PHARMACIA

Pharmacia 71: 1–10
DOI 10.3897/pharmacia.71.e113509

Research Article

Acceptance factors of telemedicine in times of COVID-19: Case Argentina

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Received 30 September 2023 ♦ **Accepted** 23 November 2023 ♦ **Published** 14 May 2024

Citation: Schlottke JA, Alvarez-Risco A, Bertiche EL, López RB, Torletti CV, del Hoyo FY, Del-Aguila-Arcentales S, Mejia CR, Rojas-Osorio M, Davies NM, Yáñez JA (2024) Acceptance factors of telemedicine in times of COVID-19: Case Argentina. Pharmacia 71: 1–10. https://doi.org/10.3897/pharmacia.71.e113509

Abstract

We performed an analytical, cross-sectional study of 285 consumers to assess the influence of social influence, resistance to use, facilitators to use, perceived ease of use and perceived usefulness of telemedicine on the intention to use telemedicine of citizens of Argentina in times of the pandemic by COVID-19. The proposed research model was analyzed using partial least square structural equation modeling (PLS-SEM). Perceived ease of use had a positive effect (0.624) on perceived usefulness; facilitating conditions had a positive effect (0.476) on usage intention; perceived risk (-0.062) and social influence (0.072) did not have an effect on usage intention. Bootstrapping showed that the beta coefficients were statistically significant. The outcomes may provide ideas to healthcare managers to know what an expectation about telemedicine is and develop new services directed to patients.

Keywords

Argentina, telemedicine, telehealth, social influence, resistance to use, facilitators to use, perceived to use, perceived usefulness, COVID-19, pandemic

Introduction

Health needs have changed dramatically due to the COVID-19 pandemic, generating the development of different services for patients. The COVID-19 pandemic reached 241 million confirmed cases and more than 6.6 million deaths worldwide on November 24, 2022 (WHO 2021). Social isolation as a preventive strategy to avoid contagion finally caused significant changes in the population's daily life. Since the beginning of the pandemic could be

recognizing the lack of communication to guide the population to protect itself; in this context, the fake news started to spread further, complicating the targeting of COVID-19 patients (Alvarez-Risco et al. 2020). In education, due to the distance modality, extensive use of virtual tools was generated by the students. It generated a longer connectivity time which could generate the performance of several simultaneous activities during the virtual synchronous classes (Curelaru et al. 2022); a strong impulse has been generated for the efficient use of business resources to support the resilience of organizations that are basing their actions on the framework of the circular economy. During the social resilience process, many working people were laid off, or their companies stopped operating, for which they stopped working and had to assume contingency plans to obtain resources, which has generated a significant increase in new entrepreneurship (Apostolopoulos et al. 2021; Nasar et al. 2022; Sharma et al. 2022). The profound need for responses to the pandemic has generated various investigations that sought to contribute to public health management and various business and social resilience strategies (Alvarez-Risco and Del-Aguila-Arcentales 2021; Chung et al. 2021).

The current and future interests of the students about their contribution to the fulfillment of the Sustainable Development Goals have been evaluated since the personal and economic demands of the countries change in a VUCA (volatile, uncertain, complex, ambiguous) world, so to know in detailing student preferences is strategic to generate new training and professional development policies. New services have been generated based on disruption to solve problems generated in the pandemic, such as food e-commerce and those reported in some countries. Globally, tourism changed due to the isolation of people, which generated the bankruptcy of airlines and tourism companies, which have been strongly affected by the absence of customers. Because tourism has been restricted worldwide, hotel services have been very strongly impacted since there were no tourists, and hotels lost their customers, generating a massive loss of jobs. Other impacts include product and service prices.

Due to the large number of patients arriving at hospitals to be treated for COVID-19, patients with other diseases, such as hypertension or diabetes, have seen their access to medical care limited, generating a lack of control of chronic diseases, leading to the worsening of the patients and finally to increase the death in these patients (Shibata et al. 2020). Given the lack of medical care and misinformation, patients' decision to self-medication is generated (Rojas Román et al. 2020). The measures of social isolation have been worldwide, but there has been confusion in following one country the norms that are applied in another country, which could generate risky results, such as the case of the children taking to the streets when the second wave was approaching (Yáñez et al. 2020). Work continuity has also been impacted since many professionals during the pandemic have been afraid and frustrated at not having protective equipment and seeing many deaths without being able to avoid it, especially at the beginning of the pandemic, when protocols were non-existent and supportive treatment was uncertain. Likewise, damages have been generated in health workers due to the excellent deployment for the care of the population, with alterations in mental health. Due to the offer of telemedicine started in several countries, there is a need to know the acceptance of telemedicine in countries where its implementation is not comprehensive, which allows us to know patients' expectations.

