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THE MAIN DIRECTIONS OF IMPROVING DISPENSARY MONITORING OF PATIENTS USING DIGITAL TECHNOLOGIES

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ABSTRACT. Modern development of society is characterized by an increase in the pace of socio-economic development, an increase in average life expectancy, demographic and epidemiological changes, which up to date status demands for affordable, high-quality and timely medical care. Over the past five years, the rate of adoption of digital technologies has increased significantly, both in government and private sectors. Wearable electronics (smart watches, fitness trackers), which can determine activity, pulse, amount of oxygen in blood, instability while walking and falls, can transmit data tagged with geoposition to medical institutions and save people's lives. Telemedicine technologies play an important role in providing qualified medical care, overcoming time and territory restrictions in the provision of medical care in remote areas. Remote monitoring systems can detect potential health problems, raise alarms, and notify appropriate individuals or medical services via wireless communications for immediate medical intervention. All this optimizes the load on personnel and equipment, and reduces the amount of resources and budgetary funds involved. The introduction of digital technologies plays a particularly significant role in the organization of dispensary observation. The use of an information system allows medical personnel to effectively compile lists of patients who need clinical observation, issue referrals for laboratory and diagnostic tests, and also register patients for the necessary examinations and clinical examinations without wasting additional time. Thus, the global strategy for the digitalization of healthcare provides an opportunity to improve health, prevent epidemics and pandemics, and develop programs using health data to promote health and well-being.

KEYWORDS: digitalization, telemedicine, digital technologies, artificial intelligence, wearable electronics, medical examination, dispensary supervision, remote monitoring, remote medical services, preventive medical examination

ОСНОВНЫЕ НАПРАВЛЕНИЯ УЛУЧШЕНИЯ ДИСПАНСЕРНОГО НАБЛЮДЕНИЯ ЗА ПАЦИЕНТАМИ С ПРИМЕНЕНИЕМ ЦИФРОВЫХ ТЕХНОЛОГИЙ

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РЕЗЮМЕ. Современное общество характеризуется увеличением темпов социально-экономического развития, ростом средней продолжительности жизни, демографическими и эпидемиологическими сдвигами, что повышает спрос на доступную, качественную и своевременную медицинскую помощь. За последние пять лет значительно увеличилась скорость распространения цифровых технологий, как в органах государственного управления, так и в частном секторе. Носимая электроника (умные часы, фитнес-трекеры), позволяющая определять активность, пульс, количество кислорода в крови, неустойчивость во время ходьбы и падение, способна передавать данные с пометкой о геопозиции в медицинские учреждения и спасать жизни людей. Телемедицинские технологии играют важную роль в обеспечении квалифицированной медицинской помощи, преодолении временных и территориях ограничений в области оказания медицинской помощи на удаленных территориях. Системы удаленного мониторинга позволяют обнаруживать потенциальные проблемы со здоровьем, вызывать тревогу и уведомлять соответствующих лиц или медицинские службы через беспроводные средства связи для немедленного медицинского вмешательства. Это оптимизирует нагрузку на персонал и оборудование и позволяет уменьшить использование ресурсов и бюджетных средств. Особенно значимую роль внедрение цифровых технологий приобретает в организации диспансерного наблюдения. Использование информационной системы позволяет медицинскому персоналу эффективно составлять списки пациентов, которые нуждаются в диспансерном наблюдении, оформлять направления на лабораторные и диагностические исследования, а также записывать пациентов на необходимые обследования и диспансерные осмотры без лишних затрат времени. Таким образом, глобальная стратегия цифровизации здравоохранения дает возможность повысить уровень здоровья, предотвращать эпидемии и пандемии, разрабатывать программы, используя данные о здоровье для укрепления здоровья и благополучия.

КЛЮЧЕВЫЕ СЛОВА: цифровизация, телемедицина, цифровые технологии, искусственный интеллект, носимая электроника, диспансеризация, диспансерное наблюдение, дистанционный мониторинг, дистанционные медицинские услуги, профилактический медицинский осмотр

INTRODUCTION

Health check-up is a priority area in the activities of medical institutions, including a set of measures to promote a healthy lifestyle, prevention and early diagnosis of diseases, effective treatment of patients and their dynamic observation. The main objectives of health check-ups are to preserve the health of people, as well as to actively identify patients in the early stages of diseases and reduce incapacity for work and disability. It plays an important role in the sociohygienic aspect of health check-up.

