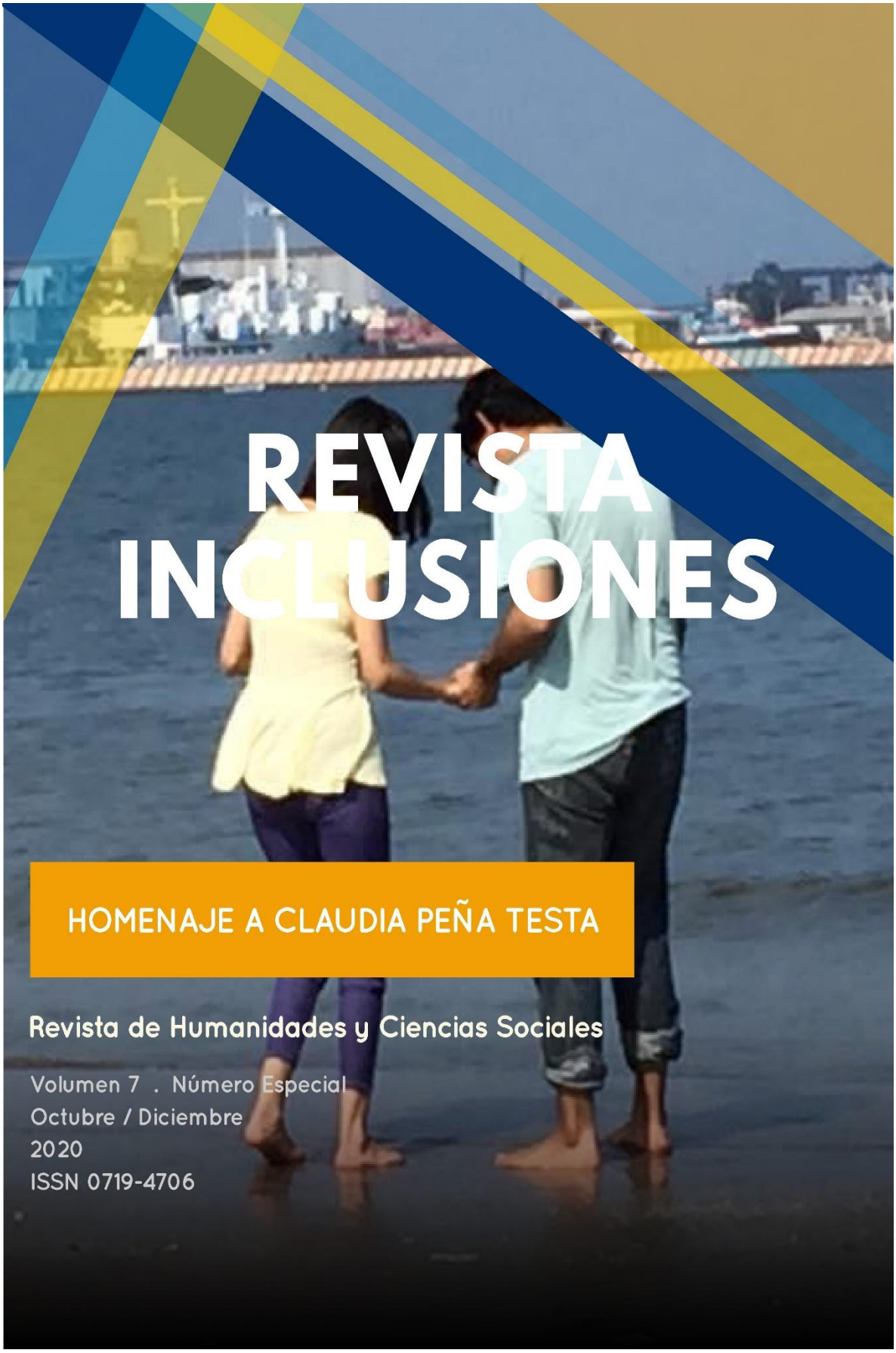

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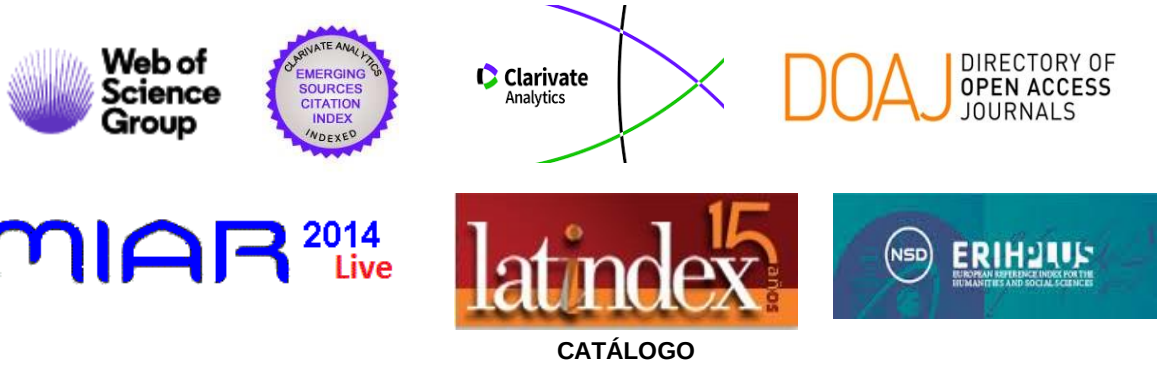

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IMPACT OF TELEMEDICINE ON IMPROVING THE EFFECTIVENESS OF THE FIGHT AGAINST COVID-19: INNOVATIONS AND PROSPECTS

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Abstract

The aim of this study is to analyze the possibilities of telemedicine as an innovative treatment method in the fight against coronavirus. The article analyzes telemedicine as a direction of medicine, medical service and a method of providing medical services. Based on an expert survey, the main tasks and functions of telemedicine are identified and the main types of telemedicine services in the fight against coronavirus are characterized. It has been proven that to overcome the negative consequences of the coronavirus pandemic and given the level of development of telemedicine in general, the availability of appropriate equipment and personal safety in the context of the coronavirus epidemic, the most promising areas of telemedicine use are patient counseling, telemedicine consultation and telemonitoring.

Keywords

Healthcare – Telemedicine – Telemedicine networks – Teleconsulting – Telemedicine consultation

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Baksheev, Andrei Ivanovich; Turchina, Zhanna Evgenievna; Galaktionova, Marina Yuryevna; Chesnokova, Larisa Leonidovna; Sharova, Olga Yanovna y Rakhinskiy, Dmitriy Vladimirovich. Impact of telemedicine on improving the effectiveness of the fight against COVID-19: innovations and prospects. Revista Inclusiones Vol: 7 num Especial (2020): 168-179.

Introduction

The development of information technologies significantly changes the process of providing medical care. Due to the constant improvement of information and communication technologies, new prospects for the development of medicine are opening up. It has become possible to consult leading specialists regardless of their location, remotely control the patient's treatment process, manage surgical operations, provide psychological assistance, especially to patients in difficult life situations, etc[1].

