A Century of Telemedicine: 
*Curatio Sine Distantia et Tempora*
A World Wide Overview – Part V

Editors:
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2022
A Century of Telemedicine: Curatio Sine Distantia et Tempora
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Preface

Dear Reader,


The goal of the series is to present different national and cultural points of view on the development and implementation of Telemedicine/eHealth/Digital Health and to share the information with international, national and regional institutions and policy makers as well as with all groups and individuals involved with healthcare. It provides directions of a wide variety of decisions, able to affect the form and functioning of the healthcare sector and offers clues towards the expected future of health organization at community level. The results and guidelines presented apply to all – national and local administration, individual practitioners, group practices, healthcare systems, as well as to providers of health-related services where there are Telemedicine/eHealth interactions either directly to the patient or from provider to provider for the purpose of healthcare delivery.

The series “A Century of Telemedicine. Curatio Sine Distantia et Tempora: A World Wide Overview” is especially important now, in the time of COVID pandemic as Telemedicine/eHealth comes in many shapes and sizes and offers numerous advantages over the traditional healthcare treatment. Before the pandemic, Telemedicine/eHealth was often neglected. The COVID threat quickly changes the attitude towards it.

This volume presents a historical approach of Telemedicine and eHealth/Digital Health in two countries – Morocco and Portugal. Thus, the total number of countries introduced in all five parts reaches 23!

Each chapter reveals different solutions for the treatment of patients and wellbeing of citizens, provides a glimpse and summarizes the best practical achievements, governmental policies, existing solutions and experiences in one country.

The editors are convinced that this volume offers useful information to those who are preparing to expand Telemedicine/eHealth/Digital Healthcare in their regions or countries. It will allow them to rely on the experience of the others and make them aware of the benefits and problems that were encountered during and after implementation of systems or services, and as such, will help to possibly avoid mistakes and reduce potential problems.

It is necessary to remind that as in the previous books:

- Each chapter covers various areas of Telemedicine/eHealth in one country;
• The countries presented in the volume are chosen on basis of a random selection method;
• Chapters are listed alphabetically, following the countries names;
• The original style of the authors is respected as much as possible;
• Despite the amount of information included in each chapter, no doubt that many services, projects and facts are still out-of-sight. We hope to be able to fill these gaps in the later editions.

We firmly believe that everyone involved in Telemedicine/eHealth will find this book not only interesting, but most valuable as well.

Enjoy your reading!

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Digital Health and Telemedicine in Morocco: Progress and Challenges

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I. Introduction

Morocco is located on the top North of the African continent, bordering Africa, Europe, and the Arab world. Morocco, as His Majesty Former King Hassan II famously put it, is "a tree with its roots in Africa and its branches in Europe".

Morocco's reputation as a pioneering nation in the fields of Education and Medicine has always been well-known. The world’s oldest university, the Qarawiyyn, was founded in 859 by an educated wealthy woman, Mrs. Fatima Al Fihria, in the imperial capital of Fes. The first diploma of Medicine ever has been delivered at the University Al Qarawiyyn in 1832. Morocco is reconciling with its illustrious past in Health and Medicine, which manifests itself in a willingness for the Health system to accept modern technologies.
Morocco, like many other developing countries, strives to provide affordable, accessible, and high-quality health care. Using information and communication technologies (ICTs), digital health has the potential to enhance health care services by increasing their efficiency and quality of delivery. Telemedicine was born out of health professionals' ambition to use ICTs in order to provide the greatest number of individuals with high-quality care quickly, easily, and from any location and at any time.

1.1. Morocco: Presentation

Morocco, officially the Kingdom of Morocco, is the north westernmost country in North Africa. It faces the Mediterranean Sea to the north, where the Strait of Gibraltar separates it from Europe, the Atlantic Ocean to the west, Algeria to the east, and Mauritania to the south. It has a population of almost 37 million people and covers an area of 710,850 km² [1]. Its official and prevalent religion is Islam, and its official languages are Arabic and Berber, with Moroccan dialect. Arabic and French are also commonly spoken.

Medical and biomedical sciences are taught in French, which is the common language used by the medical staff. Moroccan identity and culture are a fusion of Berber, Arab, Sub-Saharan African, Jewish, Maure and European influences.

The political capital is Rabat, and its most populous city is Casablanca, which is the economical hub. Rural population was reported at 36.47% in 2020 [2]. Morocco has the African continent's fifth-largest economy and major influence in both Africa and the Arab world. It is a member of the Arab League, the Union for the Mediterranean, and the African Union. Morocco is a semi-constitutional unitary monarchy with an elected parliament.

1.2. Health System in Morocco

The Moroccan health system is divided into two parts: public and private. There are 2,689 primary health care centers and 144 public hospitals at various levels; local, provincial, and regional. There are a total of 22,146 hospital beds, 6,763 private practices and 439 clinics in the private sector, which is concentrated in urban regions and to the north of the Atlantic coast.

The health system is suffering from a severe lack of resources, particularly human resources: the density is 0.68 doctors and 0.84 nurses and midwives per a thousand population. There are a total of 23,374 doctors, at a ratio of 7.1 doctors per 10,000 inhabitants, while, the World Health Organization recommends a minimum of 23 doctors per 10,000 people. The health-sector investment is low (less than 6% of GDP) and direct household consumption is high (around 54%).
Morocco's health system is undergoing substantial regionalization reform, with the establishment of 12 new areas. With the extension of health insurance for most vulnerable groups (RAMED) in 2012, an additional 8.5 million people now have access to free public health services. Compulsory Health Insurance protects employees in both the public and private sectors (AMO). Moreover, the government is working on health insurance for self-employed people, who account for one-third of the population. Moroccan citizens, on the other hand, expressed dissatisfaction with the health system, particularly with the quality of care and the unfairness of access to services, highlighting a large disparity between urban and rural locations. As for
territorial disparities, over half of doctors work in Casablanca-Rabat axis. Four Moroccans out of ten must travel more than ten kilometers for their first health encounter.

Morocco is undergoing an epidemiological change, with an increase in non-communicable diseases (NCDs), which account for 75% of all fatalities in the country (cancer, metabolic diseases, including diabetes, and cardiovascular diseases, which contribute 40% of the causes of mortality). Accidents account for 7% of all deaths, with communicable diseases, maternal and perinatal mortality, and nutritional factors accounting for the remaining 18%. The projected prevalence of hypertension is 32.4%, with obesity and hyperglycemia at a young age accounting for 16.4% and 9.9%, respectively [3].

Morocco intensified its efforts to reduce maternal and newborn mortality between 1990 and 2015, with a 78.1% drop in maternal death and a 65% reduction in infant mortality. In 2017, maternal mortality was 70 per 100,000 live births [4], while infant mortality was 19.9 per 1,000 live births [5].

The country's increased immunization coverage and disease control measures have aided in the eradication of major infectious illnesses such as polio, malaria, trachoma and schistosomiasis. However, Tuberculosis continues to be a problem in some locations. To address this public health issue, a multi-sector effort was initiated in 2013. Whereas, HIV/AIDS prevalence in the general population remains low and largely stable, at roughly 0.1% as per 2017, with a higher prevalence among particular vulnerable target populations. When compared to other nations in the Eastern Mediterranean Region, Morocco has the greatest rate of antiretroviral therapy coverage.

1.3. Digital Infrastructure in Morocco

In 2017, Morocco ranked fourth among African countries for both internet connectivity (fiber optic, 3G, 4G) and mobile connectivity [6]. By 2019, more than 74% of the population have internet connection [7]. Furthermore, electrification has been extended to practically every part of the country, from the most isolated and rural parts to the most densely populated areas [8].

The kingdom's ICT sector is one of the most mature in the region. The market is however dominated by three main operators: Maroc Telecom, Orange Maroc and Inwi. The Moroccan mobile market reached 44.73 million subscribers in the first quarter of 2019, reflecting a 127% penetration rate. While pre-paid subscriptions accounted for more than nine out of ten subscriptions, post-paid plans increased by 20% year on year (y-o-y) in the first quarter of 2019, according to the National Telecommunications Regulatory Agency (ANRT) [9]. During the same period, Maroc Telecom
controlled 43% of the mobile market, while Orange and Inwi controlled 35% and 22%, respectively. In 2020, the three operators had 39.4%, 34.54%, and 26.06% of the market, respectively [10].

Despite apparent market saturation, telecom providers have increased their revenue by increasing customer data use. In the first quarter of 2019, two out of every three Moroccans have an internet connection, a 9.32% year-on-year growth to 23.1 million users. This surge is primarily due to the growing use of mobile internet, which accounted for an astounding 93% of all internet connections during the same period. Following the debut of 4G in 2014, Huawei’s 2019 Global Connectivity Index indicates that LTE (Long-Term Evolution standard for wireless broadband communication) is now available in 60% of the country. Orange Maroc announced a 1.2 billion dirhams annual investment plan to enhance its 4G and optical fiber infrastructure in 2019. Meanwhile, Maroc Telecom intends to invest 10 billion dirhams in infrastructure between 2019 and 2021, bringing the total expenditure to 68 billion dirhams, and Inwi is pursuing 5G development.

With the diversification of online material and the decline in Smartphone pricing, the percentage of Moroccans who own a Smartphone increased to 80% in 2019 [11]. Three-quarters of internet users are online daily, with social media being their primary source of information. The increase in data consumption has compensated for the decline in revenue from voice over internet protocol (VoIP), with average revenue per user (ARPU) from data consumption increasing from Dh24 ($2.50) per month in the first quarter of 2016 to Dh31 ($3.23) per month three years later, despite a decline in market prices over the same period.

The World Economic Forum’s Network readiness index, which is included in its "Global Internet Technology" report, ranks nations on their ability to use ICT prospects. The kingdom was placed 78th out of 139 countries in 2016, up from 88th in 2010. The ranking highlights the importance of Morocco focusing its efforts on the construction of stronger infrastructure, the provision of more comprehensive training, and the promotion of private-sector digitalization. Nonetheless, it recognizes the productive efforts made in cost reduction and increased ICT use throughout government. Morocco is seeking to improve its status on many indices, not just the World Economic Forum report. Both the governmental and commercial sectors recognize the economic value of a thriving ICT sector.

In terms of infrastructure, Maroc Telecom dominates the country’s fiber-optic network (25,000 kilometers), followed by Wana Corporation (Inwi) (6,000 kilometers) and MediTel (Orange) (2,000 kilometers) [12]. In 2012, the government launched a 10-year broadband strategy with the goal of connecting the entire population to the internet by 2022. A component of the
plan requires telecom companies to spend 2% of their revenue on network development in financially unviable zones. Although 60% of households own a computer or tablet, there is a large technological divide between rural and urban areas, with ownership rates of only 36% in rural areas and 72% in urban ones [13].

According to ANRT, fiber-to-the-home connections reached 107,000 in the third quarter of 2019, a 65% increase over the same period in 2018. Market participants recognize the value of pooling telecom infrastructure in the development of nationwide high-speed internet. With civil works accounting for between 50% and 70% of deployment costs, infrastructure sharing would significantly cut service providers’ investment costs. In February 2019, Law No. 121-12 declared fiber internet to be a universal service and reaffirmed an earlier requirement for operators to present a technical offer for infrastructure sharing. Additionally, the new rule permits operators to deploy fiber networks in public areas and mandates that all new buildings be connected to the high-speed network.

Orange adopted a plan in 2019 to connect 1 million households to the network over four years. Additionally, it inked an agreement with the Office of Vocational Training and Work Promotion (OFPPT) in April 2019 to develop a curriculum for fiber network installation and maintenance jobs training programs. Indeed, the sector requires additional investment across the board, not just in infrastructure and training. Plans for 5G are now underway, and a greater emphasis on security will be required going forward.

II. Telemedicine in Morocco: Overview

Telemedicine in Morocco offers prospects for the country's health systems but is hampered by many technological, regulatory, sociological, and cultural impediments. While telemedicine is still in its infancy, it is gaining traction among health professionals and policymakers. Numerous efforts in telemedicine have been established such as in teleoncology, teleradiology, telecardiology, and teleechography.

The popular was one consisted of a “Qualcomm” Wireless mobile health ultrasound patrol pilot project for the detection of high-risk pregnancies in the Fes region (Central Morocco) [14]. The purpose of this Mobile Health pilot was to demonstrate how improved wireless technologies and connected portable ultrasound devices could enable access to cutting-edge imaging diagnostics in previously unreachable locations. This project allowed physicians in different cities to analyze and cooperate on patient care data in real-time. The usage of wireless technology sped up the supply of medical data for evaluation, shortened the time required for diagnostic review or second opinions, and decreased per-patient expenditures.
Another telemedicine endeavor was the Korean Cooperation's mobile health Tuberculosis program in the city of Salé (Rabat twin city).

In 2007, a Teleoncology pilot project was conducted between the Oncology Institutes of Rabat and Brussels, Belgium. At the same time, an international pediatric Tele-education network was developed between Washington, Rabat, and Marrakech child hospitals to improve community and healthcare professional understanding and practice of children's healthcare issues. US physicians share clinical information and train healthcare staff in both Moroccan cities. This project resulted in building a telemedicine station in Rabat and the training of 40 physicians and other healthcare professionals. The Telecardiology component of the project with Marrakech University Hospital assisted in identifying challenges to long-term deployments, such as reliable technology, constant bandwidth, satellite time, time zone, and language.

Morocco has one of Africa's most advanced telecommunications infrastructures, with three fixed and mobile network operators. Morocco also boasts one of the region's highest rates of mobile penetration. This demonstrates the country's potential for telemedicine development. However, several obstacles persist, including the absence of a national e-health strategy, the need of an advanced legal framework, a lack of understanding of the potential benefits of e-health among both patients and health providers, privacy concerns, a lack of robust information infrastructure in hospitals, and a shortage of competent and trained employees and technicians. Additionally, the objective of information technology divisions within the Ministry of Health (MoH) must be clearly stated.

During the Second National Conference on Health, held in Marrakech in 2013, many professionals emphasized the crucial need for new technologies as a vital technique to overcome the existing state of partitioning and ensure the transparency required for an open architecture. One of the fundamental conclusions of the conference was that we could not govern the health system without scientific foundations and intelligent information, i.e., accurate and relevant data that allows us to regulate the system and make strategic decisions to adapt it to social changes. Because of this, and in response to these recommendations, healthcare organizations have increased their IT investment budgets, and numerous university hospital centers have already begun the process of acquiring "electronic patient records" and "hospital information systems". The Moroccan government council examined a decree (No 2-18-378) relating to the practice of telemedicine in May 2018, and a “Moroccan Telemedicine Society” was born, an organization, mandated by the MoH, whose mission is to establish a technological infrastructure for the development of telemedicine activities for the benefit of rural and isolated
populations. It also aims to develop telemedicine practice and encourage its widespread deployment all over the country.

2.1. Important Institutions for Telemedicine Deployment

The Digital Development Agency (ADD)

The Digital Development Agency (ADD), established by Law No. 61.16 and announced in Official Bulletin No. 6604 on September 14, 2017, is a strategic public institution with legal identity and financial autonomy [15]. The Agency, governed by the Ministry of Industry, Trade, Green and Digital Economy (MICEVN), is in charge of implementing the State's digital development policy, as well as supporting the distribution of digital tools and the development of their use among citizens. Several cross-functional missions have been allocated to the Digital Development Agency in its capacity as an institutional player, with the goal of structuring the digital ecosystem and bringing about the creation of true digital economy operators. It is also about contributing to the development of digital administration by assuring user engagement, both citizens and businesses, as well as establishing a normative framework for digital products and services. Its mandate includes the reduction of the digital divide inside the country, the support of the Industry 4.0 revolution, and the leadership of societal transformation through education and awareness. The ADD is also in charge of fostering research and development, social and entrepreneurial innovation, and guaranteeing responsible and sustainable digital inclusion, among other things. Furthermore, the ADD takes a participatory approach with all stakeholders (public and private sectors, civil society) and ensures coordination and consultation on the numerous problems of digital transformation and its impact on the global environment (administration, company, and citizen).

In particular, this digital transformation orchestrated by the ADD would help to facilitate and improve the access of different social categories to health across the Kingdom, which would therefore help to ensure the appropriate conditions for the expansion of the health coverage that has been considered a national priority.

Recently, the ADD and the National Council of the Order of Physicians (CNOM) signed a framework partnership agreement on digital development on 24th of September 2020. The objective of this agreement is to set up a framework for partnership and collaboration between parties in the digital field and to set the terms of its implementation.

The two entities thus aim to pool their efforts and resources around six areas of cooperation relating to:
1. The provision for the benefit of the CNOM of the various shared digital platforms developed by ADD and in particular the Digital Order Bureau and Electronic Parapheur;
2. The development of the use of telemedicine;
3. The support for the CNOM in the digital development worksite as well as on the organizational plan than that applied to the activities of the council;
4. The consultation on legal and normative aspects related to telemedicine;
5. The training of trainers and the development of human capital in the health sector by digital and its medical applications;
6. Raising awareness of digital technology and its different uses at national and regional levels, for the benefit of the public and private health sector in collaboration with the regional councils of the National order of physicians.

National Council of the Order of Physicians (CNOM)

A private law institution responsible for a public service mission, the Order ensures the ethical regulation of the medical profession. Present in all territories, the Order acts as closely as possible to physicians in their practice. It provides them with ethical insight, legal advice, supports their installation, guides them in their administrative procedures, and supports them in the event of difficulties. The Order also ensures that the best interests of the patient are preserved, and the doctor-patient relationship is at the heart of its concerns. It has disciplinary bodies in this regard [16]. On the day after the COVID-19 pandemic emergency, the CNOM has set up a "telemedicine commission" to facilitate the implementation of a practice of telemedicine accessible to the public and to doctors and in accordance with the law. The Council aims to ensure that telemedicine and the use of ICT in the health sector led to a real improvement in the quality of health services, while ensuring the protection of professionals, patients and their data health. One of the immediate achievements of the CNOM was the introduction of the amended telemedicine decree in coordination with the Ministry of Health. [16]

The National Commission for the Protection of Personal Data (CNDP)

The National Commission for the Protection of Personal Data (CNDP) was created by Law No. 09-08 on February 18, 2009 for the protection of individuals with regard to the processing of personal data [17]. It is responsible for verifying that the processing of personal data is lawful and legal and that it does not infringe upon privacy, fundamental human rights
and freedoms. The commission is made up of personalities known for their impartiality, their moral probity and their competence in the legal, judicial and IT fields. The commission makes the protection of medical data its main task.

The CNDP was seized on April 27, 2020, to rule on compliance with Law 09-08 relating to protection of individuals with regard to the processing of personal data, the WIQAYTNA application, the purpose of which is to support the health management of the spread of COVID-19 pandemic. The CNDP considers that compliance with Law 09-08 is based on the fact that the WIQAYTNA application is planned to be deployed according to the following assumptions:

- Use on a voluntary basis only;
- Support for the health system, in particular to rationalize the allocation of resources with a view to strengthening the screening policy and informing citizens;
- Control by health authorities of the parameters of the alert calculation algorithms;
- Use of "tracing" without a "tracking" mechanism;
- User information;
- Limitation of access to data to authorized persons only;
- Commitment not to use the data for purposes other than that authorized;
- Commitment to destroy the data collected and generated upon exiting the state of emergency health, except those that can feed, in an anonymized and regulatory manner, the scientific research;
- Declaration of non-use of black box; and
- Commitment to make the code accessible for audit and verification purposes.

The CNDP was also seized to evaluate the conformity of the newly deployed telemedicine platforms with the law. As such, The CNDP became a central element in the authorization given by the MoH for telemedicine practice.

*The Moroccan Society of Telemedicine (SMT)*

The SMT was established as a non-profit organization and aims to establish a technological infrastructure for the development of telemedicine activities for the benefit of populations in rural and isolated areas. The founding members and members of the Board of Directors of the SMT are the Health Department, the Interior Department, the Department of National Education, Vocational Training, Higher Education and Scientific Research, the Royal
Armed Forces Health Service, Mohammed VI University of Health Sciences (UM6SS), and the National Telecommunications Regulatory Agency.

The SMT's objectives are to contribute to the development of telemedicine practice, to promote and support its deployment at national level, particularly in favor of disadvantaged and isolated populations, to install and operate any technological or physical infrastructure necessary to carry out telemedicine acts, and to encourage others to do so [18]. The SMT proceeds to the appropriate equipment of the pilot sites located in rural and isolated areas, with the support of the public authorities, the involvement of medical staff of dispensaries under the regional structures of the health department, as well as, in a first phase, the medical staff of the UM6SS, in order to carry out teleconsultation acts covering both general medicine and primordial specialties.

