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Telemedicine in the Fight Against Pandemic Covid-19 Effectiveness, Risks and Prospects

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Annotation. The COVID-19 pandemic posed a global challenge to healthcare systems, revealing their vulnerability in the face of mass infection and resource scarcity. One of the key solutions was the introduction of telemedicine, which provided remote interaction between doctors and patients, while preserving access to care. The aim of this study is to analyse the effectiveness of telemedicine technologies during the pandemic, assess potential risks and determine the prospects for the development of digital medicine in the post-pandemic era. Based on a comparative analysis of data on the number of referrals, hospitalisations and patient satisfaction, it was found that telemedicine allowed not only to reduce the burden on hospitals, but also to maintain continuity of treatment of chronic diseases. At the same time, risks associated with limited access to technology and reduced quality of diagnostics in the absence of face-to-face examination was identified. Prospects for telemedicine include its further integration into national health care systems, subject to regulatory and technical improvements.

Keywords: telemedicine, COVID-19, digital health, remote care, pandemic, risks, efficiency, medical transformation.

INTRODUCTION. The pandemic of a new coronavirus infection (COVID-19), which started at the end of 2019 and covered the whole world within a few months, has led to enormous changes in all spheres of social life, and above all in healthcare. The scale of the virus, the high speed of transmission and the serious health consequences have required health systems to mobilize resources rapidly, implement new organizational solutions and reduce human contact as much as possible. These challenges have increased the need for technologies that can provide health care without the physical presence of the patient in a health-care facility.

It is in this context that telemedicine, which previously occupied a peripheral position in the structure of health care, has come to the forefront.

Telemedicine technologies have not only reduced the number of face-to-face visits, but also made it possible to manage patient flows more flexibly, diverting patients quickly depending on the severity of their condition and the availability of beds in facilities. In addition, telemedicine has opened up opportunities for interdisciplinary interaction between specialists, including online joint consultations, real-time training and exchange of experience, which is especially important as new clinical scenarios and protocols emerge.

Nevertheless, such a rapid and large-scale implementation of telemedicine has raised many questions. It turned out that not all patients and medical organizations are ready for the transition to the remote model. In a number of regions, insufficient Internet connectivity, lack of digital devices and low levels of digital literacy were factors that limited access to telemedicine services. In addition, there were difficulties associated with the inability to conduct an objective physical examination, limitations in making a diagnosis and conducting certain types of diagnostic tests. This, in turn, challenged the universality of telemedicine as a substitute for face-to-face appointments and raised concerns about the quality and safety of care.

The pandemic also exacerbated the problems of legal regulation in the sphere of remote healthcare. At the time when mass introduction of telemedicine began, many countries, including Russia, did not have a sufficient regulatory framework governing remote counselling, verification of patient identity, collection and storage of medical data, and the responsibility of the parties for the result of care. This necessitated prompt amendments to legislation and the development of new standards of work, which took place in an accelerated mode, often with a delay relative to existing practice.

The significant impact of the pandemic on patients' perception of telemedicine cannot be overlooked. Whereas before 2020, remote counseling was perceived predominantly as an experiment or a forced measure, after months of restrictions and self-isolation, many patients have come to appreciate its convenience, speed and flexibility. The level of trust in online doctors has increased, especially when it comes to repeat appointments, monitoring medication or consulting a narrow specialist who is difficult to reach at home. The resulting digital habits and changing behavioral patterns of the population laid the foundation for a further transformation of medical interaction that continues even after the epidemiological risks have decreased.

Thus, the COVID-19 pandemic was not only a test for health systems, but also a powerful catalyst for the development of telemedicine technologies. Today, telemedicine is no longer perceived solely as a temporary emergency measure. It is seen as an integral part of the modern model of medical care, capable of ensuring the sustainability of the health care system, increasing the availability of qualified care and promoting a personalized approach to treatment. However, in order to move towards sustainable and quality use of telemedicine, it is necessary to analyze its effectiveness, identify potential risks and outline realistic prospects for further development in a post-pandemic world.

Against this background, this study aims to comprehensively assess the role of telemedicine in pandemic control, determine the extent of its use, identify key challenges and risks, and draw conclusions that can inform further strategic decisions on digital health. The analysis is based on statistical data, survey results, opinions of the professional community and current research in the field of digital transformation of healthcare services. The results can be useful not only for scientific understanding of the changes that have occurred, but also for the development of specific management decisions in healthcare that ensure resilience to future crises.

MATERIALS AND METHODS OF THE STUDY.

Both empirical and analytical methods were used to achieve the set objectives. The basis was data from the Ministry of Health of the Russian Federation, reports of the World Health Organization, analytics of insurance companies and digital platforms (in particular, SberHealth, Yandex. Health, DOC+), as well as studies published in peer-reviewed international journals (The Lancet, JAMA, BMJ).

Comparativistics was used as a method of analysis - comparison of indicators before the pandemic, at the height of the pandemic and at the stage of declining incidence. The volume of telemedicine consultations, the share of remote consultations in the total structure of medical care, hospitalization rates and patient satisfaction were assessed.

