Nina E. Rusanova[1]
The Institute of Social and Economic Problems
of Population of the Russian Academy of Sciences.
Russian Federation, 117218,
Moscow, Nakhimovsky prospect, 32
http://www.isesp-ras.ru/

History and issues of digital healthcare in Russia

Abstract. The article is devoted to the history and current issues of the digital healthcare system in Russia. The issues of the correspondence of the population's need for modern medical care and public health responses are considered, the results of which are reflected in a change in qualitative demographic indicators.

Keywords: health, digital healthcare, telemedicine, digital economy

JEL codes: I14, I18, N94

Introduction

Relevant goals of the demographic development of Russia are to increase the birth rate and increase life expectancy, which cannot be achieved without an effective system of health protection. The specificity of modern healthcare based on the use of technological innovations assumes active participation of the population in maintaining their own health and responsibility for it, that is, the formation of self-preserving behavior that meets individual needs of the person, on the one hand, and takes into account the rapidly growing capabilities of medicine, on the other. In this connection, the task arises of investigating the adequacy of the needs of the population and the responses to them from the public health sector, the results of which are reflected in the change in qualitative demographic indicators. Today, these problems are of particular importance in the context of digital healthcare as part of the innovative "digital economy" of Russia.

1. The concept and history of digital healthcare

In 2017, Presidential Decree No. 203 approved the "Strategy for the Development of the Information-Oriented Society in the Russian Federation for 2017–2030", where digital economy is defined as "an activity in which the key factors in

[1] Nina E. Rusanova, Doctor of Economics, Associate Professor, Leader Researcher of the Institute of Social and Economic Problems of Population of the Russian Academy of Sciences. E-mail: ninrus238@mail.ru.

production are data in digital form, processing large volumes and using analysis results of which, in comparison with traditional forms of management, can significantly improve the efficiency of various types of production, technology, equipment, storage, sale, delivery of goods and services" [Decree..., 2017] and established several areas of work for the period up to 2025, one of which is digital health (digital health, digital medicine — *"digital healthcare", "digital health"*) — the use of information and communication technologies to solve health issues. In recent years, telemedicine technologies (TMT), which are understood as remote development of medical, consultative-diagnostic and methodological assistance, as well as remote training of medical specialists, have received significant development and active use in the practice of world health.

"Digitalization" is one of the leading trends in modern healthcare around the world, the necessity of which is based on "moral obsolescence" of the health protection systems formed in the last century in the relevant socio-economic and technological conditions, in the absence of highly effective medical care and remote control. In this regard, the United Nations has included the section "Digital Health" in the "Millennium Development Goals Declaration", which will significantly improve the scope for universal health coverage (UHC), which according to the World Health Organization (WHO) seeks to ensure that all people receive quality health services in the right place and at the right time without the financial hardships associated with it, when it becomes necessary to choose between obtaining healthcare services and meeting other basic needs. UHC assumes focus of health systems on people, not illnesses; providing the necessary assistance in the right place and at the right time; a low level of payment for medical services, which does not lead to impoverishment of patients; absence of the need to choose between obtaining health services and meeting other basic needs [World Health Day..., 2018]. UHC is of great importance for the effectiveness of the national economy, social stability and well-being, security and individual productivity [Together on the road..., 2017], for which the share of payments made by patients at their own expense should not exceed 15% of the total expenditure on healthcare [Tracking Universal Health Coverage, 2017].

The evolution of remote delivery of medical care and services is based on the progress of telecommunications. At the same time in each time period the most modern and advanced technologies were used for telemedicine purposes. In certain periods, telemedicine became a powerful means of acquiring fundamentally new arrays of medical knowledge (for example, as in the case of radiotelemetry). Regardless of the evolution of healthcare systems and models, the availability and timeliness of medical care (both primary and specialized) remained an extremely pressing issue. However, the attitude towards it progressed quite clearly: awareness of the existence of the problem was replaced by target models (for example, centers of marine radiomedicine, sanitary aviation), and

those in turn evolved into full-fledged telemedicine networks that solve both clinical-organizational and educational problems. Medical science evolved alongside practical healthcare: relevant tasks and pressing needs of physiology, aerospace and sports medicine literally forced creating new methods of scientific knowledge based on telecommunications. Thus, periodization of telemedicine is possible [Vladzimirsky, 2015]:

