

# Trends in the use of Digital Technologies in the Decision of the Personnel Issue in Health Care

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## ABSTRACT

A shortage of personnel today is observed in the social sectors, in particular, in healthcare. This problem is most acute in rural areas. In this regard, the article explores the possibility of using digital technologies for effective planning of workforce, as well as trends in the development of digitalization of healthcare - the ability to make an appointment with a doctor without leaving home, telemedicine technologies, etc. The problems of personnel deficit in the healthcare industry in Krasnodar Territory are analyzed. It was revealed that 30% of students in medical specialties lived in rural areas before entering a medical educational institution, but 70.4% want to work in the city, and 69% - in a private clinic. 30.2% strongly disagree to work in rural areas, and 57% will agree under certain conditions. The respondents consider high wages, a well-equipped workplace and social infrastructure equivalent to the urban one as weighty reasons for agreeing to work in rural areas. The shortage of personnel adversely affects the efficiency and quality of medical care. The use of digital technologies makes it possible to increase the availability of medical care. However, a number of issues remain unresolved. Not all of the possibilities of digital technology are known to both doctors and patients. A significant part of the population, although their share is gradually decreasing, still do not have access to Internet resources, do not have computer literacy skills, and fear the transfer of personal data to third parties. To maintain positive trends along with an increase in the number of trained specialists, it is necessary to develop the use of digital technologies, inform the population about the emerging opportunities.

**Keywords:** *information systems, medical personnel, telemedicine, digital technologies*

## 1. INTRODUCTION

According to the World Health Organization (WHO), today Russia is one of the five countries with the largest number of doctors per capita, ahead of the United States, Germany, China, Great Britain and Japan. However, in some parts of the country there is a low availability of doctors (less than 30 doctors per 10,000 population). [1, 2] In 2019, Presidential Decree No. 254 "On the Strategy for Healthcare Development in the Russian Federation for the Period up to 2025" noted that the priority areas for solving the main tasks of healthcare development in the Russian Federation are, among others, improving the functioning of the unified state information system in the healthcare sector ( Unified State Health Information System) and the creation of a unified digital circuit in health care based on a unified state information system in the health sector. Information support in the field of healthcare is carried out through the creation, development and operation of:

- federal state information systems in the field of health care;
- information systems in the field of health care of the Federal Mandatory Medical Insurance Fund and territorial compulsory medical insurance funds;

- state information systems in the field of healthcare of the constituent entities of the Russian Federation;

- medical information systems of medical organizations;

- pharmaceutical information systems.

All medical organizations and specialized medical institutions regularly enter data on doctors and nurses into the system of state registration of medical personnel in the Unified State Health Information System. However, the surge in the incidence of coronavirus infection necessitated an urgent update of data on all available healthcare resources for their further planning and effective use, and, first of all, data on the number of medical personnel. [3]

Difficulties in training, distribution, service and efficient use of the health workforce arise in many countries, which reduces the availability and quality of health care. The WHO Executive Board launched the Global Strategy for Human Resources for Health in 2016: Workforce 2030, which aims to improve health and socioeconomic development outcomes at national, regional and global levels to ensure universal accessibility and quality of the health workforce. [4, 5]

According to Rosstat, at the end of 2018, the number of

doctors in our country was 703.7 thousand people, and the number of nurses was 1491.4 thousand people, which is 47.9 and 101.6 for 10,000 people, respectively. Compared to 2010, the indicator decreased by 2.2 and 4.0, respectively.

## 2. BACKGROUND

In accordance with the Decree of the President of the Russian Federation of May 7, 2018 No. 204 "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024", national projects are currently being implemented in 13 interrelated areas, including: Demography, Health, Digital economy. Ensuring the accelerated introduction of digital technologies in the economy and social sphere is one of the national development goals of the country. At a meeting of the Council for Strategic Development and Priority Projects, Russian President V.V. Putin stressed that the digital economy is not a separate industry, but a new basis for the development of the system of public administration, economy, business, social sphere, and the whole society. The formation of a digital economy is a matter of national security and the country's independence. The implementation of these areas was corrected by the spread of the new coronavirus infection. So in March 2020, an urgent registration of all Russian doctors and nurses in the Unified State Health Information System was required. [6, 7]

The creation of such a register is provided for by the federal law "On the protection of public health" The unified state information system in the field of healthcare (in accordance with Federal Law No. 242-FZ dated July 29, 2017) includes 13 groups of subsystems, including the register of medical organizations, the register of medical documents and the register of medical workers. Uniform State Health Information System performs the following tasks:

- information support of state regulation in the field of health care;
- information support for the activities of medical organizations, the implementation of medical activities, including the provision of medical care;
- informational interaction of information providers in the Unified System and users of information contained in the Unified System;
- informing the population on the issues of maintaining a healthy lifestyle, preventing diseases, receiving medical care;
- ensuring citizens' access to healthcare services in electronic form, as well as interaction of information systems in the healthcare sector.