Covering a wide variety of services and technologies, telemedicine is particularly effective as an alternative to home care, speeding up the transfer of information from competent medical practitioners and providing information more often than it is possible when visiting a patient, as well as including the assessment of health indicators from digital media[2]. Telemedicine is increasing the virtual offering of service providers and expanding access to new geographic locations, facilitating competition. Consequently, telemedicine intensifies price and non-price competition, reduces travel costs and improves access to quality health care. Telemedicine also has significant potential to improve access to geographic locations with poor health care, reduce costs and improve people's health in the short and long term[3]. Today, almost half of hospitals in the United States use remote transmission of medical images. American telemedicine networks connect more than 3,200 services. ATA members represent telemedicine programs in 40 countries on six continents[4]. Healthcare consumers demand comfortable and high-quality care, and telemedicine offers it. According to a survey by Intel, 72% of consumers said they were ready to see a doctor using telemedicine for urgent conditions. Three prominent alliances of members of Connected Care, Anthem, MD Live and Teladoc already report about more than 95% patient satisfaction with telemedicine[5]. Thus, at present, there is rapid development and fast implementation of telemedicine in almost all countries of the world. At the same time, sudden restrictions and risks caused by the spread of the COVID-19 virus also created conditions for the widespread involvement of telemedicine as an alternative method of remote communication among doctors and patients using modern means of communication[6].

