# Rural and Occupational Telemedicine Status in Ecuador

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## Abstract

The advancement of telemedicine in Ecuador reflects a sustained commitment to technological integration to improve access and quality of medical care. Since 1998, various projects have been carried out that cover both rural and urban areas, evidencing the benefits of telemedicine in communicating and monitoring patients' health. **Objective:** Given this context, this text aims to show the evolution of telemedicine in Ecuador, with a particular focus on rural and occupational medicine programs. **Methodology:** The methodology used in this study is a literature review of a descriptive and exploratory nature. **Results:** The study revealed that Ecuador has made significant progress in the implementation of telemedicine, especially in rural areas and in the workplace. **Discussion and Conclusion:** Despite challenges in implementation, such as information security and resistance to change, telemedicine continues to consolidate in Ecuador as a pillar for more accessible and efficient medical care.

**Keywords:** Health Care, Health Care Quality, Computer Security, Amazon Ecosystem, Telemedicine, Ecuador, Occupational Health, Health Personnel, Technology, Telematics

## Resumen

*Estado de Telemedicina Rural y Laboral en Ecuador.*

*El avance de la telemedicina en Ecuador refleja un compromiso sostenido con la integración tecnológica para mejorar el acceso y la calidad de la atención médica. Desde 1998, se han llevado a cabo diversos proyectos que abarcan tanto zonas rurales como urbanas, evidenciando los beneficios de la telemedicina en la comunicación y seguimiento de la salud de los pacientes. **Objetivo:** Ante este contexto, este texto pretende mostrar la evolución de la telemedicina en el Ecuador, con un enfoque particular en programas rurales y de medicina ocupacional. **Metodología:** La metodología utilizada en este estudio es una revisión de literatura de carácter descriptivo y exploratorio. **Resultados:** El estudio reveló que Ecuador ha realizado avances significativos en la implementación de telemedicina, especialmente en áreas rurales y en el ámbito laboral. **Discusión y Conclusión:** A pesar de los desafíos en la implementación, como la seguridad de la información y la resistencia al cambio, la telemedicina sigue consolidándose en Ecuador como un pilar para una atención médica más accesible y eficiente.*

*Palabras-clave: Atención Médica, Calidad de la Atención de Salud, Seguridad Computacional, Ecosistema Amazónico, Telemedicina, Ecuador, Salud Laboral, Personal de Salud, Tecnología, Telemática*

## Resumo

*Status da Telemedicina Rural e Ocupacional no Equador*

*O avanço da telemedicina no Equador reflete um compromisso sustentado com a integração tecnológica para melhorar o acesso e a qualidade da assistência médica. Desde 1998, têm sido realizados vários projectos que abrangem zonas rurais e urbanas, evidenciando os benefícios da telemedicina na comunicação e monitorização da saúde dos pacientes. **Objetivo:** Diante deste contexto, este texto pretende mostrar a evolução da telemedicina no Equador, com foco particular nos programas de medicina rural e ocupacional. **Metodologia:** A metodologia utilizada neste estudo é uma revisão de literatura de natureza descritiva e exploratória. **Resultados:** O estudo revelou que o Equador obteve progressos significativos na implementação da telemedicina, especialmente nas áreas rurais e no local de trabalho. **Discussão e Conclusão:** Apesar dos desafios na implementação, como a segurança da informação e a resistência à mudança, a telemedicina continua a consolidar-se no Equador como um pilar para uma assistência médica mais acessível e eficiente.*

*Palavras-chave: Cuidados de Saúde, Qualidade dos Cuidados de Saúde, Segurança Informática, Ecossistema Amazónico, Telemedicina, Equador, Saúde Ocupacional, Pessoal de Saúde, Tecnologia, Telemática.*

# INTRODUCTION

As a developing country, Ecuador makes considerable efforts and investments through its public and private entities to improve the living conditions of its inhabitants. Health is one of the sectors most impacted by these initiatives, and a notable impact on the population's quality of life has been observed[1].

