

# Diabetic Foot and COVID-19 Pandemic in Argentina: Foot and Ankle Specialists Respond to the Use of Telemedicine

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## ABSTRACT

**Introduction:** Telemedicine was the recommendation of international societies during the COVID-19 pandemic for medical consultations in patients with diabetic foot (DF). The main aim of this work is to evaluate the use of telemedicine as a tool for the evaluation and follow-up of patients with DF by foot and ankle specialists in Argentina. As secondary objectives, we propose to assess the satisfaction perceived by the professionals with the use of this tool, to evaluate the specific strategies used to carry out the remote medical consultation, and to determine its permanence when returning to the usual care activity. **Materials and Methods:** Three surveys were sent to members of the Argentine Society of Medicine and Surgery of the Leg and Foot in May and July 2020 and April 2022. **Results:** According to 75% of respondents, the most valuable function of telemedicine was prevention, followed by monitoring of the clinical pathology (54.1%), postoperative follow-up (41.6%), and diagnosis (29.1%). The most commonly used resources for remote consultation were telephone conversations, followed by images sent by instant messaging. Only 37.5% used electronic health record platforms during 2020. **Conclusions:** The most commonly used resources for remote consultation were telephone conversations, followed by images sent by instant messaging. 33.4% of respondents were satisfied with telemedicine consultations in May 2020, while in July, satisfaction with this tool rose to 46.7%. In April 2022, only 13% of those surveyed in July 2020 continued offering remote consultations.

**Keywords:** telemedicine, foot and ankle, diabetic foot, traumatology, COVID-19 pandemic

**Level of Evidence:** IV

## Pie diabético y pandemia de la COVID-19: adaptación al uso de la Telemedicina por los especialistas de pie y tobillo de los Servicios de Traumatología de la Argentina

## RESUMEN

**Introducción:** La telemedicina fue la recomendación internacional durante la pandemia de COVID-19 para las consultas médicas de los pacientes con pie diabético. El objetivo de este estudio fue analizar el empleo de la telemedicina como herramienta en pacientes con pie diabético, por parte de especialistas en pie y tobillo de la Argentina. Como objetivos secundarios se planteó valorar la satisfacción percibida por los profesionales con el uso de esta herramienta, evaluar qué estrategias se usaron para realizar la consulta médica remota y determinar la permanencia al retornar a la actividad asistencial habitual. **Materiales y Métodos:** Se enviaron tres encuestas a los socios de la Sociedad Argentina de Medicina y Cirugía de la Pierna y Pie, entre mayo 2020 y abril de 2022. **Resultados:** La función más valiosa de la consulta remota fue la prevención (75% de los encuestados), el seguimiento clínico (54,1%), el seguimiento posoperatorio (41,6%) y el diagnóstico (29,1%). El recurso más utilizado fue la conversación telefónica, seguida del envío de imágenes por mensajería instantánea. Solo el 37,5% utilizó las plataformas de historia clínica

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virtual. **Conclusiones:** Los recursos más utilizados para la consulta remota fueron la conversación telefónica, seguida del envío de imágenes por mensajería instantánea. El 33,4% estaba conforme con la consulta por telemedicina en mayo de 2020, mientras que, en julio, la conformidad ascendió al 46,7%. En abril de 2022, solo el 13% continuaba con las consultas remotas.

**Palabras clave:** Telemedicina; pie y tobillo; pie diabético; traumatología; pandemia; COVID-19.

**Nivel de Evidencia:** IV

## INTRODUCTION

Argentine Republic Decree No. 297/2020<sup>1</sup> of March 2020 for the “preventive and compulsory social isolation” implied the application of restrictions to all non-urgent medical consultations. Thereafter, providing care to people with diabetic foot in the way recommended by the guidelines and available evidence was not possible and this required the search for alternative ways to provide adequate follow-up to patients, avoiding or decreasing the attendance of high-risk patients in health centers. Trauma services, and specifically the foot and ankle sectors, had to adapt to this new reality, adopting patterns from recent experiences in other countries that had already begun with pandemic restrictions.<sup>2-4</sup>

Telemedicine is defined by the World Health Organization as the provision of healthcare services by health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities.<sup>5</sup>