- 1850–1920 — the early experimental period: single experiments on the transfer of medical information through telecommunications, the first steps to integrate diagnostic devices and communications, episodes of telegraph communication in military medicine and in emergency situations;
- 1921–1954 — the period of primary classification: large effective telemedicine networks based on radio communication, which are the main instrument of medical assistance to crews of sea vessels and the population of isolated territories (in conjunction with sanitary aviation), experiments on the transfer of biological information through communication channels, video transmission;
- 1955–1979 — the period of large-scale application: the bloom of large effective telemedical networks on the basis of interactive videoconferencing and transtelephone electrocardiography (with automated interpretation including); the revolution of knowledge in physiology due to the wide introduction of instruments of bioradiotelemetry; formation of mobile telemedicine on the basis of satellite communication; scientific research in the field of effectiveness followed by the development of the concept and methodology of telemedicine;
- 1981 to present — the period of technology change and gradual transition to modern clinical telemedicine: modernization of the methodology on the background of personalization of computer equipment, development of the Internet, the emergence of digital diagnostics.

In 1997, the Telemedicine Foundation was established and a draft program for Telemedicine, approved by the Ministry of Health of the Russian Federation and the Ministry of Science of the Russian Federation, was elaborated. In 2012, about 600,000 automated workplaces for medical personnel were connected to the Unified State Health Information System (USHIS), and the number of equipment enabling the organization of videoconferencing sessions increased from 887 units in 2009 to over 4,000 in 2012. [Levanov et al., 2017].

2. Structure, subjects and objects of digital healthcare

To provide citizens with a constitutional right to health protection, the modern model of the healthcare system should use such already existing elements of "digital healthcare"; as modern diagnostic equipment, angiography, laparoscopy,

medical statistics that enable collecting and processing large amounts of data ("*big data*") to take optimal strategic solutions. To this end, in Russia "in 2019, as a whole the formation of a system of telemedicine consultations between medical organizations of different levels will be completed. In 2020, the formation of a unified state health information system on the basis of a unified electronic medical record of the patient will be completed as a whole,. From 2020 onwards, digital monitoring of the health of patients from risk groups will be gradually introduced with the help of individual devices measuring blood pressure, pulse, concentration of glucose and other elements in the blood, position in space, etc., with the inclusion of an emergency response system when these parameters change to critical values. It is planned that, starting from 2020, computer-based *big data* processing programs will begin to be introduced that will enable automatic selection of algorithms of medical support for each person taking into account telemedicine consultations" [Gusev, 2017]. The basis of such a forecast is the fact that medical information technologies in Russia today reach 80-90% of the national market of computer systems, forming the five main trends of digital medicine [Digital Health..., 2018]:

1. Personalization of health care, which enables selecting medicines not for an abstract patient, but for a specific person.
2. Blockchain, which involves distributed storage of information on different computers.
3. Preventive medicine, enabling timely detection of the cause of a disease (with the help of "smart gadgets" and genetic analysis) and preventing it (for example, through control of nutrition and physical activity).
4. The rise of the role of smartphones, which provide the storage of useful information in mobile applications (digital prescriptions, analysis data, ultrasound, CT and MR-image, etc.), as well as communication with the doctor and monitoring of chronic conditions.
5. Artificial intelligence to improve the accuracy of diagnosis.

An effective complex of digital medicine includes a set of remote interaction services with a doctor, devices for remote monitoring of the patient's life indicators, including self-diagnosis, a single database of patients and medical facilities, online medical data exchange and specialists' consultations, as well as Internet frequency analysis of thematic user inquiries, allowing to determine the onset of epidemics or the increase in the number of specific health disorders in a particular region.