From 1998 to the present, Ecuador has witnessed multiple projects aimed at both intellectual and financial investment in the field of health, with a particular focus on telemedicine. These projects have covered both rural and urban areas of the country. However, when we focus on the aspects of telemedicine in healthcare and the workplace, the following references stand out:

José Ortiz et al. (2011) work on telemedicine and telehealth at the School of Medical Sciences of the University of Cuenca concluded that telemedicine facilitates communication between students, health professionals, and the community, regardless of the distance. This allows an exchange of experiences and clinical data that strengthens the training of the professionals involved[2].

Lindao et al. (2018) researched the application of telemedicine in the province of Santa Elena, Ecuador, as technological support in the monitoring and control of the health of patients treated in the public system. Their study suggests that telemedicine contributes to improving the monitoring of the health status of patients in real-time, avoiding traditional medical consultations[3].

María Noboa (2022), in her research on the telemedicine system in occupational health for the monitoring of employees of the public company Petroecuador, showed that users who received care via telematics rated this method of care positively. This is especially relevant considering the geographical distribution of Petroecuador's centers, some of which are located in remote areas of the Ecuadorian Amazon[4].

Advances in telemedicine in Ecuador have been significant and have represented an important contribution to date. This progress reflects the country's continued commitment to leveraging technology to improve access and quality of medical care in various areas, reinforcing the importance of continuing to move forward in this direction.

# METHOD

The methodology used in this study is a descriptive and exploratory literature review. A bibliographic review of primary and secondary sources was carried out, including reports, scientific articles, and official documents. In addition, specific cases of telemedicine implementation in different regions of Ecuador were analyzed, focused on rural and occupational medicine programs. The information was collected through academic databases and government websites.

# RESULTS

The study revealed that Ecuador has made significant progress in the implementation of telemedicine, especially in rural areas and in the workplace. Programs such as the "Telehealth Program for chronic patients in the rural sector of Pichincha" have proven effective in improving access to health services in remote communities.

## Telemedicine in the Rural-Ecuador Sector

Primary health care in rural areas of Ecuador is structured in a network of three types of establishments: Health Centers (HC): They offer comprehensive care with greater complexity, several professionals and equipment are located in the provincial capitals, Health Subcenters (HSC): They provide basic medical care with less complexity than the HC located in the cantonal capitals, and Health Care Centers (HCS): wich offer basic health services are located in most cases, isolated, in areas of low population density[5]. It is important to mention that in the Health Care Model (MAIS-Modelo de Atención de Salud) of 2018[6], the new typology and homologation of health establishments for the first level of care is defined as follows: Health Care Centers, General Office, Health Center - A, Health Center - B, Health Center - C, this structure is fundamental as an access point since 80% of the health demands of the population are met at this level. Through the referral and counter-referral system, access to more complex units and services is ensured, until the need or problem presented by a patient is resolved[7].

In 2013, Ecuador, through the Ministry of Telecommunications and the Information Society and the Ministry of Public Health, published the "Project for the Expansion of the Telemedicine Program at the National Level" ("Proyecto Expansión del Programa de Telemedicina a Nivel Nacional"). This Telemedicine project had a national scope. In the first stage, the Amazon region was mainly considered, with command and support centers in the Sierra region, located in 20 establishments of the Ministry of Public Health.

Ecuador faces challenges in medical services in rural areas, similar to other developing countries, such as the shortage of specialized doctors in remote areas, limited resources such as infrastructure, equipment, and limited supplies in remote health units, and concentration of specialists and resources in major cities[5].

The National Telemedicine Program proposed to allow access to all health services by the Ecuadorian population in the most distant and remote areas through new technologies that would allow permanent access to advances in science and technology[5].

Through the initiatives of the academy, the Universidad San Francisco de Quito at the end of March 2020, led by the School of Medicine, launched the "Telehealth Program for chronic patients in the rural sector of Pichincha" ("Programa de Telesalud para pacientes crónicos del sector rural de Pichincha"), focused on vulnerable groups including older adults, patients with chronic conditions and pregnant women[8].

The School of Medicine launched this innovative project to improve the quality of life of patients with chronic conditions in rural areas. Based on telemedicine, this project involved volunteer students from the careers of medicine, psychology, clinical psychology, and nutrition. The volunteer students were in charge of making phone calls to patients at the different health centers of the Ministry of Public Health. During these calls, the students followed up on the patient's chronic conditions, offered them emotional support, and provided them with educational information on COVID-19 prevention, nutrition, and physical activity[8].