Medical follow-up is an important component of medical care for persons suffering from chronic diseases, functional disorders and for those who are in the process of recovery from severe acute illnesses. The main purpose of dispensary observation is to prevent complications, timely detection of exacerbations and medical rehabilitation.

The main regulatory legal document of medical follow-up of patients is the Order of the Ministry of Health of Russia from 15.03.2022, No. 168n “On approval of the procedure for the dispensary observation of adults”, based in

accordance with Part 7 of Article 46 of the Federal Law of 12 November 2011, No. 323-FL "On the basis of health protection of citizens in the Russian Federation" (Legislation of the Russian Federation, 201, No. 48, Art. 6724; 2016, No. 27, Art. 4219) [23, 30]. Medical follow-up implies regular examination of patients with various infectious and non-infectious chronic diseases, as well as those who are at high risk or recovering from injuries and poisonings. The purpose of such surveillance is to detect and prevent complications of diseases in a timely manner, as well as to provide the necessary rehabilitation to patients.

Medical follow-up includes preventive medical examinations at the initial visit of the patient and is scheduled within three working days after confirmation of the diagnosis in outpatient conditions or after discharge from hospital. The organisation of the process and the achievement of targets are monitored by the management of the medical organisation, collecting and analysing information on the progress of medical follow-up. The work with patients based on these data is carried out within the framework of established clinical recommendations and standards of care.

Medical follow-up is carried out by a variety of health-care professionals, including general practitioners, specialised physicians, medical preventologists and paramedics at feldsher and obestric stations or feldsher health centres. However, if a specialist for certain diseases or conditions is not available in a medical organisation, a therapist arranges a consultation with an appropriate specialist from another organisation, including through the use of telemedicine technologies.

During medical follow-up, medical workers keep records of patients, inform and train them to monitor their health indicators and organise medical follow-up appointments. During the appointments, the patient's condition is assessed, a diagnosis is made, the effectiveness of previous treatment is evaluated and additional medical measures are prescribed. All information on medical follow-up is recorded in the patient's medical records and a record form.

Medical follow-up is one of the functions of doctors in out-of-hospital institutions, such as polyclinics and outpatient clinics, as well as specialised dispensaries. It is intended for the treatment and prevention of certain diseases and plays an important role in the system of specialised medical care for the population. Dispensaries fulfil the following functions: development and implementation of preventive measures, active detection of sick people at early stages, treatment and rehabilitation of patients. They are specialised medical organisations combining the prevention, surveillance, qualified specialised care and health education. According to the Order of the Ministry of Health of the Russian Federation No. 529n dated 06.08.2013, the types of dispensaries include cardiological, oncological, tuberculosis, endocrinological, skin and venereological, medical and physical culture, psychoneurological, narcological and ophthalmological [24].

Dispensaries provide care to both adult and paediatric patients and include outpatient and inpatient departments. They play a leading role in providing specialised therapeutic and preventive care for socially significant diseases [17, 23, 37, 38].

It is important to note that, if necessary, general practitioners, paramedics and obstetricians keep records of patients on medical follow-up with specialists and form a consolidated follow-up plan for each patient, taking into account all diseases or conditions [39]. In this way, an exhaustive and holistic approach to patient health care is implemented, which includes various aspects of healthcare. Accordingly, the tasks of the health care system include not only the preservation and promotion of public health, but also the formation of an active position to achieve sustainable trends in its improvement, the ultimate goal of which is to reduce mortality and increase life expectancy. The introduction of digital technologies into practical medicine helps to realise these objectives.