In addition, a survey among doctors and patients (n = 512) was conducted to assess the perception of telemedicine as a form of care. Methods of correlation analysis and visualization using SPSS and Excel software were used for quantitative interpretation of the data.

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An equally important component is risk identification [2]. With limited physical contact, a doctor cannot perform a full-fledged examination; assess visual and tactile signs, which affect the accuracy of diagnosis. In addition, the existence of gaps in digital infrastructure and legal regulation has led to difficulties in ensuring continuity and safety of medical support. All this makes it necessary to comprehensively analyze both positive and negative aspects of telemedicine development, which was undertaken in this study.

The data obtained are based on multiple sources: government and platform statistics, results of online surveys of patients and physicians, and a comparison of the pre-vision and post-vision periods. The results are visualized using tables and graphs accompanied by detailed analytical commentary. Attention is focused not on single cases, but on generalized trends that allow assessing the systemic effect of the introduction of telemedicine technologies.

Table 1. Dynamics of telemedicine referrals in Russia (2020-2024)

Year	Number of references (million)	Share of the total number (%)
2020	0,02	0,1
2021	3,4	7,5
2022	9,8	27,3
2023	6,7	19,1
2024	5,2	13,4

The presented data reflect the dynamic growth in the number of telemedicine referrals during the pandemic period, with subsequent consolidation of their share in the health system. Whereas in 2020 such visits were isolated, by 2022 the share of remote consultations exceeded a quarter of all visits. This indicates that telemedicine has ceased to be a marginal tool and has moved to the status of a full-fledged channel of interaction between the patient and the healthcare system.

The maximum values were recorded in 2022, when massive waves of infection continued and the level of restrictions remained high. The drop in the number of applications in 2023-2024 can be explained not by a decrease in demand, but by the adaptation of the medical system: a return to face-to-face appointments, expansion of the hybrid model's capabilities, and partial saturation of demand. However, despite the decline in absolute numbers, the level of telemedicine activity in 2024 remained hundreds of times higher than pre-covision levels.

Telemedicine was most in demand in the management of patients with chronic diseases, mild forms of COVID-19 and in psychiatric and neurological practices. However, its use in emergency care and surgery remained limited.

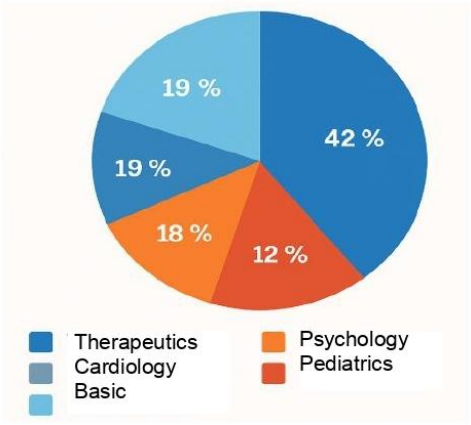

Figure 1: Main areas of telemedicine by number of applications in 2024

The diagram showing the distribution of telemedicine calls by areas in the past 2024 demonstrates a clear shift in the focus of digital health towards therapy, which is due to the universality of this specialty. The dominant share of calls indicates that therapists have become the main link of primary remote contact, taking on a significant flow of patients with a wide range of complaints, including those related to COVID-19 symptoms. This pattern indicates a high degree of public confidence in therapeutic care in a remote format and that it is in this area that telemedicine has proved most adaptable to the pandemic.

Other specialties also showed a marked participation in the telemedicine process, indicating a broadening of the range of tasks solved by digital technologies. The visual distribution in the diagram balances the traditional view of telemedicine as a purely consultative practice and emphasizes the growth of its functional content. Taken together, the image suggests the formation of a multidisciplinary model of remote health care, in which not only general practitioners but also subspecialists participate. This reflects both the changing needs of patients and the development of technological solutions that provide conditions for complex remote interaction in medicine.

Thus, it can be argued that telemedicine not only compensated for the shortage of face-to-face care during the crisis period, but also laid the foundation for long-term changes in patient behaviour patterns. A significant part of the population has become convinced of the convenience and accessibility of the remote format, which encourages repeat visits and forms stable loyalty. In the future, this creates prerequisites for the transition from occasional to systematic use of telemedicine in clinical practice.

Table 2. Main risks of telemedicine according to medical professionals (survey, 2024)

Risk	Mentions (%)
Lack of face-to-face examination	78
Difficulties with technical support	54
Legal insecurity	41
Limited functionality	36
Patient mistrust	27

The results of the physician survey demonstrate the range of problems faced by the medical community when using telemedicine platforms. The greatest concern is the inability to perform a face-to-face examination, a problem that affects the fundamental principles of medical diagnosis. It is the physical examination that is often key to making an accurate diagnosis, especially in cases of complex symptomatology or the presence of comorbid conditions. Consequently, the lack of visual and tactile contact with the patient is seen by doctors as a serious compromise that reduces the accuracy and safety of diagnosis.