The goal of this national initiative is to enable Morocco to take advantage of the opportunities provided by new ICTs, to which all layers of the Moroccan population now have access, in order to gradually and staggeringly reduce the existing health disparities between urban and rural populations.

The Moroccan Association for Telemedicine and eHealth (MSfTeH)

The Moroccan Association for Telemedicine and eHealth (MSfTeH) is a scientific non-governmental organization (NGO) that was founded in 2011 by scientists, health professionals and engineers as one of the tools to achieve the ambition of promoting digital health research and implementation and telemedicine practice in Morocco. The support and endorsement of the International Society for Telemedicine & eHealth were instrumental in this creation.

Interests and research projects from members include implementation of Open Source in Medical Information Systems, medical images analysis, managing electronic health records, mobile health application, to cite some. The objective is to promote sustainable telemedicine projects and to increase the awareness of the importance of a national eHealth roadmap. The MSfTeH is contributing in building local capacities in the field of telemedicine and eHealth through teaching, research and services. The association focus has been the increase of awareness of the importance of Telemedicine and eHealth for a better and efficient health care system.

The MSfTeH organized a number of international eHealth and medical informatics conferences and workshops in eHealth, telemedicine, bioinformatics, medical Information and medical informatics. The MSfTeH is also working in setting up educational and training programs including workshops, university courses and full master degree in telemedicine,
medical informatics and eHealth to prepare the missing human resources for any large implementation of eHealth in the national health system [19, 20].

**Moroccan Medical Informatics Association (SMIMS)**

In 2009, the SMIMS was created at the Medical Informatics Laboratory (CMIL) of the School of Medicine and Pharmacy in Casablanca with the objectives of disseminating and transferring knowledge regarding health information technology and promoting efficient use of medical information technology to improve patient care. The hosting lab (CMIL) has been responsible for a residency program for physicians interested in the medical informatics specialty. CMIL has been involved in international programs such as NetAdded to reduce digital division in e-divided areas, through hybrid satellite-wireless technologies; or EMISPHER for Internet-Satellite Platform for Health, Education and Research.

### 2.2. Morocco’s Strategies for Telemedicine Deployment

The MoH 2025 Health Strategy, the broad outlines of which were approved by the Council of Government on April 19, 2018, is based on 25 axes and 125 actions and requires at least 24 billion DH of investments. The strategy aims to create an integrated health system, for an organized and strong healthcare offer accessible to all citizens, driven by effective programs and supported by new governance [21]. The Moroccan Ministry of Health's "Health Strategy 2025" intends to organize and enhance the healthcare system in order to increase access to health services, improve management, and optimize resource allocation and utilization. The digital swift was an ideal approach to achieving these aims; it leverages the strengths of the current IT infrastructure and takes it to the next level by enabling access to electronic medical records via personal computers, tablets, and smart phones.

In January 2019, the head of government entrusted the Digital Development Agency (ADD) with the task of preparing a note to propose to the government guidelines for the development of digital development in Morocco by 2025 [22]. This note was finally approved at the last ADD board meeting held on December 23, 2019. The ADD defines the prospects for digital development in Morocco with three main challenges:

- Improving the quality of public services,
- Improving the productivity and competitiveness of the national economy and
- Reducing social inequalities.

One of the program's key axes is to improve individuals' quality of life through the use of digital technology. Digitization can provide new views for people by helping less privileged populations to get access to information,
social benefits, education, and care services. It suggests using telemedicine to redraw the health map and rebalance the territory in favor of places with low medical density. As a result, it is planned to integrate digital development into at least three major domains, including health with the objective of enhancement of patient care, such as the development of electronic medical records to ease information sharing and patient medical monitoring.

2.3. Law of Telemedicine in Morocco

Morocco is one of the few countries in Africa and the Arab world to have a legislative framework governing the practice of telemedicine [23]. It was established by 131-13 law [24] on the practice of medicine (Dahir No. 1-15-26 of 19th February 2015), which allowed for the incorporation of telemedicine as a stakeholder in healthcare procedures through its articles 99 to 102. This law was reinforced by an implementing decree number 2-18-378 [25], which took effect on July 25th, 2018 and defined telemedicine precisely and established the regulatory framework for all telemedicine processes and acts. Finally, and in light of the uniqueness and sensitivity of health data, when deploying telemedicine practices, the provisions of 09-08 law [26] relating to the protection of personal data are considered. Faced with the extraordinary circumstances surrounding the COVID-19 pandemic, the National Council of the Order of Physicians (CNOM) made a very prudent decision to authorize the use of teleconsultation, albeit at no cost, in the monitoring of patients at a distance, even in the absence of a health professional present as required by the 2018 regulations. This has facilitated the use of video follow-up conversations with treating physicians for a large number of patients, particularly those with chronic conditions. This constraint underscored the importance of amending the first telemedicine decree of 2018, several of whose provisions were recently updated in a new decree recently adopted by the Council of Government on January 14, 2021 and published in the official journal on February 1st, 2021. Specific provisions have been revised such as the one to change the definition of medical consultation mentioned and the components of the license application file, by requiring applicants to provide a copy of prior authorization for processing personal data by the CNDP [27].

2.4. Telemedicine Projects in Morocco

Number of telemedicine initiatives have been launched in Morocco. They concern various fields such as teleoncology, teleradiology, telecardiology, and teleechography. Most of them never scale up. Here below we describe some of those relatively meaningful projects.

mHealth for Maternal and Child Health and Pregnancy at Risk
The company Qualcomm and its partners [14] have deployed a “Mobile Ultrasound Patrol” project, which attempts to enhance women's care by identifying and treating maternal mortality's fundamental causes early on. In three villages in Morocco, Oulmes, Boulemane, and Ribat el Kheir (Central Morocco), medical examinations were conducted. Doctors to whom data is transmitted provided diagnosis in two Moroccan and one French city centers. The concept utilizes three primary tools: a portable ultrasound unit, a smartphone or tablet, and a 3G key.

The findings of the first experiment, which lasted nine months, established the technique's success by highlighting the significant savings that may be produced. The Mobile Ultrasound Patrol initiative equips physicians and nurses with backpacks that include gadgets that are wirelessly connected to specialists in hospital clinics, ensuring high-quality and far-reaching diagnoses. Patients, nurses, and physicians use mobile devices such as smartphones and phablets (phone-tablet) to access the system. The images are acquired using a Sonosite M-turbo portable ultrasound device. The photos are delivered wirelessly over a Wi-Fi network via a dongle attached to a wireless Sony smartphone or tablet pre-loaded with a DICOM-compliant application for medical data encryption. Images are delivered from the medical equipment over a 3G mobile network to Trice Imaging Inc.'s cloud-based image management platform. In a secure Internet reception area, images can be seen. An encrypted e-mail is automatically delivered to the medical advisor with a link to the photographs. The medical advisor uses a phablet to access the system and review the images before writing a report. In the image management technology, clinicians on both sides collaborate, provide feedback, and pinpoint areas of interest while seeing the images on a viewer.

Figure 2. Mobile Ultrasound Patrol Morocco
As a consequence, 575 examinations, totaling 3,108 images, were wirelessly transmitted via 3G technology, with doctors awarding the ultrasound a perfect clarity score of 98%. 94% of the exams revealed the possibility of high-risk pregnancies. A second opinion was requested for 158 patients. The deployment of such advanced wireless technology resulted in:

1. Reducing the time to obtain a diagnostic test or second opinion from two weeks to less than 24 hours;
2. Reducing medical diagnostic costs each patient from $80 to $2;
3. Reducing the time required for medical data to be transported for evaluation from four days to two seconds and
4. Enhancement in medical personnel's (midwives, nurses, and general practitioners') ability to produce ultrasonography from 20% to 92%, which is sufficient for diagnosis.

Additionally, participating physicians observed an increase in the number of patients seeking post-trial care. The number of deliveries made at these facilities has increased, which is a significant step toward minimizing dangerous home deliveries.

**Mobile Health Tuberculosis**

Another telemedicine initiative concern mobile health Tuberculosis pilot project in the city of Salé (Rabat area) by the Korean Cooperation. The partnership agreement between the Moroccan League Fight Against Tuberculosis (LAT) and the South Korea Cooperation Agency was signed on March 2014 to deploy the ‘Mobile Health Tuberculosis’. This innovative concept in the treatment of tuberculosis equips patients with a smart box that detects patients who leave treatment. The Mobile Health Tuberculosis is a simple and inexpensive way to careful monitoring of the patient and a better coordination among stakeholders [28].

Currently the experience has been extended to other cities of the kingdom (Skhirat, Temara, Khemisset, Tangier and Kenitra). This project aims to improve the adherence of tuberculosis patients to treatment by strengthening direct supervision, and thus reducing the morbidity of tuberculosis in the Moroccan population.

The main objectives of this initiative have been:

1. Strengthen the “Directly Observed Treatments” strategy system via Mobile Health technology by staffing high-risk patients or patients who have dropped out of treatment with Smart-pillbox;
2. Improving the follow-up of patients suffering from tuberculosis;
3. Improving the technical and management capacities of the fight against tuberculosis by training and sensitizing the various partners on the use of Smart-pillbox and
4. Establishing an approach centered on the patient and his family by raising awareness of the risks of abandoning treatment. The targeted population included patients with tuberculosis, patients withdrawing from treatment, contacts of tuberculosis patients and high risk groups.

**Regional Initiatives in Telepathology**

The French company RESINTEL was providing telepathology services for hospitals in Morocco since 1994.

Circa 1998, the TRANSPATH network was stopped due to lack of funding for continued operation.

iPath platform for telepathology gained significant traction during 2001, being extensively used by the Réseau Afrique Francophone de Télémédecine (RAFT) project.

In 2004 in Casablanca, a telemedicine unit equipped with a satellite connection and four ISDN lines was deployed.

In 2005, the Euro-Mediterranean Internet-Satellite Platform EMISPHER provided real-time online telemedicine services to Mediterranean countries, including Morocco [29].

**Belgian Moroccan Cooperation in Telemammography Project**

In 2007, a partnership agreement between the “Lalla Salma Foundation against Cancer” and the “Brussels Center Coordination for Breast Cancer Screening” helped to set up a breast cancer screening program by telemammography. The digitized mammograms performed at the Oncology Center of Rabat (INO) and interpreted locally by Moroccan radiologists, were sent to Brussels Bordet Institute for a second reading. This method proved to reduce the risk of errors of interpretation and diagnosis [30].

**US Morocco Partnership for Telecardiology**

In 2005, Children’s National Telemedicine program supported the establishment of a pediatric teleeducation network in Morocco. This project resulted in the installation of a telemedicine station in Rabat and training of 40 physicians and staff.

A second donation was made in 2009 to fund cardiac surgical trips to Marrakech. The goal was to augment the skill level of the pediatric cardiovascular team through teledmedicine and onsite visits. Considerable improvement in echocardiography skills was observed. The focus on barriers including technology, satellite availability, language and time difference has contributed to the success of the project.

**Hospitals Rendez-vous Online**
In Dubai 2016 Government World Summit, the *Rendezvous* apps bagged the award in the one-stop app category, on the regional level in the health sector.

The app developed by the ADD and the MoH manages hospital Rendezvous, appointment schedules, etc. This service has been generalized since January 2016 to all hospitals throughout the kingdom.

**Medigraf Platform for Teleconsultation**

In October 2013, a teleconsultation has been achieved with the help of a telemedicine’s platform, *Medigraf*, designed and deployed by a Portuguese company.

This solution, was deployed in two hospitals and three clinics in Casablanca and in the region of El Jadida. This project is a partnership between Meditel Foundation, and the Ministry of Health.

**Fight against Glaucoma through Tele-expertise**

The project consisted in caravans that play an important role in screening for glaucoma and diabetic retinopathies that can cause blindness.

A team of technicians was trained in the use of the pulsed air tonometer and the non-mydriatic retinography. The patients were sorted into 3 categories:

1. No anomalies;
2. Uninterpretable examination and
3. Suspected cases.

Ten percent of the patients examined were then taken care of by ophthalmologists and often within the framework of medical caravans. Tens of thousands of people have benefited from these exams.

**Sharing Experience North-South**

Moroccan surgeons from IBN SINA University Hospital were able to follow live surgeries that took place on September 30, 2014 in the service of Dr. TIM Tollens, laparoscopic surgeon in Bonheiden, Belgium. They were able to ask questions about the operation. Applications included Inguinal hernia treated with TAP, Median eventration by plaque under laparoscopy, 3rd recurrence of inguinal hernia treated with UHS biface plate, and Plate hernia treated with TAP.

**Moroccan-Russian Expert Committee on Telemedicine**

A Moroccan-Russian expert committee has taken place on October 1st, 2018 at the headquarters of the Ministry of Health. During this meeting, the representative of the “Moroccan Telemedicine Society” presented the current
telemedicine system in Morocco and the representative of the Russian delegation, exposed the telemedicine system at the level of the Russian Federation. This collaboration focused on tele-expertise to overcome the shortage of doctors in rural areas and to target the landlocked population in 160 priority municipalities, which represent 6.25% of the Moroccan population [31].

National Telemedicine Program for Rural Areas

The Ministry of Health launched in partnership with the Moroccan Telemedicine Society (SMT), on October 22\textsuperscript{nd}, 2018, a large telemedicine program, in favor of isolated rural areas.

The objective of this program is to cover 160 rural communes and a population of nearly 2 million people who lack access to health care [32].

The stakeholders used a three-stage deployment approach to ensure the initiative's success. The first, launched in 2018, involved establishing a 'proof-of-concept' (POC) in six rural areas. This concept is being expanded to cover over 40 local sites in the second phase, which is currently proceeding and will last through 2021. Since March 2020, four of these have been operational, with an additional eight currently being deployed. Finally, between 2021 and 2025, the deployment plan will be scaled up to a nationwide level to reach the 160 sites target.

The individuals living in these isolated localities will receive a range of healthcare services, including primary care, maternal, neonatal, and pediatric illnesses, cardiovascular disorders, and diabetes, as well as maybe dermatological and eye-care services. These services will span the spectrum of prevention, identification, treatment, and follow-up.

A fully integrated telemedicine platform was purchased to ensure the best possible service delivery. This is based on medical devices that have been certified and a global software solution. It enables doctors to examine and diagnose patients remotely via videoconference while directing a qualified medical staff member on-site. The platform offers a variety of features and functions, such as managing electronic health records, issuing prescriptions, and scheduling appointments, all while adhering to data privacy and security standards. Communication between the central hub and the remote site is accomplished through telecom connections that will be designed and sized based on demand.

It is worth mentioning that this project was carried out within the framework of a partnership involving several actors, namely the Ministries of Health, the Ministry of the Interior and the Ministry of Vocational Training, the Ministry of National Education and Scientific Research, as well as medical services under the General Inspectorate of the Royal Armed
Forces, the National Telecommunications Regulatory Agency (ANRT) and the Mohammed VI University of Health Sciences.

**Oriental Telemedicine Initiative**

Telemedicine has finally become a reality in the Oriental region, thanks to Nortis Telecom with the introduction of a trial project at the Mohammed VI University Hospital Center (CHU) in the city of Oujda [33].

This project provides a variety of videoconferencing teleconsultation services. It aims to establish a telemedicine solution in the Oriental region by connecting the Oujda CHU via satellite to the health center of the municipality of An Beni Mathar in the province of Jerada (South of Oujda), as well as a mobile unit, in order to obtain remote diagnoses, specialized advices, and continuous monitoring of patients. The initiative entails the establishment of two permanent locations equipped with appropriate equipment (at the CHU-Oujda and the Ain Béni Mathar health center), and a mobile unit to reach outlying areas without specialist physicians. It is built on a Nortis Telecom technology platform that connects a referral center to two remote locations, in this case a rural health clinic and a mobile unit. This one-of-a-kind experience, which is critical for the region, was anticipated to result in improved patient care provided by specialized and interdisciplinary teams, while also minimizing the lengthy commutes endured by many patients.

![Oriental Telemedicine Initiative](image)

**Figure 3. Oriental Telemedicine Initiative**
Another initiative, officially called “Telemedicine in the Eastern Region”, funded by the Spanish Agency for International Development Cooperation (AECID), has been launched by Eurona, the Spanish telecommunications multinational in the Oriental region of Morocco. This program aimed to extend telemedicine from the eastern region to the rest of Morocco and later to other African countries. The Eurona telemedicine program operated on the basis of a technological platform that interconnects a reference center with a rural health center and a mobile unit. In this way, health stuff is able to conduct a direct and visual communication path for the diagnosis and treatment of patients through tele-consultation strategies, tele-surveillance, tele-expertise and tele-assistance. Likewise, the company has endeavored to provide medical equipment and train healthcare professionals who will be at the forefront of this teleconsultation for some vital specialties including but not limited to Cardiology and Pulmonology.

The project was made possible with the support of the Moroccan Ministry of Health, the Andalusian Public Health Technology Park Foundation of Granada, and its Moroccan subsidiary CINECOM / Nortis Maroc [34].

**Telemedicine in The Region of Marrakech**

In 2018, the regional health directorate of Marrakech-Safi signed a cooperation agreement with the regional council of Marrakech-Safi, the Faculty of Medicine and Pharmacy of Marrakech and the Mohamed VI University Hospital Center to set up a telemedicine platform, in particular the specialty’s teleconsultations at the level of basic health centers.

The project concerned a population of 4,835,919 inhabitants distributed over eight provinces of which six provinces have more than 60% of their population in rural areas (75% of the provinces of the Marrakech-Safi region). The following map (Figure 4) shows the distribution of the population targeted by this project.

The multi-parties agreement concerned the support and dissemination of telemedicine technology at regional level, with all requirements of a technical structure aiming to carry out clinical examinations remotely. This technology made it possible to connect the various healthcare structures in the region with the Mohammed VI University Hospital of Marrakech.

The project consisted of providing 28 sites fairly distributed all over the region with telemedicine equipment so that they can connect and communicate with the Marrakech University Hospital. The teleconsultations carried out concern several specialties, namely Dermatology, Endocrinology, Internal Medicine, Neurology, Pediatrics, Rehabilitation, Otorhinolaryngology and Rheumatology.
The Indian company HOPS healthcare, a pioneer in Telemedicine, has signed a Memorandum of Understanding (MoU) with the University Hospital of Marrakech and has been the privileged partner of this Marrakech-Safi program. The Table 1 and chart (figure 5) show the number and proportions of teleconsultations carried out by province and specialty until the end of July 2021.

We can clearly see that the greatest number of teleconsultations has been carried out in the province of Al Haouz as being the most vulnerable province in the region, and whose rural environment presents more than 83%, which made this experience very effective and very practical. More than 55% of teleconsultations carried out concern neurology. As a specialty with rare human resources, the assignment of neurologists is generally carried out in urban hospitals, so this telemedicine experience shows that we can further promote the access of the rural population to neurology. While this project was a great success, there were also many challenges including the constraints in relation to the technical installations (the 4G network or optical fiber); the organizational constraints regarding the agendas of medical
specialists; the constraints in relation to COVID-19, especially as some hospitals have been totally reserved for infected patients.

Table 1. Number of teleconsultations by province / speciality by July 2021.

<table>
<thead>
<tr>
<th>Speciality / Province</th>
<th>AL HAOUZ</th>
<th>CHICH AOUA</th>
<th>REHA MNA</th>
<th>SAFI</th>
<th>YOUS SOUFIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermatology</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Internal Medicine</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Neurology</td>
<td>34</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Motor Rehabilitation</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>ORL</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**GNU Health (Free, Open Source) Alternative**

GNU Health is a free health and hospital information system with strong focus on public health and social medicine. Its functionality includes management of electronic health records and laboratory information management system. It is designed to be multi-platform, supporting Linux distributions and FreeBSD on the server-side. It uses PostgreSQL as its database engine. It is written in Python and uses the Tryton framework as one of its components.

The United Nations University has adopted GNU Health. In 2011, it became a GNU official package and was awarded Best Project of Social Benefit from the Free Software Foundation at LibrePlanet 2012, at University of Massachusetts Boston.