Diabetic patients are a population at risk and decreasing their attendance at health centers became imperative to avoid contagion. The use of telemedicine is a strategy related to this purpose, which not only allows the clinical monitoring of the patient, but also provides preventive measures.<sup>6,7</sup> It is the recommendation of international societies for the care of this group of patients in this context.<sup>6,8</sup> The COVID-19 crisis resulted in a complete modification of the ways of providing healthcare, both in and out of hospital, in order to be able to attend to the massive influx of COVID patients. In order to prevent at-risk patients from attending hospitals, specialist diabetic foot staff were forced to seek a follow-up solution in the technology, despite insufficient or contradictory evidence about its effectiveness. However, before the current crisis, the role of telemedicine in disasters, military medicine and rural care was already in sight.<sup>9</sup> In Argentina, the development of Telesalud (Telehealth) began approximately 20 years ago, at the Pediatric Hospital “Prof. Dr. Juan P. Garrahan”, for the communication between health institutions that are part of the network, seeking a second opinion, a consultation on a specialty that does not exist in the public hospital attended by the patient or a study that requires more technology than is available in that care center. It is also useful for the follow-up of patients who have already received care away from their homes. Currently, we have the Red Federal de Telesalud y Comunicación a Distancia (*Federal Telehealth and Distance Communication Network*) under the Ministry of Health. This network allows first-opinion consultations for patients and second-opinion consultations for professionals.<sup>10,11</sup> Teleconsultation had already been proposed for wound follow-up and, recently, the role of teledermatology in the pandemic has been reported.<sup>12,13</sup> To date, we have not found any publications on the use of telemedicine by foot and ankle trauma teams specialized in diabetic foot in our region.

The technologies used for teleconsultation must ensure the quality, security and protection of personal and sensitive data, as established by Act No. 25,326. It is recommended that the technology used has the standards for health information systems and security and cybersecurity protocols for the inviolability of information.<sup>14,15</sup> Development of this modality and implementation by the health team were abrupt during the beginning of the pandemic; in some cases, it was necessary to resort to informal communication channels, such as instant messaging, to avoid the cessation of medical care for this group of patients.<sup>16,17</sup>

Therefore, the main objective of this study was to analyze the use of telemedicine as a tool for the evaluation and monitoring of patients with diabetic foot by teams made up of foot and ankle specialists from Argentina. As secondary objectives, we propose to assess the satisfaction perceived by professionals with the use of this tool, evaluate which specific strategies were used for remote medical consultation, and determine the permanence of teleconsultation when returning to usual care activity.

## MATERIALS AND METHODS

Two surveys developed with the Google Drive document creation tool (Google Inc., Menlo Park, CA, USA) were sent to all members of the Sociedad Argentina de Medicina y Cirugía de la Pierna y Pie (SAMECIPP, *Argentine Society of Medicine and Surgery of the Leg and Foot*), in order to obtain data on the implementation of telemedicine as a tool for the evaluation, diagnosis, and monitoring of patients with diabetic foot.

The surveys, once approved by the evaluation committee of the SAMECIPP board of directors, were sent by email to all members. The first one was sent at the beginning of the pandemic (May 2020) and the second one, around the time of the exponential increase in the number of cases (July 2020).

The inclusion criteria were: trauma specialists, members of SAMECIPP, who carry out regular and specific consultations of diabetic foot at the time of responding to the survey. Incomplete or inconsistent surveys were excluded.

The variables surveyed were:

- Healthcare center where they develop their professional activity: free text.
- City: free text.
- Healthcare level of the center: selection of an option (primary, secondary or tertiary).
- Using telemedicine before the pandemic: selecting an option (Yes-No).
- Telemedicine use at the time of the survey: selecting an option (Yes-No).
- Frequency of controls with this modality: selection of an option (0, 1 to 5, 6 to 10, 1 to 20 and more than 20 weekly consultations).
- Tools for remote consultation: selection of one or more options (telemedicine or electronic health record platform, WhatsApp®, telephone or other option to complete).
- Resources used during remote consultation: selection of one or more options (telephone conversation, email, text message, photo, videos, caregiver interview, or other option to complete).
- Consideration of the most valuable function of the tool: selection of one or more options (prevention, diagnosis, treatment, study request, clinical follow-up, postoperative follow-up, or other option to complete).
- Conformity with the information obtained and the guidelines indicated during the teleconsultation: selection of an option (Yes-No).
- Satisfaction with the remote consultation: open response; the responses were grouped into categories: satisfied, partially satisfied, dissatisfied, or does not apply/does not answer.