Today, no medical institution can provide the same high quality of medical care for all diseases, so the doctor is forced to seek consultations with more qualified colleagues in difficult cases. World statistics show that about half of the primary diagnoses are wrong, and the number of consultations that are conducted annually for the correct diagnosis is 5–8% of the country's population; for Russia with a population of approx. 146 million people it is about 12 million

consultations per year [Teimurazova, 2017]. The use of digital technologies "dilutes" the boundaries of a medical institution, region, the state and allows organizing interaction between patients and medical workers located in any points of the Earth where there is connection. In fact, there is a single distributed in-space medical institution that assists any patient — telemedicine is a cross-border tool for the provision of medical care. In Russia, the relevance of these problems is confirmed by federal law, which came into effect on January 1, 2018 and regulates the activities of digital medicine, in particular, prohibiting remote diagnoses.

Digital health requires a developed digital infrastructure, the ability of health workers to learn it and the willingness of the population to take advantage of it. To make a diagnosis, several groups of medical data are usually used: complaints of the patient and medical history (the source is only the patient himself), examination by the doctor (determination of clinical symptoms), if necessary, instrumental examination (radiography, ultrasound, CT, MR-image, etc.), laboratory and morphological studies (blood tests, cytology and etc.). If traditional medicine focuses primarily on the first two groups of data, the digital one gives priority to instrumental research, as well as generalization of large data sets, blockchain technology and artificial intelligence. This requires a single unified classification of medical data, enabling digitization of subjective and objective information about the state of health.

Of all the stages of medical care — primary and secondary prevention, clinical examination, screening, diagnosis, treatment, rehabilitation, tertiary prevention, palliative care — modern digital medicine developments are effective at the stage of an already developed disease for differential diagnosis, i.e. medicine curative, but they are not enough at the stage of preventive medicine, based on the treatment of complaints and the patient's health history.

The Internet, as well as general technological progress, has significantly changed the ways in which doctors receive and use information. Social networks such as *Facebook*, *Twitter*, *LinkedIn* and *YouTube* are already used to train medical personnel, provide information to patients or doctors. They enable rapid interaction in crisis situations, as they are more and more intrusive and have significant influence in many countries, including those where the average income of citizens is at medium or low levels. The use of social networks to promote, disseminate and discuss medical knowledge, initiatives, projects, research, news and other activities among peers has now become one of the most effective ways of communication, more useful than traditional methods. Social networks not only allow users to find out what people from their circle of communication are doing, but they also facilitate automatic selection of necessary information, reputation management, increase compulsion, responsibility for quality and virus destruction of information and applications. A successful example of the use of social networks among modern and future European general practitioners is the

Vasco da Gama movement (*VdGM*), which is a working group within the European Council of the WONCA (World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians.). The WONCA European council includes 47 participating organizations and represents 75,000 family doctors in Europe. Even in cases where the accounts were managed by doctors, the published content was professionally prepared; all communications corresponded to the same standards. But those who took part in this did not receive any compensation for their efforts and time spent. Potentially, this can even lead to their "burning out", jeopardizing the key element of the strategic plan and the duration of network communication. Despite the fact that LinkedIn is considered the most professional network, Facebook has become the most popular channel for communication in this young community by promoting knowledge and information sharing on joint projects, scientific and medical educational programs, and providing interaction, opportunities for brainstorming and creating new ideas. Doctors and health professionals should use the power of social media to facilitate interaction not only with peers and colleagues, but also with patients and generally with the entire population. Promoting "online professionalism" and preparing the ground for the creative development of colleagues require the proper use of social media [Gomez Bravo et al., 2016].