According to the Institute for Leadership and Healthcare Management, a shortage of medical personnel (less than 30 doctors per 10,000 population) is noted in the

Kurganinsk, Pskov, Vladimir, Tula, Sverdlovsk, Kostroma, Volgograd, Kaluga regions and the Chechen Republic. Sufficient provision with doctors (more than 50 doctors per 10 thousand of population) is noted in such regions as: Republics of Sakha (Yakutia) and North Ossetia, Khanty-Mansi and Chukotka autonomous districts, Magadan region, St. Petersburg. The difference between the highest and the lowest level of provision of medical personnel is 2.7 times.

The indicator of provision of paramedical personnel in the country is on average 86.2 per 10,000 population. Low security (less than 70) is noted in the Primorsky Territory, Kaliningrad, Leningrad, Moscow regions, the Chechen Republic and Moscow. Sufficient provision (more than 120 per 10 thousand of the population) is noted in the Khanty-Mansiysk, Yamalo-Nenets and Chukotka Autonomous Districts, the Republics of Tyva and Komi, Magadan Oblast. The difference between the maximum and minimum security is 2.4 times.

The WHO recommended ratio for the number of doctors and nurses is 1: 4 (WHO Munich Declaration, June 2000). On average in foreign countries, the number of doctors and nurses is 1: 3; in Russia - 1: 2.2.

The number of medical personnel in the Russian Federation is shown in the diagram (Figure 1).

As of January 1, 2020, 5,677,786 residents lived in the Krasnodar Territory, the number of doctors - 18,567 people, nursing staff - 39,011 people. The indicator of the provision of the population with doctors is 32.7 per 10,000 people, which is lower than the national average (37.4), the indicator of the provision of the population with medical personnel is 68.7 per 10,000 people. - low security. The ratio of the number of doctors and nurses is 1: 2.1.

According to the Federal Statistical Survey in the field of remuneration of certain categories of social and scientific workers in 2019 (published by Rosstat), 565 thousand doctors were employed in the healthcare sector of the Russian Federation. Thus, there are 38 doctors per 10,000 population, which corresponds to the passport of the National Healthcare Program. The number of nursing staff in the country during the same period amounted to 1.314 million people, while the number of nursing staff fell to 264 thousand people.

It should be said that more than 390 thousand doctors are women. More than 54 thousand doctors (10%) and 196.5 thousand paramedics (16%) work in rural areas.

According to the UN, almost half of the world's population lives in rural areas, while rural doctors are only 25% of the total number of doctors employed in health care. The number of rural doctors is sometimes difficult to calculate due to the densely populated territories and blurred boundaries between city and village (France, Japan), but also in many countries there is a real shortage of rural doctors (Canada, USA, Scotland). [2]

