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ORIGINAL RESEARCH

Characterization of patients receiving telemedicine care by an outpatient orthopedics and trauma service in Colombia

Caracterización de pacientes atendidos mediante telemedicina por un servicio ambulatorio de ortopedia y traumatología en Colombia

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Abstract

Introduction: Telemedicine consultation is a health care strategy that uses information and communication technologies to improve access to health services, mainly for people located in geographic areas that are far from the place of care or have difficulties in traveling.
Objective: To describe the sociodemographic and clinical characteristics of patients from the department of Chocó (Colombia) served between January and May 2020 by the orthopedics and trauma service using telexpertise, as well as the opportunity times and the possibility of making clinical decisions during the consultation.
Methodology: A retrospective descriptive study was carried out on 70 patients with non-traumatic musculoskeletal conditions who, between January and May 2020, and by means of synchronous telexpertise (video call), received specialized care from the orthopedics and trauma service of a digital hospital during a consultation with a digital physician in a secondary care hospital in Chocó. This strategy was evaluated in terms of timeliness and the possibility of making clinical decisions during the consultation.
Results: 78.57% of the patients were able to continue to receive telemedicine health care after the consultation. Additionally, during the consultation, 10% of these patients were prescribed with infiltration or surgical procedures, while referral for face-to-face consultation with a specialist was requested for 8.57% of the patients. During the telexpertise consultation, therapeutic decisions were made in 91.43% of the patients.
Conclusion: Based on our findings, it can be stated that synchronous telexpertise care can be used in areas where complex geographical conditions and the lack of specialists restrict access to health services, since it allows making timely therapeutic decisions.
Keywords: Telemedicine; Remote Consultation; Orthopedics; Technology (MeSH).

Resumen

Introducción. La consulta médica por telemedicina es una estrategia de atención en salud que utiliza tecnologías de la información y las comunicaciones para mejorar el acceso a los servicios de salud, principalmente de personas ubicadas en zonas geográficas alejadas del lugar de atención o con dificultades para el traslado.
Objetivo. Describir las características sociodemográficas y clínicas de pacientes del departamento de Chocó (Colombia) atendidos entre enero y mayo de 2020 en la especialidad de ortopedia y traumatología mediante telexperticia, así como los tiempos de oportunidad y la posibilidad de tomar decisiones clínicas en la consulta.
Metodología. Estudio descriptivo retrospectivo realizado en 70 pacientes con afecciones musculoesqueléticas no traumáticas quienes, entre enero y mayo de 2020, y mediante telexperticia sincrónica (videollamada), recibieron atención especializada por parte del servicio de ortopedia y traumatología de un hospital digital durante una consulta con un médico digital en un hospital de segundo nivel de atención de Chocó. Esta estrategia fue evaluada en términos de oportunidad y posibilidad de tomar decisiones clínicas en la consulta.
Resultados. El servicio de atención en salud por telemedicina se continuó luego de la consulta en 78.57% de los pacientes; además, durante la consulta, en 10% de estos se ordenó procedimiento de infiltración o cirugía y en 8,57%, remisión para consulta presencial con especialista. Durante la consulta por telexperticia, se logró tomar decisiones terapéuticas en 91,43% de los pacientes.
Conclusión. Con base en nuestros hallazgos, es posible afirmar que la atención por telexperticia sincrónica puede ser utilizada en áreas donde las complejas condiciones geográficas y el déficit de especialistas limitan el acceso a los servicios de salud, pues permite tomar decisiones terapéuticas oportunas.
Palabras clave: Telemedicina; Consulta remota; Ortopedia; Tecnología (DeCS).

Introduction

Musculoskeletal disorders are a common cause of medical consultation worldwide. They result in morbidity in a large segment of the working-age population and patients affected by such disorders often require referral to a specialist.[1] Moreover, since the high demand for consultation services for this type of disorders exceeds the supply, the length of waiting lists increases, negatively impacting the opportunity to receive care. Added to this situation, Colombia's geographic characteristics and its complex social and economic conditions complicate access to outpatient healthcare services.[2,3] Telehealth responds to this problem, as it seeks to bring specialized healthcare closer to populations that have difficulty accessing these services.