The current study was carried out in Argentina, a developing country with different characteristics compared to countries that have provided telemedicine since many years ago. The research aims to evaluate the influence of social influence, resistance to use, facilitators to use, perceived ease of use and perceived usefulness of telemedicine on the intention to use telemedicine during the COVID-19 pandemic.

Theoretical framework

Globally, telemedicine has been increasing its implementation and its application in the treatment of various diseases such as cancer (Royce et al. 2020), tuberculosis (Bedard et al. 2017), diabetes (Ghosh et al. 2020), hypertension (Omboni and Ferrari 2015), and ophthalmology (Saleem et al. 2020). Telemedicine is considered a medical service provided through various means of connection that connects a health professional and a patient separated by a physical distance. Thus, there are various platforms through which these services are provided. The most common and complete is the video call, the synchronous conversation in which the professional and the patient can see and hear each other during the medical consultation. However, asynchronous services also allow patient health care; thus, even the increasing presence of bots that can provide information is seen. Telemedicine offers a valuable option for different types of patients who may see access to health services restricted, decongesting hospitals and allowing better quality care; however, many patients may feel that telemedicine is depersonalized care, lacking in warmth, and ultimately inhuman. Also, other patients need physical contact with the health professional, direct eye contact and a smile in person.

The use of telemedicine has increased, even in countries where it was already in operation, such as the UK (Wootton 1999), Australia (Crowe and Mcdonald 1997), Canada (Jin et al. 2004), Germany (Klar and Pelikan 2009), Japan (Takahashi 2001), South Korea (Lee et al. 2000), United States (Perednia and Allen 1995), China (Hsieh et al. 2001). In other countries, its use was initiated by the pandemic (LeRouge et al. 2019); although telemedicine services are not yet the central part of medical care, they return to low-demand services, possibly after the pandemic. Previous studies show diverse telemedicine adoption levels (Menachemi et al. 2004; Spaulding et al. 2005; Martin et al. 2012; Ranganathan and Balaji 2019) and are explained by different barriers (Stanberry 2000; LeRouge and Garfield 2013; L'Esperance and Perry 2016). Patient resistance is a usual phenomenon whenever changes are made to standard healthcare systems. An understanding of the factors that influence the acceptance of telemedicine services among patients is necessary. Because telemedicine involves a significant investment of resources due to the technology involved, it is vital to know

the level of acceptance to have sustainability in the service. The benefits of telemedicine are achieved if continuity in service use is achieved. The limitation of the empirical evidence generates the need to develop a theoretical model that can be used to predict the acceptance of telemedicine. This model must be tested in different realities due to the characteristics of each region and country.

Theory

Technology acceptance model (TAM)

People may have different reasons to accept a new service; however, when this acceptance is linked to the use of technology, this construct is called acceptance of technology. Because the development of science constantly presents users with different technological products, the acceptance of technology is an aspect that constantly has relevance in purchasing a product or service. The evolution of mobile phones (Wei et al. 2010; Moreira et al. 2017; Moss 2021) or video game consoles (Kuo et al. 2017; Ozuem et al. 2017) has accepted technology as a crucial element for technological development and commercial offer for customers. For the present study, the Technology Acceptance Model (TAM) was proposed by Davis (Davis and Venkatesh 1996). TAM consists of two primary constructs: perceived ease of use and perceived ease of use. However, when one thinks about the aspects that have an integral influence on the acceptance of telemedicine, the social influence, the resistance that the person would have to this new service and at the same time, the conditions that facilitate it must be considered. For this reason, based on the TAM, these components are incorporated, as has been done in previous investigations.

Development of hypothesis

Intention to use telemedicine (IUT)

The intention to use a specific technology is a changing element over time. The different technological gadgets that are used daily have evolved rapidly. For this reason, it can be expected that the change in the intention of a particular technology is influenced by its greater availability, accessible price, more people in the environment using said technology, ease of use, and benefit of using it, among others. There is evidence of evaluation of intention to use healthcare technology in different types of patients (de Veer et al. 2015; Quaosar et al. 2017; Zhou et al. 2019; Ahmad et al. 2020), but it has not been evaluated in the general population of developing countries such as Argentina. Therefore, the intention to use telemedicine is established as the dependent variable explained by the other independent and mediating variables in the present study.