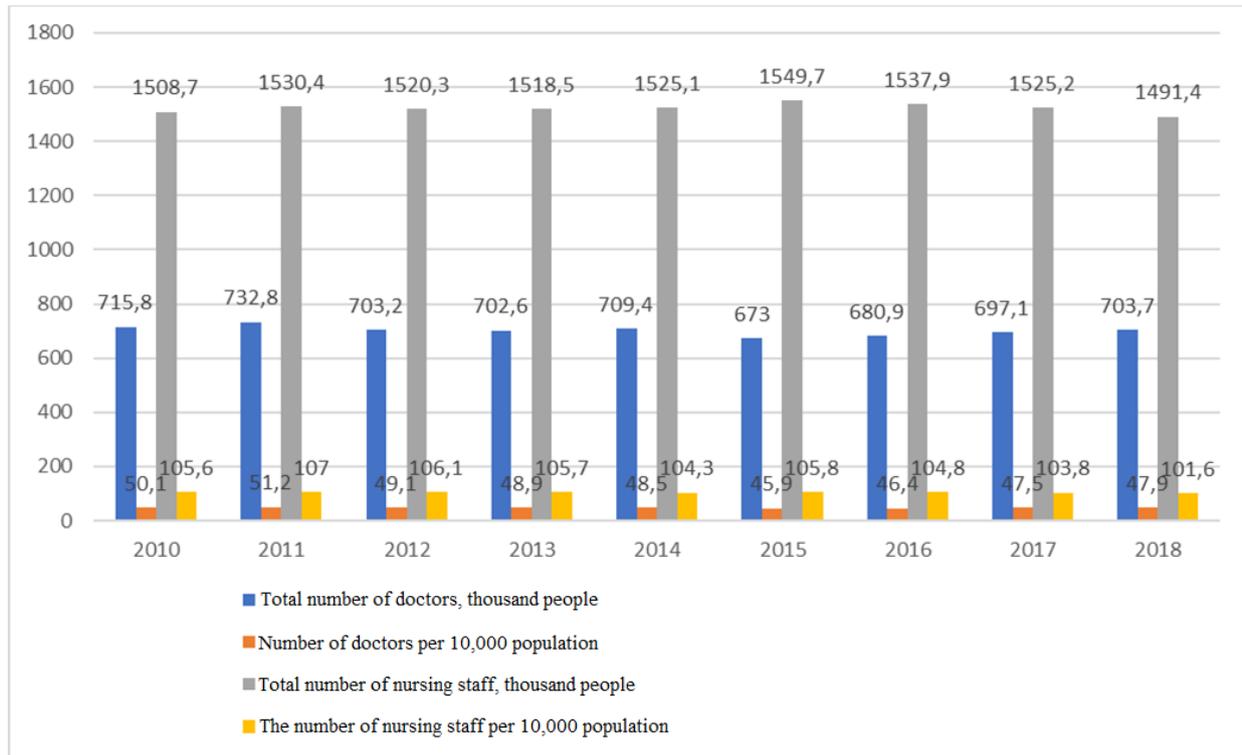


Figure 1 The number of medical personnel (at the end of the year) as of November 28, 2019 (according to Rosstat)

In most countries facing the problem of the outflow of medical personnel from rural areas and a decrease in the attractiveness of the profession for young people, the main reasons include the lack of roads and transport links with remote areas, limited access to social infrastructure facilities, a low level of provision of housing and communal infrastructure, high food prices. The programs being implemented to attract doctors to the countryside in our country - "Zemsky Doctor", "Zemsky Paramedic" - with the obligatory condition to work for a certain period of time under a Targeted Training Agreement and similar programs in other countries (Australia, New Zealand, Vietnam, Mongolia, Japan and etc.), of course, are aimed at solving the problem, however, unfortunately, they do not give a quick effect. [2, 8, 9]

The socio-economic characteristics of the Krasnodar Territory (the agricultural sector is developed) determine the specifics of the structure of the population: the number of urban residents is 10.6% higher than the number of the rural population (3142394 thousand and 2535392 thousand people, respectively). At the same time, it cannot be said that doctors working in cities serve exclusively the urban population - in the region there is a developed structure of medical organizations, including a significant number of specialized regional hospitals, including in the territory of the city of Krasnodar. There is also a shortage of medical workers in the Krasnodar Territory - there are not enough more than 7 thousand doctors and more than 9 thousand mid-level medical workers.

The authors conducted a survey among students at medical

schools in Krasnodar on the Google Forms platform (Figures 2-8).

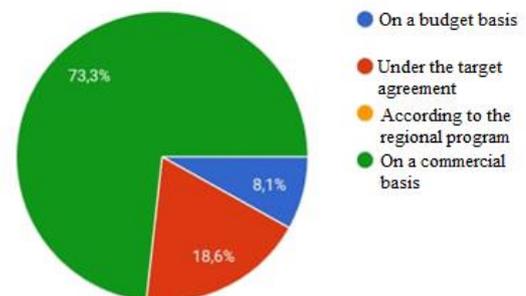


Figure 2 The question "under what conditions do you study?"

Among the surveyed students of higher and secondary medical institutions, a large proportion are students studying on a commercial basis - more than 70%; more than 18.5% are trained under the target contract, and 8% are state employees.