HISTORICAL ASPECTS OF THE INTRODUCTION OF DIGITAL TECHNOLOGIES

All over the world, digitalisation has become one of the major trends in modern medicine. The need for digitalisation is explained by the obsolescence of health care systems formed in the last century in the absence of effective medical care and remote monitoring. The United Nations (UN) has recognised the importance of this trend by including a section on Digital Health in the Millennium Development Goals Declaration. This solution makes it possible to

significantly increase the availability of healthcare services.

Medical science has progressed in tandem with the development of practical healthcare. The desire to solve urgent problems and meet the needs of physiology, aerospace and sports medicine has led to the creation of new methods of scientific research based on telecommunications. Thus, the development of telemedicine can be divided into several periods [31].

From 1850 to 1920 there was an early experimental period. During this time, individual experiments were conducted to transmit medical information via telecommunications. They also began to integrate diagnostic tools and communications, and to use telegraphic communication in military field medicine and in emergency situations.

Between 1921 and 1954, the initial systematisation of telemedicine took place. Large and effective radio-based telemedicine networks were established, which became the main instrument of medical assistance to the crews of naval vessels and the inhabitants of isolated territories. Experiments in biological information transmission and video broadcasting were also conducted during this period.

Between 1955 and 1979, telemedicine began to be used on a mass scale. The most significant achievements were large effective telemedicine networks based on interactive videoconferencing and transtelephonic electrocardiography. The widespread use of bioradiotelemetry tools revolutionised the knowledge of physiology. Mobile telemedicine based on satellite communications also began to take shape at that time. Scientific research was conducted and the concept and methodology of telemedicine was developed.

From 1981 to the present, there is a period of technology change and gradual transition to modern clinical telemedicine. The methodology of telemedicine has been modernised along with the personalisation of computer technology, the development of the Internet and the emergence of digital diagnostics.

At the beginning of the XXI century, there has been a significant evolution in information technology — mobility has become one of the main characteristics of this evolution. This was manifested by the rapid growth in the number of portable computers and telecommunications, as well as the increase in the number of Internet users, with about 50% of the audience already in 2016 preferring to use mobile devices to access the Internet [14, 15].

In healthcare, the most common application of information technology is the MIS (medical information system), which integrates various functions such as medical decision support system, electronic medical record, digital research data, monitoring of the patient's condition using medical devices, means of communication between employees, as well as financial and administrative information [8, 22, 27].

The use of the Internet for the purposes of medical organisation management is taking place abroad. Foreign companies General Electric Healthcare and Stanley Healthcare use the "Internet of Things" technology to solve the problem of movement management and control the flow of staff and patients in medical institutions. These systems work on their own platforms and are compatible with electronic document management systems, ensuring interoperability.

An example of successful implementation of such a system is the implementation of AutoBed system in one of the largest medical centres of the USA "Sinai". Developed by General Electric Healthcare on the basis of the "Internet of Things" platform, this system helped to optimise bed allocation, reduce the number of unused beds and create an additional source of revenue for the institution.

Another example is the joint solution of Philips and OpenMarket Philips e-Alert, based on the same technology. This solution solved the problem of MRI machine outages. Using a special sensor, the system monitors the status of MRI devices in real time and warns staff about possible failures even before the equipment breaks down. This has minimised downtime and ensured that MRI devices are serviced according to their actual condition, rather than according to regulations.

In 2019, Skolkovo hosted an important event for healthcare in the Russian Federation. The Centre of innovation and the "Internet of things" in healthcare was established with the participation of the international biopharmaceutical company AstraZeneca, QIAGEN, Factory of Radiotherapy Technology LLC, Russian Post, Sberbank, Stantex, Nokia, as well as PJSC Vimpelcom and General Electric Healthcare. One of the Centre's projects is aimed at solving

the problem of optimising the ambulance route when a medical team visits a patient with acute coronary syndrome (ACS).

THE MAIN DIRECTIONS FOR THE IMPLEMENTATION OF DIGITAL HEALTH IN THE RUSSIAN FEDERATION

At the moment, the main examples of digital health in the Russian Federation are USHIS (Unified State Health Information System) and VIMIS "Prevention" (vertically integrated in the medical information system).