Almost half of the respondents also pointed to technical difficulties: unstable connections, failures in platform architecture, lack of integration with medical information

systems. These factors not only slow down the workflow, but also create risks of information loss, double counting or disruption of treatment continuity.

The legal vulnerability of the physician in remote interaction remains an unsettled area. The lack of clear rules for verifying the patient's identity, agreeing on the scope of the consultation, recording the diagnosis and documenting the interaction creates a potential threat to both doctor and patient. This uncertainty makes telemedicine vulnerable to legal implications and reduces the willingness of professionals to actively use it [3].

It should also be taken into account that the limited functionality of telemedicine services, especially in budgetary institutions, hinders the integrated application of these solutions. Limited possibilities of integration with laboratory diagnostics, images, medical histories and electronic prescriptions do not allow us to talk about a complete replacement of traditional appointments [1].

Thus, the identified risks highlight the need for further modernization of telemedicine infrastructure. Without eliminating these problems, it is impossible to ensure the proper level of safety, efficiency and trust necessary for sustainable integration of telemedicine into the overall health care structure.

This study has identified key challenges and achievements related to the use of telemedicine during the COVID-19 pandemic, as well as the directions for its further development. Despite the high dynamics of digital transformation of healthcare, a number of risks associated with organizational, legal, technological and social factors remain in this area. Therefore, it is advisable to develop a systematic set of measures aimed at strengthening infrastructure, increasing patient confidence, optimizing the regulatory framework and improving the qualifications of medical professionals [5].

The first step should be the development of the regulatory and legal environment. With the rapid introduction of telemedicine into healthcare practice, it has become obvious that the existing legislative norms do not fully cover all aspects of remote interaction between doctor and patient. There is a need for detailed regulation of the issues of patient identification, medical confidentiality, and the legal validity of recommendations received in a remote format. This is especially important in light of the growing number of online consultations, in which the doctor does not always have access to the full clinical picture [10].

The next priority should be to ensure technical accessibility of telemedicine. Analysis of practice has shown that a significant part of the population has difficulties in connecting to the services: both due to poor digital literacy and the lack of a stable Internet connection in some regions. To solve these problems, it is necessary to include telemedicine infrastructure in national programmes of digitalization and telecommunication development, as well as to implement educational campaigns aimed at teaching the population basic skills of interaction with digital medical services [7].

Improving the quality of telemedicine services through continuous professional development of physicians is also essential. The remote format requires special competences in the field of communication, information management and decision-making in conditions of

limited visual and instrumental examination [8]. Therefore, it is necessary to form specialized professional development programmes where medical specialists can develop skills in telemedicine platforms, decision-making algorithms and legal aspects of remote consultation [11].

Based on the challenges and opportunities identified in the course of the study, the table presents specific recommendations for the development of telemedicine in the post-pandemic period.

Table 3: Set of recommendations for the development of telemedicine based on the analysis of COVID-19 practices

Direction	Specific actions	Ожидаемый эффект
Legal and regulatory	Updating legislation on telemedicine; introduction of new standards of service delivery	Increasing legal protection of doctor and patient; reducing risks
Infrastructure	Expansion of Internet access; introduction of telemedicine in small communities	Increasing health care coverage; overcoming territorial inequalities
Educational	Development of training and retraining programmes on telemedicine	Improved quality of services; increased professional readiness
Technological	Integration of telemedicine platforms with medical IT systems	Reducing errors; speeding up data exchange
Socio-communicative	Conducting information campaigns; increasing digital literacy of the population	Building confidence in telemedicine; increasing number of users

Thus, only a systematic approach to solving the existing problems can ensure the sustainable development of telemedicine as the most important segment of modern healthcare. It is necessary to recognize that telemedicine has ceased to be an auxiliary tool and is increasingly integrated into everyday clinical practice, which means that it requires appropriate adaptation of all components of the healthcare system - from legislation to staff training [9]. As the risk of new epidemiological challenges persists, the role of telemedicine will only increase, and timely steps in its development will determine the effectiveness of the health care system's response to future crises.

CONCLUSIONS.

The results of the analysis confirm the high efficiency of telemedicine as an anti-crisis tool in the context of the COVID-19 pandemic. Thanks to the large-scale introduction of remote consultations, it was possible to maintain the availability of medical care, relieve the burden of

outpatient and polyclinic link and minimize the risks of infection for both patients and medical staff.

At the same time, significant limitations have been identified that require a comprehensive approach to overcoming them. These include technical and infrastructural inequalities, issues of legal regulation, and the need to develop quality standards for remote diagnostics. It is important to note that telemedicine in its current form cannot replace traditional medicine, but is an effective complement to it.

The prospects for further development are related to the integration of telemedicine platforms into the state health care system, providing access to digital technologies in all regions of the country, as well as training medical professionals and patients to work in the digital environment. Given the results obtained, it can be argued that the future of telemedicine in the postpandemic world is not related to temporary adaptation, but to sustainable transformation of medical practice.

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