

# The Role of Virtual Technologies in Surgical Practice in the Era of COVID-19 Development

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## ABSTRACT

The development of coronavirus infection has put all other diseases on the back burner, including routine surgical operations. However, delaying the timing of surgical intervention also negatively affects the health of patients, as the development of the disease continues. In addition, individual patients who are being treated at home for a number of reasons also need the advice of a professional surgeon, and it is not always possible to conduct such a consultation in person with the current period of pandemic development.

For this reason, the need for surgical intervention, as well as the organization of patient consulting should be carried out in modern conditions, taking into account compliance with certain safety measures for the health of the doctor and the patient. This task can be solved by using virtual technologies in surgical practice, which contribute to the possibility of organizing remote surgical care and allow realizing medical potential in compliance with antiviral protection measures.

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## INTRODUCTION

In the context of the development of coronavirus infection, the provision of surgical care to patients is associated with various difficulties.

In this regard, virtual technologies can provide remote access to medical services and mutual interaction between the doctor and the patient. This allows one to avoid unwanted contacts, and also saves both money and time. Thanks to its implementation in the field of surgery, the chain of medical care will be preserved, and the waiting list will be reduced. In addition, virtual technologies contribute to the organization of continuous training of practicing surgeons and make it possible to popularize the latest achievements of specialists through online communication.

The purpose of the study is to consider the role of virtual technologies in surgical practice in the era of COVID-19 development.

## MATERIALS AND METHODS

Through the use of analytical and comparative methods, a study of publications and specialized materials of specialists in the field of the use of virtual technologies in the field of surgery was conducted. The works concerning both the possibility of providing surgical care and conducting consultations remotely, as well as works concerning the use of virtual technologies in the retraining of surgical personnel were analyzed.

## RESULTS

Thanks to advances in telecommunications and information technology in recent decades, telehealth has gained popularity. Telehealth allows one to provide medical care through interactive video

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### KEYWORDS:

Coronavirus infection, Surgical practice, Virtual technologies.

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and audio conferences in real time. This allows the doctor to interpret medical data and discuss treatment plans with patients remotely, eliminating the need for commuting and reducing medical and operational costs.<sup>[1]</sup> The COVID-19 pandemic has created problems for patients' access to medical care. The uncertainty associated with the transmission of the disease limited the ability of patients to attend medical institutions, especially in elective medical specialties. The introduction of remote virtual healthcare provided alternative access to patient care, which made this method especially useful during the COVID-19 pandemic.<sup>[2]</sup>

While other medical disciplines have been using telemedicine for some time, the field of surgery has only recently begun to introduce this method into clinical practice.<sup>[3]</sup> A significant number of studies have demonstrated that telehealth does not compromise safety and allows obtaining similar patient satisfaction indicators in certain patient groups.<sup>[4]</sup>

Teleconsultations of patients have become one of the activities of surgeons using virtual technologies. In particular, in one of the clinics in the USA, before the teleconsultation, the patient was provided with a copy of the privacy policy and a module containing the necessary information, including a download link, as well as a brief explanatory description of telehealth and related features, including limitations and pitfalls, with special attention to confidentiality. Before any teleconsultation, patients were asked to sign a copy of the informed consent stating that teleconsultations are not a substitute for physical examinations. In addition, patients had to accept or reject the possibility of using screenshots of video consultations as follow-up actions. An additional questionnaire was introduced, in which it was found out whether the patient owns the appropriate equipment for teleconsultation. This was especially important for elderly patients, who in many cases had to seek help from younger acquaintances – another aspect assessed using the questionnaire.

Teleconsultations were programmed in the same way as regular consultations, using the same management database used in routine clinical activities, and each patient was informed about the schedule by the phone.

A particularly important step was the introduction of virtual technologies into the practice of neurosurgeons. Innovative efforts to use mobile video platforms for inpatient services and evaluation of telemedicine intensive care units have led to a huge expansion of neurological services in various countries. The development of mobile devices for high-resolution video conferencing has increased the usefulness and prevalence of these digital health systems and their use by service providers.<sup>[6]</sup>

On the contrary, in neurosurgery, the practice of evaluating patients without an apoplectic stroke, as well as training residents in remote control, has changed only gradually over the past decade. Neurosurgeons are reluctant to use digital medical technologies; however, the COVID-19 pandemic has inspired the rapid introduction of digital healthcare infrastructure in many areas.

