazakhstan exposed its fundamental structural problems during the pandemic. The healthcare system operates under a centralized structure because patients are required to pay 36% of their healthcare costs directly out of pocket (Kulzhanov et al., 2007). The healthcare system exhibits significant differences in the availability of medical services across various regions. The unified health insurance fund received mandatory employer contributions since 2017 to enhance funding and improve service delivery (World Health Organization, 2024).

COVID-19 has created various social and economic effects across different populations. The World Bank reported that the pandemic resulted in a 20-year high increase in extreme poverty, which affected 90 million people worldwide (Lakner et al., 2021). The number of people in Kazakhstan earning less than $5.50 per day increased from 1.1 to 1.5 million during the pandemic (Kitamura et al., 2022).

The economic effects of the pandemic varied across nations. The United States incurred financial losses exceeding $16 trillion in 2021, equaling 90% of its total GDP (Cutler & Summers, 2020). The Polish economy experienced its first production decline since 2000, largely due to its diversified industry and advanced digital infrastructure (Kitamura et al., 2022). The Turkish economy experienced

slower growth but maintained better performance than Egypt, Ukraine, and Kazakhstan, where GDP declined sharply (Kitamura et al., 2022).

The initial price surge in food items in Kazakhstan evolved into a more severe inflation problem due to declining export demand, decreasing oil prices, and currency devaluation. The economic recovery from the pandemic relied heavily on mass vaccination programs; however, vaccine shortages and public doubts about the vaccines slowed down the immunization process (Sallam, 2021). The economic costs extended because the factors prevented the achievement of herd immunity.

Kazakhstan's oil revenue enabled the country to manage its debt more effectively than most lower-middle-income nations, despite its limited financial resources. The healthcare system faces two significant risks from future crises, stemming from its structural weaknesses and the substantial share of healthcare expenses paid directly by patients.

Recommendations for Improving Healthcare Management

The experience of different countries during the COVID-19 pandemic highlights several key areas that can serve as a foundation for strengthening healthcare management in Kazakhstan (Table 2).

Table 2 – International experiences in managing the COVID-19 pandemic and their applicability to Kazakhstan.

Recommendation	Example	Applicability for Kazakhstan
Coordination, planning, financing, and monitoring	In Western Washington, a Regional Coordination Center was established to ensure equitable distribution of workload (Mitchell et al., 2020); in Sri Lanka, programs were developed to strengthen community preparedness (Hettiarachchi et al., 2021).	The establishment of emergency coordination centers in regions along with the creation of hospital interaction systems between public and private medical facilities.
Risk communication, community engagement, and infodemic management	In the United Kingdom, passenger surveys were conducted at airports (Zhang et al., 2021); in the USA, Northwell Health launched "COVID-19 Conversations" (Williams et al., 2022).	Doctors should use online platforms and social media to establish direct communication with their patients and conduct periodic surveys to evaluate their communication success.
Surveillance, epidemiological research, contact tracing, and adaptation of measures	In 35 countries of the WHO AFRO region, a monitoring and evaluation plan was implemented (Impouma et al., 2021).	A unified national platform for epidemiological surveillance needs to be implemented to link with regional and international databases.
Border control, international transport, and mass gatherings	Vietnam quickly suspended international flights (Duong et al., 2020).	Development of protocols for rapid closure and control of entry points, including the use of digital technologies for tracking flows.
Laboratories and diagnostics	In Canada, a system of rapid reviews for decision-making was created (Neil-Sztramko et al., 2021).	A national laboratory network with standardized procedures will be established through the development of unified standards and the implementation of rapid review systems and online result access.
Infection prevention and protection of healthcare workers	In Singapore, support measures for migrant workers were implemented (Wang & Teo, 2021).	The plan includes protection for vulnerable groups such as migrants and rural residents and remote work arrangements and healthcare worker support.
Clinical management and therapy	In the USA, treatment protocols for COVID-19 were developed and regularly updated (Stawicki et al., 2020).	The country needs to develop new clinical protocols which must receive mandatory updates for implementation in Kazakhstan's specific healthcare environment.
Logistics and supply chains	The Canadian Armed Forces participated in supporting the healthcare system (Edge et al., 2020).	The military and National Guard provide support for logistics and healthcare operations during crisis situations.
Strengthening primary health care and systems	In some countries, teams in emergency departments were separated to reduce risk (Quah et al., 2020).	Emergency department operations undergo reorganization through the implementation of team-based emergency medicine practices.