3. Needs for self-preserving behavior of the population and the capabilities of digital healthcare

The development of digital healthcare in the world has shown that it has achieved the greatest clinical effectiveness in addressing the problems of women's health, oncology, functional diagnostics, and the formation of a healthy lifestyle. In the context of the spread of the epidemic of noncommunicable diseases (NCDs), that is, heart attacks, strokes, cancer, diabetes and asthma, leading to premature death and disability of the able-bodied population, this becomes an important factor not only to improve public health and improve the quality of human capital, but also reducing the cost of effective treatment. Two thirds of the companies involved in digital medicine are located in the United States, 19% in Britain, and 5% in Germany. 30% of the developments are dealing with surgical topics, 19% with the development of new drugs, 13% with telemedicine technologies, 10% with healthy lifestyle and fitness projects. However, the main trend is the use of new types of data for drug development, as pharmaceutical companies note a fall in drug sales that fit the vast majority of people, without taking personal therapy into account [Digital Health..., 2018]. As a result, in the USA, after the introduction of telemonitoring and consulting medical services, the number of hospitalizations and visits to clinics among diabetics decreased by 58%, in the Netherlands, the number of hospitalizations in cardiac departments of hospitals decreased by 64%,

there are 39% less visits to clinics, and hospital stay for treatment decreased by 87% [A digital approach..., 2017]. In Europe in 1999-2002 an examination of the structure of the telemedicine area was performed, which initiated new projects, including EMDIS (European Marrow Donor Information System), EPIC (European Prototype for Integrated Care), FEST (Framework for European Services in Telemedicine), ISAAC (Integrated Support Communication System), NUCLEUS (Customization Environment for Multimedia Integrated Patient Dossier), SHINE (Strategic Health Informatics Network for Europe).

Traditionally, the dominants of the protection of women's health focused on the problems associated with pregnancy and childbirth, but not all women know that the main cause of women's deaths are cardiovascular diseases, and therefore postpone application for appropriate medical care. Telemedicine gives every woman the opportunity:

- To quickly get necessary information.
- To get access to databases where information about women's health will accumulate.
- Obtain processed and sorted by certain criteria information intended for women of certain categories (for example, those suffering from certain diseases or engaged in work related to occupational hazards, etc.).

In countries that already have "digital" traditions and a developed telecommunications structure, remote medical assistance can provide some medical manipulation by the patient's own capacities at home. For example, the *British Medical Journal* ("*The BMJ"*) describes the results of independent medical abortion for 1,000 women from Ireland and Northern Ireland (where abortions are permitted only in case of a threat to life) in 2010-2012. After receiving the pills for abortion by post, women underwent an abortion procedure with real-time instructions and support from an online service controlled by doctors. 95% of these independent abortions were successful, less than 1% of women reported having a necessity for blood transfusion, 2.6% indicated that they needed antibiotics, less than 10% noted symptoms of potentially serious complications, and almost all of them sought medical help in person when they were given such a recommendation [Mingalieva, 2017].

In Russia, one of the positive examples of using digital healthcare opportunities in remote regions is the Jewish Autonomous Region (Khabarovsk Territory), where the practice of virtual detour by neonatologists of women in the first days after discharge from the maternity hospital was introduced. A remote engineer with telemedicine equipment comes to the house of the woman who has given birth and organizes a session with the neonatologist in real time. Doctors of the regional center of obstetrics and gynecology conduct up to 3,000 remote consultations per year, which made it possible to halve the complications of pregnancy [Telemedicine in the service..., 2012].

Oncological diseases are one of the main causes of death in the world: in 2015, 8.8 million people died from this disease. The most common deaths come from lung cancer (1.69 million deaths), liver cancer (0.788 million cases), colon and rectal cancer (0.774 million), stomach cancer (0.754 million), breast cancer (0.571 million). Cancer is the cause of almost every sixth death in the world, approx. 70% of deaths from cancer occur in low- and middle-income countries, a common problem is the recourse to late-stage medical care and the inaccessibility of diagnosis — in 2015, only 35% of low-income countries reported having publicly available pathology services in the public sector. Over 90% of high-income countries and less than 30% of low-income countries reported on the availability of appropriate medical services. [Cancer... 2018]. A common problem is the recourse to medical care in late stages of the disease and inaccessibility of diagnosis. Currently, 30-50% of cancers could be prevented by avoiding risk factors and implementing appropriate evidence-based prevention strategies, as well as by early detection of cancer and management of cancer patients. This requires a set of procedures such as vaccination, clinical evaluation, endoscopy, medical imaging and nuclear medicine, surgery, laboratory and pathology, radiotherapy, systemic therapy, palliative care and end-of-life care [WHO list..., 2017]. The main components of early detection of cancer — early diagnosis and screening — are based on modern digital technologies, but these are quite complex and expensive methods.