GNU Health is a project of GNU Solidario, a non-profit NGO that works in the areas of health and education with free software. GNU Health has been set up for a proof of concept in the pediatric service for autoimmune diseases of the Ibn Rochd University hospital in Casablanca. A server with Linux Ubuntu has been installed within the service with the GNU Health application...
where the standard modules have been deployed and tested by health professionals.

![TELECONSULTATION PER-SPECIALITY](image)

**Figure 5.** Teleconsultations by province/speciality in Marrakech Region telemedicine project

### 2.5. International Telemedicine Events Organization

Morocco organized regular national meetings and hosted many global events on Telemedicine and eHealth. The most important ones were:

- The 3rd International conference on eHealth in Casablanca on December 2010, in partnership with the Open University of London,
- The 9th Euro-Mediterranean conference on Telemedicine and Medical Informatics in Nador, on October 2013, in partnership with the Euro Mediterranean Association for Telemedicine and Medical Informatics and
• The 22nd International conference on Telemedicine and eHealth in Casablanca, on December 2017, in collaboration with the International Society for Telemedicine and eHealth (Figure 6).

The aim of this International Conference was to present practical experiences and research results in the field of Telemedicine and eHealth solutions, and to provide opportunities for healthcare providers, industry representatives, policy makers, researchers and scientists to meet, share and discuss current projects, research, and new concepts and ideas in Telemedicine, Telehealth and m/eHealth.

Earlier, in 2014, Morocco hosted the first EU exploratory seminar where initial conclusions confirmed that there is significant interest in, and potential for, cooperation in the area of eHealth policy and its implementation between EU and Southern Mediterranean countries.

In addition, since 2014, the MSfTeH has been participating in the annual international videoconference organized by the French Telemedicine Network, Catel.

![Figure 6. The opening ceremony of the 22nd International Conference on Telemedicine and eHealth in Casablanca on December 6-8t, 2017](image)

2.6. Promoting Training in Digital Health and Telemedicine

A broad and effective propagation of telemedicine on the national territory is manacled by the dearth of experts in telemedicine and ICT specialists as professionals or managers of health.

To overcome this lack, the launch of the first Master of Digital Health and Telemedicine was planned since 2019 at the Mohammed VI University of Health Sciences in Casablanca, aiming to form telemedicine experts [35]. The content of this Master was prepared by a commission of national and international experts, chaired by the former head of knowledge sharing management that has telemedicine as a component at the WHO, and with the
support of the US National Library of Medicine of the National Institute of Health.

In addition, a module of telemedicine has been added to the curriculum of the Biomedical Engineering last year and for the first time in the country.

A University diploma in Telemedicine has also been organized at the School of Medicine of the University Hassan II in Casablanca.

2.7. Telemedicine in the Times of COVID-19

The COVID-19 pandemic and the draconian measures applied to limit its spread have accelerated the process of digitalizing many activities, including those within the health sector.

In Morocco, digital health has been deployed extensively to support the management of the current health crisis. The government has comprehensively integrated digital technology throughout its coordinated containment and mitigation processes [36]. These processes encompass testing and diagnostics, virus genomic surveillance, telecare of suspected and chronic patients, COVID-19 patient contact tracing and tracking, a laboratory information system for medical material dispatching, biological sample collection, data processing nationwide, and smart vaccination management.

Wi9aytna, tbib24, jawaz-asseha, and other telemedical platforms have been established for various purposes.

2.8. Barriers for Telemedicine Full Deployment in Morocco

More broadly, the barriers to a more widespread and quick deployment of telemedicine are technical, but also ethical, legal, economic, and social. It is critical to note that most Morocco's telemedicine activities remain in the pilot stage. Numerous obstacles remain, including the absence of a dedicated national e-health strategy, a lack of clarity regarding certain aspects of the legal framework, insufficient IT infrastructure in many public hospitals, and, most significantly, a shortage of qualified personnel to implement telemedicine projects. Additional ethical concerns include patient rights, quality standards, and data ownership. On the regulatory side, we believe that the law should be significantly improved, particularly with regard to price and reimbursement policy. Clear regulations for tele expertise actions should also be developed so that this additional telemedicine component can be integrated into Morocco's digital health system. We should consider an economically viable, relevant, and efficient model.

Having said that, we are very optimistic about the future of telemedicine in Morocco. Many elements of the puzzle have been or are being set, have put the country on the right track thus preparing a fast and full deployment in the near future.
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30
TeleHealth Evolution in Portugal in the Last Century

Chapter Editors

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I. Introduction from Chapter Editors

Portugal’s society is aged, innovative, and somehow “nomad”. The land it occupies is small but difficult to travel while its maritime area is one of the largest in Europe and 20th worldwide. More than five million Portuguese or first-generation Portuguese decedents live outside Portugal. Scattered to the old four corners of the World that their ancestors helped discover in the 15th Century. Equally they are in the “new corners” as large migration fluxes moved them into Dubai, Central Europe, or the US/Canada. Particularly, those who are EU citizens often come and many seek and receive care in Portugal. Tele-health in Portugal is better understood in the future as global tele-health for Portuguese, and global tele-health from Portugal, particularly to Portuguese speaking countries due to our language conduit, a tradition that was present since the earliest days of telehealth in Portugal. This study, about the history and future of Portuguese telehealth is, therefore, both an account of achievements but also a projection of aspirations, from people who have long been used to travel and bridge distances. A tele-nation.

Brief on Portuguese Health System

Portugal accounts for about 2% of the total EU population, with about 10.3 million people in 2017, more than a quarter of a million less than in 2011. The population is expected to decline to 9.9 million by 2030 and to 9.1 million by 2050 [1].

Portugal health system can be understood as the sum of the Continental Portugal system and two sub-systems of health covering the autonomous governed regions of Azores and Madeira, which have been influenced and
scoped in many continental initiatives of telehealth. As islands they are particularly positioned to benefit and need telehealth. Most published work is produced in continental Portugal and tends to be biased for the Public Sector Healthcare provision, due to the predominance of the public NHS as major national level organization until mid-2010s when private health groups moved from a local base to national network size and organizational structure. This chapter tries to capture that dynamic as, particularly with COVID-19 pandemic, the private sector use of telehealth solutions raised very impressively, but also strategic use and considerations on healthcare process redesign in private healthcare are also emerging.

The Portuguese public National Health Service (NHS) is organized into five health regions and aims to provide access to all effective medical services on the basis of need. Although regulation, monitoring, control and financing of the public health system are within the central administration competences, the principle of decentralization and autonomy in the operational management of health organizations has been granted since the establishment of the NHS in 1979 [2] [3].

Also note the paucity of telehealth-related indicators in both WHO work and OECD-EC reports, even in subtopics like accessibility where they would make tremendous logic These statistical descriptors of the country often prevent us to see emerging trends and novelty, such as is the case for decades of experimentation in tele-health and a golden decade 2011-2021 of tremendous advancements in digital health [4] captured into the conclusions of a WHO 2018 report [5] in these words:

*Portugal can be proud of progress in terms of the use of information and communications technologies in the health sector. This provides a good basis for more efficient operation of the system (...). It is important to retain the focus on these developments as drivers and facilitators of better service delivery and to make the best use of the potential for wider use of the data in research, monitoring, quality assurance and service development. (Page 20)*

Tele-health is a key component in such developments and bears the potential to significantly contribute innovatively to “monitoring” of patients and populations, and boost service development into hybrid and more digital-first, distance-proof health care services. In 2019, Portuguese Ministry of Health adopted one of the first national level tele-health strategies in Europe. Developed by the Shared Services of the Ministry of Health (SPMS), the Portuguese Digital Health Agency, the “Plano
“Estratégico Nacional para a TeleSaude (PENTS)” [6]. This plan was prepared interactively over one year. It covers not only innovative concepts and ideas, structuring necessary steps into 2019-2023, but also provides a briefer account of past events and hallmarks, most of which are referred to in this text but others would be additional information for the reader.

**Brief on the Structure and Logic of the Chapter**

After this brief introduction, the emergence of telemedicine services in Portugal and the collaboration with CPLC part aims to recall the historical but also strategic importance of this collaborative space of tele-health maturation in Portugal’s Telehealth evolution. A summary is then provided of key enablers for services such as the Legal Framework, Clinical Guidance and Medical Code of Ethics, which were aligned in the years of 2012-2015 alongside innovative reimbursement schemes for both teleconsultations and home telemonitoring. A set of examples follow, covering a range of concrete services, compiled into eight contributions on the evolution in provided teleservices. This also included current services provided by SPMS covering the topic of telehealth from central perspective of the National Health Service. Telehealth in Private Institutions are very important and covered here. The rise of Ambient Assisted Living technologies (AAL) in Portugal, and the contribution of Portugal to the Iberian Telehealth landscape give us two perspectives on how the evolution of Telehealth may go, and what can we do and learn together with our natural neighbours. Tele-health in occupational health and telehealth education are not marginal topics but areas where steps have been taken, but much more could be done in its evolution in Portugal. Finally, future perspectives on telehealth, assistive living and the final frontier of tele-self-technologies closes this chapter on the Telehealth evolution in Portugal. A final word of THANK YOU to all contributors, a special thank you to Paula Amorim for her immense help with editing and to you, our reader. I hope you enjoy.

**References**

[1] [https://www.euro.who.int/__data/assets/pdf_file/0004/426388/05_PORT-CountryRep_WEB.pdf](https://www.euro.who.int/__data/assets/pdf_file/0004/426388/05_PORT-CountryRep_WEB.pdf)
II. Telehealth Evolution in Portugal

2.1. First Consultations in National Health Service

Fernando Mota
Portuguese Association of Telemedicine, Vice-president, Portugal

First known telemedicine initiatives in Portugal came out at centre region in 1995 and following years where Coimbra’s Paediatric Hospital (CPH), actually part of Coimbra University Hospital Centre (CHUC – Centro Hospitalar e Universitário de Coimbra), performed the sole successful case. The use of telemedicine to improve healthcare coverage in the country came to Dr. Eduardo Castela, paediatric cardiologist, later, creator and Director of the CHUC’s Paediatric Cardiology Service (PCS), during a visit to Mayo Clinic in the USA in 1995. Dr. Eduardo Castela (also a Mayo Clinic trainee) shared his ideas with a body of people who revealed to be determining to the success of the initiative.

So, he led an informal but decisive team who was responsible for a hard and long plan of meetings and training sessions, addressed to physicians and other health professionals together with management board members to promote adherence to the project explaining the benefits and the added value of the adoption of telemedicine practice.

This huge effort of planning and raising of awareness was awarded on October 14th, 1998, where the first telemedicine consultation took place. Dr. Bilhota Xavier (paediatrician at Leiria’s Santo André Hospital, some 80 km south of Coimbra) was the partner who build-up a successful telemedicine practice between Coimbra and Leiria, both benefitting of known telemedicine advantages, namely the improvement of healthcare access to population. The same occasion also took place successful telemedicine consultation with Porto’s Júlio Dinis Maternity.

As a result of the success of these connections, protocols have been signed with the SNS district hospitals of Region Centre as well as the Vila Real Hospital in the North Region, establishing the regular use of CHUC’s PCS telemedicine on paediatric and foetal cardiology.

Late, by 2006, 13 hospitals extended the existing protocols to the tele-emergency service provided by PCS 24h per day, 7 days per week, still on both, paediatric and foetal cardiology.

By 2007 and following years PCS enlarged its telemedicine activity to the PALOP (African Countries with Portuguese as Official Language) in a systematic and regular base, with consultations to children, pregnant
women, and specialized training to local health professionals through the telemedicine platform, involving Angola (Luanda and Benguela), Cape Verde (Praia e Mindelo) and São Tomé e Príncipe.

“The PCS performed, from 1998 to 2016, a total of 32,685 out-patient teleconsultations (TC)” (telemedicine activity focuses mostly on outpatients) [1].

From 2007 to 2016, a total of 1647 TC were performed with Angola (linking to both Luanda and Benguela hospitals), 477 TC with Cape Verde (linking to both Praia and Mindelo hospitals) and 82 TC with São Tomé and Príncipe’s central hospital. The PCS continues to perform telemedicine on a weekly base. Soon, it was expected to include Guinea-Bissau in the network.

With the opening of the new CPH facilities, in 2011, a peak of admissions and observations occurred: respectively 483 and 1140, largely exceeding the average of 286 children per annum seen by PCS team, by that time.

Nowadays – 23 years after first teleconsultation – PCS is still providing paediatric and foetal cardiology teleconsultations regularly together with the tele-emergency service.

CHUC’s Paediatric Cardiology Service is the sole case in Portugal where telemedicine became a regular day-to-day routine.

Critical factors of success of PCS case rely, among others, on the following aspects:

- People & leadership;
- Planning and
- Technology.

It was crucial to the success of the project not only the leadership ability showed by Dr. Eduardo Castela but also the involvement, participation, and commitment of the members of the team including PCS and local hospitals physicians and health professionals as well management board members that gave his support and adherence to telemedicine.

To this purpose is most relevant the effort on planning carried out by the team members during that long period between 2015 and 2018!

On the other hand, the “telemedicine technological platform is a simple but sophisticated equipment. The Medigraf’s TC platform was developed by Portugal Telecom with direct guidance from Dr. Castela. It enables real-time visualization and the record of an echocardiogram, while oral communication and data files’ exchange occurs between the specialist physician, Physician A, and the other site’s physician, Physician B. The medical data is recorded in the databases of the national health information system.
In addition to these information systems, the PCS’s activity relies also on complementary diagnosis procedures. The most frequent are echocardiography (Echo) - Doppler, transthoracic two-dimensional (12-lead), and electrocardiography (ECG) - Holter (until 24-h), stress test.

A telemedicine session observation, focusing on the physician A’s procedures and interaction with the equipment, provided the understanding on how telemedicine allows the optimization of the physician A’s schedule and the better management of his functions. The observed telemedicine session was transmitted from CHUC to another national district hospital, in a total of 45 min for 5 TC.”

“From the PCS perspective, the TC schedule is managed by assigning each patient, considering the hospital of origin (site B) to a designated consultation day and physician (site A). This planning procedure eases management at both hospitals. The patients with appointment in B usually are previously prepared and aligned for the TC with A, for optimization. Preparation does not require an additional consultation. It is mostly scheduling a paediatric consultation where a nurse helps preparing the patient for a telecardiology exam that takes about 5 min. Despite those efforts, a major part of the observed time (52%) was considered as waste time, spent on hold (…), with the patients’ turnover, and documents’ sending and receiving proceedings. “Hold time” varies from hospital to hospital, as some are more efficient than others regarding these proceedings.”

CHUC’s Paediatric Cardiology Service was the truly kick-off of telemedicine in Portugal and APT is keen on spread the testimony of such a case study as it shows crucial aspects to be learned in order to succeed in other uses of telemedicine, such as, teleconsultation on different specialities, telemonitoring, telediagnosis, telescreening, and so many others.

The recent book published by APT, “Telemedicina, Telessaúde e Transformação Digital na Saúde” beyond giving a brief historical overview of telemedicine in Portugal, debates the literacy, clinical eligibility and the medical curriculum changes as well as the telemedicine ethics and regulation, to end up with recommendations to national sustainable implementation of telemedicine and telehealth activities in the context of digital transformation of health.

References

2.2. The Emergence of Telemedicine Services in Portugal and the Collaboration with CPLC (Community of Portuguese Language Countries)

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Introduction

Telehealth services improve access to healthcare whenever barriers exist, mostly due to lack of human specialized resources, or due to organizational issues (e.g. reducing face-to-face consultations and treatments) [1]. The COVID-19 pandemic shown us that telehealth has become a tool for improving access to care. Telehealth, when safely played by the care provider and well accepted by the patient, proves to be a reliable way of delivering care with quality to people [2].

To create sustainable telehealth services, it is critical to fulfil some requirements, such as the Momentum's Shamrock framework for telemedicine implementation [3]. Eighteen critical successful factors work as drivers to enable the context of based values for transition from strategy, management and organization to operational levels [1].

Telehealth as a Key Healthcare Promoter in Portugal

The Portuguese national healthcare services (SNS) recently incorporated telehealth in its new strategy, with several considerations for its operationalization, thus recognizing Telehealth as one of the axes targeting quality improvement and effectiveness in primary healthcare [4, 6].

Portugal has been an early adopter of telehealth mostly to overcome geological barriers and the shortage of healthcare professionals. Starting in 1998, the Pediatric Telecardiology Service (PTS), with the total of 32685 out-patient teleconsultations (until 2016), is a leading actor of telemedicine in Portugal. The service has been grounding its telemedicine activity to improve access, connecting Coimbra's University Hospital (CHUC) with 13 other Portuguese national hospitals, and regularly with Portuguese-speaking African countries, through a teleconsultation platform - Medigraf (Portugal Telecom/Altice), a simple but sophisticated technological solution [1].
Everything began with Dr. Eduardo Castela (Director of the CHUC's Pediatric Cardiology Service), that looked for partnership and engaged Dr. Bilhota Xavier (Pediatrician at Leiria's Santo André Hospital) to start the service. Both believed on the benefits of creating this service and that the scale-up to other hospitals would help to mitigate the access problem. Partnership with key stakeholders, were the foundation for professionals' engagement and service networking development. Motivation, teamwork and leadership (within a dominant "Clan" culture, according to Organizational Culture Assessment Instrument), with perseverance, were key to the success of this service [1].

PTS's sustainability lays on positive results, new regulations and the increasing support from the hospital board that set up a window of opportunity to establish the service. The results of such service are not only the provided care at distance (emergency and scheduled teleconsultations, both first and subsequent consultations), but also economical ones. This telemedicine service has already saved significant resources to the system and families: about one million euros for the health system and approximately 419 euros per patient [1].

PTS enabled real-time clear communication and sharing of information, overcoming main barriers, improving access, in central Portugal and in Portuguese-speaking Africa, by encompassing both pediatric and fetal cardiology. From 2007 to 2016, a total of 1647 teleconsultations were performed among Angola, Cape Verde and Sao Tome and Principe.

Telehealth from Portugal to Community of Portuguese Language Countries (CPLP)

The CPLP's Ministries of Health have recently expressed their commitment for the promotion of information and communication technologies targeting the universal health coverage at a sustainable cost [5]. Portugal (e.g. Pediatric Cardiology Service [1]), Brazil (e.g. RUTE teleeducation network) and Cape Verde’s uses of telemedicine to address evacuations (e.g. National Telemedicine Program [7]) are the most notorious cases.

Brazil starting the Telemedicine University Network (RUTE), about 15 years old, to provide healthcare professionals and academics the platform to support care special interest groups (SIG). SIG network keeps growing in collaboration, having 380 institutions and 1,912 participants [8].

In Cape Verde, telemedicine is contributing to the reduction of inequalities in access to health, providing remote consultations and helping to reduce evacuations inter-island and internationally (in 2014, only 18% of teleconsulted patients was evacuated) [7]. Telemedicine became mandatory
in case of eventual evacuation, becoming national standard for performing a teleconsultation for first diagnosis, prior to the evacuation decision. The most expressive services are neurology, cardiology, surgery, dermatology and orthopedics (together representing about 65% of teleconsultations).

In 2014, the Praia Central Hospital supported 74% of teleconsultations, most real time and inter-island. Other countries have been addressing telehealth to overcome care barriers (e.g. São Tomé and Príncipe [9] and Angola [10]).

Telehealth to Better Serve Growing Demands

The burden of infectious diseases and antibiotic resistance poses an increasing challenge for health systems. Telemedicine can be the answer to address it rapidly and help cope with global issues of context (e.g. the necessity of isolation due to a pandemic setting).

Recently, in Cape Verde, telemedicine has been promoted as facilitator in the process of building a cooperative Antibiotic Stewardship network [11]. The pilot study has addressed its first two stages, the problem and objectives setting. Results point as priorities the lack of human resources (e.g. the need of specialized nurses), the need to optimize material resources management and stock procurement (e.g. to prevent important antibiotics rupture), and the need for improved access to clinical and prescription information (e.g. some services still rely only on paper register system). Proximity to healthcare professionals will be essential to engage them (e.g. with the promotion of periodic training sessions and infection control meetings). Healthcare professionals' networking and better access to clinical information (e.g. an integrated information system) can be essential to stewardship, and telemedicine can play a central role in this.

Final Considerations

Telehealth is now more rooted in health systems than ever. Public and private systems are incorporating telehealth to help delivering healthcare of quality, widening their range of action and improving access to care services. It is important as complementary to current services, in both individual and public health contexts. Diagnosis, consultation and treatment are therefore covered at an increasing set of medical specialties (e.g., teleradiology, telecardiology or tele-psychiatry) and primary healthcare (e.g. chronic care) as well.