Perceived ease of use (PEOU)

A central component of TAM is perceived ease of use, that is, how easy it can be for the person to use the technology offered. There are differences between people regarding the level of digital literacy (Santos et al. 2018; Techatawewan and Prasertsin 2018; Kaiper-Marquez et al. 2020), which can contribute to the perception of ease of use. People who are highly digitally literate generally have an easier time adapting to new technologies (Cruz-Torres et al. 2021). Some studies evaluated the perceived ease of use related to mobile health technology (Schnall et al. 2015), electronic health records (Tubaishat 2018), electronic books (Nasser Al-Suqri 2014), and virtual reality simulation (Fagan et al. 2012).

Perceived usefulness (PU)

It is the extent to which a person thinks deeply that using a system help in enhancing their performance. For the current study, perceived usefulness must be understood as how much technology can provide a concrete utility, in this case, to replace the usual health care. The usefulness inside the person may be based on saving time by not attending the appointment in person, saving the transfer to the place of the face-to-face appointment, the comfort of the house, and even getting better outcomes for their health. Previous studies have evaluated perceived usefulness in the healthcare system as acceptance of to use of electronic health records (Alsohime et al. 2019), IoT health devices (El-Haddadeh et al. 2019), and medical care by mobile phones (Lee et al. 2018; Scheper et al. 2019).

Social influence (SOC)

With the expansion of the Internet, information between people is easily and quickly distributed, often without any filter, which allows the environment, friends and family to have an important influence on the decision of daily activities, from the simplest ones such as where to tale lunch (McFerran et al. 2010; Zhou et al. 2013) or the type of medical insurance they take (Kansra and Gill 2017; Oh and Jeong 2017). For this reason, social influence is considered to capture that external influence on decisions to use telemedicine, possibly based on previous experiences in the environment or opinions based on preferences, expectations or fears. The opinion of family and friends are critical and can encourage the utilization of telemedicine services. For the current study, social influence is the attribute that promotes and prevents people from using telemedicine services.

Resistance to use (RES)

Several studies have described the resistance to technology (Hannafin and Savenye 1993; Howard 2013; Hsieh 2016; Roy et al. 2018; Safi et al. 2018) but have not been widely performed in health settings in developing countries, specific resistance to telemedicine services. The use of new technology always carries a risk of misuse, and in the case of health, it would imply that the care of the health problem could not be efficient with the consequent health complication and loss of time and money. In times of pandemic, the telemedicine service has often been the only alternative, but that does not mean that later people want to continue using the service. For this reason, it seeks to measure the resistance, evident when the type of medical care can be freely determined.

Facilitating conditions (FAC)

Personal communication devices such as mobile phones, tablets and laptops are increasingly available to people in economic terms. However, there is a group of people who still have limitations, accessing these technologies but of low range, which makes functions difficult more complete communication systems such as video calls or access to meeting rooms with other participants (Shao and Lee 2020). For this reason, facilitators can contribute with the choice of technology, always considering their connectivity and the type of device they have for a successful and fast connection. For this reason, this construct is crucial since it assesses whether, physically, in terms of resources, the person has the intention of using telemedicine services.

Hypothesis

H1: SOC has a positive and significant effect on the IUT
H2: PEOU has a positive and significant effect on PU
H3: PU has a positive and significant effect on IUT
H4: RES has a negative and significant effect on the IUT
H5: FAC has a positive and significant effect on the IUT
H6: PEOU has a positive and significant effect on IUT

Research model

Fig. 1 details the model created to explain the relation of variables in the current study. The model shows SI, PEOU, PU, RU, FU and IUT.

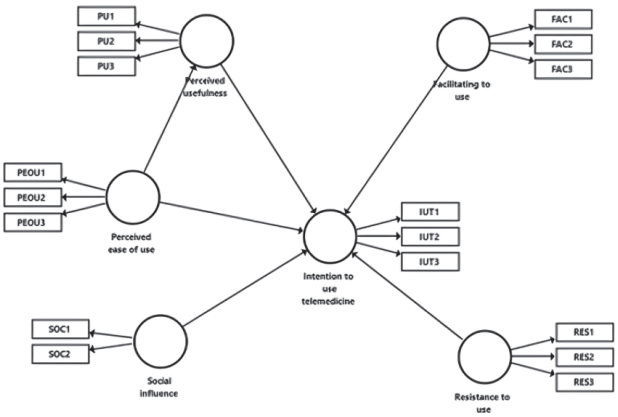

Figure 1. Research model.