Thus, at the level of modern medical technologies, the benefits of "digitalization" are obvious for the timely diagnosis and treatment of diseases that are one of the main causes of high female mortality, for example, equipping medical institutions with digital mammography machines. Online consultations that are provided by specialists on thematic sites and forums, educational information aimed at improving the culture of self-preserving behavior of the population, and the rationalization of labor in medical institutions where the majority of those working are women, are of great importance.

The American venture fund RockHealth, which invests in digital medicine projects, conducted a study of making consumer decisions regarding various categories of digital health. Out of over 4,000 adult Americans surveyed, only 12% of respondents are ready to use portable gadgets for health monitoring, 17% are willing to perform mobile health control, and only 7% are willing to use telemedicine. Gadgets are required mainly for those who want to become more active and lose weight, and if their first buyers were young and generally healthy people, but now a third of the new users have at least once been on inpatient treatment during the year preceding the survey. Over 50% of respondents use gadgets to control weight, approx. 25% — to control blood pressure, approx. 15% — to control sleeping [Digital medicine..., 2014].

In the Russian Federation, at minimum, there are approx. 0.5 million users of smart gadgets. Among respondents with such chronic problems as insomnia,

headaches and stress, most active monitoring is behalf those with sleep disorders, and most of all they are interested in controlling activity — over half have pedometers. Among those suffering from chronic stress, over 30% monitor neither weight, nor pulse, nor their own activity, only 18% regularly register their own health parameters, over 50% admit their own responsibility for health, over 30% thoroughly care for their health, but only 7% are willing to independently pay for health services and goods [Digital medicine..., 2014].

4. Problems of digital healthcare (patient, professional, institutional)

According to WHO, the success of the development of telemedicine depends, first of all, on the level of economic development: the overwhelming majority of existing telemedicine services are provided in countries with the highest income [Telemedicine..., 2012]. The most economically developed countries, as a rule, have sufficiently developed a technology and information and communication infrastructure, freedom in allocating resources within the healthcare system, as well as greater support in conducting experiments and research on new approaches to healthcare. This creates the potential for more formalized and systematic development and implementation of telemedicine solutions. Telemedicine initiatives in lower-income countries are informal, not part of a structured telemedicine program, but remain part of the occasional remote link between local specialists and medical advisory institutions. In the years 2000-2014 there was a decrease in the share of public funds in the financing of the health sector, which limits access to medical care for people with low and middle income [Barroy..., 2017].

Despite the active self-preservation behavior of the population of all ages, that is, the interest in preserving and improving health, the opportunities for remote healthcare are ambiguously perceived by Russians — according to ResearchMe data, even among "advanced" Internet users aged 25–34, every second responder refers to telemedicine skeptically, mainly due to inaccurate data, the possibility of leakage of personal information and the qualifications of physicians working remotely. Although in 2017 the RF law on telemedicine services was adopted, only 7% of respondents know about this, 36% "have heard somewhat", and the rest do not know anything about it. Only 57% of those familiar with the regulation of telemedicine activities agreed to a remote consultation with a doctor [in video chat formats (42%), telephone conversation (26%), messenger (21%)]; mostly women aged over 45 [**Mingalieva, 2017**].