Other examples of innovation in the scope of telemedicine and telehealth are rising. Interoperability among single telemedicine systems will facilitate global monitoring and global surveillance of emerging diseases, helping health systems to cope with the several barriers inherent to each national
system and also global barriers, epidemic-related, representing a challenge at multiple levels, from the organizational to the sociocultural, economic and political.

Acknowledgments

Mélanie Maia is supported by FCT-POCH (PD/BD/128444/2017). The funding body provided financial support for the conduct of the related research, having no involvement in the analysis or in writing the article.

References

2.3. Legal Framework, Clinical Guidelines, Medical Code of Ethics

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Portugal follows the European directives on Telehealth, but as there is no standardization of regulation at European or international levels, Portugal has created its own rules.

The regulation of telemedicine is more recent than the telemedicine activity itself. Fig. 1 shows the regulation timeline with some milestones in terms of ethics, clinical practice and legislation.

Fig. 1: Regulation hallmarks
Code of Medical Ethics

The first regulation related to telemedicine refers to the code of medical ethics, in 2009 [1], which dedicated a chapter with three articles on Telemedicine, related to doctor-patient relationship (a teleconsultation should be organized to preserve that relationship) and to the doctor’s responsibility to ensure the quality and safety of information. In 2016, there was an update of the code of medical ethics, adding an article on clinical records, which is required in every teleconsultation [2].

The code of medical ethics also has two articles referring to digital information, essentially focused on security, in a digital network that cannot be connected to other networks. Since the patient is the owner of his/her clinical information, the access to third persons should only be allowed with the patient’s consent. Those who are responsible for processing health information must ensure data confidentiality. The General Data Protection Regulation later reinforced these issues.

Clinical Guidelines

In Portugal, the public body in the Ministry of Health responsible for issuing clinical and organizational guidelines is the Directorate-General of Health (DGS). The clinical guideline (NOC) that serves for all Telemedicine activities was published in 2015 (NOC nº 10/2015) [3], with three relevant aspects:

- The patient must give his/her consent before the teleconsultation,
- Scheduled teleconsultations must follow the rules of Central Administration of the Health System (ACSS) and
- A report of the consultation must be made and stored in the institution’s information system.

Before this NOC, the first NOC published was the Dermatological Telescreening in 2014 [4]. Other NOCs were: Digital Telepathology [5] (2015) and Teleradiology [6] (2015). This type of soft-law is very important as it has a binding effect not just on managers but also on health professionals directly.

Legislation

Directive 2011/24/EU [7] of the European Parliament establishes patient rights to cross-border healthcare and rules to facilitate access to safe and high-quality cross-border healthcare and promote cooperation in healthcare between Member States. Telemedicine is an important tool in this matter. It breaks down geographic barriers and allows users to be tracked thousands of kilometres away. We live in an age of people movement and clinical information must accompany this movement, following the citizens
wherever they go. «Online Health», allowing the continuity of healthcare, is one of the points addressed in this Directive.

With the Ministerial Order publications 3571/2013 [8] and 8445/2014 [9], the importance of Telemedicine for the entire National Health System (NHS) was reinforced. The Dispatch 3571/2013 reinforced the usefulness of e-Health technologies as innovative tools that allow a policy of proximity between health professionals and patients.

The Ministerial Order 8445/2014 determines that access to Telemedicine should be generalized within the NHS. All NHS hospitals and primary care units must prepare their units for telemedicine activities and appoint an Internal Telemedicine Promoter.

In 2016, the Council Ministers Resolution, Resolution 67/2016 [10] determined the creation of the National Telehealth Center (CNT) to achieve a higher level of articulation, integration, and improvement of Health Care quality, in cooperation with the NHS Contact Center. CNT integrates a Coordinating Unit, a Research and Development Unit in articulation with several thematic units and a Teletraining Unit.

In that same year, the Council Ministers Resolution 62/2016 [11] approved the National Health Strategy for the Health Information Ecosystem 2020 - ENESIS 2020. The health information ecosystem is the set of technologies, people and processes that intervene in the life cycle of information related to all dimensions of citizen and related health, regardless of the place of care/or organizational barriers; it provides for the enshrinement of several principles, namely:

- Principle of transparency and open data;
- Principle of citizen-centricity;
- Principle of data portability and health-specific legal, organizational, semantic and technical interoperability alignment with other ongoing initiatives;
- Adoption of a comprehensive governance model, integrated into the Sectoral Governance provided in the Council for Information and Communication Technologies, which is sustainable and effective;
- Adoption of good practice benchmarks and institutional standards.


During the COVID-19 pandemic, in 2020. The Dispatch 5314/2020 [14] determined that the primary and hospital health institutions of the NHS
must ensure the identification and rescheduling of the entire planned assistance activity not carried out due to COVID-19 pandemic.

In March 2021, draft resolutions from different political forces entered Parliament for discussion, presenting some recommendations to the government on telehealth, detailed in section 2.4.8.

References

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2.4. Evolution in Provided Teleservices

2.4.1. Alentejo Telehealth Program

Luís Gonçalves
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The health region of Alentejo was a pioneer in the implementation of Telemedicine in Portugal, as it has a structured and continuous program started in 1998 and covering several stages. It was a very important program that served a very large region, with a multifaceted and sparse population.

The Program extended to 26 health facilities with platforms located in 21 health centers (family health units), in the 5-regional hospitals (Beja, Elvas, Évora, Litoral Alentejano and Portalegre) and at the Alentejo Health Regional Administration (ARS) headquarters in Évora. It started working with teleconsultations between primary and hospital care and developed into four pillars, namely: Teleconsultations, Teleconsultancy, Teleformation and Dermatological Telescreening.

Teleconsultations

The teleconsultations were the beginning of the Program between regional hospitals and primary care, encompassing ten medical specialities: Neurology, Dermatology, Surgery, Paediatric Surgery, Cardiology, Physical and Rehabilitation Medicine, Orthopaedics, Endocrinology (Thyroid Pathology) and Vascular Surgery. Teleconsultations provided by nurses were carried out on wounds. Teleconsultations were also carried out between facilities mentioned in regional hospitals with Lisbon hospitals, mainly in the form of Teleconsultancy.

Table 1: Number of teleconsultations carried out in the different areas of Alentejo ARS between 2012 and 2019.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Teleconsultations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>3648</td>
</tr>
<tr>
<td>2013</td>
<td>3327</td>
</tr>
<tr>
<td>2014</td>
<td>3246</td>
</tr>
<tr>
<td>2015</td>
<td>3042</td>
</tr>
<tr>
<td>Year</td>
<td>Count</td>
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<td>------</td>
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</tr>
<tr>
<td>2016</td>
<td>2391</td>
</tr>
<tr>
<td>2017</td>
<td>2479</td>
</tr>
<tr>
<td>2018</td>
<td>2763</td>
</tr>
<tr>
<td>2019</td>
<td>2885</td>
</tr>
</tbody>
</table>

Teleconsultancy

Teleconsultancy is mainly used in the speciality of Physical and Rehabilitation Medicine, among physiatrists and physiotherapists, also in the context of mental health and therapeutic decision consultations in oncological pathologies.

Tele-Education

Teleeducation is implemented through the annual teletraining plan in which the needs of training of health professionals and the orientations of the Alentejo ARS are determinant to conduct courses, actions and sessions from Alentejo ARS to the facilities, which have Telemedicine platforms. Between 2012 and 2018 were made 56 courses, 78 actions, 517 sessions attended by 3017 professionals, with broad scientific and training benefits for the entire region.

Dermatological Telescreening

Dermatological Telescreening consists of sending photograph(s) of the lesion(s) and also standardized clinical data from the primary health care to a dermatology specialist at Évora Hospital, who diagnoses the lesion and prescribes treatment or, in cases of doubt, makes a face-to-face appointment at the hospital. For the entire region of Alentejo there are only two dermatologists both working at the Évora Hospital, which makes this Program crucial for the health of many people. This simple and effective method has been adopted at national level by determination of the Ministry of Health, making teleconsultation mandatory in first consultations in Dermatology.

Conclusions

In this review, the more relevant aspects of 23-years of the Alentejo history in the telemedicine Program were pointed out.

Alentejo is a region with a dispersed population, aged, with a high degree of dependence and low literacy. The Telemedicine Program aimed to serve the citizens by adapting health services to their needs. The Program contributed decisively:
To the improvement of accessibility of patients to medical speciality consultations,
To the decrease of waiting times for medical acts, to reduce waiting lists for consultations, to reduce transportation costs,
To update the family doctors training more specifically,
To reduce expenses related to hospital consultations,
To reduce social costs associated with patients (follow-up, accommodation and food),
To significantly increase the degree of patient satisfaction,
To contribute to environmental sustainability and, last but not least,
To highlight the uninterrupted durability of the Program during 23 years.
2.4.2. Telehospitals

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We define Telehospital as the practice of providing hospital care to a patient from a remote physician or another healthcare professional that can give support and guidance remotely to a patient.

Before the COVID-19 pandemic, at the beginning of 2019, 53% of respondents of a Portuguese barometer on telehealth [1] considered telehealth a priority for the Health Institution. With COVID-19, the world became more digitized, and everyone had to adapt to a new reality. Hospitals realised how many tasks could be conducted from afar, mainly with telemedicine, often with much greater efficiency. One of the main benefits of telehealth is the rapid access to healthcare while promoting equity in this access. Telehealth is seen as a key tool for providing universal health coverage and for the integration of care, especially in chronic disease conditions [2-3]. However, this is only effective if integrated in a treatment plan understood and accepted by all stakeholders [3], where care processes are fully coordinated, and patient data are shared in a safe and integrated manner in the care delivery process [4].

To achieve that, research into telehealth solutions must be integrated into new models of care and payment [5] and developed in co-creation with patients, so that its potential can be evaluated along the continuum of care in the institutions that are implementing these new models and trying to be more effective. If we can achieve effectiveness, we also have greater efficiency in the system if we can avoid a re-hospitalization, for example, we have less costs for this patient because it has not degraded his state of health and we have obtained resources to treat other patients [5].

Therefore, as patients not only want but also expect telehealth services from their provider, hospitals need to follow this transformation. The question being how? With agile care and administrative processes, and finding where the change is needed; providing doctors with dedicated teleconsultation spaces with appropriate design, and proper infrastructure to accommodate this new normal. In the results of a survey developed by WHO the biggest obstacles to the development of telehealth programs were identified: financing, infrastructure, priorities for the health system and a lack of legislation and regulation for this type of programs [2]. Aware of this challenge, and based on projects developed over the last few years in Portuguese hospitals, the Portuguese Association of Hospital Administrators
(APAH) identified in early 2019 [1], a set of barriers that still represent a challenge to the dissemination of new use cases of telehealth in Portuguese hospitals. This study measures and highlights that 61% of the national health care organizations point the technical infrastructure as the main barrier to the development of telehealth (specifically, the broadband coverage difficulties or limited internet access). Following the weak literacy in telehealth (whether they are professionals or patients) with 53% of the institutions and 44% of them stating the low motivation of professionals to adopt telehealth.

In other words, we are working to address all critical factors, as facilitators for a successful implementation, as well as ensuring the necessary deployment at a scale that can provide the health outcomes that the NHS pursues, as a value proposition for all investments in this area.

Thus, based on the financial resources associated with the hospital program contracts and European funds for this area, we are adjusting the financing needs for future initiatives. In terms of infrastructure and network coverage, we have SPMS (Shared Services of the Ministry of Health), to centrally manage the technological renovation and expansion, including procurement for the hospital asset management update, comprising workstations, peripherals, and other technical requirements. This entity also promotes workshops and training aimed at citizens, NHS users, and also health professionals. At the same time, the experience of the industry and professionals in the sector is helping to establish, at the level of information systems governance, a reference architecture and the adoption of interoperability standards (HL7, IHE, SNOMED) to support best practices and the change management process.

In short, the limitation in terms of financial resources, but also the lack of initiatives to reorganize the corresponding internal processes, were a burden to the expansion of these technologies. On the human side, the patient's inability to use these technologies, coupled with a poor perception of the benefits of telehealth in the professional dimension, substantially weighed on the level of adherence and adoption.

With regards to the change management process, we can have actual and future health professionals trained in these new technologies, not only on how to use them, but also how to innovate and how to use data gathered to the maximum capacity. Moreover, we got to have leaders. We attain trained leaders that really know how to evolve teams on digital health and understand the needs to build the health digital strategy.

The future of this work will require systems that support lifelong learning with flexible education and training systems that can anticipate the skills required by the labour market. It is therefore essential that changes be made,
but it is inevitable to say that the way we traditionally provided health care has changed. The key is to create value, technology must create value for professionals and for patients.

References


2.4.3. Primary Care Delivery through Digital Health

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Context

Aging populations and chronic diseases prevalence are increasing the demand for healthcare, which alongside expensive technology, are leading to rising costs of care [1]. The increase in average life expectancy and population ageing has an impact on sustainability of health resources [2]. In Portugal, people over 65 years old have in average more than three chronic diseases with high prevalence of multi-morbidity (MM) (78.3%), and their numbers are also climbing [3].

To curb this increase in chronic diseases’ prevalence, health systems have been focusing in health promotion and primary care for decades [4]. Primary care (PHC) is defined as the first point of contact with the healthcare system, providing generalist care delivered outside inpatient setting [5]. This setting includes family medicine, general internal medicine, general paediatrics, community pharmacy, and community health services such as long-term care facilities. The main consequence of this setting for chronic disease patients is the difficulty to understand and adhere to recommendations from multiple physicians and health professionals [6]. Lack of coordination and integration of care due to poor communication and interaction between patients and healthcare providers [6], and a lack of proper health information systems (HIS) to manage patient and healthcare providers’ communication [7], have been regularly cited as major challenges for the provision of care to chronic disease patients.

Most evidence shows both acute and chronic conditions can be better managed in the community. PHC practices are in a unique position in the health care system to both identify patients who need more intensive care and to provide care to patients with chronic conditions that improves their health outcomes. However, there are still significant barriers to healthcare access, especially for chronic patients. The COVID-19 pandemic has further
deprived chronic patients of their essential health care, with serious consequences.

**Digital Health in Primary Care**

The Portuguese National Healthcare Service is based on universal access, and is characterized by both a strong commitment towards PHC and the adoption of new technologies. One major stepping stone in the integration of information systems that were dispersed among different providers was the inception of SClinico®, PHC’s electronic health record (EHR), accessible to physicians, nurses and other health professionals in the Portuguese NHS. EHR can impact decision-making, how healthcare professionals and patients interact with each other, how health information is stored and used, and how patients manage their own health through electronic apps and devices [8]. However, challenges exist in the management of EHR by health professionals, namely the burden on workload these information systems bring, already thoroughly described in the literature. Thus, the design of the EHR and other interactive health information systems has been the focus of increased attention in primary care. Properly designed digital platforms can provide better access to care with significant improvement in the quality of life. The PHC digitalization opens a possibility for the collection of structured data to enable Artificial Intelligence, providing innovative, efficient, and affordable solutions to patients at any time, from anywhere and in a friendly manner. It can also support family physicians decision-making, and enable nurses to further contribute in improving chronic patients’ treatment adherence.

A recent development in PHC digitalization was the implementation of METHIS®. The METHIS® platform is a new web-based platform, whose main functionality is to enable the provision of primary healthcare remote consultations and remote patient follow-up [9]. This platform was used in PHC health centres in Lisbon Health Region, starting during the COVID-19 pandemic, to mitigate the barriers of access to care. This system provides PHC professionals with a centralized platform for communication with patients supported by a videoconference, a scheduling system for teleconsultations, and access to SClinico® information (e.g. diagnostic information and medicines prescriptions), streamlining the consultation process, aiming to improve the online interaction with patients. METHIS® is an example of what can be achieved when research and implementation align in PHC, and is now entering an evaluation stage supported by a cluster randomized control trial, where its impact on health outcomes and patient quality of life will be assessed.

ePharmacy

Over the past two decades, community pharmacies have increasingly implemented services, both for medication management and in collaboration with other professionals. As part of the PHC ecosystem, community pharmacies are increasingly providing more health care services, with a high degree of patient satisfaction and overall positive evaluation. There is growing evidence of the value these new services add to disease management [10]. Pharmacists, within the PHC context, are in a unique position to both identify patients for outcome improvement and provide patients the pharmaceutical care required to improve therapeutic and health outcomes.

Pharmacy practice has been shaped by technological evolution [11]. In Portugal, the pharmacy sector is characterized by an early adoption of new technologies (computer systems, robotics and business intelligence are some examples). However, barriers to pharmacy services’ implementation exist, with the lack of time, collaboration with physicians, pharmacists’ self-confidence and patient inclusion being the most cited [12].

Nowadays, community pharmacy practice is highly computerized, collecting patient information on a continuous basis, creating a permanently updated medicine consumption EHR. However, these records are not yet fully integrated with SClinico®, what amounts to be one of the more flagrant barriers to community pharmacy integration in the primary healthcare system. Nevertheless, some experience already exists with the use of interactive information systems.

In ePharmacare [7], a web-based platform that could provide remote monitoring and follow-up of patients supported by pharmaceutical care concepts was designed. The main health outcomes assessed were impact on medication adherence, on arterial pressure and glycaemia, while other relevant outcomes such as satisfaction, utility and intention to proceed with its use were also assessed. The information system had a positive impact on health outcomes, but revealed that even if it provides a close patient follow-up by a health professional, it could not substitute the personal interaction of a consultation. Moreover, pharmacists who used the system referred that its integration with physician’s systems would be an important improvement.

Conclusion

PHC supported by digital platforms provides better care and helps improving patients’ quality of life. Moreover, placing the priority in the integration of different information systems used by different professionals
involved in the care processes (e.g. pharmacists and physicians) will yield high efficiencies and potentially better satisfaction and quality of life for patients. Also, the development of analytical tools supported by HIS that push the management of health conditions to the community, may enable policy makers to better realize the value of PHC services. Giving a greater emphasis to PHC supported by information technologies (TeleHealth) will contribute for the sustainability of future health systems and allow the continuous fostering of innovation to the healthcare sector, contributing to its resilience and sustainability.

Acknowledgment

J.G and L.V.L would, respectively, like to thank the Foundation for Science and Technology (FCT) for the support, by the Scientific Employment Stimulus contract number CEEC/CBIOS/EPH/2018 & UIDB/00667/2020 (UNIDEMI).

References:

2.4.4 Telepathology

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The Telepathology Model of Hospital Centre of Cova da Beira and IPATIMUP

Hospital Centre of Cova da Beira, E.P.E serves approximately 100,000 inhabitants, based in Covilhã, a city in the north interior of Portugal. Since its beginning in 2013, this hospital lacks doctors, mainly specialists in Anatomic Pathology. However, it has a comparatively well equipped laboratory and highly specialized histo-technicians in its technical staff.

For many years, the model used to meet the diagnostic needs, was to send all biological materials to external laboratories with high costs associated and a long response time (average response time was more than 15 days). Additionally, demotivation of the technical staff was evident as they found themselves incapable of doing more and better, because all the work was done externally, limited themselves to the routine task of sending and receiving biological material.

Facing this scenario, in 2013, the supply of digital pathology model, raised an alternative that allowed the reduction of costs, a faster response time to the required diagnostics and the satisfaction of the technical staff, giving them the chance to use their knowledge, increasing with it their levels of motivation, once all biological material was processed within the laboratory itself.

This model consists of the preparation and processing of all exams within the laboratory of the hospital, and only the diagnoses were made by an entity outside the hospital (IPATIMUP - external laboratory that carries out the diagnosis).

Since IPATIMUP is located in Oporto, about 300 km from the hospital, it was necessary to make a model that might allow that, only the diagnosis be done outsider the hospital, and meeting the stringent quality criteria imposed by IPATIMUP, entity accredited by CAP (College of American Pathologists).

This new model predicts that each test required from the Anatomic Pathology laboratory, start to be carried out in the hospital by its own lab staff. To develop this Digital Pathology Model, new equipment has been acquired. In this sense a High-Definition Digital Tele-Macroscopy system has been installed, which allows pathologists in IPATIMUP give their
support in real-time exams administered by highly specialized histotechnicians with a Macroscopy master.