Since the launch of the project, 1,229 patients have been treated in general medicine, 15 in nutrition, and 31 in psychology. With the support of the entities involved, this service aimed at maintaining the physical and mental

health to the communities until December 2020[8].

In October 2022, at the Calderón Teaching Hospital located in the city of Quito, the authorities of the Ministry of Public Health, the Vice Presidency of the Republic, and the Huawei company verified the telemedicine service of this health center (9). "This health facility is a pioneer in the implementation of its flow for the teleconsultation process, prioritizing care in the specialties of dermatology, endocrinology, neurology, otorhinolaryngology, vascular surgery, and cardiology"[9]

This second-level health center began telemedicine services in 2022 with the Nanegalito Basic Hospital, located in a rural area northwest of the capital. It increased the services in 2024 to 8 health facilities such as: Puéllaro, Perucho, Chavezpamba, San José de Minas, Nono, Calacali, Pomasqui, and San Antonio de Pichicha. This information was released by the Zonal 9 coordination.

Dr. Karla Flores, in 2023, Undersecretary for Strengthening the National Health System in the Vice Presidency, highlighted that the digitalization of medicine has significantly transformed communication within the health system. According to her, telecare, by focusing on the patient, not only facilitates continuous monitoring but also supports timely care and improves health outcomes. This progress is aligned with national strategies, and the donation strengthens the National Health System.

The Pan American Health Organization, the World Health Organization (PAHO/WHO), and the Ecuadorian State met in Quito in March 2023 to discuss the Digital Transformation in the Health process in the country. The objective of this meeting was to strengthen the collaboration between both parties to advance the implementation of digital transformation in the Ecuadorian health sector. During the meetings and workshops, topics such as the regulatory, strategic, and technical framework that will guide the transformation, as well as the technical cooperation that PAHO/WHO will provide to Ecuador were discussed[10].

PAHO/WHO is committed to supporting Ecuador to a more digital health. The organization will provide technical assistance in areas such as policy development, training of health personnel, and the implementation of technological solutions.

In July 2023, the Telemedicine Service Pilot Plan was implemented between the Monte Sinai General Hospital (HGMS) in Guayaquil and the Puerto Villamil Health Center, located in the Isabela canton of the Galápagos province[11]. This new service benefited around 3 thousand inhabitants of this island, who received real-time telematic care in the specialties of internal medicine, psychiatry, dermatology, and endocrinology.

### Occupational Telemedicine in Ecuador.

Telemedicine has facilitated earlier diagnoses and continuous monitoring in the workplace, particularly in specialties such as dermatology and occupational medicine. However, challenges remain related to information security and resistance to change.

Telemedicine has gained significant importance and impact, extending to various areas of the medical field and evolving in line with technological development. Dermatology was one of the first specialties to adopt these technologies given that skin diseases are the second most common cause of occupational diseases reported in work environments[12]. Telemedicine and artificial intelligence are now applied in various areas of occupational medicine, facilitating earlier and more accurate diagnoses, and resulting in significant cost savings.

In the occupational medicine, technology plays an essential role in improving the health and well-being of employees. Thanks to technological advances, it is now possible to access medical care remotely and in a timely manner through telemedicine. This has opened up new possibilities for occupational medicine, allowing occupational health professionals to provide high-quality medical care without employees having to physically travel to an office, without interrupting their workday and obtaining an immediate resolution of their pathology.

Therefore, technology in occupational medicine encompasses a wide range of services for both the management of common diseases and for addressing occupational diseases, such as teledermatology. This is achieved through tools and applications ranging from wearable devices that monitor health in real time to mobile applications that provide access to online wellness programs. These technologies allow employees a greater control over their health and well-being while making it easier for occupational medicine professionals to provide more efficient and personalized care.

### Advantages of integrating technologies in occupational medicine

The integration of technologies into occupational medicine offers numerous advantages for both employees and healthcare professionals. One of the main advantages is improved access to healthcare. With telemedicine, employees can receive care regardless of their geographic location or which corporate matrix they are located in. This is beneficial for those who work in remote areas or have difficulty accessing specialized medical services.