One of the first problems of the COVID-19 pandemic was the provision of urgent neurosurgical consultations while limiting the contact of neurosurgical personnel with potentially

infected patients. In an attempt to quickly put into effect virtual patient assessments and limit contact with infected patients in the network of neurological clinics in the USA, the initial steps of specialists included the use of an already existing mobile television system used to manage patients in our neurological intensive care unit.

Thus, the InTouch Health device provides high-resolution audio and video recording for assessing the patient's condition and is equipped with an installed screen that allows the medical professional to be visible to the patient.<sup>[7]</sup> The communication platform can be accessed either through a web platform for computer users or through a mobile application such as a smartphone or tablet, and all require an institutional subscription to access the provider. The most sophisticated versions, which are usually not required for most consultations, have full three-dimensional robotic capabilities with full integration of electronic medical records.

The video consultation system was well suited for a thorough interview and anamnesis collection, and with the assistance of a licensed nurse or other medical professional, it was easy to undergo a full neurological examination. This included assessing the strength of myotomes, the sensitivity of dermatologists, reflexes, and more specialized neurological research methods.

Finally, the remote audiovisual technology was complemented by simultaneous remote access to an electronic health record (EHR), which includes patient images and laboratory test results, which allows real-time evaluation of clinical, laboratory and radiographic data, which further accelerates decision-making.

The use of the system was limited mainly by lack of time and ease of use. Purchasing a docked video system with removing it from the dock in the intensive care unit, moving the system to the appropriate floor, positioning the system (sometimes in a crowded patient care room or in an elevator) and logging in time, an application synchronized with the device can add up to 20 minutes of setup time before a neurosurgical evaluation. In the context of the need for urgent neurosurgical care or even in the context of an already long and overloaded day, such time spent on setting up may be impractical.<sup>[9]</sup>

Specialists of the network of neurological clinics in the USA emphasized that from the very beginning of preventive measures and even after the resumption of the hospital system with a full range of services for routine treatment, the institution paid considerable attention to the transfer of most outpatient clinical visits from personal to virtual appointments.

One of the strengths of virtual visits is their usefulness in providing an optimal learning environment for trainee neurosurgeons. Organized on the basis of a group chat model for conference communication, the video session allows residents and other trainees to interact with the patient in the presence of the attending physician, observing more naturally in a virtual setting than would be possible in a personal setting.

The use of virtual visits gave trainees a rare opportunity to receive specific and direct feedback on communication skills, methods of medical examination and the ability to collect anamnesis. The opportunity for attending physicians to be present in virtual chats allows these interactions to be carried

out with maximum efficiency in time, which are usually lost during a normal busy working day in the clinic.<sup>[10]</sup>

Growing digital clinical services required the support of an electronic imaging infrastructure and the ability to easily transfer images from external centers or institutions for viewing during virtual visits. Neurosurgery relies heavily on diagnostic imaging results for treatment planning, and many neurosurgeons prefer to view clear images rather than just read radiography reports. Since patients no longer come to face-to-face appointments at the clinic with visualization in their hands, it has become necessary to develop a system accessible to the patient in order to ensure the effective exchange of images from third-party institutions with clinical staff.

The transition of our interdisciplinary patient management conferences has been one of the most intuitive applications of videoconferencing technology.

The advantages of switching to a virtual platform are vividly illustrated by the practice of treating spinal tumors. Surgeons no longer need to travel to another building for a conference before or during surgery. Support staff joining the meeting virtually (schedules, nurses and supervisors) can also monitor the progress and at the same time contribute to further enhanced coordination of care.<sup>[11]</sup>

The review of E-Health applications in the modern literature on plastic surgery was also studied. The works on the evaluation of telehealth in plastic surgery were studied. Among the included studies, various areas were studied (wound treatment, burn treatment, trauma, free flap treatment, cleft lip/palate repair), and all reported improved postoperative monitoring and increased access to experience while reducing costs. Some authors reported on obstacles and limitations for telehealth applications, including overdiagnosis and dependence on telecommunication systems. It can be concluded that modern advances in telemedicine have become a worthy addition to the set of plastic surgery tools, and have emphasized the need for high-quality evidence to demonstrate clear and reproducible benefits of telemedicine in everyday clinical practice.<sup>[12]</sup>

Another group of authors conducted a study on plastic surgery and telehealth, as a result of which it was determined that more than 90% of the studied positions of practicing surgeons talk about the positive effects of using virtual technologies in their work (increased access, cost savings) using telehealth. Accordingly, it can be concluded that the positive aspects of the use of virtual technologies in surgical practice have a certain priority.