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[1] J. Grigsby; M. Rigby; A. Hiemstra; M. House; S. Olsson y P. Whitten, “The diffusion of telemedicine”, Telemedicine Journal and e-Health Vol: 8 num 1 (2002): 79–94; A. I. Baksheev; Z. E. Turchina; G. V. Yurchuk; D. V. Rahinsky; A. V. Leopa y T. V. Melnikova, “Medico-psychological support of elderly patients with somatic pathology in doctor-patient relations”, Journal of pharmaceutical sciences and research Vol: 10 num 10 (2018): 2506-2509 y A. I. Baksheev; Z. E. Turchina; V. V. Mineev; S. V. Maksimov; D. V. Rakhinskiy y L. U. Aisner, “Euthanasia in modern society: the topicality, practicability, and medical aspect of the problem”, Journal of pharmaceutical sciences and research Vol: 10 num 6 (2018): 1360-1363.

[2] A. G. Ekeland; A. Bowes y S. Flottorp, “Effectiveness of telemedicine: a systematic review of reviews”, International Journal of Medical Informatics Vol: 79 num 11 (2010): 736-771.

[3] T. H. Broens, “Determinants of successful telemedicine implementations: a literature study”, Journal of Telemedicine and Telecare Vol: 13 (2007): 303-309.

[4] A. Darkins; L. Foster; C. Anderson; L. Goldschmidt y G. Selvin, “The design, implementation, and operational management of a comprehensive quality management program to support national telehealth networks”, Telemedicine Journal and e-Health Vol: 19 num 7 (2013): 557–564.

[5] D. Grabowski y A. O’Malley, “Use of telemedicine can reduce hospitalizations of nursing home residents and generate savings for Medicare”, Health Affairs Vol: 33 num 2 (2014): 244–250.

[6] S. R. Chowdhury; T. C. Sunna y S. Ahmed, “Telemedicine is an important aspect of healthcare services amid COVID-19 outbreak”, International Journal of Health Planning and Management (2020): 1-9.

Literature review

Scientists conducting research in the field of health care have different views on the essence and content of the concept of "telemedicine". The study of the most common definitions of this term made it possible to systematize them into three main groups: the interpretation of "telemedicine" as a separate area of medicine, a type of medical services and a way of providing them (Table 1).

Definition
as a direction of medicine
direction of medicine, which is based on the use of computer and telecommunication technologies for remote medical care and timely consultations[7]
modern direction of development of informatization of medicine, which involves the use of modern information and telecommunication technologies for remote diagnosis and treatment of diseases, assistance in emergency situations and advanced training of medical workers[8]
an independent direction of medicine based on an innovative approach that combines medical knowledge, hardware and software and a target function in a single structure, which operates with the help of information and telecommunications support and carries out remote diagnostics, treatment and monitoring of a person's health state directly at their place of residence[9]
medical service that combines medical knowledge and equipment with information and communication technologies that provide examination, observation and treatment of a patient at home[10]
round-the-clock medical care, medical and related services, constant medical support using specialized individual telecommunication devices when needed[11]
as a way of providing medical services
set of means to be provided with medical information of any object equipped with computer technologies at long distances, also on a global scale[12]
systems for bringing highly specialized medical care to every home[13]

[7] D. Alajmi; S. Almansour y M. Househ, “Recommendations for Implementing Telemedicine in the Developing World”, Studies in Health Technology and Informatics Vol: 190 (2013): 118–120.
[8] C. Carlo; P. Gabriele y P. Giuseppe, “Telemedicine for developing countries – a survey and some design issues”, Applied Clinical Informatics Vol: 7 (2016): 1025-1050.
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set of medical, information and communication tools that provide constant medical support, control and maintenance of the patient's life while performing professional activities when needed[14]
mobile technologies, medical applications, services and devices that collect data on the state of a person's health, their processing and exchange in a dialogue with a doctor. They are intended, on the one hand, for diagnostics, treatment and effective patient care and, on the other, for control over their adherence to a healthy lifestyle[15]

Table 1
Scientific approaches to the definition of "telemedicine"

According to research results[16], the main directions in the field of telemedicine are remote monitoring in the treatment of chronic diseases; development of large telemedicine networks; Mobile 2.0 technology when creating new generation telemedicine systems; organizational approaches to telemedicine; telemedicine in the treatment of diabetes; telepsychiatry; the use of cellular communications in healthcare; evidence-based medicine protocols in home telemedicine; telemedicine in ophthalmology; innovative technologies in telemedicine; telemedicine in neurology; telemedicine technologies to improve treatment of rural patients; improvement of the means of communication when using telemedicine; legal issues of telemedicine; distance surgery projects; telemedicine in pediatrics; remote analysis of medical images; teledermatology; telemedicine in rehabilitation; remote trauma treatment.