Materials and methods

The methodology for this research includes a correlational design. The aim is to describe the factors explaining the intention to use the telemedicine service.

Data collection

The data collection was performed from citizens in Argentina through a non-probabilistic sampling. Participation was completing an online questionnaire between June 28 – July 14, 2021. It was completed 285 questionnaires. The questionnaire was share by Internet. The collection of the questionnaire was using an online distribution by via emails and WhatsApp, that is, snowball technique.

Instrument

"Informed consent was obtained from all individual participants included in the study. The participants received the following information: "The online questionnaire is for scientific purposes. If after you start answering the questions, you do not want to go ahead for different reasons, feel free to do so". The participants answered yes/no to statements "I have freely decided to participate in this study", "I understand that my participation is voluntary," and "I received information about the objectives of the present investigation". For this research, it was used a questionnaire that consisted of a 5-point Likert scale based and adapted from instruments developed to assess PU (Davis and Venkatesh 1996), PEU (Davis and Venkatesh 1996), social influence (Venkatesh et al. 2012), resistance to use (Hsieh 2016), and facilitating to use (Riffai et al. 2012). The section related to PEU (three items), PU (three items), social influence (two items), resistance to use (three items), facilitating to use (three items), and intention to use telemedicine.

Data analysis

The data was analyzed using SmartPLS statistical package version 3.3.2. The questionnaire was validated using partial least square structural equation modeling (PLS-SEM); it also determined the construct and discriminant validity and internal consistency through composite reliability. Cronbach's alpha reliability coefficient evaluated each subscale's internal consistency. Finally, the questionnaire's discriminant validity was established by applying the Fornell–Larcker criterion (Fornell and Larcker 1981; Lopez-Odar et al. 2020). To verify the statistical significance, it was used the non-parametric technique of Bootstrapping (Streukens and Leroi-Werelds 2016). The current research used a resampling strategy (5000 resamples).

Results

285 participants from Argentina completed the survey. Most respondents were women [169 (59.29%)], ranging between 18 and 47 years.

Reliability

Table 1 shows that the scales exhibited reliability coefficients (Cronbach's Alpha) higher than the expected minimum of 0.5 in the PLS-SEM exploratory analysis.

The model was analyzed using PLS-SEM, which included the reliability analysis of each indicator, the internal consistency of each dimension (composite reliability),

Table 1. Internal consistency analysis using partial least square structural equation modeling (PLS-SEM).

Scale	N° of items	Cronbach's Alpha	Range of relations item – scale
Perceived ease of use	3	0.813	0.841–0.867
Perceived usefulness	3	0.82	0.839–0.878
Social influence	2	0.627	0.820–0.884
Resistance to use	3	0.876	0.830–0.932
Facilitating to use	3	0.822	0.820–0.893
Intention to use telemedicine	3	0.821	0.765–0.910

Sample: 285 questionnaires.

the analysis of the average variance extracted and the discriminant validity.

Composite reliability

The coefficients of sub-scale reliability were between 0.842 and 0.924 (Table 2). An acceptable level of composite reliability must be greater than 0.70 (Taber 2018). Overall, the values obtained for the six sub-scales confirm the reliability of the questionnaire.

Table 2. Construct validity by PLS-SEM.

Scale – Items	Loading	Composite Reliability	AVE
PU		0.893	0.735
Using TM would improve the quality of my healthcare	0.839		
Using TM would improve my access to healthcare services	0.855		
Using TM would be useful in my daily routine.	0.878		
PEOU		0.889	0.728
I would find learning to use TM would not be very difficult for me	0.841		
I would find it easy for myself to interact with doctors using TM	0.851		
Interacting with TM systems would be clear and understandable for me	0.867		
SOC		0.842	0.727
People around me who mean to me a lot would prefer if I would use TM services	0.820		
I am forced to change habits to adapt to new developments in social media	0.884		
RES		0.924	0.802
I wouldn't want TM to alter my traditional way of using healthcare services	0.932		
I wouldn't want TM to interfere or change the way I interact with doctors.	0.921		
I don't want TM services to change the way I deal with my health problems and choices	0.830		
FAC		0.894	0.737
I would be able to have all the necessary resources for using the TM	0.820		
I would acquire sufficient knowledge to use the TM service	0.893		
TM suite well with my healthcare routine	0.861		
IUT		0.895	0.740
Assuming that I was given a chance to access TM, I intend to use telemedicine services	0.910		
Whenever I would need remote medical care from professionals, I would gladly use TM services	0.898		
I intend to inform my relatives and friends about TM	0.765		

Sample: 285 questionnaires; TM = Telemedicine.