In Colombia, the provisions for the implementation of telehealth and the parameters for practicing telemedicine were established in Resolution 2654 of 2019 by the Ministry of Health and Social Protection,[4] in which telexpertise is defined as a remote relationship established through synchronous or asynchronous communication that seeks to provide any healthcare service using information and communication technologies (ICT). Such a relationship is established between two health professionals or a health professional and non-professional health personnel. In the first case, one of the professionals meets the user in person and is responsible for both the treatment and the decisions and recommendations given to the patient, while the other professional provides medical care remotely and is responsible for the quality of the medical opinion. In the second case, the non-professional health personnel may be a technician, technical expert or assistant who deals with the patient in person and is responsible for the actions carried out within the scope of their field; on the other hand, the remote professional is responsible for the treatment and recommendations received by the patient.[4]

Some studies have reported that telemedicine has advantages for both patients and health systems in that it speeds up the diagnostic and treatment processes,[2,5,6] reduces the costs of care,[7] and reduces travel times while maintaining the quality standards of care perceived by patients.[2,6] However, there are few studies on the implementation of this modality of care in orthopedics and trauma services.

Therefore, the objective of this study was to describe the sociodemographic and clinical characteristics of patients from the department of Chocó (Colombia) served between January and May 2020 by the orthopedics and trauma service using telexpertise, as well as the opportunity times and the possibility of making clinical decisions during consultation.

Materials and methods

Study type, population, and sample

Descriptive and retrospective study conducted on 70 adult patients (>18 years) with non-traumatic musculoskeletal conditions who, between January and May 2020 and by means of synchronous telexpertise (video call), received specialized care by the orthopedics and trauma service of a digital hospital, located 230 kilometers from this department, during a consultation with a digital doctor in a hospital in Chocó (N=70).

Telexpertise

Specialized care (telexpertise) was provided through LivingLab Telesalud, also known as the Digital Hospital, which is located in Medellín (Colombia). It began to be conceived in 2010 and was consolidated as a project financed with resources from Colombia's

General Royalties System (Sistema General de Regalías) in 2013. It provides healthcare services through teleconsultation to patients from the departments of Antioquia, Chocó, and the archipelago of San Andrés and Providencia. At the time of publication of this research, the Digital Hospital has treated patients from 116 municipalities in the department of Antioquia.

The Digital Hospital is a secondary care center of reference for telemedicine. This means that it is a healthcare service provider that has trained health human talent and sufficient and necessary ICTs to provide remote support in any of the phases of healthcare (promotion, prevention, diagnosis, treatment, rehabilitation, and palliation of the disease). This support is required by users or healthcare providers.

It should be noted that during the online consultations with the orthopedics service of the Digital Hospital, patients were attending a face-to-face consultation at a hospital in Chocó (secondary care level), where they were accompanied by a general practitioner trained in musculoskeletal semiology.

Technical team and interventions

The patient care process in the Digital Hospital is carried out using the Analítica platform, which was developed by the institution itself and allows access from any device with an Internet connection, as well as interoperability with other electronic medical record systems. In this sense, the platform enables the referral and care of patients in and from different spaces and locations around the world. In addition, Analítica allows for the sharing of different types of files, thus improving the clinical information of each patient. It is worth mentioning that such platform complies with national regulations in terms of security, privacy and interoperability, as stipulated in Law 2015 of 2020.[8,9]

The process begins with the referral of the patient to the orthopedics and trauma service by the general medicine service once authorization has been obtained from the benefit plan administration entity. In their municipality, patients go to their primary healthcare service provider institution (IPS by its acronym in Spanish) where health personnel, trained in the use of the Analítica telemedicine platform, receive the documentation that accompanies the referral (clinical records, authorizations, and results of diagnostic and laboratory tests). If this clinical information is sufficient, the patient's suitability to participate in an efficient telemedicine procedure is decided. Then, eligible patients must sign the informed consent in order to approve being treated by telemedicine.