The purpose of the article is to analyze the possibilities of telemedicine as an innovative treatment method in the fight against coronavirus.

Research objectives:

- to define the main tasks and functions of telemedicine in the fight against coronavirus;

- to describe the main types of telemedicine services in the fight against coronavirus.

Research hypothesis: To overcome the negative consequences of the coronavirus pandemic and given the level of development of telemedicine in general, the availability of appropriate equipment and personal safety in the context of the coronavirus epidemic, the most promising areas of telemedicine use are patient counseling, telemedicine consultation and telemonitoring.

[14] K. L. Rush; L. Hatt; R. Janke; L. Burton; M. Ferrier y M. Tetrault, "The efficacy of telehealth delivered educational approaches for patients with chronic diseases: A systematic review", Patient Education and Counseling Vol: 101 (2018): 1310–1321.
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According to the results of the study, it can be concluded that the purpose set in the study was achieved.

Methods

To solve the objectives set in the study, the following general scientific methods were used:

a) theoretical: analysis of peer-reviewed scientific and analytical sources on the issue of telemedicine implementation;

b) empirical: an expert survey. The experts were given the following main objectives: to define the main objectives and functions of telemedicine in the fight against coronavirus and characterize the main types of telemedicine services in the fight against coronavirus.

At the first stage of the research, the available scientific and analytical sources in the field of research were studied.

At the second stage of the research, online communication with experts was carried out. The survey was conducted in Russian on September 26, 2020. The survey was attended by experts (25 people), employees of health care institutions, with at least 5 years of professional experience. All survey participants were warned about the purpose of the survey and the plan of the organizers of the study to publish the results in a general form.

Results

According to the experts, the following are the main objectives of telemedicine in the fight against coronavirus (Table 2).

№	Main objectives of telemedicine	%*
1	ensuring that patient care is provided when distance is critical	90%
2	assistance in improving the quality of care and optimization of processes of organization and management of health care	85%
3	creation of a unified medical space to counteract the spread of coronavirus	82.5%
4	formation of systemic approaches to the implementation and development of telemedicine in the health care system to counteract the spread of coronavirus	80%

Note: compiled based on the expert survey; *percentage of expert references

Table 2

The main objectives of telemedicine in the fight against coronavirus

The experts noted that the telemedicine network is closely related to the concept of telemedicine, that is, the form of organizing the medical care delivery to the population using telemedicine. The telemedicine network allows performing the following main functions in the fight against coronavirus (Table 3).

№	Functions	%*
1	To regulate and systematize the process of providing medical care using telemedicine	90%
2	To ensure the compatibility of information and data in the delivery of medical care using telemedicine	87.5%

3	To ensure the use of medical information standards in the process of providing medical care using telemedicine	85%
4	To monitor the quality of medical care delivery using telemedicine	82.5%

Note: compiled based on the expert survey; *percentage of expert references

Table 3

The main functions of telemedicine in the fight against coronavirus

Based on the expert survey, the types of telemedicine services that can be used in the fight against coronavirus and their characteristics were determined (Table 4).