It was also necessary to install a device that allowed the scanning of all slide preparations. Other control points were added with the installation of a digital platform (LIS) which allows the traceability, control, and track of all processes within the laboratory.

Technically coordinated by IPATIMUP, this linkage joined the pathologists’ team, the molecular biologists and the specialized technicians allowing them to develop the routine pathological diagnosis and promote continuous training of technical staff.

Since 2013, all the surgical production that needs a pathologic examination is shipped to the hospital pathology laboratory and, after the informatics registry on LIS is conducted, IPATIMUP laboratory develops a telemacroscopic examination and produces a report supported by the model bellow.

![Operational circuit](image)

**Fig. 2: Operational circuit**

In 2013, after the implementation of the telepathology model, the average time of test results delivery was reduced to 10 days. Only a year after, there was a production increase of 27.6%, and therefore the average waiting time of the results delivery was about 8 days. In 2015, there was again a rise of 5.1% on the total number of exams with an average delivery time of 7 days.

This was also the year that a telepathology model was approved by DGS (Portuguese Health General Directorate - Standard 004/2015 of 03/25/2015), and therefore the accreditation of CAP (College of American
Pathologists) was delivered to the telepathology model and used by the Cova da Beira Hospital.

In the following years there was a stabilization in the number of exams and in the average response time around 7 days, reinforcing that the urgent exams have much lower response times, depending on the urgency they may have response times of less than 24 hours.

As an outcome, we observed a full reduction of the response time, the development of the hospital lab efficiency and quality system, the access to continuous and differentiated training by the technical staff and hospital physician as well as the constant improvement of the model in use.
2.4.5 Teledermatology

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Initial Phase

Until 2013, dermatology teleconsultations in Portuguese Health Service (SNS) were developed by the initiative of some Services of Dermatology and Primary Care Centers (CS) of its area of influence. They were limited initiatives, without systematization and financial accounting and entirely dependent on voluntary work.

Nevertheless, by introducing a new approach and consequent sensitivity to its benefits for patients and professionals were important initiatives.

Most approaches used e-mail accounts as a technology platform. A few had dedicated technology but incompatible with the SNS computing platform. Those more systematized systems did not have adequate continuity.

Officialization Phase

In 2013 (Ministry Order No. 3571/2013) finally begins the systematic and persistent introduction of teledermatology (it was even considered a priority).

The official NHS e-referral information system came to support this type of consultations, ending the informal phase of teledermatology.

Except in the services that used the previous informal systems, the start-up was slow, having to overcome resistance and mistrust of professionals and patients.

Multiple training sessions for professionals for the use of the software and hardware (capture of images), eventually overcame the resistance and mistrust. The positive results also helped to meet the previously defined objectives:

- Equity of access to Health Services (regions without dermatologists in the SNS, have had equal access to Dermatology consultations);
- Increased response speed;
- Reduction of absenteeism and patient travel.

The technique that was quickly imposed was the Store-and-Forward technique, which is very favorable in the case of Dermatology for providing higher resolution images than the video systems and do not have incompatibilities of schedules between the various players. Real-time or hybrid consultations are residual.
Generalization Phase

In 2014, the mandatory generalization phase of dermatology teleconsultations began (Ministry Order No. 8445/2014). This year the first Work Norm was also approved by The Health Authority (DGS) - 005/2014. Since then, all referrals for Dermatology must be requested for teleconsultation, according to the approved norm (clinical information and appropriate photos).

It is the responsibility of the hospital consultant to screen the referral. It can be made for face-to-face appointments, with the appropriate priority (normal or higher), or for teleconsultation.

In case of teleconsultation, the primary care doctor (GP) will receive a return information, consisting of diagnosis advice and treatment suggestions. The GP informs the patient and, if they agree, starts the treatment. In most cases, the problem is solved without any other referral.

Progressively the Dermatology Services of the SNS have adhered to this modality of consultation. For the last 4 years, all dermatology services in the SNS have been operating the teleconsultation program.

Currently about 30% of the first dermatology consultations are made by the modality of teleconsultation.

Advantages and Disadvantages

In addition to the benefits expected by the legislator:

- Equity in access to health services by all users, regardless of geographic region;
- Faster response times;
- Eviction of travel and absenteeism of users,

Teledermatology also provides a continuous training tool to all professionals and frees up resources at hospital level for face-to-face consultations.

The earlier detection, with better acuity of urgent situations, provides a prompt intervention, preventing delays in the treatment of malignant diseases, thus improving the prognosis of patients. This is mostly notorious in pigmented lesions, which are especially well suited, mainly with images of dermatoscopy, to this type of consultation. They account for about 50% of daily applications, most of which are benign, but include some of the main malignant skin tumors.

The most obvious disadvantage is a lack of interaction with patients and a slight lower diagnostic acuity in some situations. This inconvenience is minimized with prudent use or teleconsultation and with the increasing use of dermatoscopy in the CS.
Teleconsultation in Pandemic Times

The ongoing pandemic (Covid-19), with the allocation of resources (at CS and Hospital level) for its control, decreased face to face and teleconsultations.

Unexpectedly in this context, the teleconsultation showed another of its advantages – maintaining the consultations in safety, particularly at the level of CS. Many patients contacted their assistant physician by e-mail, then forwarding clinical complaints and images of patients to the Hospital. Although the image quality is lower, especially by the size reductions automatically applied by most mobile phones in the inclusion of them as email attachments, it is still suitable for a diagnosis.

It was a contribution to the popularity of this modality between patients and colleagues, lowering the resistance of both.

In recent months with the progressive end of confinement programs, references to dermatology consultation are returning to the pre-pandemic level.
2.4.6 Telemonitoring in Chronic Obstructive Pulmonary Disease

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Introduction

Chronic obstructive pulmonary disease (COPD) is a common respiratory condition characterized by airflow limitation [2, 3]. It affects about 800 000 Portuguese and is the 5th cause of death in Portugal [1].

In addition, COPD is associated with other chronic diseases, which, in turn, increase its morbidity and mortality. COPD’s high prevalence and chronicity result in high numbers of medical emergencies and hospitalizations, which not only require the use of large amounts of resources but also negatively impact the patient’s and family’s quality of life [2].

An early diagnosis of COPD is particularly important because appropriate management of the illness can decrease its symptoms, reduce its exacerbations, improve the patient’s health, and prolong life. Spirometry is the hallmark of the diagnosis evaluation and, thus, must be easily accessible to patients who may be suffering from COPD [2, 3].

Telemonitorization, also known as remote monitorization of patients, provides, when using a specialized professional technological platform, an adequate access to various technologies that measure vital and communication parameters, to monitor the physiological and health conditions of patients in their own home or even while in transit [4 - 6].

This service intends to improve the quality of services rendered to citizens, by offering the patients continuous support throughout their illness, reducing the number of exacerbations (and trips to Urgent Care, hospitalizations, etc.), closely following the changes in the conditions of each patient while allowing for a timely reaction that postpones the worsening of the illness as much as possible [4 - 6].

Telemonitoring of Patients with COPD in Portugal – An Innovated Program

The Local Health Unit of Alto Minho (Unidade Local de Saúde do Alto Minho or ULSAM), ensures health care services for 10 counties in the district of Viana do Castelo. This profoundly rural region in the northern part of Portugal is characterized by poor transport access and home to 241,147 people, with 25.2% aged 65 and over (Source: INE 2014).
ULSAM combines Hospital and Primary Health Care and a Network of Continued Community Care (Source: Law Decree 183/2008 of September 4).

In 2014, two parallel programs were created and developed in ULSAM for the management of COPD patients. These programs allow for early diagnosis and an adequate therapeutic approach as well as remote monitoring of critically ill patients.

1 - Breath Well Live Better Program

The Program “Breath Well, Live Better” emerged in 2014, inserted in the Clinical Governance Good Practices Program, as a result of the recognized need to sensitize the community and the health professionals to COPD.

With the objective of promoting the integration of the network of primary health care and hospital health care, the project permitted the development of a scheme covering all phases of intervention with users, combined with a plan to train the various participants to promote the sharing of information and knowledge. Thus, training was given to Primary Health Care professionals as well as to the community.

The primary care physicians first identify the users who may suffer from the illness (according to the GOLD criteria) and then schedule the spirometry exam in their Functional Unit (USCP/USF). The cardiopulmonology technician performs the examination, applies the clinical questionnaires (CAT and mMRC), and records the exacerbations. Should the COPD diagnosis be confirmed [2], the stratification is done, and the most severe cases (Groups C and D) are referred to the Service of Pulmonology. Those cases that require continuity of care, in terms of primary health care, are referred to the community health team. From February 1, 2014, to January 31, 2021, 12,215 spirometries were performed which allowed the identification of 1,562 cases of COPD. These distributed according to GOLD Classification (A to D) into: A – 402; B – 786; C – 51; D – 323.

2 - Telemonitorization program

The VitalMobile Telemonitoring Platform was adopted as part of a strategy to control the state of health, act in a timely manner and thus reduce the worsening of the clinical situation of patients and prevent the use of ULSAM’s Health Services. Launched in 2006, VitalMobile already had 8 years of experience in remote monitoring in other diseases and several of those previously used that could be adapted to patients with COPD in more advanced stages (GOLD C- D).

The monitoring devices available to patients (oximeter, thermometer and blood pressure monitor), communicate automatically and wirelessly with
provided smartphones, enabling the automatic transmission of biometric data to the platform with minimal intervention by the patient or caregivers. After evaluating the patient, the pulmonologist defines their personalized alert algorithm, which will allow the frontline nursing team to intervene in real-time backed by medical support, for timely control of exacerbations. The patient’s therapeutic plan is defined as well as the therapeutic protocol for the SOS interventions.

3 - Primary Care Integration
Insufficient health literacy and low level of education were overcome with the help of the multidisciplinary team of the Program, through the promotion of a relationship of trust with the patient and family/caregivers. The adaptation of technology to the patient, and not the reverse, as well as the human relationship established between both parties, facilitated the whole integration process leading to 100% accession, as well as far and frequent contacts between patients and the clinical team, namely the nursing staff. Patients are instructed to make a mandatory daily assessment of the available vital parameters. If the clinical situation worsens, the patient may self-monitor as often as necessary to keep the episode of instability in check. Nursing is responsible for watching the monitoring of the various patients 24 hours a day.

This model has been shown to be highly effective including in the COVID-19 pandemic phase with a reduction in the number of exacerbations (Table 2).

Integrated Management of patients with COPD is a direct consequence of the Telemonitorization Program creating conditions for intervention in the patient's natural habitat by the Community Care Unit teams, ECCI and Health Center.

In promoting the best clinical practices for the control and treatment of COPD, respiratory rehabilitation should be kept at home, always maintaining the safety conditions and protection of the patient and health professional, thus avoiding greater exposure to increased risk factors inherent to the transport of patients to Rehabilitation Centers.

Other no less important interventions can also be carried out by health professionals at the patient's home, namely in teaching, incentivizing and certifying the correct use of inhalers, in the possible necessary medical evaluation, in the protection of indoor exposure to biomass, and in the appropriate feeding by taking advantage of existing resources.
Table 2: Number of exacerbations before and during the COVID-19 pandemic

<table>
<thead>
<tr>
<th></th>
<th>1 year before enrolment</th>
<th>1 year after enrolment</th>
<th>variation %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urgency episodes</strong></td>
<td>305</td>
<td>107</td>
<td>-64.9%</td>
</tr>
<tr>
<td><strong>Hospital admissions</strong></td>
<td>97</td>
<td>30</td>
<td>-69.1%</td>
</tr>
<tr>
<td><strong>1st COVID wave</strong></td>
<td>1-3 to 30-6 2019</td>
<td>1-3 to 30-6-2020</td>
<td></td>
</tr>
<tr>
<td><strong>Urgency episodes</strong></td>
<td>28</td>
<td>15</td>
<td>-42.3%</td>
</tr>
<tr>
<td><strong>Hospital admissions</strong></td>
<td>04</td>
<td>03</td>
<td>-25.0%</td>
</tr>
<tr>
<td><strong>2nd COVID wave</strong></td>
<td>1-10-19 to 31-3-2020</td>
<td>1-20-2020 to 31-3-2021</td>
<td></td>
</tr>
<tr>
<td><strong>Urgency episodes</strong></td>
<td>36</td>
<td>19</td>
<td>-47.3%</td>
</tr>
<tr>
<td><strong>Hospital admissions</strong></td>
<td>9</td>
<td>7</td>
<td>-22.3%</td>
</tr>
</tbody>
</table>

*Homologous periods*

References


2.4.7. Telemonitoring in Cardiac Failure

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The Burden of Cardiovascular Diseases

Cardiovascular diseases (CVD) are the leading cause of death in Europe and in the United States (US) and a major cause of disability [1, 2]. In US the prevalence of CVD (comprising ischemic heart disease, heart failure, stroke and hypertension) in adults ≥20 years of age is 48.0% overall, and in 2017 were responsible for ≈17.8 million deaths [2]. In the European Union (EU) over 60 million people are living with CVD [3] which causes 1.8 million deaths every year or 36% of all deaths [1].

Ischemic heart disease (IHD) and hypertension (HT) are among the most common CVD [4, 5], with 22% of myocardial infarctions in Europe being related to HT [4]. In Portugal the prevalence of IHD has been progressively decreasing, but the prevalence of CV risk factors in the country remains high [6, 7]. The overall prevalence of HT was 36% in 2015 [6], reaching 71.3% in individuals aged between 65 and 74 years, and in those receiving treatment for HT, 30% had not blood pressure controlled [6].

Heart failure (HF) is a heterogeneous, complex, and prevalent syndrome that can be viewed as the chronic stage of any disease leading to cardiac functional impairment [8]. IHD and HT are often its cause. HF is estimated to affect 64.3 million people worldwide [8, 9], and around 400 000 in Portugal – almost 4% of the population [10]. It is associated with high mortality and morbidity, readmission rates and costs [11], and it is the leading cause of both hospitalization and readmission amongst older adults [2, 12]. In Portugal, in 2013, HF was the third most common cause of hospitalisation, mostly in people aged 65 years and over [13]. One in five people hospitalized for HF is readmitted at least once in the first year after discharge [14], and in 2016, HF was reported to contribute to almost 19,000 hospitalizations in Portugal [15]. Worldwide, HF costs are high [16], representing in Portugal about 2.6% of public health expenditures [14, 17], most of which are related to hospital readmissions. Mortality is also high, with a recent meta-analysis including over 1.5 million all-type HF patients, estimated the 1, 2, 5 and 10-year survival to be 87%, 73%, 57% and 35%, respectively [18]. In 2014, HF was responsible for almost 5% of deaths in Portugal [19].
The risk of CVD and HF increases with age, and as the population continues ageing, their incidence is set to increase dramatically [1, 2, 10, 20], a scenario that urges to be controlled and changed.

**Telehealth and Telemonitoring in Portugal**

Telehealth tools have been applied in cardiovascular medicine in Portugal for decades, with local cutting-edge initiatives spread across the country, but the need for a more widespread use and greater applicability has become imperative in light of the COVID-19 pandemic, given the pressure it has imposed on the health system [21].

Telemedicine in cardiology emerged in Portugal in 1998, with the Cardiology and Fetal Telemedicine consultation, at the Pediatric Hospital of Coimbra. Since that time and during the last 20 years, the telemedicine service of the Pediatric Cardiology Service at Coimbra University Hospital Centre has enabled better coverage of the population within the central region of Portugal [22, 23], while simultaneously extended telemedicine (teleconsultation on a regular or urgent context) to several Portuguese-speaking African countries, such as Angola, Cape Verde and São Tomé and Príncipe [24]. Today, clinicians from these countries keep working remotely with cardiologists and other specialists in Portugal.

Telemonitoring (TM) or remote monitoring (RM) refers to the use of telecommunication technologies to monitor the patient's status at a distance. TM is one of the powerful tools included in the wide and growing field of telehealth that facilitates patient monitoring as well as the timely transfer of patient-generated data from patient to care team and back to the patient, allowing adequate intervention [25]. To capture data, TM can employ a number of measurement devices such as implantables, biosensors, blood pressure cuffs, glucometers, pulse oximetry, and others; the user-entered data are transmitted, stored in secure records systems accessible to care team, flag abnormal readings or responses, and alert clinicians to abnormalities via e-mail or text messages. In response to these alerts, clinicians/others can log into the system, review data, follow up with patients, or take other appropriate actions [25].

Telemonitoring can contribute to improving the access and quality of medical care, including prevention, diagnosis, treatment, monitoring, rehabilitation, and management, and fits into several clinical cardiovascular contexts. These include adequate control and management of CVD risk factors (e.g. HT, diabetes) [26], diagnosis of arrhythmias and/or signs of volume overload in patients with implantable cardiac devices [27-33], early detection and treatment of decompensation episodes in HF patients (thus preventing (re)hospitalizations) [27-29, 34, 35], and monitoring of patients...
participating in home-based cardiac tele-rehabilitation programs [36 - 38]. TM programs often have an educational component, enabling cardiovascular prevention (primary or secondary), which is largely centred on regular counselling (face-to-face or virtual) and allows patients to better manage their health condition as well as participate in their health care [39].

However, outside these vast and well-defined clinical contexts, there is a broader facet of TM use, which is never focused, but which nevertheless fits the definition of TM (“the use of telecommunication technologies to monitor the patient's status at a distance”). This facet is the unscheduled daily use of simple digital technologies (email, video calls, phone messages, etc.) as easy patient-to-doctor-to-patient communication channels, allowing in the afferent loop, the patient to report the clinical condition, blood pressure and heart rate data, laboratory and other tests results, etc., and in the efferent loop (doctor-to-patient), the action taken by the doctor, that may include the adjust of medical therapies, or other decisions. This “remote monitoring” facilitated by technology, is common in Portugal and perhaps in many other countries, it is useful for many patients with CVD, and it has totally changed the type of contact between physicians and patients.

Telemonitoring TM Projects

In Portugal, several TM projects took place since the past decade.

The Vital Jacket®, designed and developed at the University of Aveiro [40] – centre region of Portugal - was one of the first wearables developed and marketed in Portugal. First tested at Gaia / Espinho Hospital Center in 2009, its use proved effective and bringing benefits to users. It is a wearable vital signs monitoring system that joins textiles with microelectronics. Its evolution have focused on cardiology and sports and scaled down from a jacket to a T-shirt. The cardiology version was approved as a medical device for the European market compliant with the MDD directive 42/93/CE, holding the CE1011 mark. It is a discrete ambulatory ECG, allowing patients to carry on their daily life activities while analysing ECG for long periods, detecting arrhythmias, and monitoring patients during remote cardiac rehabilitation sessions, allowing the medical management of the patients. The signals are captured through electrodes spread across the structure of the shirt and can be transmitted in real time through Bluetooth technology or stored on a small memory card placed in the pocket, which allows a picture of the patient's cardiac activity to be made over several days.

Patients with cardiac implantable electronic devices (CIED), many of which with chronic HF, are a growing population that has regular follow-up in-person clinic visits. The use of RM has been recognized a valuable and
cost-effective option in the follow-up of patients with CIED, promoting a closer follow-up and improving outcomes [41-43].

In Portugal there are 29 centres implanting CIED, with 1014 new procedures per million population performed in 2018 [44]. Scientific production in this area is large, but it is beyond the scope of this writing. However, some recent initiatives or publications in the area of TM in HF patients and/or related to cardiovascular outcomes are cited or briefly mentioned [31, 32, 43, 45-47].

The PORTLink study (PORTuguese Research on Telemonitoring with CareLink®) (NCT03125382) was a multicentre, randomized, open-label controlled trial, aimed to assess the safety, functioning, patient satisfaction, and costs of RM when compared to traditional in-clinic follow-up, in a Portuguese population with CIED. It included adult carriers of implantable cardioverter defibrillator (ICD) or cardiac resynchronization therapy with ICD (CRT-D), eligible to the CareLink® system. Patients newly implanted or with previous conventional follow-up were randomized to RM (n=69) or conventional follow-up (n=65, control), and followed for 12 months (unpublished) [46]. The authors conclude that RM reduced significantly the burden of in-office visits with high level of patients’ and healthcare professionals’ satisfaction did not require any additional action, and that RM is a safe alternative to conventional follow-up (unpublished) [46]. In a previous work, in a propensity score-matched cohort of ICD recipients with long-term follow-up (44 months), the same group of investigators demonstrated that RM was associated with a lower rate of the combined endpoint of hospital admission for HF or cardiovascular death [43].