## DISCUSSION

There is little data on the perception of telehealth by patients and doctors. Prior to COVID-19, telehealth research focused on postoperative care, where they found high acceptability and patient satisfaction. Studies conducted during the COVID-19 pandemic in general surgery and otolaryngology patients have shown mixed results regarding patient satisfaction. Individual authors conducted an institutionally designed online survey during COVID-19 and found high satisfaction among respondents who were either patients who had undergone surgery themselves or their loved ones who had done so (n =

1827, 86% of respondents reported that they were extremely or partially satisfied).

More than 70% of their patients reported that it was extremely or very important for them to meet and be examined by a surgeon before surgery, which was similar to the results of our study. Only 50-60% of their patients believed that doctors thought the same way; the guiding endocrinologists in our study strongly advocated, that patients meet with their surgeons before surgery. Fifty-five percent of respondents reported that face-to-face visits were more effective for establishing trust and comfort, which was similar to the results of our study, where 60.8% of patients cited concerns about face-to-face communication as one of the reasons not to use telehealth. Only a third of their patients would choose telehealth if social distancing were removed from the equation.

Some patients cited concerns about the quality of medical care as a reason not to try telehealth, but a large group of patients believe that telehealth is as good as personal visits.<sup>[13]</sup>

Several studies have examined the attitude of both patients and doctors to telehealth. A survey of patients (n=187) and doctors (n=26) of various surgical specialties in the Mid-Atlantic region assessed the attitude of each group to telehealth, although the groups were not compared with each other. More than three-quarters of doctors expressed interest in continuing to use telehealth after the COVID-19 pandemic, but only a third of patients expressed the same opinion. In their study, 32.8% of patients reported that they would still like to see their doctors in person, despite the threat of COVID-19. Also, 70.6% of patients were more likely to use telehealth due to the pandemic, 6% - less, and the remaining 25.5% said that no more and no less likely.

The current state of e-health and telehealth applications in surgery was also investigated. Most electronic and mobile medical applications were focused on visualization, but they lack large-scale application in everyday clinical practice.

In separate papers, data on the growing capabilities of mobile phones with cameras and their use in medical imaging were analyzed. Healthcare professionals, managers and ICT developers have seen the benefits of enhanced monitoring and patient care at home. Medical specialists warned about data overload for patients, managers noted difficulties with constant patient motivation, and ICT developers noted that reliable devices, applications and software of appropriate quality are of paramount importance for the success of virtual technologies in patient care. They also noted that applications should be user-friendly, easy to install and intuitive to use.

Information about the development of an application for mobile phones using the IOS interface for assessing facial motor disorders was also studied. This could be the next step for mobile smartphone technology to quantify facial deformities due to various diseases (for example, peripheral facial nerve paralysis). Such an application can also be used for simple measurement of the consequences of reconstructive surgery for facial motor disorders.<sup>[14]</sup>

It should be noted that in each case, the attending physician should be able to respect the confidentiality of the user or patient, safely store data to prevent access by third parties or unauthorized personnel and obtain their informed consent.

## CONCLUSION

Thus, it can be noted that the use of virtual technologies in the practice of surgeons of various specializations is aimed at, on the one hand, reducing contacts with patients in order to reduce the likelihood of contracting a new coronavirus infection, on the other hand, it allows one to expand the scope of communication between specialists from different countries, conduct online consulting, as well as participate in online seminars on retraining and exchanging of experience.

The future of virtual technologies in surgery determines, first of all, the possibility of conducting operative medical consulting in conditions of hospital congestion, taking into account the development of a pandemic or the impossibility of rapid access of ambulance specialists to the patient. This will not only save the lives of patients who cannot always make the right decision on their own before providing qualified medical care, but also increase the level of public confidence in the provision of medical services that can be obtained as soon as necessary and without leaving home.

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