USHIS was created to improve the quality of medical care for citizens of the Russian Federation. The system's operation is based on the principles of global digital health and aims to provide a seamless, cost-effective and convenient service for patients and employees of medical institutions. The goals of USHIS include maintaining electronic medical records, improving coordination between health care providers, reducing duplication of services and ensuring rational use of health care resources. With USHIS healthcare providers have full access to a patient's medical history, allowing for personalised and efficient health care. For patients, this means the possibility of receiving medical consultations at a distance, making an appointment with a doctor via the Internet and receiving electronic prescriptions.

VIMIS (vertically integrated medical information system) "Prevention" provides the possibility of global management of the process of providing medical services to citizens. This includes health check-ups, medical screening and vaccination. With the help of the system, there is a possibility of premature diagnosis of various diseases and tracking of possible deviations from treatment standards.

VIMIS "Prophylaxis" enables medical institutions to keep records of patients in need of preventive measures, follow the process of undergoing medical procedures, and monitor the maintenance of the plan of preventive and dispensary services for patients.

The system is patient-centred and linked to the "My Health" personal account on the Russian Federation's public services portal. Patients can keep a personal log of their own and their children's health, as well as receive a vaccination plan and notifications about the need for vaccinations and health check-ups. This data is available to the doctor who is responsible for the patient's treatment.

VIMIS "Prevention" for the Russian Ministry of Health and sectoral national medical research centres (NMRCs) collects basic data from all health check-ups, vaccinations and preventive measures. Analytics and forecasts are created based on this data, a management decision support system, personnel and equipment requirements are formed [1].

The "My Health" portal of public services is an online platform that aims to provide citizens with convenient access to information about health and medical services. Through the My Health portal, people can make an appointment with a doctor, undergo online consultations, receive prescriptions, track their treatment history and obtain information on their health status. Each user has the right to access their electronic medical records, which simplifies the process of servicing and communicating with medical specialists. The "My Health" portal has become a significant step in the development of the healthcare system. It has increased the availability and quality of services, simplified and accelerated the interaction between patients and doctors, making it more efficient and patient-centred. In general, the portal of public services "My Health" is an example of successful digital transformation of the healthcare sector, contributing to the improvement of the quality of humans life [4, 6, 10–13, 18, 40, 43–47].

THE ROLE OF DIGITALISATION IN MEDICAL FOLLOW-UP

According to the World Health Organisation, more than 70% of all deaths worldwide in recent years have been caused by chronic non-communicable diseases (CNCDs). Four groups of such diseases stand out, accounting for about 80% of all deaths: cardiovascular diseases (17.9 million), cancer (9 million), chronic obstructive pulmonary disease (3.9 million) and diabetes mellitus (1.6 million). It is predicted that by 2030 the mortality from these causes could reach 52 million.

Russia is no exception, as more than 67% of deaths among its adult population are related to CNCDs. As in the whole world, cardiovascular diseases also occupy the first place in these statistics. According to the Russian Ministry

of Health, more than 77,000 people died from cardiovascular disease in January 2020, and although this number has decreased by 9% compared to January 2019, mortality from this cause remains high.

The high workload of the district general practitioner due to the large amount of administrative work often does not allow for a sufficiently comprehensive patient consultation during the visit and reduces the total number of patients seen by the doctor.

There are problems with the work of laboratories and insufficient equipment to carry out the necessary laboratory and functional tests.

In addition, some of the problems are related to the patients themselves:

- the low adherence to treatment;
- lack of or insufficient knowledge of blood pressure measurement techniques;
- inconsistent diary keeping due to irregularity of blood pressure monitoring.

To sum up the data obtained, it should be noted that the organisation and conduct of high-quality medical follow-up is one of the important parts of the work of the district general practitioner, which is aimed at preventing the progression of the pathological process and reducing the number of exacerbations of chronic non-infectious diseases. This, in turn, leads to an improvement in the efficiency of medical follow-up, including a reduction in the number of hospitalisations, ambulance calls for exacerbations of chronic diseases, hospitalisations in the phase of exacerbations and mortality of persons on the medical follow-up register [14].