Multidisciplinary and integrated care programs are the current goal standard of HF management and have been successful in reducing all-cause hospitalization rates [30, 48], but their scope can be expanded using remote TM [34, 35]. The early identification of HF deterioration before the need for urgent hospital admission has been a major focus of interest in several countries and regions, and over recent decades, several approaches to TM have been used in an attempt to improve the outcomes [27-29, 34, 35].

Home TM can involve non-invasive or invasive measuring devices that capture and transfer physiological and disease-related data from the patient to healthcare providers, enabling detection of clinical deterioration and early clinical intervention. Invasive TM uses implantable cardiovascular electronic devices inserted in the patient’s body (e.g. cardiac resynchronization therapy devices, ICDs or implantable hemodynamic monitoring) to capture and transmit information about the onset of pulmonary congestion and arrhythmias, and allows early detection of signs of decompensation, enabling its correction and reducing hospitalizations for
HF [27-30, 34, 35]. However, the intrathoracic implantation of hemodynamic sensors does not seems feasible on a large scale. Alternatively, non-invasive TM can potentially overcome this limitation, but as different programs and strategies have led to variable results in clinical trials, the role of non-invasive TM in the management of patients with HF is still controversial, although increasingly considered useful [27-30, 34]. In fact, several meta-analyses point to clinical benefits [49, 50], with non-invasive TM with medical support proving to be more effective when compared to conventional healthcare in reducing all-cause hospitalization, HF hospitalization, all-cause mortality, cardiac mortality, and length of stay [50]. However, the success of non-invasive TM programs strongly depends on patient’s adherence to technology and therapy.

In Portugal, non-invasive TM has emerged as an interesting avenue for patient empowerment, and the government has recently launched special programs for chronic diseases, including HF. In addition, in recent years, there have been many collaborative initiatives and projects in several centres and institutions, developed with resources for research and technological development in the area of Healthcare.

The AdHeart project, developed by University of Porto - north region of Portugal, in collaboration with Fraunhofer Portugal, aims to develop strategies in non-invasive TM in HF, and assess the impact and determinants of adherence to technology and therapy [51]. The investigators presented the SmartBEAT solution, a Smart system for the management of HF in older adults [52, 53], consisting of a wearable that collects data from several sensors - weigh scale, blood pressures, physical activity bracelet – supported by a smartphone that transmits to the cloud, where a decision support algorithm helps physicians to detect HF decompensation episodes early and prevent HF hospitalisations. The system was evaluated during a pilot phase for two weeks with nine seniors, and later for 1-3 months with 38 seniors HF patients. Adherence to the evaluation protocol was high (97% for three months), and perceptions on wellbeing and disease control were considered positive. Healthcare professionals found the usability of the portal high, and providing interesting information about patients' health status. A randomized, controlled study of 12 months duration is planned [51].

The Centro Hospitalar Universitário Lisboa Norte, in Lisbon, has been operating a noninvasive TM programme since 2017 for people with chronic HF who are considered to be at higher risk of hospitalisation [35, 54, 55]. Those are patients with severely reduced left ventricular ejection fraction who had been discharged from hospital after an episode of HF decompensation at least once during the previous 12 months [35, 54, 55].
Telemonitoring aims to further reduce hospitalisations and mortality, and ameliorate functional capacity and quality of life, depending on the type of HF and the individual situation [35, 54, 55].

Each patient in the program is informed about the program's characteristics and objectives, and receives regular education about self-care management in HF, as well as training and guidance on handling the instruments. After written informed consent to be monitored is obtained, patients have access to medical equipment at home and a smartphone app to transmit (via Bluetooth) a range of biodata including weight, blood pressure, heart rate, peripheral oxygen saturation, body temperature, and ECG recording [35, 54, 55]. Data are transmitted to a dedicated web-platform automatically every day, or three times per week if the patient is considered stable. Data can also be transmitted manually, if needed, for example if symptoms worsen [54]. The TM centre (constituted by a team of cardio-pneumologists and HF-trained nurses) read the biodata and analyse the alerts (generated whenever a parameter falls outside the defined limits for each patient). When the team receives an alert, they communicate with the patient (or their carer) to gather further information, which also includes validated HF-specific questionnaires, and if necessary, contact by phone and email the hospital's medical team, consisting of several cardiologists from the TM program, with a scale available 24/7/365. Cardiologists then contact the patient directly by phone, make a second evaluation, and take the appropriate action promptly, with care instructions to achieve stabilisation and avoid potential hospitalisation [54].

This 24/7 personalized TM program, detailed in Fig. 3, reduced the rate of hospitalizations and all-cause mortality by 73% at 12 months, compared to the standard of care (SoC) for patients with HF [35]. In addition, a reduction in the number of days lost due to hospitalization or early death was observed [35]. In one year, a patient under TM lost on average only 5.6 days due to unplanned hospitalization / early death, a number significantly lower than the 48.8 days observed with the SoC clinical follow-up [35]. In this TM program, the inclusion only of patients with advanced HF and at high risk of decompensation, as well as the 92% adherence to data transmission by patients, were critical determinants for the success observed [35].
During the 3.5 years of the program, the total number of patients has been kept limited (30 to 40 patients), although not always the same. In fact, large-scale invasive TM programs may need a different and simpler model, because a tailored approach and keeping the patient adhering to the program can be very difficult to achieve and maintain in a large population, outside the controlled environment of a clinical trial.

The randomized multicentre Telemedical Interventional Management in Heart Failure II (TIM-HF2) trial included 1571 patients with HF and a HF hospitalisation in the previous 12 months [56]. Patients in the interventional group had a significantly lower percentage of days lost due to unplanned cardiovascular hospitalisation or death of any cause and significantly lower all-cause mortality, although cardiovascular (CV) mortality did not decreased [56]. On the basis of the positive results observed in TIM-HF2 trial, in 2019, a clinical update from the Heart Failure Association of the European Society of Cardiology (ESC) proposed a home TM model using an approach similar to the one used in TIM-HF2 as part of the medical care for HF patients [57]. It should be noted, however, that in TIM-HF2, one
year after the end of the intervention, in real-world conditions, the positive effect on mortality and morbidity was no longer observed [58].

Furthermore, the effectiveness of TM programs varies according to the intended objectives and characteristics of the target population. The protocols to be applied, as well as the actions to be taken (which can sometimes be urgent), must have a uniform basis, but adapted to each patient to achieve the intended results.

Other TM Programs

Other TM programs are running at several other National Health Service hospitals (Portuguese: *Serviço Nacional de Saúde*, SNS), with characteristics adapted to local and regional realities.

At Hospital de Santa Marta, Centro Universitário Lisboa Central, in Lisbon, the project MORE CARD - Monitorização Remota Na Prevenção Da Descompensação Da Insuficiência Cardíaca (*English: Remote Monitoring for the Prevention of Heart Failure Decompensation*), aims to create a Remote Monitoring Unit for ambulatory HF patients, integrating noninvasive and invasive RM (including cardiac resynchronization therapy devices, ICDs, and implantable hemodynamic monitoring) in a single dedicated sector that includes all the necessary equipment, professionals, and resources. This project was one of the winners of the Scholarship “Mais Valor em Saúde – Vidas que Valem” (Value Based Healthcare) [59], a program launched by the Portuguese Association of Hospital Managers (*Portuguese: Associação Portuguesa de Administradores Hospitalares, APHA*), Exigo (a Portuguese consulting company), Gilead, and IASIST. The program intends to support the implementation of projects in SNS hospitals that aim to introduce the necessary changes for a better allocation of health resources.

The Covid-19 pandemic has created a significant backlog of patients with serious health problems in need of diagnosis, treatment and support. Health systems must be prepared to ensure that long-term challenges can be met during public health threats, and innovative ways to allow remote monitoring of patients with CVD need to be encouraged [60].

References


2.4.8. Telehealth during COVID-19 Pandemic

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The GT3D working group of the Iberian Society of Telemedicine and TeleHealth (SITT) was created in July 2020, under proposal of Henrique Martins, and is made up of academics, health professionals, physicians, information technology professionals, patient associations, interested in telehealth and in digital transformation of Iberian Peninsula.

On 19th October 2020, a winter report was produced that addressed the organization of health systems in the first phase of the COVID-19 pandemic and described what happened, what did not happen, what should have happened and what should happen in the near future. The group revealed that the pandemic brought out two latent themes as a result of the inertia caused by economic and financial interests that block the transformation of health, which is considered more as a business than a right of citizenship. These themes are shortsighted health and telehealth policies limited in their health systems and healthcare delivery model reform ambitions.

At this stage of the pandemic, it was proven that the concerns about social and public health systems were able to face it more effectively for universal citizenship. This helped to avoid devastating examples such as those in the United States of America (inexistence of social status and insufficiency of public health) and in Brazil (incapacity of public health service resources and prevalence of private health services that only serve a privileged minority of citizens).

Even so, digital health has proved to be a decisive factor as it brought patients closer to health services. A good example concerns the surveillance of chronic patients at a distance, having advanced in tele-home care processes with telemonitoring, keeping these more fragile patients in their homes and avoiding unnecessary trips to hospitals.

Telehealth offered a very valuable support to the activity of health professionals, facilitating their tasks and improving their abilities to fight the pandemic. This analysis led GT3D to send a strategic document on Telehealth policies to the legislative power in Portugal (Assembly of the Republic) for 3 parties: Socialist Party (PS), Social Democratic Party (PSD) and Communist Portuguese Party (PCP), requesting that resolutions be drawn up with recommendations to the government on the Telehealth strategy. Thus, on March 2021, the following draft resolutions, mentioned
in order of entry, were entered into the board of the Assembly of the Republic, presenting their recommendations to the government:

**PSD Resolution Draft (submitted on March 2021)**

The Assembly of the Republic resolves, under the terms of paragraph 5 of article 166 of the Portuguese Republic Constitution, as follows:

1. **Recommendations to the Government:**
   a. Promote in NHS hospitals that have home hospitalization programs, in complementarity with tele-assistance programs, using telemonitoring;
   b. Create conditions that guarantee the universal access of NHS users to the respective family doctors or other assistant doctor, through teleconsultation using image;
   c. Create a Mission Team with a technical role to implement the National Strategic Plan for Telehealth (PENTS), in conjunction with professional orders in the area of Health, patient associations and scientific societies;
   d. Ensure support to users of groups at higher risk and chronic patients through the implementation of a Home Support Network that integrates Telehealth (Home Tele-assistance Network);
   e. Create mechanisms that allow the various medical specialist to reformulate the form of providing quality and safe care to patients, integrating Telehealth in the action flowcharts of the standards of clinical guidance and integrated care processes of several pathologies and clinical contexts, aiming towards to the best clinical practices;
   f. Promote the regulation, dissemination, preparation and updating of clinical guidance standards in the area of Telehealth;
   g. Ensure, in conjunction with the Health regulatory Authority (ERS), audit mechanisms in order to regulate activities related to Telehealth in the public and private sectors to guarantee good clinical and cybersecurity practices, as well as other existing regulations;
   h. Ensure the creation of National Telehealth Networks at the level of the several medical specialties, reinforcing the articulation between primary and hospital care, as well as between health units within the public, private and social sectors, in order to promote communication, referral and
information flow, using Information Systems under cybersecurity conditions;

i. Determine as mandatory the integration of knowledge of Telehealth in the training courses of the several professional groups linked to Health;

j. Value research at the level of Telehealth support technologies, designing and approving in a participatory manner a research, development and innovation agenda for financing cost-effective solutions and promoting collaboration between health institutions, academic institutions and industry;

k. Support patient associations and federations, encouraging their participation in the development of health policies that integrate Telehealth and, in particular, in the implementation of PENTS (National Strategic Telehealth Plan);

l. Approve legislation on the right to Telehealth, as part of the set of citizen's rights.

2. Comply with the recommendations contained in this Resolution within the following deadlines:

   a) Until the end of the first semester of 2021, those foreseen in sub-paragraphs a) and b) of the previous point;

   b) Until the end of the second half of 2021, those provided for in paragraphs c) to k) of the previous point;

   c) Until the end of the first half of 2022, as provided for in subparagraph l) of the previous point.

Draft of PS Resolution (submitted on 7th June 2021)

In accordance with Article 156 (b) of the Portuguese Republic Constitution, the Assembly of Republic resolves to recommend to the Government that:

1. Encourage the updating and implementation of the National Telehealth Strategic Plan approved in 2019, as well as the existing regulations on this matter, creating a permanent telehealth advisory committee, coordinated by the National Telehealth Center;

2. Ensure the access to digital and telehealth services, through simple-to-use channels, which allow for a uniform experience for the citizen, regardless of the reason for such use;
3. Ensure that advances in home hospitalization programs integrate telehealth services and the access to the means of telemonitoring and teleconsultation, safely and effectively;

4. Promote the dissemination and mandatory availability, in all units of the NHS, of dematerialized models using digital channels based on the Electronic Health Record, which allow the booking of appointments and renewal of usual medication;

5. Identify the potential for the inclusion of Telehealth solutions in the different stages of the circuit of care provision and, in particular, in terms of prevention, with the promotion of self-assessments or digital self-screening that allow the early identification of health problems;

6. Promote the implementation of teleconsultation (preferably with sound and image) in primary health care, in order to improve user’s access to their family doctor;

7. Create conditions to effectively support patients at higher risk and chronically ill in telecare and telemonitoring, through a National Telehealth Network;

8. Promote the creation of Telehealth Referral Networks, at the level of the several clinical specialities, allowing, for instance, referral to National Reference Centers;

9. Integrate the in-person service responses and the remote service responses, promoting the articulation between local, regional or central units, in order to enhance the use of specialized Diagnostic Centers, or guarantee the continuity of care after the tele screening in the SNS24;

10. Boost efficiency through the use of complementary central responses or the creation of care units by digital means, boosting the shared management of NHS resources;

11. Promote the existence of a general legislative framework for telehealth, based on the several legislative initiatives promoted over the last decade;

12. Reinforce and incorporate telehealth activity in the Clinical Guidance Standards and Integrated Assistance Processes of the several professional orders, in order to guarantee the standardization of good practices with quality and safety;

13. Provide for mandatory training of the several professional groups in the field of Telehealth, involving, for this purpose, higher education institutions;
14. Promote the development and innovation projects to finance cost-effective solutions based on collaboration between health institutions, academic institutions and industry;
15. Promote the updating of the reimbursement tables of therapeutic acts, in order to promote the several forms of provision of Telehealth;
16. Support patient associations and corresponding federations, boosting their participation in the definition of health policies that integrate Telehealth;
17. Expand the access solutions for segments at risk of exclusion to digital and telehealth services such as the SNS24 counter;
18. Create a panel of telehealth users that supports opinion/satisfaction analysis about telehealth services;
19. Establish the necessary indicators and create conditions for monitoring telehealth activity, within the scope of monitoring the assistance activity of the NHS, which allow decision-making by several management structures;
20. Establish mandatory and phased adoption of semantic and technical interoperability standards and norms for health data and communication between systems;
21. Renew the technological park for telehealth, updating the requirements for public tenders in order to allow the existence of equipment that follows technical standards of interoperability and cybersecurity;
22. Train health professionals and citizens in terms of digital skills, with the implementation of training and qualification actions;
23. Generalize the offer of telehealth services at different levels of care;
24. Review and update the guidelines for contracting in the telehealth area, positively discriminating the provision of telehealth services, ensuring compliance with the quality and safety standards of the process.

Draft Resolution of the Bloco de Esquerda (BE) Party (submitted on 16th June 2021)

Under the applicable constitutional and regulatory provisions, the Parliamentary Group of the Left Block proposes that the Assembly of the Republic recommends to the Government that:
1. Strengthen the NHS units to carry out teleconsultations, through the installation of modern technological equipment capable of guaranteeing their performance with quality;
2. Strengthen human resources and train current staff in order to ensure an effective and timely response in the field of telemedicine;
3. Ensure the interoperability of information systems existing in NHS, allowing communication and access to information, within the strict and existing rules that respect the privacy and security of such data;
4. Proceed with the creation of the Single User File.

PCP Draft Resolution (Submitted on 18th June 2021)

The Assembly of the Republic, pursuant to paragraph 5 of article 166 of the Constitution of the Republic, resolves to recommend to the Government that:

1. Make the necessary legislative changes to consider the access to telehealth as an integral part of the right to health, defining the measures and conditions corresponding to the assumption of responsibility by the State in its implementation, through the National Health Service;
2. Guarantee to the services and units of the NHS the necessary means to implement the tele-assistance programs and the existence of this complementary response in the context of health care, namely the use of telemonitoring;
3. Promote the integration of care between health services and units and between the several levels of action in the NHS - Primary Health Care, Hospital Health Care, National Network of Continuous Integrated Care - promoting communication, referral and the flow of information using Information Systems, under conditions of cybersecurity and health data protection;
4. Create conditions for universal access to image teleconsultations, by decision of the user, adopting the necessary specific measures namely:
   a. access from the home, such as elderly homes or retirement homes, social facilities for people with disabilities, continuing care units or other localizations;
   b. Access to primary health care appointments and hospital appointments;
c. The adequacy of public services and jobs, including providing them with the necessary technology;
d. The conditions for inter-institutional articulation between the entities involved in the different areas and sectors;

5. Ensure the participatory nature of the implementation of the National Strategic Telehealth Plan (PENTS), namely by ensuring the participation of entities and structures with intervention within its scope, including structures and entities representing patients or users;

6. Ensure, within 60 days, the creation or updating of the regulations necessary for the execution of PENTS, as well as its dissemination;

7. Create a Mission Team with a technical role for the implementation of the PENTS, ensuring proper articulation with the several entities involved in the scope of Telehealth, namely professional orders, patient associations, scientific societies, General Directorate of Health (DGS), The Shared Services of the Ministry of Health (SPMS) and the Central Administration of Health Services (ACSS);

8. Define and implement a Telehealth dissemination plan with NHS entities and services and their users;

9. Consider as priority the implementation of a Home Assistance Network, articulated with a Home Support Network and aimed at chronic patients and users considered to be as at higher risk;

10. Develop the necessary steps to integrate Telehealth in the action flowcharts of the Standards of Clinical Guidance and Integrated Care Processes of various pathologies and clinical contexts;

11. Create audit mechanisms, in the public, private and social sectors, of activities related to Telehealth, either for the purpose of verifying good clinical practices and other existing regulations, or for the purpose of guaranteeing cybersecurity and data protection conditions, involving the Health Regulatory Authority (ERS), the National Data Protection Commission (CNPD), the National Cybersecurity Center and other entities with competences in this area;

12. Ensure training in the area of telehealth, either through training professionals in their positions, or through the integration of this training area in the specific training of different groups of health professionals;
13. Create conditions for scientific and technological development in the area of Telehealth, namely:
   a) Ensuring articulation between entities from different sectors involved in Telehealth technologies, namely health units and services, higher education institutions, research centres, State laboratories, industrial units and telecommunications service providers;
   b) Promoting and directly funding specific scientific and technological research projects in higher education institutions and State laboratories;

14. Implement the National Telehealth Networks at the level of each medical specialty, namely constituting the necessary structures for the articulation between entities with responsibilities in this area, namely the DGS, the SPMS and the ACSS.

The different texts were unanimously approved in the Plenary session on 25th June 2021 and sent to special committee for refinement and merge into one unique text scheduled for final voting by Parliament in September 2021. The involvement of all parties was led by SITT in its digital transition working group, this is key to sustainability and political support even when governments change.
Healthcare institutional portals, particularly those of hospitals, allow a set of digital services that serve and satisfy health needs at a distance. In this sense, they too are a form of telehealth. Hospital portals in Portugal began to emerge more significantly in the early 2000s [1].

Although hospitals, public and private, have since invested in their portals to serve their patients and citizens, in 2016 the Ministry of Health Portuguese, with the Shared Services of the Ministry of Health (SPMS), made available a national citizen portal that included a Citizen’s Area – interface of services between the National Health Service (NHS) and the citizens. It allows access to the EHR, making it possible to consult clinical data and results from medical examinations. It allows and encourages citizens to contribute with relevant information to complete their clinical records. It gives access to a set of services that previously forced the citizen to visit the health units. Examples of this are setting up an appointment with the family doctor, asking for chronic medication prescriptions, access the digital vaccination record, the information on the waiting time for a surgery, among others. This is a highly relevant means to empower citizens in the active management of their health and to bring them closer to the Portuguese NHS.