In addition, the second survey included a question to analyze whether remote consultation increased or decreased in July in comparison to April: selecting an option (Yes-No).

Regarding the third survey in April 2022, it was reported whether specialists continued to conduct telemedicine consultations on diabetic foot.

The data obtained (categorical variables) are expressed as absolute presentation number and percentage.

## RESULTS

The surveys were sent to 218 SAMECIPP members. Thirty-nine professionals from 28 centers met the inclusion criteria in the first survey (Tables 1 and 2).

Six specialists (15%) conducted telemedicine consultations before the pandemic. Twenty-four of the professionals surveyed (61.5%) offered telemedicine consultations for diabetic foot in April 2020. Sixteen (66.6%) of these 24 professionals had 1 to 5 weekly consultations; four of them (16%), 5 to 10 and another four (16%), less than one weekly consultation. The most frequently used tool was sending images through WhatsApp® (WhatsApp Inc., 2009) in 21 cases (87.5%), followed by the chosen virtual medical record platforms (9 cases, 37.5%) and phone calls (7 cases, 29.1%). Regarding the resources for teleconsultation, 21 professionals (87.5%) preferred telephone conversation and the use of photographic images and 45.8% also used video images.

**Table 1.** Data by care facility (n = 28)

Level of care	n (%)
Primary, n (%)	25 (89.3)
Secondary, n (%)	2 (7.1)
Tertiary, n (%)	1 (3.6)
Exclusive diabetic foot office in the Orthopedic Service, n (%)	27 (96.4)
<b>Province</b>	
Autonomous City of Buenos Aires, n (%)	11 (39.2)
Buenos Aires, n (%)	8 (28.6)
Neuquén, n (%)	2 (7.1)
Misiones, n (%)	2 (7.1)
Santa Fe, n (%)	1 (3.6)
Entre Ríos, n (%)	1 (3.6)
Salta, n (%)	1 (3.6)
Córdoba, n (%)	1 (3.6)
Corrientes, n (%)	1 (3.6)

**Table 2.** Demographic data.

	Specialists (n = 39)
Male, n (%)	36 (92)
<b>Professional activity</b>	
Public sector, n (%)	29 (74.3)
Public and private sector, n (%)	7 (17.9)
Private sector, n (%)	3 (7.8)
<b>Region</b>	
Autonomous City of Buenos Aires, n (%)	15 (38.5)
Buenos Aires (province) n (%)	11 (28.3)
Córdoba, n (%)	3 (7.7)
Mendoza, n (%)	2 (5.2)
Santa Fe, n (%)	1 (2.9)
San Juan, n (%)	1 (2.9)
Salta, n (%)	1 (2.9)
Neuquén, n (%)	1 (2.9)
Río Negro, n (%)	1 (2.9)
Entre Ríos, n (%)	1 (2.9)
Tucumán, n (%)	1 (2.9)

Figure 1 details the telemedicine functions reported by respondents, the most valuable function being prevention (75%).

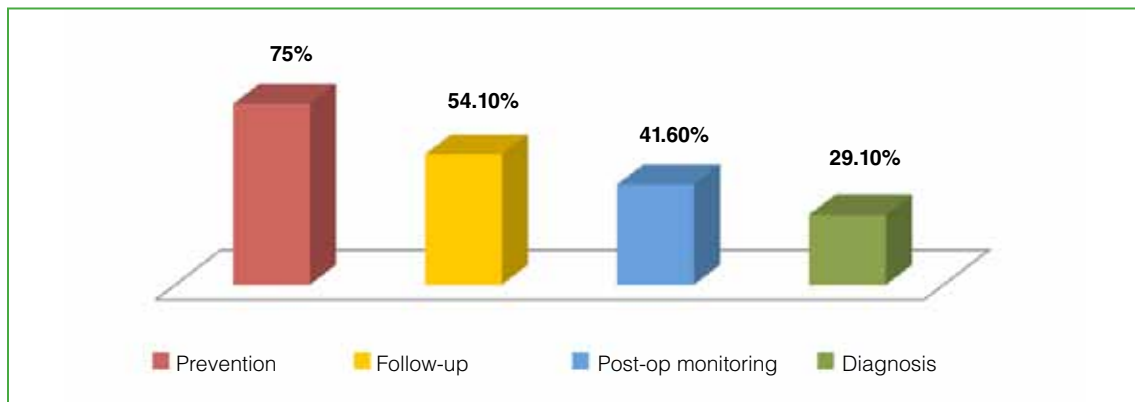


Figure 1. Main functions of telemedicine communicated by professionals during the pandemic.