Subsequently, patients are registered in the Analítica platform, creating a "Clinical Note", which includes a summary of the case and the diagnosis for which the patient was referred. The informed consent form, completed and signed by the patient and the physician requesting telemedicine care, is also attached.

The platform generates a notification that is evaluated by the Digital Hospital management team, taking into account different filters and ensuring that the necessary information is available for the telemedicine consultation, as this optimizes the assessment by the specialist.

Data collection and variables

The following data were collected for each patient after reviewing their medical records at the local hospital and those created in the Digital Hospital by the orthopedics and trauma specialist: sociodemographic (age and sex) and clinical (diagnosis

and treatment) characteristics, clinical decision made by the orthopedics and trauma specialist, request for additional telemedicine appointments, medical recommendations received and education about the disease during the teleconsultation, and request for face-to-face assessment. Data were entered into a database created in Microsoft Excel for further processing.

The opportunity time variable was defined as a result variable and was measured based on the following indicators: process opportunity, result opportunity, and total opportunity. The first refers to the time elapsed between the creation of the user on the platform and the date on which the telexpertise appointment with the orthopedics and trauma specialist was assigned; the second is the time between the day on which the appointment took place and the day on which the telexpertise consultation with the orthopedics and trauma service occurred; and the third is the time elapsed between the day on which the user was created on the platform and the day on which the synchronous telexpertise consultation took place (Figure 1).

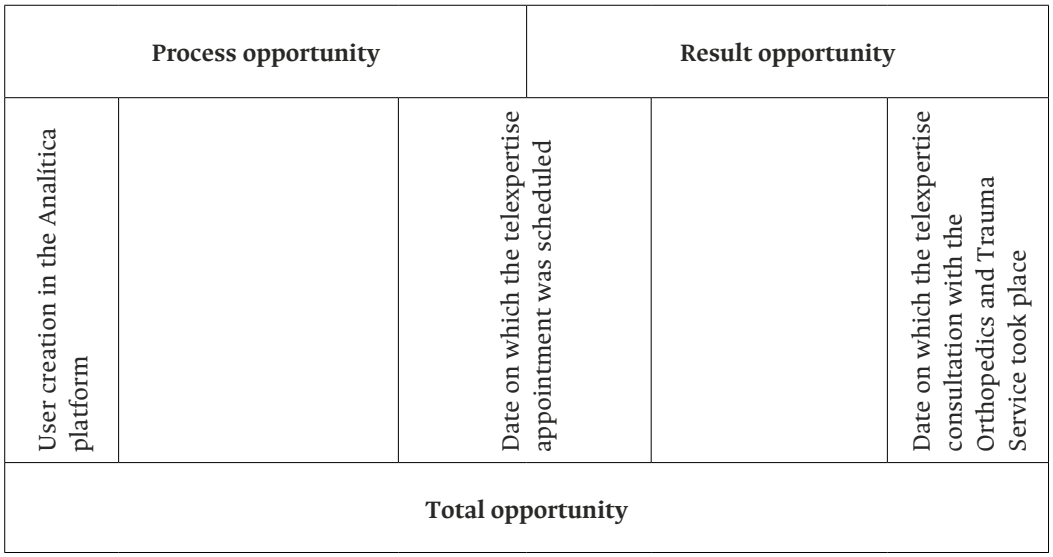

Figure 1. Definition of the opportunity variable.
Source: Own elaboration.

Statistical analysis

Data are described using absolute frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables, since the data showed a normal distribution (Kolmogorov-Smirnoff test). All analyses were performed in the R Studio statistical software.