At the same time, a normative [2] was issued by these entities for the standardization of the websites layout of the NHS hospitals and later the SPMS made available a template webpage that most public hospitals use and adapt to. Private hospitals have more freedom in websites design and features making the expectation of clearer, usable, easier, and more appealing websites a reality.

Since then, there have been many excellent examples of innovative digital services available on hospital portals, both in the public and private sectors.

A recent study published by the United Nations University Operating Unit on Policy Driven Electronic Governance (UNU-EGOV) [3] evaluated the official websites of 135 Portuguese public and private hospitals between July and August 2019. This study reports the results of the first application of the Health Sector Website Assessment Index (HSWAI) to the Portuguese context, encompassing 135 hospitals. The HSWAI was developed through a process of identification, selection, analysis and categorization of indicators, arriving at four main structural criteria: Content, Services, Community
Interaction and Technology Features. The iHSWAI, that is the average value for this assessment, is 0.359 and the percentage of hospitals with classification equal or above this value is 48%. The highest classification achieved was 0.624. Hospital’s assessment counts with two separate groups: public hospitals and private hospitals.

The results achieved rank the hospital Instituto Português de Oncologia do Porto Francisco Gentil (IPO Porto), a public oncology institute in first place.

Since early on, IPO Porto has invested in providing a wide range of digital services and in a massive digital literacy of its patients and healthcare professionals. Starting by working on this cultural change with the implementation in 2012 of electronic kiosks that effectively addressed the needs of the patients in their check-in and check-out processes during their consultations, exams and treatments, the strategy was to first create a patient area in the hospital portal where patients could access their appointments, make rescheduling requests, access to several types of declarations, make requests for reports and clinical information, have access to an online chat, and many other options. In 2017 and in an evolving perspective, assumed that the number of kiosks existing for their colossal use became insufficient, the strategy was to transform users' smartphones into a kiosk, significantly placing the patients at the centre of their journey inside and outside the hospital. To respond to this need, an APP was implemented that, in addition to all the services available on the hospital portal, allows the patient to do the check-in and be called to the doctor in the same way. It is also possible to make online appointments for administrative services.

Since the beginning of this digital transformation in 2012, a specific identity was created for the project, named "Bem-Me-Ker", which is still today extended to all digital services for patients. Marketing and communication as well as the existence of a wide range of professionals and volunteers trained to be the digital mediators of the patients was the great key to success for the use and patient’s satisfaction. Some relevant metrics: >25,000 active users, 8000 access and 800 requests per month.

In the same study, in the ranking of the best hospital portals, we could find a group of private hospitals named CUF, whose first hospital portal dates back to 2013, being the first mobile version available in 2015, MyCuf. Over time and fruit of evolutionary work, culminating in its relaunch in December 2020 after a deep process of user experience review (UX). This creative process featured: collaboration with team specialized in UX and application development, interviews with end users to collect key problematic points from the previous version of the application, prototyping
and testing with end users, monthly updates for inclusion of improvements / customer feedback. The most relevant features / used by customers: check-in, appointments, and exams, with immediate confirmation, access to the exams results, access to images and possibility to share with the doctor via email, payments by MBWay and bank card. Some relevant metrics: > 650,000 active MyCuf accounts, 60,000 - 70,000 appointments scheduled per month, 800-1000 check-ins per day performed in the app, representing 10% of admissions in self-service.

Another example of success, the portal MY LUZ of the group of private hospitals named Luz Saúde, and which is also in the top 10 of the same study, is the personal online platform of Hospital da Luz’s customers, where they can carry out video consultations and access a set of features and information about their health and that of their families, free of charge, confidentially and securely. The first version of the online customer area was created in 2014 with the name “Client Portal”. In 2019, a project team was formed with the purpose of improving the digital customer experience of the Customer Portal, not only through the incorporation of new features but also through the use of a simpler, more intuitive and faster user interface that enabled actions by and input from the customer. In terms of project management, the Agile model was used, and - for the identification of problems that needed solving and finding solutions - the Design Thinking methodology was used. This consisted of four steps:

1. Immersion and research, lasting 6 weeks, and an intense phase of research and contact with customers and internal stakeholders to gain knowledge of the context and identify issues to explore;
2. Synthesis and exploration, with a duration of 6 weeks, where work was done on exploration, co-design of flows and identification of opportunities;
3. Definition and design, with a duration of 4 weeks, where wireframes and high definition prototypes were designed and later tested with customers; and
4. Implementation and testing, lasting 8 weeks.

The new client area was launched in August 2019, both as a web version and as an app (available on the App Store, Google Play and AppGallery Huawei), and with the new branding “MY LUZ”. Some relevant metrics: >600,000 customers; every month there are more than 600,000 accesses, 73% of which via mobile; more than 300,000 exams results are viewed monthly, and more than 90,000 appointments are booked through MY LUZ; by the end of 2021, more than 10% of consultations will be carried out as video consultations, as a result of the integration of online and offline touchpoints into the customer journey as a way to ensure the best clinical
follow-up; and more than 2 million euros in online payments have been made.

Although Portugal is a very competitive country in the Digital Health area, there is a long way to go for a true single repository of health data, for greater digital literacy of citizens and professionals, for greater interoperability that is reflected in a better service provided by hospitals from their portals.

On the other hand, we must invest in engaging patients in the delivery of the health care has the potential to improve health outcomes patient satisfaction, so hospital portals may enhance patient engagement by enabling patients to access their electronic medical records and facilitating secure patient-provider communication.

Increasing patient engagement is a goal of hospital portals, but the involvement with the healthcare professionals is also the key for the success of their use.

Finally, as a holistic strategy described in the Portuguese National Telehealth Plan 2019|2022 (PENTS), every new hospital portal must follow the Strategic Lines for the Development of Telehealth (LEDTS): Governance and Empowerment Model, Human Capital, Technology, Accessibility and Equality, Quality and NHS Financing and Sustainability [4].

References

III. Telehealth and eHealth in National Health Service

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“It is clear that Portugal is now in the forefront of eHealth in Europe”

(WHO, 2018)

Telehealth needs enablers. Patient and professional digital identification, trusted services and national ID for all, citizens and professionals are very important.

When, in 2017, Portugal launched the SNS Wallet, an APP that contained not only ePrescriptions, Allergies or Vaccinations, it anticipated what is today, 4 years later, the concept behind the Green Digital Certificate for COVID-19. More than one million Portuguese were using this app before the pandemic. It is now called SNS24 APP but retained its main functionalities with the addition of COVID-19 related ones.

When in 2012, Portugal became the 6th country in the EU to launch a Public free patient portal with patient record functionalities that allowed patients to write and document aspects of its own health status, it anticipated a trend now visible in all developed nations [1].

Today, the reserved health area of the SNS Portal [2] is used with secure authentication by more than 2.6 Million people, I estimate. Linking Patients and Doctors became easier when in 2012, while leading the Shared Services of the Ministry of Health (SPMS), we started to create a live and trusted database of all doctors, linked to eID and eAuthentication methods, which led to speedily implementation of ePrescription in less than 2 years from zero to 99% of all prescriptions in public and private settings.

Shortly after, in 2018, we launched mPrescription. This is a mobile service that used mobile trusted national level and eIDAS compliant eIdentification eAutentication, and, eSignature in one APP. PEM Mobile, was a tremendous success and 2 years later at the onset of the pandemic about 25% of all 60,000 prescribers (medical doctors and dentists) were using this app to send prescriptions over to their patients while they talked over the phone with them at the same time and from any location in the world. During the pandemic, this was an essential tool and now more than
65% of all doctors use it on a daily basis. M-PRESCRIPTION is a form of telehealth and an indispensable tool for many modern telehealth services as it means that a simple smartphone can allow video call, and prescription – the two key ingredients for teleconsultations to be not just helpful, but efficacious and solve there and then the problem of many patients.

The vision that telehealth was part and parcel of a bigger digital health equation was key. The Ministry of Health captured this vision in 2011 when it joined efforts in telehealth policy with those in ehealth. The Clinical Informatization Committee had, as one of its working groups, a telehealth working group that helped create legal, clinical guidelines and reimbursement enablers while developments of key IT tools were required and placed all under the same authority, SPMS. This was a fundamental step for the alignment of four major project lines and, together, create what is now possible: Mobile-Telehealth for patients regardless of their status.

1. Patient and Doctors eID and eSignature promotion usage, leading to patients’ 2-factor authentication on portals and mySNS wallet and doctors to prescribe e- and m-prescriptions.
2. Launch of Patient Portal [2] with progressively more functionalities, one of which, telehealth consultation area and a set of initiatives to foster citizen awareness of digital tools.
3. Merge of phone service, called Linha Saúde 24, with several IT teams and products, into an omni-channel approach under a hybrid team of health professionals and IT technicians – SNS 24 service [3].
4. Creation of a “specialized” center for telehealth promotion the Centro Nacional de TeleSaúde (CNTS) and a network of PITs (“Promotores Internos de Telesaúde” – telehealth internal promoters) in all NHS units (Primary care and Hospitals).

The creation of SNS24, by Decree of the Council of Ministers in June 2017 [3] was a hallmark, this is by far the larger teleconsultation service, first mostly inbound calls and services, and towards 2019 a set of new outbound calls, for example for elderly isolated seniors had been started. Joining the efforts of the teams working on e-referral and other e-services allowed the birth of a rules based online service in February 2018. This started functioning as symptom checker for flu and one year later it, in March 2020, it became a crucial tool, to educate, triage and help triage millions of questions on COVID-19-like symptoms.

The way to make use of all local and regional expertise, illustrated in different sections in the chapter while launching new methodologies and initiatives, like telemonitoring pilot services to Chronic Respiratory Patients [5], and upskilling actors and fostering quality of telehealth care was the
establishment of the CNTS. It was created by the Council of Ministers in 2016 [4] and entered full functioning in early 2017. The network effect of a core competency team, with more than 60 PITs regular meetings, guideline production and best practice awards and other sharing promotion initiatives was very significant with pre-COVID-19 pandemic annual increase of about 20% of teleconsultations in NHS institutions. Online public dashboards with data on teleconsultation statistics per institution and a financing policy that promoted teleconsultations and telemonitoring was complemented by central procurement policies and practices. Telemonitoring services companies were identified, qualified and their products and services made easily available for public procurement using framework agreements created by SPMS working as central procurement agency. Telemonitoring of patients moved from conventional outsources services to hybrid formats where subcontractors as well as public sector teams can both participate in this service for which there is inclusively a new mobile APP for telemonitored patients to connect to the NHS.

Large enough vision [6], understanding that many elements – not often associated with telehealth - are required to create a telehealth enabling environment, and strong continued and political supported leadership were the three elements that allowed Portugal to leapfrog into one of the most advanced public sector telehealth set of solutions between 2012 and 2018.

References

[4] [https://www.cnts.min-saude.pt/](https://www.cnts.min-saude.pt/)

The Portuguese private healthcare sector has been continuously growing throughout the last decades. Citizens who have access to private healthcare are usually also users of the public system. Waiting lists, not having a free choice of the treating physician in the public system, as well as convenience are the main reasons pointed out for choosing a private provider. About 31% of the Portuguese population held a private health insurance in 2019 [1]. In the same year, 35.9% of the country’s health expenditure was private. From the 36,100 existing hospital beds 11,600 belonged to private hospitals, 33.8% of surgeries, 40.2% of outpatients’ consultations and 26.6% of urgent care episodes were performed outside the NHS [2]. There has generally been a constructive relationship between the NHS and private healthcare providers: The private sector has been collaborating with the public sector to combat NHS waiting lists. Thus, in 2019, the Portuguese SNS contracted 1.4 billion euros to the private sector for surgeries, consultations or complementary diagnostic tests [3]. There also exist a few public-private partnerships in the management of NHS hospitals [4]. On the other hand, there is also a controversial and potentially conflicting practice: a large proportion of health professionals are shared, i.e., they work in NHS institutions as well as in private hospitals.

Adoption of Telehealth among Traditional Private Healthcare Providers

The adoption and success of telehealth among private healthcare providers depends highly on the market’s reimbursement models. Whereas teleconsultations are fully covered by the main health insurances, other modalities, like telemonitoring are still not. Nonetheless, almost all major private healthcare providers – some forced by the COVID-pandemic – now offer telehealth services.

Cuf is the largest Portuguese private healthcare provider and, since its foundation in 1945, the one with the longest experience in the market. It runs a large network of hospitals and ambulatory clinics.

Teleradiology was the first telehealth service established in the early 2000s. This made it possible to provide all its hospitals with 24/7 radiologist coverage. In 2018, Cuf launched its first telemonitoring pilot for diabetes patients. In January 2020, Cuf created a new position in the organisation: the position of Clinical Director for Digital Transformation. It is the first of
its kind in the Portuguese healthcare sector and a strong indicator of the importance given to new models of care leveraged by new technologies. Since then, Cuf has been committed to actively redesigning care pathways based on a clear vision that the patient's clinical journey will be hybrid: remote touchpoints (e.g., teleconsultation) and digital touchpoints (e.g., app), will synergistically integrate with classical contact points, with professionals in physical health units.

In March 2020, Cuf launched its teleconsultations as a new channel for follow-up consultations in more than 30 specialities, but also for first appointments in selected ones. In the first 12 months more than 75,000 video consultations were performed. During the COVID-19 pandemic it created a remote monitoring service with biometrics for patients assisted in Cuf’s urgent care services, that not having an indication for hospitalisation, benefited from clinical surveillance.

In June 2020, it launched its first service following a remote first concept: a video-consultation designed for assistance to acute, non-urgent illnesses. It has a dedicated medical team, geographically decentralised, but with its own clinical governance and specific clinical and non-clinical procedures. It serves adult and paediatric clients from all over the country and even beyond its borders and is integrated with the physical offer, whenever necessary. One of its main features is its high-resolution rate. Less than 10% of cases need referral to onsite care - only 3% to an emergency or urgent care service [5].

Luz Saúde, the second largest private healthcare provider in Portugal, was the first healthcare provider in the country to launch direct physician-to-patient video consultations in 2016. For this purpose, it created Hospital da Luz Digital Clinical Center, with a dedicated physical infrastructure, clinical leadership, as well as specific rules, procedures and training to ensure quality and safety of its services, as well as providers’ capacitation.

In 2020, Luz Saúde created its own, free-of-charge, 24/7 nurse phone triage, Luz24, based on algorithms for paediatric and adult patients with the aim to support clients and to streamline urgent care flow in their physical units. During its first year, it performed more than 25,000 triage episodes. When eligible, patients can be directed to an urgent video consultation with a doctor for further evaluation and guidance.

Other telehealth services so far provided by Luz Saúde are teletherapy in the areas of speech therapy and physiotherapy [6].

Lusíadas, the third largest private healthcare provider, also launched teleconsultations and a nurse phone triage during COVID-19 pandemic [7].
Private Health Insurers - From Financier to Provider Leveraged By Telehealth

In Portugal, private health insurers have traditionally limited their role to financing and have not directly provided healthcare. This has changed in recent years - much leveraged by telehealth.

The three largest companies, Multicare (Fidelidade) Médis (Ageas), and AdvanceCare (Tranquilidade) today offer nurse phone triage, symptom checkers, as well as general medicine and paediatrics video consultations – some free of charge for their policy holders [8].

However, the insurer Médis has the longest history of using telehealth and has been especially innovative in this field. In 1996, it created the first nurse phone triage service in the country. This inspired the Portuguese NHS to set up its own service for the paediatric population. Médis supported the creation of the phone line "dói, dói, trim, trim" in 1998, which later widened its scope and evolved into the current NHS Contact Centre, SNS24.

In 2015, Médis was the first to launch telemedicine booths for corporate partners, equipped with medical devices that enabled more sophisticated video consultations. Recently Médis partnered with SWORD Health, a Portuguese tele-physiotherapy start-up [9].

Tech Innovators as New Healthcare Providers

Technological companies have been vigorously entering the healthcare space around the world over the past years. In Portugal, several health tech start-ups have emerged on the market – some with remarkable international success.

When it comes to healthcare provision, the 2014 founded SWORD Health stands out. SWORD Health offers a virtual solution for musculoskeletal conditions that traditionally would be treated by physical therapy. The company offers remote physiotherapy through its licensed physical therapist and the SWORD Health Digital Therapist, an FDA and CE listed device with a tablet and motion sensors.

The company already operates as care provider in three continents and has gathered 135$ million in funding. By the end of 2021, it is expected to have reached unicorn status. [10].

Knok is a start-up founded in 2015. It developed a digital platform to connect patients with physicians. Initially it adopted a marketplace model for home visits or video consultations. Today it has its own medical team and performs about 130,000 video consultations per year. Meanwhile it extended its business providing its video consultation platform and advisory to third parties in Portugal, Spain and Latin America [11].
Telehealth Leveraging Private Philanthropy

The Instituto Marquês de Valle Flôr is a private Portuguese institution of public utility for development and cooperation with Portuguese-speaking countries. It was founded in 1951, first with a special focus on São Tomé e Príncipe. Health is one of its priorities. "Saúde para Todos" (Health for All) is a main project: Portuguese clinical teams from around 17 specialties are regularly brought in to help local teams in care and education.

Since 2012, it has also extensively integrated telemedicine to support local doctors remotely from Portugal. To do this, it worked together with Portugal Telecom's (now Altice) innovation team and co-created a new telemedicine platform, which could overcome bandwidth constraints, often a problem in destination countries, thus enabling teleradiology, teleophthalmology and other image-intensive teleconsultations [12].

References

[9] https://www.medis.pt; self-reported data
[12] https://www.imvf.org; self-reported data
V. The rise of AAL in Portugal: From the Hospital to the Health Center and Patients Homes

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Introduction

In Portugal, the percentage of the population aged over 65 has been growing, with a 3.8\% increase in the last 10 years [1]. Whereas the average life expectancy is increasing, the disease burden associated with ageing is rising. In 2020, 73.8\% of the population over 65 years of age reported having a chronic illness or long-term health problem, lasting or likely to last 6 months or more [2]. Furthermore, 60.8\% of the elderly population indicated feeling limited in performing activities considered usual for most people due to a health problem [2]. In this way, new technologies have innovated in the sense that health care provision is brought closer to the patient, instead of just promoting visits to health establishments.

Ambient Assisting Living (AAL) is an approach that is increasingly studied and adopted in the most diverse areas, not only in Portugal, but also in Europe and worldwide [3 – 5]. Several studies point out that remote monitoring (such as wearables, sensors, IoT devices) and telemedicine services are already being developed and created, not only in developed countries, but also in middle-and low-income countries [6, 7].

This chapter includes four projects that are being developed in Portugal with the aim of improving the quality of life of the older population through the AAL approach, but in different contexts (hospital, primary health care, social support and remote patient monitoring system after cardiothoracic surgery).
In 2015, the Hospital Garcia da Orta (HGO), located in the Lisbon health region, created the Home Hospitalisation Unit (HHU). This Unit aims to ensure an improvement in healthcare access by promoting the reduction of complications (such as falls or multi-resistant infections) and the costs inherent to conventional hospitalisation [8]. The HHU is part of the Internal Medicine Service and has a permanent team of doctors, nurses, social worker, pharmacist, dietitian, a hospital administrator, and a technical assistant [9].

After the diagnosis has been made in hospital (outpatient consultation, day hospital or emergency department), the possibility of the pathology being treated in the comfort of the patient's home is assessed. The most common pathologies can range from urinary infections to heart or respiratory failure. In a next phase, and if the patient wishes to follow this approach, the context in which the patient is inserted is also assessed (i.e., existence of a caregiver, minimum living conditions and residence up to 30 km from the area of influence of the Health Centre Cluster Almada/Seixal). At home, monitoring and follow-up can be through telephone communication or visits by medical or nursing teams.

In this initiative, home hospitalisation is seen as a health care delivery model alternative to conventional hospitalisation, which provides continuous assistance, a psychological environment more favourable to the patient and valuing the role of the family and caregivers [10].

Five years later, the HGO has multiplied its average capacity from 5 patients to 30 and has accompanied 2128 users using this methodology [8]. These results created the foundations so that, in October 2018, protocols were signed with the aim of expanding home hospitalisation to 25 hospitals across the country [11]. Currently, there are already 31 home hospitalisation units in Portugal and the objective is to continue to grow.

