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Telemedicine in the face of the COVID-19 pandemic

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PALABRAS CLAVE
Telemedicina;
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Resumen El nuevo coronavirus SARS-CoV-2 es un virus de ARN monocatenario positivo que puede traducirse inmediatamente e integrarse en la célula huésped con su propio mensajero de ARN, facilitando la replicación dentro de la célula y la infectividad. La rápida progresión de la enfermedad presenta un verdadero desafío en todas las partes del mundo. A medida que se excede la capacidad habitual de atención sanitaria a los ciudadanos pueden generarse tensiones entre los profesionales de la salud y los gobiernos. Una de las estrategias más importantes para reducir y mitigar el avance de la epidemia son las medidas de distanciamiento social. Aquí es donde la telemedicina puede ayudar y brindar apoyo a los sistemas de salud, especialmente en las áreas de salud, prevención y prácticas clínicas, tal como se está están haciendo en otros sectores.

La telemedicina conecta la conveniencia, el bajo costo y la fácil accesibilidad de la información y la comunicación relacionadas con la salud a través de Internet y las tecnologías asociadas. La telemedicina durante la epidemia de coronavirus ha sido la primera línea de defensa de los

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sanitarios para para frenar la propagación del coronavirus, brindando servicios por teléfono o videoconferencia para atención personalizada en casos leves y limitando los recursos sanitarios para los casos más urgentes.

KEYWORDS
Telemedicine;
Coronavirus;
Viruses;
Infections;
Outbreak;
Covid-19

Telemedicina frente a la pandemia de COVID-19

Abstract The novel coronavirus SARS-CoV-2 is a positive single-stranded RNA virus that can be immediately translated and integrated into the host cell with its own RNA messenger, facilitating replication inside the cell and infectivity. The rapid progression of the disease presents a real challenge for the whole world. As the usual capacity for citizen care is exceeded, health professionals and governments struggle. One of the most important strategies to reduce and mitigate the advance of the epidemic are social distance measures; this is where telemedicine can help, and provide support to the healthcare systems, especially in the areas of public health, prevention and clinical practices, just as it is doing in others sectors.

Telemedicine connects the convenience, low cost, and ready accessibility of health-related information and communication using the Internet and associated technologies. Telemedicine during the coronavirus epidemic has been the doctors' first line of defense to slow the spread of the coronavirus, keeping social distancing and providing services by phone or videoconferencing for mild to focus personal care and limited supplies to the most urgent cases.

What is coronavirus? When and how did it originate?

The novel coronavirus SARS-CoV-2 is a positive single-stranded RNA virus that can be immediately translated and integrated into the host cell with its own RNA messenger, facilitating replication inside the cell and infectivity.[1] The coronaviruses, known since 1960, are a family of viruses that affect mammals, causing up to 15% of common colds in humans each year, mainly in mild forms.[2,3] Two variants have caused severe illnesses previously: SARS (SARS-CoV) in 2002, with severe acute respiratory distress, resulting in 9.6% mortality; and MERS in 2012 (HCoV-EMC/2012), also with acute respiratory distress, with a mortality rate of 34.4%.[4,5]

Thanks to ongoing investigation about the 'patient zero', it was discovered that the first known patient with the SARS-CoV-2 virus originated on the 17th of November 2019.[6] However, it was not until December 1st when local authorities and the WHO discovered a patient in Wuhan experiencing the symptoms with no connection to the cases that were later found in the Wuhan Fish and Seafood Market. The WHO was notified in early January 2020 of an outbreak of a respiratory disease manifesting with fever, cough and dyspnea, that in some cases provoked a severe pneumonic illness with bilateral invasive pulmonary infiltrates.[7] Since the beginning of the outbreak, there has been an exponential expansion of the infection[8]: the WHO declared it as a public health emergency of international concern on January 30th.[9] The disease was later called COVID-19. Posterior population genetic analyses of 103 SARS-CoV-2 genomes have indicated that these viruses evolved into two major types (designated L and S).[10] Its case-fatality rate is estimated to be around 2 to 3% but varies by age and other health conditions.[11]