Ethical considerations

This research followed the ethical principles for the conduct of biomedical studies involving human subjects established in the Declaration of Helsinki,[10] as well as the basic bioethical principles of beneficence and nonmaleficence, justice and respect for autonomy proclaimed in the Belmont Report,[11] and the scientific, technical and administrative standards for health research contained in Resolution 8430 of 1993 issued by the Colombian Ministry of Health and Social Protection.[12] In addition, this study is classified as a non-risk research in accordance with article 11 of the aforementioned Resolution.

Finally, it should be noted that this research was approved by the research ethics committees of the Hospital San Vicente Fundación and the Digital Hospital by means of minutes 06 of February 28, 2020, and minutes 13 of May 14, 2021, respectively.

Results

Of the 70 patients included in the study, 81.43% were women, 32.86% reported having a work contract, and 81.43% had completed some level of education. Table 1 describes the sociodemographic characteristics of the individuals included in the study.

Table 1. Sociodemographic characteristics of a group of patients from the department of Chocó (Colombia) treated with synchronous telexpertise.

Characteristic	Total (n=70)	Definitive diagnosis			
		Articular cartilage degeneration (n=23)	Low back pain (n=24)	Lower limb disorder (n=5)	Upper limb disorder (n=18)
Sex					
Female	57 (81.43%)	20 (86.96%)	19 (79.17%)	4 (80.00%)	14 (77.78%)
Male	13 (18.57%)	3 (13.04%)	5 (20.83%)	1 (20.00%)	4 (22.22%)
Age group					
18-26 years	3 (4.29%)	0	1 (4.20%)	0	2 (11.11%)
27-59 years	35 (50.00%)	7 (30.40%)	18 (75.00%)	3 (60.00%)	7 (38.89%)
>60 years	32 (45.71%)	16 (69.57%)	5 (20.83%)	2 (40.00%)	9 (50.00%)
Occupation					
Housewife	22 (31.43%)	10 (43.48%)	8 (33.33%)	0	4 (22.22%)
Student	3 (4.29%)	0	0	0	3 (16.67%)
Retired	2 (2.86%)	1 (4.35%)	0	1 (20.00%)	0
Worker	23 (32.86%)	6 (26.09%)	8 (33.33%)	2 (40.00%)	7 (38.89%)
No information	20 (28.57%)	6 (26.09%)	8 (33.33%)	2 (40.00%)	4 (22.22%)
Educational level					
None	3 (4.29%)	1 (4.35%)	1 (4.17%)	1 (25.00%)	0
Elementary school	17 (24.29%)	8 (34.78%)	4 (16.67%)	2 (50.00%)	3 (16.67%)
High school	18 (25.71%)	5 (21.74%)	9 (37.50%)	0	4 (22.22%)
University	22 (31.43%)	7 (30.43%)	5 (20.83%)	1 (25.00%)	9 (50.00%)
No information	10 (14.29%)	2 (8.70%)	5 (20.83%)	1 (20.00%)	2 (11.11%)

Source: Own elaboration.

Regarding the type of diagnosis (Table 2), it was found that 32.85% of the patients had conditions related to articular cartilage degeneration and 34.28% had low back pain. Moreover, it was identified that 8.57% of the individuals were referred to a face-to-face appointment and 78.57% required a new assessment by telemedicine in synchronous or asynchronous modality.

Table 2. Distribution of diagnoses in a group of patients served through synchronous telexpertise in Chocó, Colombia.