The professional medical community is also ambivalent about digital healthcare: some believe that remote patient support "will increase the number of medical errors", others — that it will "help in timely diagnosis in difficult clinical cases and will give great opportunities for MR-image, CT and morphological

studies, will enable producing qualitative conclusions and will elicit an economic effect". This was shown by a sociological survey conducted in 2017 among 1,024 practicing physicians and 101 healthcare organizers from all regions of the Russian Federation [Kubrik, 2017]. 89.0% of them knew what telemedicine was, and doctors were ready to devote 19.0% of their working hours to accompany patients with telemedicine, although they believed that general practitioners would be in demand in telemedicine — 60%, cardiologists — 53%, therapists — 51%, pediatricians — 46%, gynecologists — 19%, nurses — 9%. Among practicing physicians 79% already had experience of remote communication with patients (via "Skype™", e-mail or telephone). Subscribers of medical workers were: patients known to the doctor — 75%, known patients who are away — 52%, personal acquaintances of respondents — 65%, acquaintances of known patients — 34%, people unknown to the doctor — 23%, relatives of this doctor — 3%. 55.0% of doctors are ready to start consulting patients remotely (in a text chat or video) if they are provided with special equipment for remote communication by the clinic, however attempts to introduce tools for remote communication with patients were made in only 56% of private clinics and only 20% of state medical organizations. 56% of healthcare executives believe that the cost of telemedicine consultation should be lower than the cost of admission at a clinic, 37% — similar to the cost of consultation at a clinic, 7% — higher.

45% of medical organizations maintain an electronic card of the patient (ECP), 25% of institutions do not have a medical information system (MIS). The average score given by doctors to how convenient it is for them to work in the MIS is 4.43 out of 10.

Half of the doctors and ¾ of healthcare executives think that the patient needs a personal account on the clinic's website or mobile application, but only 45% of medical community representatives believe that the information from ECP should be duplicated in the patient's account: there should be no information "about the diagnoses and objective status of the patient, as patients often misunderstand medical terms and become frightened", "the results of laboratory tests for HIV prior to post-test consultations", there should be no such information as: "preliminary diagnoses"; "information that may psychologically "injure" the patient", "incomprehensible terms may provoke iatrogeny", "the patient's mental status", "information relating to STDs, psychiatry, oncology, etc.", "related with a fatal outcome", "information should be transferred at the doctor's discretion", "it is the information that the patient wants that must be transferred".

Informing patients before reception by administrators by phone is practiced in 33% of medical organizations, in 8% — through SMS messages, but every third clinic does not remind patients of admission at all, and 89% use IT and telecommunications to assess the level of satisfaction of patients (through surveys, reviews, etc.).

According to the Survey of the medical community on digital medicine and the automation of clinics in 2017, 14% of representatives of the medical community wear devices for health monitoring, for example, "smart" watches, fitness bracelets, as it motivates — 64%, should try such things as specialists — 49%, this is the future — 39%, enjoy being in the trend — 13%. At the same time, 41% of doctors believe that data from wearable devices can help make medical decisions, if a person wears them outside the clinic, 23% believe that only the measurement of physiological parameters by the doctor himself will help make decisions, and 20 % of respondents are sure that such data can only help if the device has a certificate of state registration. A significant number (17%) of respondents believe that measurement results from wearable devices will not help to make medical decisions [ONDOC, 2017].

One of the tasks of the State Program of Health Development of the Russian Federation for 2013-2020 is the creation of the Unified State Health Information System (USHIS), a component of which is the service "Appointment with a doctor in a digital form" which allows, in particular, shortening queues in polyclinics. To find out what difficulties the patients encounter when using this service, the Ministry of Health of the Russian Federation launched an Internet survey on November 21, 2013, to which 6359 people responded. (Table 1).

Table 1. Distribution of answers to the question: What difficulties did you face when using the service "Appointment with a doctor in digital form"? (%)

Question	Share
1. Absence of actual schedules of medical institutions	18.4
2. Denial of admission	16.6
3. Problems in the work of portals/systems of appointment to the doctor in the subjects	31.2
4. Problems in the work of the *gosuglugi.ru* portal	9.9
5. Other	14.9
6. I did not encounter difficulties	9.0
Total	100

Source. Calculated on the basis of data from: [Ministry of Health of the RF, 2018]

As the survey showed, the absolute majority of respondents (91%) faced problems when using one of the simplest, but at the same time most necessary services. Only one in ten patients who need full-time medical consultation could get it without hindrance, and over 40% (31.2% + 9.9%) of the applicants could not do this because of infrastructure problems, i.e. instability of Internet portals. Thus, the task becomes institutional, since the accessibility of the social Internet is determined by the state.