Discriminant validity

The Fornell-Larcker criterion was used (Fornell and Larcker 1981) to evaluate multicollinearity issues. Table 3 shows compliance with this criterion in all sub-scales, demonstrating the discriminant validity of the instrument evaluated.

Table 3. Discriminant validity by Fornell-Larcker criterion.

Scale	FU	IUT	PEU	PU	RU	SI
FAC	0.859					
IUT	0.731	0.860				
PEOU	0.600	0.584	0.853			
PU	0.569	0.660	0.622	0.857		
RES	-0.532	-0.463	-0.401	-0.425	0.895	
SOC	0.550	0.626	0.784	0.819	-0.358	0.853

Sample: 285 questionnaires.

Bootstrapping

The criterion used was 5000 resamples. The original value is expected to be similar to the average obtained value (Streukens and Leroi-Werelds 2016). Table 4 shows that all relations are significant (p values <0.01).

Table 4. Significance of trajectory coefficients.

Scale	Original sample	Mean sample	Standard deviation	t-statistic	p-value	Hypothesis Test
SOC → IUT	0.111	0.131	0.124	0.899	0.042	Accepted
PEOU → PU	0.622	0.625	0.055	11.315	0	Accepted
PU → IUT	0.256	0.244	0.092	2.782	0.005	Accepted
RES → IUT	-0.046	-0.047	0.052	0.883	0.377	Rejected
FAC → IUT	0.482	0.482	0.071	6.825	0.758	Rejected
PEOU → IUT	0.03	0.021	0.097	0.308	0	Accepted

The bootstrapping technique (5 000 times) using Smart PLS; p-value <0.05.
Sample: 285 questionnaires to citizens.

Table 5 shows the specific indirect effects to demonstrate the mediator influence of perceived usefulness between perceived ease to use and intention to use telemedicine.

Table 5. Specific indirect effects.

Scale	Original sample	Mean sample	Standard deviation	t-statistic	p-value
PEOU → PU → IUT	0.159	0.153	0.061	2.620	0.009

The bootstrapping technique (5 000 times) using Smart PLS; p-value <0.05.
Sample: 285 questionnaires to citizens.

Fig. 2 shows the research model testing.

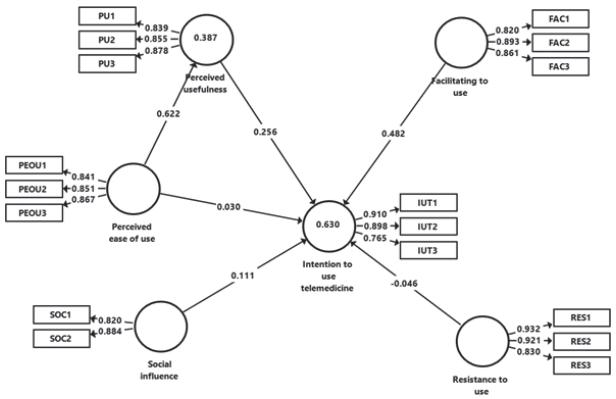

Figure 2. Research model testing.

Discussion

The present study evaluated the factors that explain the intention to use telemedicine. It was possible to show that the respondents think telemedicine would improve the quality of medical care, which is very striking since this can be a factor for the continuity of use. It could be explained by the more accessible provision of virtual medical appointments, generating the feeling that with any ailment, it is possible to have ease of medical attention, which is usually a problem in developing countries (Rust et al. 2008; Cowling et al. 2013; Syed et al. 2013; Roy et al. 2020). The second item precisely addresses the feeling that they improve their access and allow access to health services without altering their daily life since, in public health services, many people have to wait for hours to be treated, despite having a scheduled appointment. It is also seen that it is trusted that learning the use of telemedicine is not difficult, which is quite likely because, currently, telemedicine services are operated through systems that are very intuitive for patients. (Yager et al. 2017; Perissinotto et al. 2019; Sultan et al. 2020). The new form of communication and confidence building that patients feel can be generated with the health professional in charge of the consultation is relevant (Velsen et al. 2017; Costantino et al. 2021) since traditionally, patients are attended in person, being able to look closely at the patient, be physically examined and establish an emotional bond.