Diagnostic group	ICD-10 Code - Specific diagnosis	n	%
Articular cartilage degeneration (n=23)	M179 - OSTEOARTHRITIS OF KNEE, UNSPECIFIED	16	69.57
	M199 - ARTHROSIS, UNSPECIFIED SITE.	3	13.04
	M224 - CHONDROMALACIA PATELLAE	3	13.04
	M169 - OSTEOARTHRITIS OF HIP, UNSPECIFIED	1	4.35
Low back pain (n=24)	M545 - LOW BACK PAIN, UNSPECIFIED	19	79.17
	M546 - PAIN IN THORACIC SPINE.	2	8.33
	M548 - OTHER DORSALGIA	2	8.33
	M511 - THORACIC, THORACOLUMBAR AND LUMBOSACRAL INTERVERTEBRAL DISC DISORDERS WITH RADICULOPATHY	1	4.17
Lower limb disorders (n=5)	M722 - PLANTAR FASCIAL FIBROMATOSIS	3	60.00
	M766 - ACHILLES TENDINITIS	1	20.00
	M201 - HALLUX VALGUS (ACQUIRED)	1	20.00
Upper limb disorder (n=18)	G560 - CARPAL TUNNEL SYNDROME	8	44.44
	M751 - ROTATOR CUFF TEAR OR RUPTURE	6	33.33
	M654 - RADIAL STYLOID TENOSYNOVITIS [DE QUERVAIN]	3	16.67
	M674 - GANGLION	1	5.56

ICD: International Classification of Diseases.
Source: Own elaboration.

In this study, it was possible to make therapeutic telexpertise care decisions in 91.43% of the patients. Specifically, in 2.86% of the cases, the reason for consultation was solved by the specialist and in 10% of the cases surgery or infiltration procedure was requested. Only 8.57% (n=6) of the users required assessment by the orthopedics and trauma specialty in person, while 78.57% (n=55) were able to continue their care process through telemedicine, of which 68.57% and 10% were served in synchronous and asynchronous modalities, respectively. Finally, all patients received recommendations and education during the consultation (Table 3).

The total mean opportunity time was 48.8 days, taking into account that the patients at the time of the appointment had all the documentation to optimize the consultation with the specialist. Likewise, the mean for process opportunity and result opportunity was 27.43 and 21.4 days, respectively (Table 4).

Table 3. Clinical decision taken during teleconsultation according to the requirement for another telemedicine appointment and the type of diagnosis.

	Clinical decision	Diagnostic group				Total (n=70)
		Articular cartilage degeneration (n=23)	Low back pain (n=24)	Upper limb disorders (n=18)	Lower limb disorders (n=5)	
Patients who did not require a new telemedicine appointment (n=15)	Case solved	1 (4.35%)	1 (4.17)	0	0	2 (2.86)
	Surgery	0	0	3 (16.67)	0	3 (4.29)
	Infiltration procedure	3 (13.04%)	0	1 (5.56)	0	4 (5.71)
	Face-to-face appointment	3 (13.04%)	3 (12.50%)	0	0	6 (8.57)
Patients who required a new telemedicine appointment (n=55)	Synchronous appointment	14 (60.87%)	18 (75.00%)	13 (72.22%)	3 (60.00%)	48 (68.57)
	Asynchronous appointment	2 (8.70)	2 (8.33)	1 (5.56%)	2 (40.00%)	7 (10.00)

Source: Own elaboration.

Table 4. Description of the opportunity for care in patients included in the study.

Definitive diagnosis	Process opportunity (in days)				Result opportunity (in days)				Total opportunity (in days)			
	Minimum	Mean	Maximum	SD	Minimum	Mean	Maximum	SD	Minimum	Mean	Maximum	SD
Arthrosis	2	24.2	53	15.2	2	22.7	63	19.3	15	46.8	75	12.6
Low back pain	2	22.5	49	16.2	0	25.5	84	29.8	4	48.8	89	23
Lower limb disorders	3	34.2	48	18.8	0	15.4	39	19.4	37	49.6	69	11.7
Upper limb disorders	3	36.2	84	22.1	1	15.8	56	19.4	38	52	85	11.2
Total	**2**	**27.43**	**84**	**18.4**	**0**	**21.4**	**84**	**23.4**	**4**	**48.8**	**89**	**16.5**

SD: Standard deviation.
Source: Own elaboration.