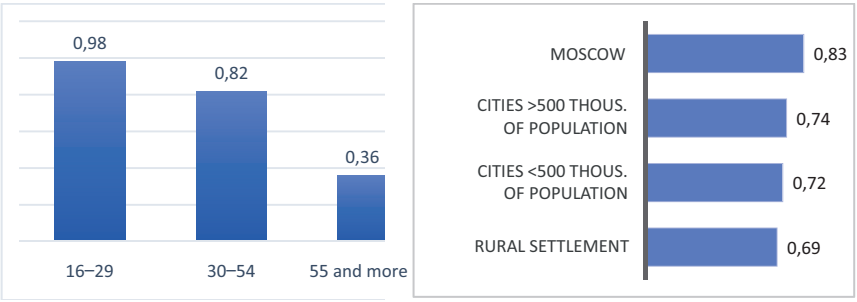
Another institutional problem of USHIS is the legal and regulatory framework for telemedicine activities, which is in the process of being formed. In particular,

this refers to the notion of "informed voluntary consent" (IVC), which, in accordance with Art. 20 of the Federal Law of the Russian Federation of November 21, 2011 No. 323-FL "On the Fundamentals of Protecting the Health of Citizens in the Russian Federation" is a necessary precondition for medical intervention [Federal Law..., 2011]. Telemedicine services are a relatively new class of services, their specificity is the combination of medical, information and telecommunication technologies. The agreement on tele-consultation provides that the patient received all necessary information and explanations about the subject of tele-consultation; the consent form must be signed by the patient and documented by the person to whom they applied for help in the case history; the consent and purpose for which it was received should be reported to the counselor who needs to ascertain the correct information about the patient and his consent; the patient should be informed of the typical risks (for example, illegal access to patient data and their further uncontrolled transmission, interruption of data transfer due to technical problems due to equipment malfunction, interference during data transmission or interruption of satellite broadcasting, etc.). In this case, the result of tele-consultation is beyond the scope of the transaction, i.e., its achievement is probabilistic and depends on many factors, therefore, the IVC should highlight possible options for the results of the consultation.

5. Prospects for digital health in self-protective behavior

Modern IT technologies create fundamentally new opportunities for medicine. The introduction of information technology into healthcare practice promptly changes the ways of diagnostics and treatment, forms of doctors' interaction with patients and colleagues, the organization of treatment and restoration of health. All this improves the quality of life of Russian citizens. "It should not just provide polyclinics and hospitals with the Internet, - said the President of the Russian Federation Vladimir Putin, — but to ensure that citizens get appointments and undergo tests without stress and queues, including older people who do not always understand such concepts as "Information technology" and "digital appointment." And doctors would get rid of unnecessary paper work and spend more time on the patient, continuously improve their qualifications on-line to seek advice from colleagues from regional and federal centers" [Digital medicine..., 2017]. Thanks to digital medicine today in Russia it is much easier to achieve reception by the necessary specialist and get timely qualified help. So, there is a digital appointment system, which is available to Russian citizens through the use of the Internet. In particular, the digital portal of government services provides such an opportunity. The issue of digital prescriptions and hospital cards has proven itself positively. Entrepreneurship is developing — there are various digital systems for automation of work inside medical institutions, as well as medical social networks for doctors and information media portals

on the Internet. The good prospects for digital health in Russia are determined by the fact that approx. 2/3 of Russians over the age of 18 use the Internet (fig. 1), but the problem is that with age, when the need for medical care grows, this indicator decreases [Development of the Internet..., 2016]. Only 5% of retirees are able to handle a computer or a smartphone and to use the Internet, and in the Russian regions, 28-67% of pensioners live in homes without adequate comforts [Shamraeva, 2017], and, probably, do not have stable digital communication.



a) b)

Fig. 1. Distribution of Russian Internet users by age (a) and type of settlement (b) [The GfK study: Distribution..., 2017].