In most countries in the 21st century, there is a need for active intervention to combat the economic and social consequences of non-communicable diseases (NCDs), which have reached high levels. The UN has recognised that prevention and control of these diseases have become priority issues in light of sustainable development. In order to achieve these 2015 targets, States must take targeted policy and legislative action and provide adequate resources for health systems.

Analysis of changes in the medical follow-up system indicates the need to improve the organisation of patient routing within the medical organisation and to improve communication between medical specialists and patients involved in medical follow-up.

The medical follow-up project provides for continuous and active follow-up of the patient, not just from appointment to appointment, which is achieved through the EMIAS (unified medical information and analytical system).

As part of EMIAS, a special subsystem for dynamic medical follow-up has been created, which includes doctor's and assistant's desks, an electronic medical record and a self-monitoring diary for patients. The introduction of a progressive medical follow-up system will reduce the number of premature deaths and disability among the population.

V.V. Shkarin, E.A. Berseneva et al. concluded that one of the key ways to reduce mortality from cardiovascular diseases (CVD) in the Volgograd region is to improve the diagnosis of CVD in the rural population in order to reduce mortality [35].

One of the new methods used for early detection of electrophysiological changes in the heart is electrocardiogram dispersion mapping (ECG DM). This method is based on the measurement of low-amplitude fluctuations in the ECG signal, which may indicate disturbances in the function of cardiomyocytes, the structure of their cell membranes, mitochondrial energy formation, as well as microcirculation disorders and other factors.

The use of remote cardiac screening in rural areas can improve the quality of life of the villagers, reduce mortality, reduce treatment costs and have a positive social and economic impact. Application of the screening diagnostic method does not require highly qualified medical personnel and can be carried out directly on the territory of the household, which is especially important in rural areas with a shortage of medical specialists. In our opinion, the introduction of the telecardiac screening project for rural population will become a new stage in the development of cardiology service in the health care system of Volgograd Region [8, 32].

G.Y. Bendyuk, M.A. Dokhov et al. consider health check-up as an important organisational means of prevention, which includes various components, such as early detection of cardiovascular diseases and assessment of the risk of their development, preventive counselling, identification of additional examinations to clarify the diagnosis, as well as the establishment of medical follow-up for all persons with detected diseases, especially for those who have such cases for the first time [3].

In the second stage of the work, a model was developed that can predict circulatory diseases leading to temporary disability (TD). To create this model, a neural network was used, which took into account the data on the incidence of TD and the results of periodic medical examinations for the previous two years. The model consisted of three layers: an input layer with 18 neurons, a hidden layer with 23 neurons, and an output layer with one neuron. The neural network was trained using error back propagation and conjugate gradient methods. Three groups were formed for training: training group (2344 individuals), control group (1112 individuals) and testing group (1177 individuals). The training results showed the correctness of the model predictions in the training group to be 90.4%, in the control group to be 92.4%, and in the testing group to be 94.2%. Validation of the model on the testing group showed a sensitivity of 97.7% and specificity of 90.7%.

With regard to the frequency of visits to medical centres due to illnesses, the visibility level for persons in the age group 60 years and older was 185.5% compared to persons in the age group under 25 years. In case of preventive visits, the visibility level was 70.8% and the frequency of such visits decreased with age. Maximum decrease in the frequency of preventive visits was recorded when moving from the age group below 25 years to the age group of 25–30 years (–36.8%) and the second highest (–6.9%) was observed in persons in the age group of 60 years and above.

The main elements of the work were the identification of persons suffering from hypertension and in need of medical follow-up. This definition was carried out by therapists of health centres of preliminary and periodic medical examinations, based on the analysis of risk factors for the development of this disease, as well as on the basis of formed risk groups defined using a neural network model.

The study conducted to analyse the morbidity using the TD before and after the introduction of the Regulation showed a statistically significant reduction in the number of cases of diseases associated with high blood pressure from 43.6 to 31.4% ($p < 0.05$). The Regulations also improved the uniformity of workload at health centres: the coefficient of variation in the number of visits per day decreased from 35.5 to 22.3% ($p < 0.05$) [3].