Discussion

In Colombia, several initiatives have emerged to improve opportunity and access to healthcare; however, there is insufficient evidence to establish clear recommendations on the use of these care strategies in the specific area of orthopedics.[13-15] Due to the COVID-19 pandemic, new technologies were quickly required to continue providing healthcare services.[16,17]

According to the World Health Organization (WHO), in order to improve health and reduce health inequalities, it is necessary to evaluate telehealth in order to generate evidence and promote the integration and appropriate use of technologies.[18,19] The WHO has gradually incorporated digital health into its guidelines to improve care and promote the health of individuals and communities through the use of ICTs in the exchange of valid information for the diagnosis, treatment and prevention of disease and injury, as well as research, evaluation and continuing education of health professionals.[20]

Some of the most relevant studies on telemedicine in the field of orthopedics report benefits of its use both in terms of satisfaction and cost-effectiveness.[7,21-24] For example,

Sathiyakumar *et al.*[22] conducted a study on 20 patients in Norway and found that there were no significant differences in patient satisfaction between the group treated with telemedicine (video call) and those in face-to-face clinic visits. These findings are similar to those of Vuolio *et al.*,[23] who concluded that, on the one hand, video call was feasible if the technology equipment worked well and, on the other hand, patients seen for the first time via telemedicine were willing to have their next consultation in this same modality. With respect to costs, Jennett *et al.*[24] reported that telemedicine was less expensive for the health system than conventional care.

Reports of telemedicine programs focused on the specialty of orthopedics and trauma have been conducted in several countries, such as the United States, Australia and some Nordic countries in Europe, and report promising results.[25,26] However, it should be kept in mind that these studies use different care modalities and were carried out in developed countries, so there are important differences regarding the social gap compared to Colombia. In the case of Latin America, a recent study conducted in 293 people in Chile by Prada *et al.*[6] found that, through a synchronous meeting between a general practitioner who was with the patient and a remote orthopedist, it was possible to significantly reduce waiting times and optimize travel times and economic costs; moreover, in this study only a small percentage of patients required face-to-face care, demonstrating the efficiency of this healthcare strategy.[6]

In the present study, it was identified that telemedicine was effective for the consultations carried out, since it was possible to recommend therapeutic or follow-up options, educate patients about the musculoskeletal disease they had, and define a treatment plan and prescribe infiltration procedures, surgery or the discharge of the patient.

As observed in our study, most of the patients treated had a diagnosis of articular cartilage degeneration or low back pain, which is similar to other studies where the reasons for consultation were degenerative and overuse disorders.[6,25] Moreover, 78.57% of the users continued to receive care through telemedicine in any modality (synchronous or asynchronous). This finding is in agreement with the findings reported in the study by Prada *et al.*,[6] in which 69.6% of patient consultations were resolved through telemedicine care. On the contrary, in this study, 8.57% of the patients required face-to-face care, a figure that is lower than that found in the Chilean study (30.3%).[6] Finally, this study showed that the mean total opportunity was 48.8 days of total opportunity, which is similar to the reduction in waiting times reported by Prada *et al.*[6] with the implementation of telexpertise care (201.4 days to 40 days).

It should be pointed out that although the findings are valuable, this is a single-center study, so it is necessary to conduct similar research with data on the implementation and use of telexpertise with larger samples from several hospitals in the country and/or the region to determine the parameters necessary for the use of telemedicine and, in particular, telexpertise to provide greater benefit in terms of healthcare to patients who, due to their geographic location or other barriers, have limited or no access to specialized healthcare services.

While it is clear that specific physical examination skills are needed to implement a telemedicine strategy for orthopedics and trauma, the results of this study and other research[6] show that telemedicine care in this specialty is possible, as only a small percentage of patients required face-to-face assessment after remote care.