Regarding compliance with the information obtained and the guidelines indicated during the teleconsultation, 13 specialists (54.1%) said they were satisfied. Seven (29.1%) said they were satisfied with telemedicine; 10 (41.6%) said they were partially satisfied; five (20.8%) said they were dissatisfied and two (8.3%) did not answer. The most common reason for dissatisfaction was the inability to perform the physical examination.

In July 2020, the second survey was sent. Twenty-two foot and ankle specialists answered it (56.4% of the respondents of the first edition), belonging to 17 centers. Fifteen (68.2%) used telemedicine at the time of the survey; seven (31.8%) did not conduct remote consultations. Among specialists conducting remote consultations: nine (60%) used teleconsultation more than in April 2020; three (20%) maintained the same number of consultations and, in three cases (20%), these decreased. Seven (46.7%) were satisfied with the remote consultation; three (20%), were partially satisfied; four (26.7%) were dissatisfied; and one (6.6%) did not answer. If we take into account the response of these same specialists in the first survey: five (33.4%) were satisfied; seven (40%) were partially satisfied; two (20%) were partially satisfied; and one (6.6%) did not answer. Three remained satisfied in both surveys and two remained dissatisfied. None of the respondents who were satisfied in the first survey were dissatisfied in the second; nor did any of the dissatisfied respondents become satisfied (Figure 2).

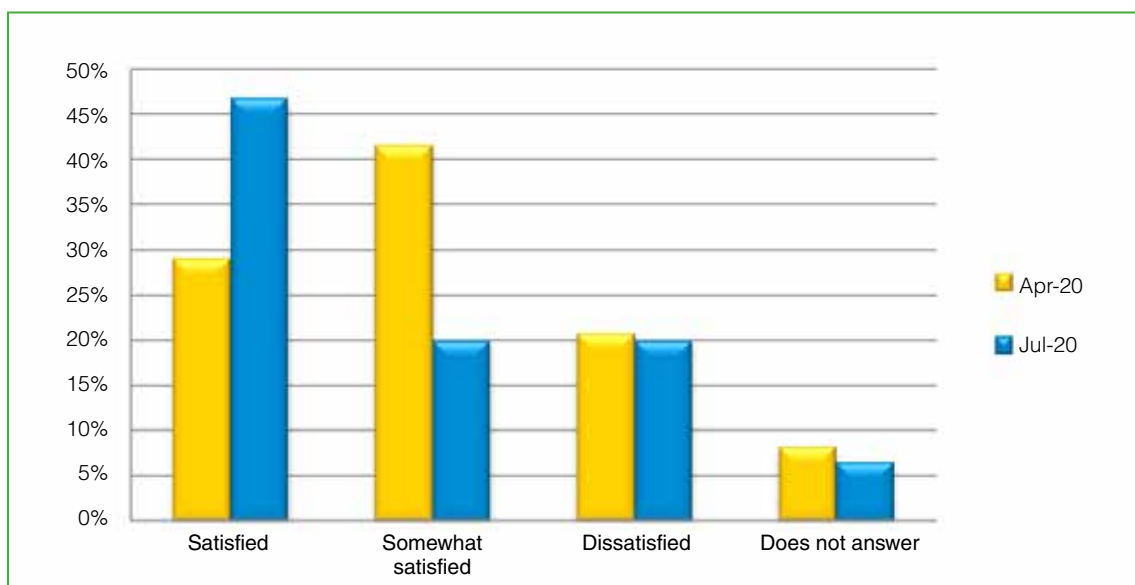


Figure 2. Degree of satisfaction of professionals using telemedicine (April and July 2020).

In April 2022, a new survey was sent to professionals who had answered the two previous surveys. Only three specialists (13%) of respondents in July 2020 continued with telemedicine.

## DISCUSSION

Telemedicine was incorporated into the care of people with diabetic foot when the COVID-19 pandemic restricted access to face-to-face consultation of at-risk patients.<sup>18,19</sup> Some institutions and authors, such as Liu et al., developed protocols of care in times of COVID, still without experimental validation.<sup>20</sup> In this new scenario, we evaluated the use of telemedicine by foot and ankle trauma teams caring for people with diabetic foot in our country.