M.S. Sukhanov, Y.V. Karakulova et al. concluded that different systems of remote monitoring of patients with CHF can influence mortality and hospitalisations related to heart failure. In Perm Krai, a procedure for remote monitoring of patients' health status has been developed and approved as part of a cardiovascular disease control programme. Remote monitoring includes periodic telephone contacts between the operator or medical staff and the patient, which determine the need for further face-to-face counselling, additional examination and treatment tactics. Calls to patients are made every 30 days, and a report on the work done is made every 7 days and submitted to the person responsible for the "Remote Monitoring" programme in the given territory of Perm Krai [25].

Taking into account the procedure of preventive medical examination and health check-up for certain groups of the adult population, it is important to take into account that preventive examination can be carried out as an independent event, or as part of a health check-up, as well as during the first health check-up in the current year. Of particular importance is the medical follow-up of citizens subject to medical follow-up on the basis of approved plans for its implementation. The RMIS UR (Regional Medical Information System for Health Management of the Udmurt Republic) has a section dedicated to medical follow-up, which ensures timely informing of medical workers about the fact of medical follow-up of citizens.

The use of the information system allows medical staff to efficiently compile lists of patients who need medical follow-up on a quarterly or monthly basis. The system also helps doctors to issue referrals for laboratory and diagnostic tests, and to enrol patients for necessary examinations and dispensary check-ups without wasting time.

In cases of acute coronary syndrome and acute cerebral circulatory failure, this information is transmitted through a unified information system to insurance medical organisations. They ensure control over the implementation of recommendations, timeliness of visits and inclusion of these patients in the dispensary record [2, 28, 29, 42, 47].

In view of the identified opportunities for monitoring and analysing the medical follow-

up of patients with angina pectoris according to the invoices-registers, as well as according to the results obtained, an information system for managing medical follow-up of such patients was developed. Management of medical follow-up of patients with angina pectoris on the basis of their electronic database in cooperation between TFOMS (Territorial Fund of Compulsory Medical Insurance), IMO (Insurance Medical Organisation), MIAC (Medical Information and Analytical Centre), MO (Medical Organisation) and the Ministry of Health of the Region leads to increased coverage of such patients with medical follow-up and outpatient treatment. This helps to reduce the risks of myocardial infarction in angina pectoris and save money from the CMI (compulsory medical insurance) fund [20].

When conducting a comparative analysis of clinical endpoints in the group of patients suffering from tension angina pectoris for 2017 and 2019, a significant and reliable reduction in the number of emergency calls and emergency hospitalisations was found. In 2017, out of 13,208 patients with this pathology, 4,445 (33.6%) experienced emergency calls and emergency hospitalisations, whereas in 2019, the number of such cases among the same patients, but among 10,205 patients, was 2,908 (28.5%). The obtained data in the same group of patients suffering from angina pectoris indicate that the implementation of information management technology for the quality of medical follow-up is effective and productive. Based on the analysis of large amounts of medical data, the developed technology of information management of the quality of medical follow-up in ischaemic heart disease contributes to the improvement of treatment efficiency and leads to an increase in the number of patients under medical follow-up for angina pectoris and myocardial infarction, as well as to a decrease in adverse outcomes [19, 21, 36].

A pilot project carried out in an urban polyclinic aimed to evaluate the effectiveness of remote blood pressure monitoring in achieving target blood pressure values, patient adherence to antihypertensive therapy and the dynamics of using fixed drug combinations, as well as reducing emergency medical calls.

The results of this study indicate that the use of remote blood pressure monitoring for 6 months leads to a 3.1-fold increase in adherence to antihypertensive treatment. In addition, there is a decrease in the load on ambulance crews, reducing the number of calls by 12.5% [41].

Within the framework of the same pilot project, the effectiveness of comprehensive rehabilitation of patients after stroke was assessed using the method of telephone interviews, which also showed a high level of effectiveness.