Information and Communication Technologies (ICT) are revolutionizing medicine through e-Health. Some benefits of e-Health in occupational diseases such as access to specialized medical advice for non-specialized services, promotion of networking through clinical and epidemiological nodes, improvement of the management of occupational diseases, promotion of clinical, epidemiological and technological research in occupational health[4].

Another advantage of integrating technologies in occupational medicine is the ability to monitor the health of workers continuously and in real time, especially vulnerable employees or those with underlying pathologies. Wearable devices, such as smart watches, allow health professionals to collect data on heart rate, physical activity level and other health indicators useful in the indicated therapeutic plans, therefore, providing a more complete view of the health of employees, allowing health problems to be detected early and in a timely manner, that is, prevention in occupational health is applied.

The integration of telemedicine and other technologies into occupational medicine and health systems in general represents an important step towards more accessible, efficient and patient-centered health care[13].

### Current trends in telemedicine and occupational medicine

One of the most prominent trends in telemedicine and occupational medicine is the use of encrypted cyber video consultations. Through video conferencing platforms, employees can access online medical consultations with health professionals, eliminating the need to physically travel to an office.

Another trend in telemedicine and occupational medicine is the use of wearable devices and health sensors for remote monitoring of employees. These devices collect data on heart rate, blood pressure, physical activity level, and other health indicators, which can be monitored by health professionals. This allows for more personalized care and early detection of health problems.

In addition, online wellness programs are also increasing in occupational medicine, known as digital corporate wellness. These programs offer workers access to wellness resources and tools, such as exercise programs, healthy eating tips, and stress management techniques. By providing workers with the tools and resources needed to improve health and well-being, these programs can help prevent diseases, especially cardiometabolic diseases that can develop in employees who do not have adequate self-care habits and healthy lifestyles guided by professionals[1,14].

### Challenges in the implementation of technology in occupational medicine

Despite the several benefits from the integration of technologies in occupational medicine, there are also challenges and ethical considerations that require attention. One of the most significant challenges is ensuring the security and privacy of information, as well as the proper management of employees' health data. In this sense, it is essential that teleconsultations are carried out through cyber-secure platforms that comply with international standards ISO 27001 and ISO 13485 that guarantee adequate compliance with patient data protection.

Another challenge in implementing technologies in occupational medicine is resistance to change. Therefore, it is important to improve the administration of change management in the presence of new technologies through education and training, lack of access to technology and the digital divide, while at the same time demonstrating the benefits of telemedicine in the occupational area by ensuring that all collaborators have access to the necessary technology to benefit from advances in telemedicine and occupational medicine[15].

## DISCUSSION AND CONCLUSION

Analysis of the state of telemedicine in Ecuador reveals a picture of significant progress, albeit with persistent challenges that limit its full potential. The implementation of telemedicine programs in rural areas has been particularly successful in improving access to health services for vulnerable populations.

However, while the benefits of telemedicine are clear, there are significant barriers that require attention. One of the most critical challenges is information security. Protecting patient data is critical, especially in a context where trust in the health system can be compromised by security breaches. It is essential that Ecuador continues to develop and implement policies and technologies that ensure information security at all levels of telemedicine.

Another key aspect is resistance to change, both by healthcare professionals and patients. Adopting new technologies in healthcare not only requires adequate infrastructure, but also a cultural transformation that allows users and healthcare providers to adapt to new forms of interaction and care. Continuous education and training are essential to mitigate this resistance and facilitate a smoother transition towards the complete digitalization of the healthcare system.

In the workplace, telemedicine has shown its ability to improve occupational health, allowing for earlier diagnoses and continuous monitoring. However, the implementation of these technologies also faces similar challenges regarding data security and acceptance by workers and employers.

International collaboration, especially with organizations such as PAHO/WHO, has been a key factor in the advancement of telemedicine in Ecuador. These alliances have provided the regulatory and technical framework necessary to guide the digital transformation of the health system. However, to ensure the sustainability and expansion of these advances, continued commitment from the government and the private sector is necessary.

Telemedicine in Ecuador has proven to be a valuable tool for improving access to and quality of healthcare in rural areas and in the workplace. Despite challenges, technological advances continue to drive digital transformation in the Ecuadorian healthcare system. It is crucial to continue working on overcoming barriers such as data security and acceptance of new technologies to maximize the benefits of telemedicine in the country.

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