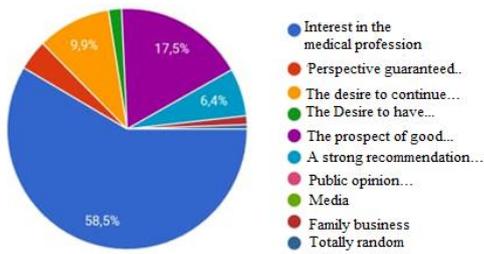


Figure 3 Question "What influenced the choice to become a doctor? "

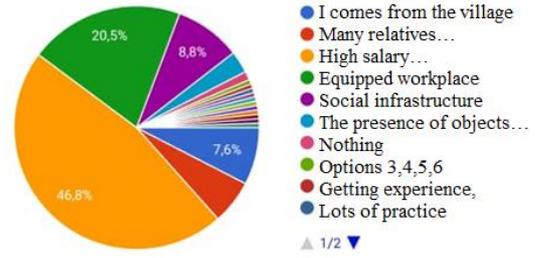


Figure 7 Question: "What would be a significant reason for agreeing to work in rural areas?"

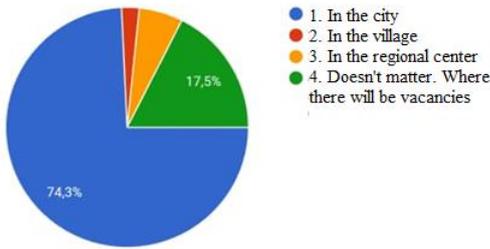


Figure 4 Question: "Where do you want to work after graduating from a university or college?"

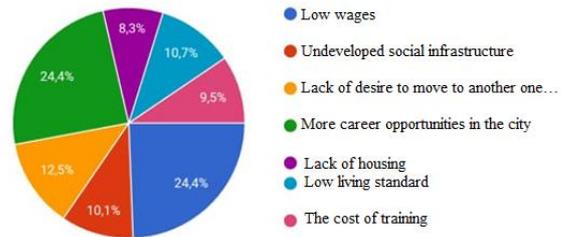


Figure 8 Question: "Rank by importance, what is the reason for refusing to work in rural areas?"

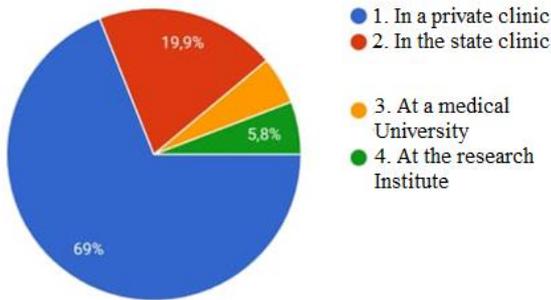


Figure 5 Question: "In which medical organization would you like to work?"

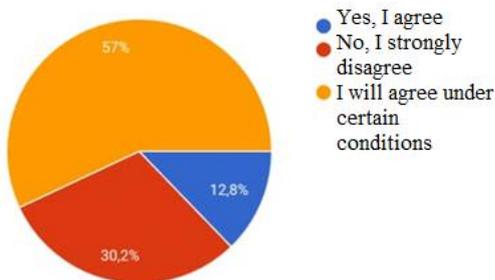


Figure 6 Question: "If you are offered to work in rural areas after graduation, what will you answer?"

The choice of the profession of a doctor is particularly strongly influenced by such a factor as interest in the medical profession.

Of the 172 respondents, almost 30% lived in rural areas before entering a medical school, but 70.4% want to work in the city, with 69% in a private clinic. 30.2% strongly disagree to work in rural areas, and 57% will agree under certain conditions. At the same time, the choice to become a doctor in 58.5% was influenced by interest in the medical profession and in 17.5% the prospect of good earnings. A significant reason for agreeing to work in rural areas was named by 46.8% of high earnings, 20.5% of an equipped workplace and a medical institution that meets modern needs, 8.8% of the social infrastructure equivalent to urban. Among the reasons why respondents refuse to work in rural areas, there were found equal shares (24.4%) low wages and more opportunities for career growth in the city. 12.5% do not want to move to another place. The rest of the reasons for the importance: low living standards, undeveloped social infrastructure, training costs, lack of housing.