Primary Healthcare METHIS Project

Primary Healthcare Centres (PHCs) are the first point of contact with the population and are suffering an increase demand of chronically ill patients [6]. The METHIS Project started in 2019 and aimed to create a PHC-level digital platform to support and monitor chronically ill patients [12].

This platform allows PHC doctors and nurses to track physiological (blood pressure, pulse rate, weight, oxygen saturation, respiratory rate, temperature) and biochemical (glycated haemoglobin, capillary glycaemia, cholesterol, triglycerides) data of the patients, as well as the therapeutic plan (pharmacological and non-pharmacological) that has been prescribed. In
addition to data monitoring, it also allows for medical or nursing teleconsultations. With the participation of the patient or caregiver, interaction with health professionals is more frequent and allows the prevention of decompensation of pathologies and the occurrence of acute episodes.

This system is already implemented in three Family Health Units (FHUs) in the Lisbon Health Region (FHU das Conchas, FHU Jardim dos Plátanos and FHU Arco Ribeirinho) and in one year more than 100 teleconsultations were carried out, with more than 80 patients.

In the next stage, the system will include remote monitoring systems with algorithm-based alerts that will make the transmission of information automatic and the follow-up more effective.

The Value of a Remote Patient Monitoring System in the Cardiothoracic Surgery Service of a Public Hospital

Patient follow-up is essential in the health pathway of cardiovascular patients [13] especially in convalescence after cardiac surgery. Postoperative complications lead to hospital readmission of 15-20% of patients during the first month and 30% in the first year [14 – 16].

To reduce risk of readmissions and increase patients’ satisfaction, a telemonitoring service was developed in the Department of Cardiothoracic Surgery of a public hospital in Lisbon, Hospital de Santa Marta – Centro Hospitalar Universitário Lisboa, together with researchers from Value for Health CoLAB, NOVA Medical School and Fraunhofer-AICOS. Vodafone Portugal supported the project with 4G connection. The telemonitoring service was designed to daily collect data from medical IoT devices and patient-reported outcomes from a questionnaire and the picture of the surgical wound using a smartphone app [17]. Patient digital literacy was reinforced in a training session before hospital discharge. Also, the telemonitoring system supported the patients with health literacy text messages defined by the clinical team, through simple chat-bot interaction.

A pilot study with 35 patients, approved by the Ethical Committee of the hospital, demonstrated that the patients using the telemonitoring service were satisfied (net promoter score: 84) [18] and had reduced clinical complications when comparing to similar patients having standard follow-up. The co-design and adherence of the clinical team was successful. The application of the Time-driven activity-based costing methodology demonstrated that a patient using the telemonitoring system received, in average, more 8,7 hours of care than the standard patient. Results from the pilot study demonstrate the value of a telemonitoring system and how it increases the access of the patient to healthcare.
Teleassistance at the Cruz Vermelha Portuguesa

The AAL includes not only the physical health of patients, but also the psychological. Thus, social and psychological support also has to be addressed. The Cruz Vermelha Portuguesa (CVP) through the Teleassistance service allows an immediate response in emergency/urgency, safety and loneliness situations by pressing a button [19]. This action will allow the user to contact a CVP Call Center and speak with an operator by phone. This operator will identify the reason for contact and forward to the most appropriate means: fire department, 911, police or for relatives/careers. Throughout the support, contact with the user is always maintained through a formal or informal network.

Conclusions

The use of AAL in health services is growing in Portugal, from health centers to hospitals. With the COVID-19 Pandemic the value of its application became evident and motivated the development of new initiatives and, more importantly, to involve patients in telehealth.

References


VI. Iberic Telehealth (Iberian Society of Telemedicine and Telehealth - SITT)

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Telemedicine and Telehealth are activities that have their reason for being precise in communication and cooperative work at a distance. So, it was natural that health professionals from neighboring countries such as Spain and Portugal, soon felt the need and advantages in developing programs and protocols in this area. This is how the Iberian Society of Telemedicine and Telehealth - SITT (Hiberiae Societas Telemedicinae et Telesanitas) emerged, bringing together several physicians, nurses, and other health professionals, many of them with an already old relationship of common work and friendship, and whose professional activity focused mostly on Portugal and Spain, but also in other countries, namely Brazil, Peru, Argentina and other South American nations.

From the outset, the intention was made to make the SITT as inclusive as possible, which is why, for example, its Statutes were drawn up in the five official languages of the Iberian Peninsula (Basque, Castilian, Catalan, Galician and Portuguese).

Thus, on March 21, 2015, at the Hospital Virgem de la Poveda, Madrid, SITT (www.sittiberica.org) was formally created, with its official registration in Spain and its first Management chaired by the Spanish Dr. Manuel Grandal, having as vice-president the Portuguese Dr. Luís Gonçalves, both with a long and persistent work in the promotion of Telemedicine and the main workers and boosters of the idea of the creation of this Society.

Objectives of SITT

The main objectives of SITT are the following:

a. To encourage the development and implementation of new telecommunications tools (ICT) in the field of health, scientific research, health administration and in all areas related to health sciences and biomedical research on telemedicine and telehealth.

b. Strengthen, support, promote and disseminate the contents of activities related to the management of health information and the tools used for this, under the name telemedicine and telehealth, ensuring the development of medical education and practice Medicine for the benefit of the population that serves.
c. Promote cooperation and exchange of actions and products generated in the field of Telemedicine and Telehealth (Biomedical Informatics) in the public and private, national and international sectors.

d. Create and maintain academic and scientific relations with foreign, international and national bodies, as well as promote their integration and support the creation of national nuclei that will strengthen the organization and activities of the Association.

e. Interact with recognized scientific and academic institutions encouraging the creation of new instances that have the same objective and are animated by the same purpose. Propose the organization of a national dissemination contribution, and thus encourage and disseminate scientific research.

f. Promote, organize, sponsor and participate in events and activities aimed at the training of Telemedicine and Telehealth, in priority areas of different countries, such as: introduction to telemedicine and telehealth, home care, standards and procedures, legal and bioethical issues, computing and information and dissemination of enterprises in these areas that can be useful to members of the health team and related.

g. Collaborate with national health authorities as an advisory and aid body in the areas of competence, to support activities and strategies to meet the main challenges.

Main Activities of SITT

There is already a long and diverse list of activities, works and publications made by SITT, which can be consulted in detail on our website. However, we highlight some of the most relevant and striking:

**SITT forums:**
The 1st forum was held in Lisbon in 2016 with the support of SPMS and commercial companies, and the 2nd in Funchal with the support of the Regional Government of Madeira the Regional Section of the Order of Nurses. The 3rd Forum, scheduled for 2020 in Barcelona, was cancelled due to the Covid-19 pandemic.

Participation of its invited members in the 1st Ibero-American Congress of Telessaude-telemedicine in Lima, Peru, in the 2nd Luso-Brazilian Day of Telessaude-telemedicine, at the University of the State of Amazonas in June 2015, at the XII Reunion del Forum of Telemedicine, in Seville, 2015, VII Jornadas de Telemedicina: la salut en linea, and several other participations that can be consulted on our website.
Publications and Documents


Preparation of a guide document on Telessaúde in the pandemic and in the future, sent at the end of 2020 to the Portuguese parliamentary groups of the PSD, PS and PCP, which led to the approval in general of four Draft Resolutions by the Plenary of the National Assembly.

Publication during July 2021 of a paper on ethics in Telehealth

Realization of several webinars (the most recent: telemedicine in Argentina, macro projects driving in Health, current situation of telemedicine in the face of the pandemic)

In 2017, SITT became an active member and with papers published in ISfTeH – International Society for Telemedicine and eHealth, and has a former president (Luís Gonçalves) as Chair of the Iberian and Ibero-American working group of Telehealth.

Short-term Plans of SITT

In addition to maintaining the activity of webinars, current ethical working groups, study in telemedicine legislation, and Telehealth and digital transformation, we will hold the 3rd SITT Forum in the fall of 2022 in Porto.

We foresee the publication of more texts of the various groups, one of them on telemedicine and palliative care is to be published also briefly.

Another aspect in which there will be a special effort is to promote, disseminate and inform on Telehealth to the general public in order to make an awareness of what it is, what its potential is and the contributions to improve healthcare delivery, but also to draw attention to the risks of misuse of health technologies. The study and observation of the impact and possibilities of communication technologies (used or unused) under the Covid-19 pandemic will continue to be the subject of SITT's attention. Finally, contacts have already been initiated with local authorities and health and educational institutions both public and private in order to establish protocols for collaboration, training and implementation of projects.
VII. Perspectives

7.1. Telemedicine in Occupational Health

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In the era of globalization, flexibility and employment mobility, the action of Occupational Health is oriented towards promoting health, well-being and functional capacity for work, preventing injury and disability, preventable diseases, absenteeism/illness, the loss of profitability and competitiveness and reduce costs. The Occupational Health activity is supported by the evidence/uncertainty of science, the cost/effectiveness of actions and measures to protect and promote health, disease prevention and the health gains obtained. In terms of the organization, it aims to find solutions that respond to health needs and empower people with the resources and conditions to manage their health potential.

The assessment of the workers’ aptitude must be carried out in person and in the context of the working environment, including organization and working conditions. In my clinical practice, the use of telephone or email contact allows me to clarify aspects of individual health and strengthen the empowerment of workers to promote health, in particular measures for the prevention and self-control of chronic non-communicable diseases (hypertension, diabetes, …); to emphasize risks at work and ways to prevent them; to communicate and clarify test results faster (analysis, rx,…) and guidance when necessary; in the COVID pandemic, quick contact with workers and management has facilitated information, guidance and tranquility in acute situations, and the decision to return the worker to the workplace, in a supported way. Even with simple resources, Telemedicine has allowed the improvement of accessibility, fluency and understandability of Occupational Health activities and strengthen the role of workplaces as health promoters.

Telemedicine can contribute to Quality in Occupational Health, avoid redundancy and waste, and create value and health gains for people, organizations and the country.
7.2. What Do Physicians Have To Learn About Telemedicine

Miguel Castelo-Branco
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Perhaps everything, since telemedicine, despite more than sixty years of existence has a low level of implementation, except for tele-imaging. Telemedicine use has been favored by the great technology development possible and has several potential advantages. It will therefore be necessary for physicians to learn in what contexts and situations they can use it, namely in teleconsultation with a patient, in a team conference, (physicians and non-physicians), in remote monitoring or accessing and sharing the results of complementary means of diagnosis.

The use of telemedicine in everyday life indeed brings aspects that are not yet embedded in day-to-day processes, something that doctors need to learn how to do. Namely, how to fit a telemedicine process into a flow of care. A few days ago, I saw a patient who, in addition to the medical situations that I follow, was in a postoperative period with a subdural hematoma. He had been operated on in a hospital 2 hours away. On the neurosurgeon’s recommendation, he performed a CT and that, despite being clinically well. Although an attempt to dialogue over the phone was done, the patient had to go to the hospital consultation and spend 6 hours. This is an example of something that a teleconsultation could have well replaced.

There are also positive examples, although still few. A few years ago, I visited a Spanish hospital for continuous care, which had few medical specialties physically present and treated patients with neurological, orthopedic, and respiratory diseases. The hospital, located 50 km from a large city, received patients from hospitals in that city. How were the opinions of specialists who had referred the patient included? Through videoconference. Since the implementation of the system, the hospital has maintained the quality of care and results and has significantly reduced travel (including road accidents). Patients responded positively to satisfaction surveys, and clinical outcomes were adequate. Teleconference is one of the areas of telemedicine that can be of great advantage. The possibility of conferring with experts regardless of location and considering opinions in the care plan is possible in this way even if there are specialists’ distribution asymmetries.
When should these concepts be learned? In my opinion, right in university. Today Telemedicine should be considered a normal and current process and used alongside other processes that students learn to do.

The use of technology of the type necessary for telemedicine always requires knowledge about how to turn on, start-up, tune, and turn off the system. Still, it also implies rules for communication and verification of correctness in the transmission of information and security and privacy. Which must be included in learning and practiced. Knowing what is possible to do and how to do it, what is available in the health institution system in which you are working and the ethical and deontological standards. As with other medical procedures and the use of communication systems, it is important to consider data protection, security and integration with health records. Patient input and involvement should also be considered central to the entire process. The use of telemedicine processes should be in the knowledge and consent of the patient. Telemedicine access should be limited to physicians and other health professionals involved in patient care. Telemedicine should be a daily process, every doctor should know how to use it.

University of Beira Interior is committed in engaging current and new students in telehealth. The informatics department has specific courses on telemedicine, linked with technology needs and opportunities. On the other hand, at the Faculty of Health Sciences of the University of Beira Interior, telemedicine has been part of the medical curriculum for eight years, as an optional curricular unit. Other courses, like Biomedical Sciences, have a 3rd year curricular unit [1] with 6 ECTS to lecture concepts and techniques associated with telemedicine:

1. Understand the principles underlying telemedicine systems;
2. Know how the equipment works;
3. Evaluate the advantages and limitations of telemedicine systems;
4. Understand technological development;
5. Suggest new ideas and functions for existing systems;
6. Perform demonstrations for different types of users;
7. Ability to dialogue with manufacturers;
8. Specify, analyze and select among the various market proposals.

There is also a b-learning course [2], with 60 ECTS, in partnership with Université de Limoges (France) and Escola Superior de Saúde Santa Maria (Porto, Portugal) that does not grant an advanced degree. It has several learning objectives:
1. Train healthcare professionals in the use of Telehealth technologies in new models of patient care and monitoring services;
2. Train health managers and administrators of health care units to adopt models of distance services, their implementation and maintenance;
3. Train information technology technicians for the implementation and maintenance of Telehealth systems;
4. Train educators for Telehealth;
5. Train commercial consultants for companies that supply Telehealth systems;
6. Foster the development of technology-based companies and providers of telehealth services, including assistance.

References

7.3. Future Perspectives

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“Yesterday is history,
Tomorrow is a mystery, but
Today is a gift.
That is why it is called Present”
Master Oogway, Kung Fu Panda

While we cannot see the future of telehealth’s evolution in Portugal, we can certainly point out trends and suggest perspectives on how we should look, and I would always argue, lead and build that future.

Portugal is fortunate to have a Strategic Plan for TeleHealth (the PENTS), a thriving ecosystem of public and private providers launching themselves into telehealth services, and a small but increasingly dynamic telehealth industry. The links with Brazil, due to the size of its market, mean business and experience opportunities for Portuguese companies and Portuguese technical and health professionals to grow fast.

Significant investment was needed and is needed to upgrade the basic IT structures in primary care and many public hospitals, without which many telehealth services, in particular large video/streaming and bulking data requiring telemonitoring services will have difficulty to thrive.

Today is, however, a gift. Portugal was left with a competent authority, centralized governance in telehealth, dynamic teams and a network of PITs who can be truly local innovators and hybridize telehealth with conventional healthcare services into modern moderated and well-adjusted solutions to a multitude of patients and citizens from the high-tech to the no-tech ones. Seize the day!

Different universities in Portugal are developing and maturing technologies for assistive living. Homecare, but also wearables and remote assistive technologies, will pave the way for new solutions to support the elderly, the frail, or the temporary incapable humans. This is the new telehealth, a mix of patient led initiatives where he or she will require and connect to health professionals but also to his/her caregiver and even other patients that suffer or are concerned with similar health issues. Such social network of care would be a sort of “linked-In/facebook/instragram” of its
own, and there is no reason why these cannot be provided by public authorities and/or regulated as social health spaces.

Finally, perhaps futuristic, but already being worked by researchers in Oporto, Aveiro and elsewhere are Brain-Machine-Interfaces. The final frontier for tele-health is the capacity to “travel” our will, our control of an object/arm/leg a prothesis or just an additional arm or hand we would like to have remotely doing something for us. Augmentation, human enhancement, and bionic life and solutions are not there just for the physical connected solutions, these can operate at a distance, they can be “tele”. This means parts of us are distant from us – I would call this “tele-self-technologies”. Perhaps one first “approximation” is today’s smartphones as they help us bridge distances and were key to tele-presence and the fight against mental disease during forced isolation in pandemic times. Loneliness, mental health, tele-presence and mental resilience are interlinked. Perhaps strangely enough Covid-19 pandemic not just increased and made tele-health need more visible, it also has shown us that contact physical and, when not possible, tele and remote, is key to health. Tele-self-technologies can be as scary as a brain-computer interface, or as simple as switching off the “Zoom” call and the telehealth platform and using a smartphone to tele-self to a meeting with friends even for those patients’ incapable of moving.

These are areas for the future of telehealth in the world. The same world where Portugal can continue to play a vital connection role and discovery function. The future of telehealth in Portugal is only dependent on present actors and their capacity to forget the past divergences and look, together, into the future.
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Career on the ICT marketplace having worked with Fujitsu Portugal for more than 20 years.

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Internal Medicine Doctor and University Professor, teaching and researching in Digital Health, Healthcare Systems and Transformation, Leadership and Management education for Medical Students and Health Professionals. One of the first CMIOs in Portugal in 2009-2013 at Hospital Fernando Fonseca, Lisbon, where he implemented large EHR system and founded an Innovation Center in Big Data and Robotics.  
Past president of SPMS, Portugal’s Digital Health Agency, where he led National eHealth efforts for close to 7 years. He represented Portugal for 8 years and was the former Member States co-chair of the EU eHealth Network, the highest policy body on eHealth in the Union.  
Elected Fellow of the International Academy of Health Sciences Informatics (within IMIA) in July 2020. Since August 2020 he has integrates the HL7 Europe Foundation Board of Directors.  
He now works as an Academic in two high-ranked business schools (ISCTE-IUL, and Catholica Business School), one Public Policy Institute (ISCSP-UL) and one medical school (FCS-UIB), and on individual consulting projects in Healthcare Transformation and Digital Health (www.henriquemartins.eu). He has authored a series of papers some of which looking at new trends for digital health at Global, European, National and Hospital levels.

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Main focus of interest is based on improving clinical management and quality of life for patients with chronic diseases.

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Health Sector Senior Management Program of AESE Business School and is postgraduate in Information Management and Business Intelligence in Healthcare by NOVA IMS.
Past Director of the National TeleHealth Center & NHS’ Contact Center, SNS 24 in Shared Services for the Portuguese Ministry of Health where, as among other projects, she led the conceptions of the first National Strategic Telehealth Plan and of the digital channel of SNS 24.
Member of WHO’s roster of experts for digital health and shares her expertise working with the EC, the EBRD and OECD. Editorial board member of Telehealth and Medicine. Chief Medical Officer for Digital Transformation at CUF.

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Graduated in Medicine at the University of Coimbra, specialization in Physical and Rehabilitation Medicine at Coimbra Hospital and University Centre (CHUC). Works at the Center of Rehabilitation Medicine of the Centro Region (CMRRC-RP) since 2007, contributing to its growth and development: graduated hospital assistant, Infection Committee, Ethics Committee, training advisor, clinical computerization, projects research, internal and inter institutional protocols that aim at good health practices and the continuum of care; Clinical Director at CMRRC-RP from January 2014 to July 2018; Member of the Board of the Specialty College of Physical and Rehabilitation Medicine from 2012 to 2018; Member of a scientific committee in the General Directorate of Health (DGS) in the elaboration of several Norms of Clinical Orientation; Collaboration with the Shared Services of the Ministry of Health (SPMS) and with the National Telehealth Center (CNTS) in the use and improvement of information systems and the use of new technologies (Telehealth); Ph.D. student at University of Beira Interior since 2019. Member of Iberian Society of Telemedicine and Telehealth since 2020.

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Background in electronic engineering. Over 18 years of experience in Pathology, in the first years as Service engineer, and then as Sales Manager in a market leader company. Solid knowledge in laboratory equipment, with special interest in telepathology. Since 2013, responsible for the technical part of the digital pathology project at Centro Hospitalar da Cova da Beira.

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Hospital Administrator over the last years in several institutions, in particular as CEO of the Red Cross Hospital, Board Member of the Hospital Center of Setúbal, Advisor for Innovation at the Hospital University Center of Lisbon Norte (CHULN) and Administrator of the Departments of Heart and Vessels and Pediatrics of CHULN.

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Senior Assistant of Dermatology and Venereology since 2010.
Regular Informal phase of Tele-Dermatology since 2001.
Implementation the Official Teledermatology in 2014
Regular collaboration with GTT (TeleMedicine WorkGroup) since 2012.
PIT (Promotor of TeleMedicine) at the Hospital de Santo António between 2017 and April 2021.