Social networks are increasingly present in people's lives, the opinion of others being of great importance in people's lives, which could also be explained by the need to validate actions (Pan et al. 2017; Kaakinen et al. 2020). Therefore, people publish many aspects of their lives, even very personal ones, such as being pregnant, having a health problem that has them hospitalized or the most profound thoughts, and often aggressive against political or sports actors (Leung 2014; Li et al. 2015; Theivendran 2021). The previous experience of other people inevitably impacts their opinion, which can be requested through a chat message on the phone or posted on the person's initiative to thank the excellent service or, more usually, to complain openly and crudely about the health service received. This information quickly spreads on the internet, mainly complaints so that the person could decide not to use the telemedicine service or continue using it due to social influence. It is impossible to verify if a negative comment posted on social media is real; people usually believe directly, and if they have doubts, they think, "for some reason, they have it published; something really must have". The difficulty of verifying what is published on social networks is its greatest strength (Aldwairi and Alwahedi 2018; Shao et al. 2018; Shu et al. 2020). Endurance Items has captured people's fears of leaving the traditional mode of medical appointments behind. Depersonalization is a fear of certain patients (Welch et al. 2017; Amparore et al. 2020).; however, it is crucial to remember how different tools have been incorporated for communication between people having resistance to use; this initially happened with the use of mobile phones for banking operations (Chemingui and Ben lallouna 2013; van Klyton et al. 2021); this resistance could be lower in young people compared to adults and the elderly (Laukkanen et al. 2007).

The aspects reported as facilitators are also aspects that companies should consider to generate telemedicine services of high acceptance and use. Health is an area that generates many businesses based on products and services, especially those that can have laptops that record and transmit data to a center for medical decision-making. Thus, shoes that record the temperature, weight and distance traveled; lenses, watches, and other devices exist. However, it is not as easy to get people to connect with health remotely as it is with their social topics, which can be seen in the increasing use of social networks to share various material. A recent proof of this difficulty has been seen by Google, which recently had to deactivate Google Health, which was seeking to position itself as a provider of medical services and which will now only be focused on the sale of health products such as exercise controllers or with online recommendations for women subsistence allowance. How has the giant not managed in 15 years (Google Health started in 2006) to find the mechanism to ensure that its clients of general services such as email or map guide can also trust and link with the health offer (The Verge 2020).

One aspect vital to the success of telemedicine services is based on two types of literacy: technology and health. Health literacy is the level of understanding a person has about the health content communicated by medical personnel or that they can read in medical reports and on the Internet. This literacy level is always explained by the fact that a country or a city dedicates resources to empowering its population through health education from the first years of life.

The current study has limitations as the data was collected in COVID-19 pandemic and need be replied in after pandemic times. The number of participants can be a limitation; however, the PLS-SEM allow make the analysis of the data. Also, the participants were citizens because patients in healthcare facilities were not available by pandemic.

Future research should evaluate the acceptance of the different modes of telemedicine provision, differentiating between the intention to be served by video call, chatbot, synchronous chat, telephone and others. Also, it is necessary to evaluate telemedicine's intention in patients with specific diseases, such as diabetes and hypertension, as well as patients from urban and rural areas. Another element that is evaluated is to know the perception of the cost of the telemedicine service, answering the question, should I pay the same for a face-to-face and virtual medical appointment? Which health professionals are most needed to offer telemedicine services? Future research should also be aimed at knowing if people are interested in blended services, that is, partial and face-to-face alternately.

Conclusion

The COVID-19 pandemic has created an opportunity for telemedicine to have gained an important role, providing the population with attention to COVID-19 cases; At the same time, it has been a starting point in developing countries to provide services to patients with other diseases that must be controlled and who, due to the lack of places for medical care, received remote care through telemedicine services. The planning of medical services for the post-pandemic period requires information from the potential users of telemedicine services so that it is possible to know who the users would be, what preferences they have regarding medical care and if specific characteristics are required. Health services in developing countries are gradually implementing telemedicine services, which are not for all patients, so it is appropriate to prioritize the types of patients who can obtain the most significant advantage from this service.

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