Telemedicine as a mitigator of the impact on health and the use of health resources

The rapid progression of the disease presents a real challenge for the whole world. As the usual capacity for citizen care is exceeded, health professionals and governments struggle. One of the most important strategies to reduce and mitigate the advance of the epidemic are social distance measures; this is where telemedicine can help[12–15] and provide support to the healthcare systems, especially in the areas of public health, prevention and clinical practices,[16–18] just as it is doing in others sectors such as teleworking and support in training and education.[19,20] In this setting, telemedicine can have different forms:

- Online consultations: telecare (telephone, videoconference) for patients who report symptoms or ask for advice regarding their sickness, which can even be used by doctors who are under household restrictions; ''forward triage'' — the sorting of patients before they arrive in the emergency department.
- Telemonitoring/screening: devices that collect, transform and evaluate patient health data such as blood pressure, oxygen level and respiratory rate, and report them to the care team; screening for symptoms by having patients answer specific questions.
- Sensors: such as GPS trackers in remote platforms to allow users to conveniently avoid potentially dangerous locations.

- Chatbots: for recommendations, FAQs, and connecting at-risk patients to a doctor.

Telemedicine connects the convenience, low cost, and ready accessibility of health-related information and communication using the Internet and associated[21] technologies. Beginning with the use of telephone consults, telemedicine has become more sophisticated with each advancement in technology and now involves complex telecommunication and computer technologies to provide healthcare information and services to clients at multiple locations,[22] which is particularly relevant in pandemics, as it can uphold the mitigation phase.[23,24] In the current situation, it can be used for the following objectives:

- Reducing the time required to obtain a diagnosis and initiate treatment, quarantine or stabilize the patient.
- Allowing for a close follow-up: citizens can stay monitored at home, avoiding over-saturation of medical facilities, preventing the movement of people (reduction in travel time), reducing the risk of intrahospital infection.
- Coordinating the medical resources used in distant locations.
- Preventing the risk of contagion, especially via professionals, who are key assets that need to be taken care of in this context: avoiding direct physical contact, reducing the risk of exposure to respiratory secretions.
- Informing citizens.
- Saving costs on antiseptic material (gloves, disposable robes, disinfecting of visitor spaces, etc.): green impact of telemedicine.
- Training health professionals (many of whom are new to the treatment of coronavirus infections).
- Monitoring the real-world data: for example, the European Centre for Disease Prevention and Control (ECDC) provides regularly updated information about the evolution of the pandemic.[25]

199 countries are currently affected by the SARS-CoV-2.[26] Not all of them have been affected the same way, as the spread started in China and it first impacted the neighboring Asian countries. Although they were the first to deal with the virus, they put great effort and discipline to combat it effectively. The epidemic has been a test for countries' innovativeness and resilience, and telemedicine has played a crucial role in the design of health policies.

In China, the National Telemedicine Center established the Emergency Telemedicine Consultation System, a telemedicine-enabled outbreak alert and response network. The private sector participated in the response organization: ZTE and China Telecom provided 5G technology for the West China Hospital of Sichuan University.[27] Singapore created a tracing system that could identify and report the GPS tracking of people under quarantine and link this information with their serological test results, allowing them to have a map of the chain of transmission.[28] In South Korea, the use of telemedicine had been very controversial since 2018, but the Seoul National University Hospital began to provide a telemedicine service to coronavirus patients near the epicenter of the virus outbreak.