One of the strengths of this study is the performance of teleconsultations in the specialty of orthopedics and trauma with the support of a general practitioner in a face-to-face manner during the visit. This demands continuing education and training in the development of specific physical examination skills that are necessary in muscu-

loskeletal semiological assessment. In addition, telemedicine also offers an option for timely healthcare for patients residing in geographically inaccessible areas.

The limitations of the present study are related to the collection of data obtained from the patients' medical records and the information provided. It was also necessary to modify the initial approach to the different methodological parameters due to the outbreak of the COVID-19 pandemic, since synchronous telexpertise required the patient to travel to the healthcare center.

Conclusions

This study presents a model of care that can be replicated in areas where complex geographic conditions and a deficit of specialists limit access to healthcare services. Further research is needed to measure economic impact and evaluate the benefits of telexpertise in orthopedics and trauma in order to facilitate and promote the development of this type of healthcare strategy in other parts of the world. Similarly, it is recommended that additional research be conducted to determine the impact of this activity in strengthening the skills of general practitioners in terms of the evaluation and management of patients with musculoskeletal disorders.

Conflicts of interest

None stated by the authors.

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References

1. Gaspar-Calvo E, Lallana MJ, Maldonado L, Aguilar-Palacio I, Castel-Feced S, Rabanaque MJ, *et al*. Enfermedad musculoesquelética en población trabajadora : perfil de los afectados y manejo farmacológico. Rev. Asoc. Esp. Espec. Med. Trab. 2023;31(4):9-22.
2. Vargas JJ, Molina MG. Acceso a los servicios de salud en seis ciudades de Colombia: limitaciones y consecuencias. Rev Fac. Nac. Salud Pública. 2009;27(2):121-30.
3. Bran Piedrahita L, Valencia Arias A, Palacios Moya L, Gómez Molina S, Acevedo Correa Y, Arias Arciniegas C. Barreras de acceso del sistema de salud colombiano en zonas rurales: percepciones de usuarios del régimen subsidiado. Hacia promoc. Salud. 2020;25(2):29-38. https://doi.org/grp78p.
4. Colombia. Ministerio de Salud. Resolución 2654 de 2019 (octubre 3): Por la cual se establecen disposiciones para la telesalud y parámetros para la práctica de la telemedicina en el país. Bogotá D.C.; octubre 3 de 2019 [cited 2023 Sep 6]. Available from:: https://bit.ly/3PrdIKZ.
5. Tuckson RV, Edmunds M, Hodgkins ML. Telehealth. N. Engl. J. Med. 2017; 377(16):1585-92.
6. Prada C, Izquierdo N, Traipe R, Figueroa C. Results of a new telemedicine strategy in traumatology and orthopedics. Telemed J. E. Health. 2020;26(5):665-70. https://doi.org/kt8t.
7. Buvik A, Bergmo TS, Bugge E, Smaabrekke A, Wilsgaard T, Olsen JA. Cost-effectiveness of telemedicine in remote orthopedic consultations: Randomized controlled trial. J. Med. Internet Res. 2019;21(2):e11330. https://doi.org/gf7c3q.