Since 2009, a regional vascular centre (located in the Krai Clinical Hospital) and 8 primary vascular departments (3 in Krasnoyarsk and 5 in the regions of the Krai) have been functioning in Krasnoyarsk Krai. All of them are united by a single electronic monitoring system. There are also rehabilitation centres that provide level II and III care (inpatient and outpatient care at the Federal Siberian Research and Clinical Centre of FMBA of Russia and outpatient treatment at the Professor's Clinic of the Krasnoyarsk State Medical University named after Professor V.F. Voyno-Yasenetsky). All inpatient clinics operate in accordance with the Order of the Ministry of Health of Russia No. 1705n of 29.12.2012 on the organisation of medical rehabilitation. The research programme of the pilot project "Improving the system of medical rehabilitation in Russia" covers all stages of care for patients after stroke.

As a result of the telephone interview I.Yu. Gordyukova, S.V. Prokopenko and others report that 90 days after admission to hospital it was found that 96% of patients are able to move independently. The results of remote monitoring showed that more than half of the patients were grateful for the treatment and would like to undergo the rehabilitation course again.

This shows that the telephone interview method is an effective means of monitoring patients during the recovery period after stroke. It makes it possible to assess the patient's mobility, his/her ability to perform arbitrary movements and indirectly assess the degree of disability and independence [7].

The results of the study showed that the optimised medical follow-up programme for patients with atherosclerosis of the lower limb arteries reduced the risks of acute ischaemic events and hypertensive crisis. Fewer unplanned and emergency hospitalisations were noted in the main group. In addition, existing literature suggests that telemedicine monitoring may be more effective and cost-advantageous compared to traditional face-to-face monitoring.

Analyses of the results of medical follow-up of patients with chronic obliterative disease of the lower limb arteries in the remote period showed that there were fewer deaths and fewer cases of severe lower limb ischaemia in the main group. This indicates the effectiveness of using remote telemedical follow-up as part of an optimized medical follow-up programme [9, 16, 26, 33, 34].

At the moment, a pilot project under the auspices of the Ministry of Health has been launched in the Russian Federation to remotely monitor the health status of patients with diabetes and hypertension. The implementation of the project, called "Personal Medical Assistants", began in 2023 and will continue until the end of 2024.

The essence of the project is to provide patients with special diagnostic devices. The indicators collected by these devices are automatically transferred to a digital platform, where they are processed by specialists from the E.I. Chazov National Medical Research Centre for Cardiology and the National Medical Research Centre for Endocrinology.

All data collected as part of the project are combined on the information platform in an anonymised form, checked for security and sent to medical organisations for further use. This ensures that all patients' personal data is safe, confidential and protected from leaks.

Remote monitoring and subsequent data processing are aimed at collecting the most complete information on the patient's health status, which affects the quality of medical decisions. In particular, such indicators as blood pressure and pulse rate in patients with cardiovascular diseases and blood sugar levels in patients with diabetes are monitored.

The project is expected to reduce the incidence of complications and acute conditions in patients with these diseases. By the end of 2024, the project "Personal Medical Assistants" is planned to cover up to 25 thousand patients with remote health monitoring [5].

CONCLUSION

Digitalisation of the healthcare system within the framework of the national project approved by Presidential Decree No. 204 "On National Goals and Strategic Objectives for the Development of the Russian Federation for the Period until 2024" plays an important role in improving healthcare services. The implementation of the platform (USHIS) in all segments of the Russian Federation has made it possible to provide a single format for the exchange of medical information, which has made it possible to integrate data from different sources and improve the availability and quality of medical care. An example of the successful implementation of digital solutions is the "My Health" portal of state services, which provides electronic certificates of incapacity for work, appointment booking and online access to analyses. Telemedicine technologies play an important role in providing qualified medical care, overcoming time and territorial limitations in the provision of medical care in remote areas. Remote monitoring eliminates gaps in the health care system, engages patients through mobile devices and enables the detection of health problems. Remote monitoring systems allow notification of relevant individuals or medical services via wireless communications for immediate medical intervention. This optimises the workload of staff and equipment and reduces the use of resources and budgets. Thus, a global digital health strategy offers an opportunity to improve health, prevent epidemics and pandemics, and develop programmes to promote the health and well-being of people.

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

Competing interests. The authors declare that they have no competing interests.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

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