The US, Japan and a number of European countries are now at varying stages of experimentation or implementation of telemedicine. As part of their effort to extend health care to the elderly, the Trump administration has announced a significant expansion of telemedicine options, which allows Medicare-enrolled Americans to talk to a doctor by phone, chat or video at no extra cost.[29]

In Spain, healthcare has both public and private systems, with 100% of the population having access to the public system. Currently, amidst the epidemic in the Spanish region of Catalonia, public health authorities have implemented a follow-up system at the primary care, which uses phone calls to monitor patients' symptoms and in cases where the symptoms become worse, to re-admit them to the hospital. This implementation offers longitudinal and continuous care for the patients. Concurrently, medical prescriptions are allocated from the Patient Electronic Medical Record (PEMR) to pharmacys' electronic systems and medication is given to patients.[30] Moreover, use and utility of My Health (*La meva salut*)[31] has increased, a digital platform provided by the public system that posts the patient key medical documents from the PEMR, making it possible for patients to access their sick leave certifications. This capability is in addition to their existing access to discharge reports, laboratory results, radiological and other complementary reports. Furthermore, some private health providers already equipped with video-visit capabilities or apps to chat with doctors are now providing these services for the general public free of charge.[32] Another, point that could be highlighted are the new collaborations established between medtech startups (middle or small medtech companies) that are giving or facilitating the use of their telemedicine platforms to be use for the public health providers, showing a potential pathway of public-private collaboration that could be reinforce and apply after the crisis is gone.

Challenges and opportunities for telemedicine

Access and security data

China's and Singapore's[33] established a strict GPS tracking during quarantine raising concerns about infringing on individual liberties and use of personal data that could not be applied in other cultures and parts of the world. Also, during the pandemic, the GDPR[34] provided some flexibility,[35] given the exceptional circumstance. Use of personal data could be based more on public interest, and public health, and personal data could be acquired without the need to obtain the consent of the data subject. The above measure could be justified given the crisis situation.[36] However, in normal times, telemedicine services must guarantee and assure access and security, that is a special concern for the application of telemedicine. But, with more comprehensive standards and regulations ensuring strong privacy and security protections, the benefits, improving the accessibility, quality, and effectiveness of health care outweigh the risks.

Although telemedicine brings important benefits to promote wellness, prevent disease, and enable the home management of chronic conditions, it involves bidirectional, digital collection and communication of sensitive health information among health care providers and patients, that

could bring some security risk,[37] lack of controls or limits on the collection, use, and disclosure of sensitive personal information. For example, a mobile health app may be financed by sharing potentially sensitive data from the app with third-party advertisers that target ads to patients based on app use or go beyond what patients could expect of using an app.

For that, it is very important identifying privacy and security risks, like breach of confidentiality during collection of sensitive data or during transmission to the provider's system; unauthorized access to the functionality of supporting devices as well as to data stored on them; and untrusted distribution of software and hardware to the patient.[38] At this point, implementation of regulations and systems that ensure appropriate limits on data access, use, and disclosure is a must. There are a number of existing technical controls can protect against these security risks, such as data encryption, face-to-face patient identity and authenticating the device patient is using and also there are already some regulations like Health Insurance Portability and Accountability Act (HIPAA)[39] and the European General Data Protection Regulation (GDPR) all of these strategies addressed for building and maintaining public trust in telemedicine.[40]

Conclusions

Telemedicine during the coronavirus epidemic has been the doctors' first line of defense to slow the spread of the coronavirus, keeping social distancing and providing services by phone or videoconferencing for mild to focus personal care and limited supplies to the most urgent cases.

This current situation makes latent structures visible that in a normal situation would not be considered. It also provides us with a very detailed sampling of how currently our health systems are providing, which are the strengths and opportunities.

There are already simple and available technologies like phone calls that have made possible the continuum of care and patient-doctor communication during these pandemics, it is expected that if we could implement new channels of communications between patient and doctors, the communication could be more fluent, easier and efficient. Examples of that in our daily clinical practice could be: Checking and informing lab results to patients, shorter the waiting list to see a specialist doctor and with a little more sophisticated device support and monitoring patients that are in their homes.

Now that we have learned that telemedicine is useful and makes easier and available to the patient-doctor communication, it should not be stopped when coronavirus is mitigated—diabetes, heart conditions, skin rashes, transition from hospital care to primary care and more —are opportunities to put telemedicine for the services of daily clinical practice.

Authors' contributions

All authors read and approved the final version of the manuscript.

Conflicts of interest

None declared.

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