8. Colombia. Congreso de la República de Colombia. Ley 2015 de 2020 (enero 31): Por medio de la cual se crea la historia clínica electrónica interoperable y se dictan otras disposiciones. Bogotá, D.C.; enero 31 de 2020 [cited 2023 Sep 6]. Available from: https://bit.ly/3PreoA1.
9. Colombia. Ministerio de Salud. ABECÉ Interoperabilidad de Datos de la Historia Clínica en Colombia - Términos y siglas. Bogotá D.C.;2019 [cited 2023 Sep 6]. Avaliable from: https://bit.ly/3ZP3yst.
10. World Medical Asociation (WMA). WMA Declaration of Helsinki – Ethical principles for medical research involving human subjects. Fortaleza: 64th WMA General Assembly; 2013.
11. National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of Research. Maryland; 1979. Available from: https://bit.ly/46tYtZg.
12. Colombia. Ministerio de Salud. Resolución 8430 de 1993 (octubre 4): Por la cual se establecen las normas científicas, técnicas y administrativas para la investigación en salud. Bogotá D.C.; octubre 4 de 1993 [cited 2023 Sep 6]. Available from: https://bit.ly/31gu7do.
13. Cáceres-Méndez EA, Castro-Díaz SM, Gómez-Restrepo C, Puyana JC. Telemedicina: historia, aplicaciones y nuevas herramientas en el aprendizaje. Univ. Méd. Bogotá (Colombia). 2011;52(1):11-35.
14. Catalán-Matamoros D, López-Villegas A. La Telesalud y la sociedad actual: retos y oportunidades = Telehealth and the current society: challenges and opportunities. Rev. Esp. Comun Salud. 2016;7(2):336-45. https://doi.org/kt8v.
15. Correa-Díaz AM. Avances y barreras de la telemedicina en Colombia. Rev. Fac. Derecho Cienc. Polít. 2017;47(127):361-82. https://doi.org/kt8w.
16. Vaccaro AR, Getz CL, Cohen BE, Cole BJ, Donnally CJ. Practice Management during the COVID-19 Pandemic. J. Am. Acad. Orthop. Surg. 2020;28(11):464-70. https://doi.org/ggr6t8.
17. Calixto B LF, Camacho F, Vergara A EM, Torres R F, Mahecha T MT, González J, *et al.* Manejo de pacientes de Ortopedia y Traumatología en el contexto de la contingencia por Covid-19: revisión de conceptos actuales revisión de la literatura. Rev. Colomb. Ortop. y Traumatol. 2021;35(1):26–34. https://doi.org/kt8x.
18. The Bellagio eHealth Evaluation Group. Call to Action on Global eHealth Evaluation: Consensus Statement of the World Health Organization (WHO) Global eHealth Evaluation Meeting. Beltagio;2011. Available from: https://bit.ly/3LZfz9b.
19. Labrique A, Vasudevan L, Weiss W, Wilson K. Establishing standards to evaluate the impact of integrating digital health into health systems. Glob. Heal. Sci. Pract. 2018;6(Suppl 1):S5-17. https://doi.org/kt8z.
20. World Health Organization (WHO). Global strategy on digital health 2020-2025. Ginebra; 2021. Available from: https://bit.ly/3ZQIYb8.
21. Buvik A, Bugge E, Knutsen G, Småbrekke A, Wilsgaard T. Patient satisfaction with remote orthopaedic consultation by using telemedicine: A randomised controlled trial. J. Telemed. Telecare. 2019;25(8):451-9. https://doi.org/gdsn9x.
22. Sathiyakumar V, Apfeld JC, Obremskey WT, Thakore RV, Sethi MK. Prospective randomized controlled trial using telemedicine for follow-ups in an orthopedic trauma population: A pilot study. J. Orthop. Trauma. 2015;29(3):e139-45. https://doi.org/f626gf.
23. Vuolio S, Winblad I, Ohinmaa A, Haukipuro K. Videoconferencing for orthopaedic outpatients: One-year follow-up. J. Telemed. Telecare. 2003;9(1):8-11. https://doi.org/cxjvxv.
24. Jennett PA, Affleck Hall L, Hailey D, Ohinmaa A, Anderson C, Thomas R, *et al.* The socio-economic impact of telehealth: A systematic review. J Telemed Telecare. 2003;9(6):311-20. https://doi.org/dtb8m6.
25. Caffery LJ, Taylor M, North JB, Smith AC. Tele-orthopaedics: A snapshot of services in Australia. J. Telemed. Telecare. 2017;23(10):835-41. https://doi.org/gch26p.
26. Aarnio P, Lamminen H, Lepistö J, Alho A. A prospective study of teleconferencing for orthopaedic consultations. J. Telemed. Telecare. 1999;5(1):62-6. https://doi.org/c8429p.