Continuation of the table

Recommendation	Example	Applicability for Kazakhstan
Vaccination	In the USA, an electronic vaccination registry system was implemented (Castillo et al., 2021).	A unified digital vaccination registry needs to be developed for integration with eGov system and medical information systems.
Note – compiled by the authors based on the sources (Mitchell et al., 2020; Hettiarachchi et al., 2021; Zhang et al., 2021; Williams et al., 2022.)		

The data in Table 2 demonstrate that countries that handled COVID-19 effectively used coordinated governance systems, along with powerful public health organizations and healthcare systems that could withstand challenges. The examples demonstrate to Kazakhstan that integrated planning across regions and public and private healthcare providers is essential to enhance both resource management and emergency medical response capabilities.

Risk communication and community engagement through digital tools in the United Kingdom and the United States demonstrate that countries need to develop more robust two-way communication systems to counter false information (Williams et al., 2022; Zhang et al., 2021). Implementing specific border control procedures, along with robust laboratory facilities such as those in Vietnam and Canada, helps doctors identify diseases at an early stage, improving containment and diagnostic accuracy (Duong et al., 2020; Neil-Sztramko et al., 2021). The protection of healthcare staff, along with updates to clinical procedures, supply chain stability, and delivery systems, proved essential for continuing healthcare operations. Digital vaccination registries demonstrate how integrated information systems enable monitoring and public trust through their combined functionality.

International practices indicate that Kazakhstan should build its health system resilience through better coordination, digital transformation, and the development of institutional readiness, thereby creating advantages that extend beyond COVID-19 pandemic management.

Digitalization and Innovation as Catalysts for System Resilience

The pandemic period brought about a rapid digital transformation that reshaped the global healthcare delivery system. Governments implemented electronic health records, teleconsultation systems, and mobile applications for contact tracing and vaccination management (R Niakan Kalhori et al., 2021). The healthcare system achieved improved patient-provider communication through these digital solutions, which also simultaneously reduced hospital workloads during lockdowns (Hantrais et al., 2021). The pandemic necessitated the use of digital systems to monitor infection rates and hospital availability in real time, enabling informed decision-making. The rapid adoption of digital technology exposed existing technological inequalities, as elderly people and rural residents often lacked reliable internet access (Hantrais et al., 2021). Healthcare organizations need to address the digital access gap to ensure equitable medical care and emergency preparedness in the event of upcoming disasters.

Lessons Learned and Policy Implications

The COVID-19 pandemic created an opportunity for Kazakhstan to develop new approaches for building resilient healthcare systems. The system needs permanent structural changes to achieve long-term sustainability despite its improved emergency response capabilities. The system needs to develop its primary healthcare infrastructure, improve workforce management, and establish national reserves of vital medical supplies and equipment. The success of vaccination programs and compliance with public health measures depends heavily on how well the public trusts the system and how effectively risks are communicated. The containment and recovery efforts of South Korea and New Zealand succeeded because their countries maintained strong public trust and delivered clear communication plans (Kwon & Oh, 2022; Officer et al., 2022). The future public health planning of Kazakhstan needs to focus on building open communication channels and active community participation. The country should dedicate funds to medical supply production within its borders because this approach will create self-sufficiency and minimize its need for international market access during emergencies.

Conclusion

The COVID-19 pandemic revealed multiple critical weaknesses in global healthcare systems, including those in Kazakhstan. The country imple-

mented multiple pandemic response measures, including hospital construction, the deployment of a digital health platform, and the development of international partnerships. Yet, these efforts failed to address fundamental systemic problems. The healthcare system faces ongoing challenges, including insufficient medical staff, restricted access to healthcare in rural areas, and high patient costs.

International healthcare experiences demonstrate that enduring healthcare systems need both physical infrastructure, capable governance, skilled personnel, and fundamental primary care services. The healthcare system in Kazakhstan needs to develop medical education programs, improve working conditions for healthcare workers, and expand telemedicine services to achieve greater equity in service delivery. The country needs to create national stockpiles of medical supplies, protective equipment, and essential medicines to improve its readiness for upcoming emergencies.

The healthcare system needs to build public trust through open communication, data-based decision-making, and community participation to achieve better health outcomes and higher vaccination rates. The pandemic presents an opportunity to advance healthcare reforms that focus on building system resilience and achieving greater healthcare equity and operational efficiency. Kazakhstan will develop an improved healthcare system capable of handling future public health emergencies by committing to establishing strong foundational elements.

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