Types of services	Service essence	%*
Teleconsulting	the process of remote discussion of a specific case of coronavirus to support the adoption of a high-quality and optimal clinical decision for the delivery of medical care	90%
Telemedicine consultation	a method of consulting at a distance, during which several (two or more) specialist-consultants are involved at the same time	90%
Telemonitoring	the process of one-time or long-term observation, assessment and prediction of the course of coronavirus based on continuous biotelemetry data, which provides a remote research of biological phenomena and measurement of biological indicators	87.5%
Teleinstruction	provision of an ambulance doctor, nurse, paramedic, etc. with video and voice communication with an expert for recommendations on first aid for coronavirus	72.5%
Telepatronage	a type of medical care for coronavirus, implemented remotely using telecommunication and computer technologies	65%
Telescreening	remote detection and formation of risk groups for coronavirus, preventive measures	65%
Telepresence	ensuring full remote participation of an expert in the treatment and diagnostic process through the use of robotic and other telecommunication and computer tools	62.5%
Telenursing	the use of telemedicine systems for nursing care and coordinated nursing work where physical distance is critical	60%
Telerehabilitation	a set of rehabilitation, assisting measures that are provided to a patient with coronavirus remotely using telecommunication and computer technologies (mainly at the outpatient stage of treatment)	60%

Note: compiled based on the expert survey; *percentage of expert references

Table 4

The main types of telemedicine services in the fight against coronavirus

According to the experts, given the level of development of telemedicine in general, the availability of appropriate equipment and personal safety in the context of the coronavirus epidemic, the most promising areas of telemedicine use are:

- advising the patient about the results of analyzes and other studies received by them in the electronic form;

- telemedicine consultation;

- telemonitoring (provided that it can be carried out remotely without compromising the quality of medical care).

Telemetry, a set of technologies that make it possible to remotely measure and collect information about the performance indicators (physiological functions) of the patient's body, is used in the process of consultation or monitoring[17].

However, according to one of the experts (Victor T., general practitioner, 11 years of work experience), “if our goal is to limit the physical contact with a patient, then telemetry cannot be very useful, since the patient is in any case in contact with medical professionals, who directly ensure the use of medical devices and it is impossible to carry out the necessary research and ensure the transmission of information about the patient's condition without them”.

At the same time, as one of the respondents noted (Andrei S., epidemiologist, 8 years of work experience), “telemetry is not a selfie that a patient can take on their own. This is a modern technical complex that combines instrumental research tools with special devices and programs. Therefore, you should not ask the patient to ‘upload a photo to Viber’ and prescribe treatment based on this photo”.

Discussion

According to the results of the expert survey, the most promising application of telemedicine in the context of coronavirus is the delivery of telemedicine consultations, which provides the transfer of medical information using the means of communication (the Internet). This kind of consultation can be conducted in two formats:

a) consultations in real-time – a format in which a direct interaction between participants is carried out. Such consultations can be carried out both between a patient and a doctor and among doctors as a consultation (video consultations). Also, the implementation of consultations with the help of modern communication technologies will allow conducting consultations with doctors of a very narrow specialization without their direct transportation, which will save time and financial resources. At the same time, real-time consultations presuppose the availability of high-quality equipment and a good Internet connection among the participants of the consultation, which determines a certain cost of this method[18];

b) deferred consultations – consultations with a patient, in which the consultation material is sent to the patient (for example, by e-mail) and does not provide for online contact[19].

[17] A. I. Baksheev; D. A. Nozdrin; Z. E. Turchina; O. Y. Sharova; G. V. Yurchuk y D. V. Rakhinskiy, “Bioethical principles and mechanisms for regulation of biomedical research”, Journal of pharmaceutical sciences and research Vol: 10 num 4 (2018): 889-892.

[18] S. Lee; T. J. Broderick; J. Haynes; C. Bagwell; C. R. Doarn y R. C. Merrell, “The role of low-bandwidth telemedicine in surgical prescreening”, Journal of Pediatric Surgery Vol: 38 num 9 (2003): 1281–1283.

[19] A. G. Ekeland; A. Bowes y S. Flottorp, “Methodologies for assessing telemedicine: A systematic review of reviews”, International Journal of Medical Informatics Vol: 81 (2012): 1–11 y A. I. Baksheev; Z. E. Turchina; O. V. Andrenko; V. V. Filimonov; D. A. Nozdrin y G. V. Yurchuk, “Geriatric patients: compliance issues and ways of its optimization”, Prensa Medica Argentina Vol: 105 num 9 (2019): 501-509.

Regarding home teleconsultation, the experts noted that “it is just a process of monitoring the state of health of a patient who is outside a healthcare institution, using telemedicine. It should be remembered that the requirement for an initial examination makes it impossible to provide remote assistance through teleconsultation alone”.