Today, 57 countries around the world face a critical shortage of trained health workers, and a shortage of health workers in remote and rural areas is found even in high-income countries. [1, 2]

### 3. CONCLUSION

According to the UN, almost half of the world's population lives in rural areas. These territories are served by less than a quarter of health professionals. The problems of

providing rural areas with medical personnel are relevant for most countries.

The experience of implementing programs to attract doctors to rural areas in our country and similar programs in other countries are certainly aimed at solving the problem, however, unfortunately, they do not give a quick effect. Medical care is still inaccessible for a significant part of people. In these conditions, the development of digitalization of healthcare is becoming increasingly important - the ability to make an appointment with a doctor without leaving your home, telemedicine technology.

Telemedicine is the use of modern means of communication for the remote provision of medical and consulting services. In 1965, the first videoconferencing session was conducted as a tool for telemedicine - the broadcast of the operation to replace the aortic valve with an artificial heart, which was assisted by the outstanding cardiac surgeon Michael Ellis DeBakey. [10]

Today it is a full-fledged direction of medicine, which is based on the use of modern communication technologies for remote consultation and medical care. At the same time, an important feature of modern telemedicine is the possibility of two-way audio and video communication.

Since 2018, certain opportunities for telemedicine have appeared in our country - remote teleconsultations, including with the possibility of remote adjustment of the prescribed treatment, as well as remote monitoring of patients by the attending physician after an in-person visit.

The development of telemedicine technologies in combination with an electronic medical record gives patients in remote areas more opportunities to receive medical care. All information about human health is collected electronically in one place. Today, there are two approaches to collecting and storing information: in the medical record, which is maintained in a medical organization and where information about the patient observed here goes (included in the so-called integrated electronic medical record - this project is being implemented at the federal and regional levels by the Ministry of Health), and personal a patient's office, which includes a personal electronic medical record (in this case, a person himself collects and stores all information about his health. Some of it comes here automatically from medical institutions, and the rest of the person will add himself, for example, information from commercial medical organizations).

At the second international conference "The Future of Medicine" in St. Petersburg, the head of the working group "Electronic Medical Record" of the Expert Council of the Ministry of Health of the Russian Federation B.V. Zingerman named examples of foreign experience in applying these technologies "For example, there are four large health insurance funds in Israel, each of which integrates information on all its polyclinics and doctors. When a patient is admitted to a large multidisciplinary hospital, only a paper statement is sent there. In the United States, the Blue Button project is being actively promoted, which allows sending medical documents to a patient after an appointment. In our country, integration projects are

also underway in the regions, and a federal patient cabinet "My Health" is being created.

In the context of the COVID-19 pandemic, accompanied by a rapid increase in the number of infected people and the area of distribution, the speed of response of medical services is crucial. During the period of quarantine measures and self-isolation, the role of technologies with the possibility of video communication, including telemedicine, increases. As an example of remote reception, management and treatment of patients in our country, we can cite the work of the Bakulev Center for Cardiovascular Surgery, where the TrueConf video conferencing server was deployed for remote monitoring of infected patients.

The adoption in 2017 of the Federal Law No. 242 and the order of the Ministry of Health No. 965n of November 30, 2017 legally substantiated the possibilities of new technologies: the procedure for the provision of telemedicine consulting services was approved, the very concept of "information technology" appeared in the industry legislation with the definition that ensuring remote interaction of medical workers with each other, with patients and, if necessary, with their legal representatives.

Great opportunities for both the doctor and the patient are provided by the use of remote monitoring of the patient's condition, as well as a system for tracking the fulfillment of doctor's prescriptions in the treatment of chronic diseases.

However, little time has passed, and not all patients have understood the emerging opportunities and nuances of new technologies. It causes dissatisfaction with the receipt of the most general, preventive recommendations and recommendations as soon as possible to see a doctor in patients who first sought medical help through a remote consultation service. But, according to legislative norms, it is forbidden to do the initial reception remotely. Only after the initial examination in person and clarification of the diagnosis, it is possible to consult the patient remotely according to the previously developed treatment plan, as well as to correct the previously prescribed treatment and to issue prescriptions for medications in the form of an electronic document.

Domestic and foreign experts also note the possibilities of telemedicine in terms of consultation decisions of specialists of different profiles (surgeon-oncologist, urologist, professor A.A.Teplov). Victor Levy, the chief physician of the Israeli medical tourism clinic levisrael, agrees with this, pointing out the problem of patients who need a "second opinion".