Although the use of teleconsultation within the framework of a structured health portal is the formal and most systematic way to conduct consultations, in some publications, informal methods of communication between physicians and patients were the most widely used, as they are accessible to many patients or their caregivers.<sup>19,21</sup> Given the need to quickly implement the remote care of many patients in a short time to avoid discontinuing follow-up, a widely used resource was sending photographs in combination with instant messaging applications.<sup>6</sup> However, photo-based diagnosis is not entirely accurate and even the urgency with which access to treatment is stratified differs among different physicians.<sup>22</sup> In our population, the most frequently used tool was images sent by instant messaging, followed by telemedicine platforms in the electronic health record of institutions. We must always take into account the handling of sensitive patient information and safeguard the confidentiality and exposure of data and images, as established in current legislation.<sup>14,15</sup>

Telemedicine also serves to provide self-care advice to patients and their caregivers or nurses, to verify weight-bearing, footwear and healing.<sup>5</sup> This was reflected in our group, where 75% used this tool for prevention. Working collaboratively and remotely is an option at this time to avoid transferring patients to institutions. The foot and ankle specialist can be the first contact the patient has with the health team when consulting them for a new foot injury; therefore, it is vital to maintain this network effectively, through instant communication.<sup>16,17</sup>

Before the pandemic, some authors already advocated the use of telemedicine<sup>9</sup> and reported similar results in diabetic foot care compared to face-to-face care. Care times and costs decreased, and documentation processes improved, while healing times were similar.<sup>23</sup> Moore et al., among others, mention the advantages of this method, particularly in the care of patients in remote or rural regions.<sup>24</sup> Other studies, such as Nordheim et al., point to the lack of evidence for the validation of telemedicine.<sup>25,26</sup> Even a higher mortality rate has been reported for patients in telemedicine follow-up.<sup>24,26,27</sup>

Among the problems related to telemedicine, some authors have highlighted the difficulty of implementing it suddenly without previous experience, the lack of a legal framework for medical practice, and the problems related to the payment of the consultation and its value.<sup>9,26</sup> Other disadvantages are the lack of sufficient validation for the care of people with diabetic foot, the interobserver discrepancy in diagnoses and treatments, and the impossibility of obtaining all the necessary information from the images sent by the patient.<sup>22</sup> The most frequent reason of dissatisfaction with telemedicine in our field was the lack of a physical in-person examination.

While the use of telemedicine through health portals increased in 2020 due to the pandemic, in our field, the resource preferred and used by the majority of the professionals surveyed was telephone conversation, followed by sending images by instant messaging applications. In April 2022, once face-to-face care activity normalized in Argentina, only 13% continued with telemedicine consultations, a similar percentage (15%) to specialists who conducted such consultations before the COVID-19 pandemic; no greater adherence of professionals to this type of consultation was achieved.

Despite the great possibilities and applications of telemedicine, we believe that rigorous project evaluations are needed in this patient group. Firstly, because of the financial sustainability challenges facing health systems and, secondly, because of the lack of sufficient clinical evidence on such projects. Evaluation should therefore be a planned process capable of determining the feasibility of use and its impact. It will be necessary to re-

organize and define which practices will remain routine in the consultation and how the care of patients with diabetic foot will be transformed in the post-pandemic era.<sup>7,19,21,28</sup>

As weaknesses of our study, we can mention that it is a small sample and that the respondents in the second survey are not totally repeated. As strengths, we have not yet found any published studies on the use of telemedicine in trauma teams, not especially in foot and ankle teams in our region, during or before the COVID-19 pandemic.

The results of this survey could be useful as a basis for planning the use of this tool in the usual practice of our specialty.

## CONCLUSIONS

The use of telemedicine by foot and ankle trauma teams in relation to the care of people with diabetic foot in Argentina increased compared to the pre-pandemic era; from 15% to 61.5% during the beginning of 2020. Upon returning to face-to-face care, the rate of adherence to telemedicine returned to 13%.

Only 37.5% of respondents who conducted remote consultations did so through telemedicine platforms. 87.5% used instant messaging for remote consultation. The percentage of specialists who were satisfied or partially satisfied remained stable in both surveys (70.7% and 66.7%, respectively); however, there was a higher percentage of total satisfaction in the second survey (46.7%) compared to the first (29.1%). None of those who were dissatisfied with the tool reported being satisfied in the second instance.

Conflict of interest: The authors declare no conflicts of interest.

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