Another promising area of telemedicine in the context of the coronavirus epidemic is the implementation of remote telemedicine monitoring systems using electronic diagnostic devices in real time or periodically transmitting data to a consultant to accumulate and analyze medical information regarding the physiological functions and take appropriate actions to provide medical care[20]. This type of telemedicine is suitable for the groups of patients with coronavirus who need constant monitoring of their medical condition. In addition, the development of universal monitoring devices for the population as a whole will allow real-time monitoring of the patient's condition and prevent the onset of diseases in the people around them at an early stage[21].

According to one of the experts (Sergei K., doctor-epidemiologist, 9 years of work experience), “doctors should take into account that no one deprives them of the obligation to meet the standards of medical care. Therefore, if telemedicine harms the quality of medical care, then telemedicine should be abandoned and the patient should be offered a classical method of treatment”.

According to the experts, to achieve the goals of fighting the coronavirus epidemic, elements of telemedicine (individual procedures, systems, etc.) should be implemented at all levels of health care delivery to ensure the operational interaction, its continuity, timeliness and availability. This determines the mechanism for organizing a telemedicine network, which consists of healthcare institutions, which are united into a single system and use an Internet platform (telemedicine portal) for interaction. The creation of a telemedicine portal, according to the experts, is necessary to fulfill the previously mentioned basic functions of telemedicine in the fight against coronavirus.

The experts noted that the use of telemedicine in health care institutions should be provided by a separate structural unit – a telemedicine office, the main tasks of which are ensuring the process of providing patients with medical care using telemedicine; implementing the latest technologies into the activities of a healthcare institution; maintaining medical, statistical and accounting documentation in the electronic form and in the form of paper documents, which is used in the delivery of medical care using telemedicine; participating in the development of recommendations for the use of telemedicine in health care institutions; ensuring the effective use of the material and technical base of the telemedicine office; ensuring confidentiality and integrity of medical information about the patient's health.

According to the task of fighting coronavirus, the telemedicine office must participate in the delivery of emergency medical care; process a request for telemedicine consultation; form a request for telemedicine consultation and search for the necessary consultant;

[20] K. Kidholm; A. G. Ekeland; L. K. Jensen; J. Rasmussen; C. D. Pedersen; A. Bowes; S. A. Flottorp y M. Bech, “A model for assessment of telemedicine applications: Mast”, International Journal of Technology Assessment in Health Care Vol: 28 (2012): 44–51.

[21] J. A. Izzo, “Diagnostic accuracy of a rapid telemedicine encounter in the emergency department”, Annals of Emergency Medicine Vol: 70 num 4 (2017): 127-128.

process the opinion of the consultant; inform the patient and/or the attending physician about the result of telemedicine consultation; ensure the maintenance of a logbook of telemedicine consultations; save the conclusions of the consultants on paper and make copies of them if necessary; keep track of requests for telemedicine consultation and consultants' opinions; refer to patients with coronavirus for medical care to health care institutions that provide secondary (specialized) medical care and tertiary (highly specialized) medical care.

Conclusion

The results of the study confirmed the hypothesis of the study that to overcome the negative consequences of the coronavirus pandemic and given the level of development of telemedicine in general, the availability of appropriate equipment and personal safety in the context of the coronavirus epidemic, the most promising areas of telemedicine use are patient counseling, telemedicine consultation and telemonitoring.

Telemedicine as an innovative method of providing healthcare services is capable of neutralizing several restrictions on the medical services market; reducing the costs of the latter, thereby making them more affordable for a wide range of the population; opening up opportunities for access to alternative medical services; neutralizing the impact of geographic and infrastructural restrictions. Telemedicine will make it possible to reduce the cost of healthcare services and actualize the need for the legal regulation of patient-client relations. At the same time, telemedicine will actualize several debatable issues regarding a clear definition of telemedicine services; harmonization of the diagnosis of the relevant groups that can be treated by means of telemedicine; accreditation of medical professionals providing telemedicine services; databases of telemedicine service providers.

Telemedicine does not replace a doctor and cannot be an alternative to them. It is a powerful tool that increases the efficiency of the primary care physician and realizes the right of every patient in the most remote places for specialized and specific medical care.

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