In the past decade active work on computerization of the healthcare system in Russia was performed. Currently the peak of this activity is observed. Medical information systems are implemented in 83 regions of the Russian Federation. A total of 57% of the physicians automated workplaces are connected to MIS. In these MIS, digital medical records of patients are maintained. In 66 regions of the Russian Federation, automated dispatching systems for sanitary vehicles have been introduced. In 75 — automated systems of preferential medicinal provision were introduced. In 83 subjects of the Russian Federation, digital recording systems for admission to a doctor have been implemented [Digital medicine..., 2017].

The strategic program for the development of the Internet in healthcare is calculated up to 2020 and for a further period in the following areas:

- health management (online consultations for citizens in health issues);
- development of telemedicine systems;
- remote education of doctors in the system of continuous medical education;
- management of intellectual systems in healthcare;
- creation of medical data warehouses;
- management of scientific research in healthcare and exchange of scientific data between physicians;
- distance drug trade and digital document management.

However, up to now, the daily professional activity of medical workers is complicated by the preservation of routine directions and methods, in which modern remote technologies have a supporting role (for example, computer information is duplicated on paper, and documentation remains one of the functions of iatric, but not average medical personnel).

A characteristic feature of the evolution of IT in the early 21st century was mobility, i.e. the rapid growth in the number of portable computer and telecommunications facilities, as well as the number of Internet users — in 2016 approx. 50% of the audience uses the Internet on mobile devices [The GfK study: Òrends..., 2017]. The most commonly applied IT tool in healthcare is MIS, which combines medical decision support, DMC, medical research data in digital form, patient monitoring data from medical devices, communication tools between employees, financial and administrative information [Sverdlov, 2014]. For several recent years, "digitalization" and a revolutionary jump in the availability of the Internet have led to the fact that previously inaccessible telemedicine technologies have become part of everyday life. On the one hand, medical organizations and individual doctors began to create websites where patients can get information about the field of specialists' activities, methods and results of treatment, study descriptions, indications and contra-indications for specific methods. On the other hand, digitized medical data has changed the system of "patient-doctor" relations, since any patient now has the opportunity to obtain data from research carried out on a digital medium or by e-mail, which helps doctors take more objective clinical decisions and even involve patients in this process. Social networks work in the same direction — their importance increases at the stage of prevention. Mobile health (mHealth) and its component — "Internet of medical things" [Tsvetkova et. al., 2014; Shaderkin et al., 2015] has become a new area of healthcare emerging at the junction of Internet technologies, mobile devices (gadgets), new methods of communication and the need to expand the availability of medical services.

Conclusion

The main principle of WHO's "Health 2020" policy is to reduce healthcare inequalities among the population, as well as the importance of the broader involvement of people in healthcare activities [Engagement and participation..., 2017]. This is in line with the strategic goals of Russia's demographic development, the implementation of which is possible, in part, thanks to the availability of promising resources for incorporating digital healthcare into the self-preserving behavior of Russian citizens. Digital healthcare can improve both the medical aid provided to the population free of charge via compulsory health insurance, and expand the range of health services normally associated with a healthy lifestyle paid for by the population on their own. At the current level of development

of digital healthcare, the gap between the population's need for preservation and improvement of health does not diminish. There is a growing need for healthcare services, as well as opportunities for digital healthcare, but the needs exceed the capabilities. While forming self-preserving behavior, the population takes into account the potential of digital healthcare, but its use depends on the individual income of consumers. The effectiveness of digital healthcare in the provision of medical aid is determined primarily by institutional characteristics, communication infrastructure and budgetary financing, and when providing medical services — by personal incomes of the population. The possibilities of digital healthcare enable taking into account gender factors, specificity of morbidity, facilitate the availability of modern technologies for preserving health, however, the degree of its development, and therefore inclusion in the population's self-preservation behavior, largely depends on the overall prospects of the digital economy.

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