According to the plans for the implementation of the national project "Health" in terms of measures to reduce the mortality rate of the working-age population, it is planned to hold 135 thousand remote consultations / consultations using telemedicine technologies by 2024. It is also assumed that by the end of 2024, within the framework of measures to reduce mortality from neoplasms, 70% of the audience of citizens over 18 years old will be covered by an information and communication campaign aimed at early detection of oncological diseases

and increasing adherence to treatment, through the main channels: television, radio and in the information and telecommunication network "Internet".

However, a number of issues remain unresolved. A significant part of the population, although their share is gradually decreasing, still do not have access to Internet resources, do not have computer literacy skills, and fear the transfer of personal data to third parties. Fears of the negative consequences of digitalization still have to be dealt with, including the transformation and disappearance of traditional markets, the replacement of certain professions with automated systems, the vulnerability of human rights in the digital space, threats to the security of digital user data, and low confidence in the digital environment due to cybercrimes.

The transition to a digital economy is one of the priorities for most of the economic leaders (USA, UK, Germany, Japan). As a rule, these transformation processes are characterized by a long period of implementation of the "digital development program" and the transition from the construction of a basic information and communication infrastructure to the formation of a coordinated policy in this area and programs to support the integration of digital technologies.

Today, we can count on artificial intelligence to help reduce the health workforce. At present, the growth in the number of radiation examinations is by an order of magnitude greater than the possibilities of training radiologists by medical universities. Therefore, the primary task is to create a system that will make it possible to take and screen out photographs without pathology and complex cases. The same applies to the work of therapists, cardiologists, endocrinologists. That is, artificial intelligence, freeing doctors from their daily routine work, will help them focus directly on treating patients.

Estonia, Finland and Denmark are still leading in the ranking of digitalization of medicine. But these countries are incomparable with Russia in terms of population and territory occupied. As the director general of the Association of Developers and Users of Artificial Intelligence in Medicine, the National Medical Knowledge Base, noted in an interview: "Taking into account the attention of the President of the Russian Federation to this issue, the roadmap of Sberbank, which announced large investments in artificial intelligence in medicine, I think that we have a good chance to keep up with the whole world".

## REFERENCES

- [1] WHO. World Health Organization. Increasing access to health workers in remote and rural areas through improved retention: global policy recommendations, 2010
- [2] O.A. Doschannikova, Filling the shortage of medical personnel in rural areas: studying domestic and international experience. *Medical Almanac*, 6 (57) (2018) 29-33. DOI: 10.21145/2499-9954-2018-6-29-33
- [3] D.A. Medvedev, Russia-2024: the strategy of social and economic development, *Voprosy Ekonomiki*, (10) (2018) 5–28. DOI: 10.32609/0042-8736-2018-10-5-28
- [4] Global strategy on human resources for health: workforce 2030, WHO, 2016, 64 p.
- [5] Social'nye aspekty zdorov'ya naseleniya, *Bulletin of the World Health Organization*, 3(65) (2019) <http://vestnik.mednet.ru/content/view/1081/30/>
- [6] N.A. Avxentyev, V.S. Nazarov, N.N. Sisigina, How could we improve the national projects in health and demography after coronavirus pandemic? *Voprosy Ekonomiki*, (6) (2020) 22–36. DOI: 10.32609/0042-8736-2020-6-22-36
- [7] V.A. Mau Economics and politics in 2019–2020: Global challenges and national answers. *Voprosy Ekonomiki*, (3) (2020) 5–27. DOI: 10.32609/0042-8736-2020-3-5-27
- [8] K. Galkin, Young physicians in the city and in the countryside: features of professional identity, *Mir Rossii*, 29 (3) (2020) 142–161. DOI: 10.17323/1811-038X-2020-29-3-142-161
- [9] K. Galkin, All the charm of country life? Types of professional identity among young doctors working in rural areas, *J. of Social Policy Studies*, 18(2) (2020) 175–190. DOI: 10.17323/727-0634-2020-18-2-175-190
- [10] R.L. Bashshur, J.H. Sanders, G.W. Shannon, (eds.) *Telemedicine: Theory and Practice*, Springfield: Charles C. Thomas, Publisher, Ltd., 1997.
- [11] M. DeBakey, Telemedicine has now come of age, *Telemedicine J.* 1(1) (1995)