Technology Acceptance in Medicine – 'Telemedicine' – The perspective of the users

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Abstract

Interest in telemedicine has been increasing over the last years. Two big reasons are the following: the rapid evolution of Information and Communication Technologies, which offer more and more potentialities and second, the increase in the demand for accessible and affordable healthcare.

Another trend in healthcare is the change of the role of the patient, from a passive element to a more active role, similar to that of a customer.

This is an exploratory work, that has the goal of describing telemedicine implementation, according to the context, and to identify the factors that lead to successful implementations and which of these factors are related to the patients and doctors who make use of telemedicine systems.First, a literature review was conducted, concerning current aspects of telemedicine and interactions of actors, such as doctors and patients.

Second, semi-structured interviews were conducted towards 9 experts, involved in several degrees with telemedicine, in order to compare their perspectives on existent barriers, opportunities and factors for success.

Two surveys were also elaborated. First, one was directed towards COPD patients who have been participating in a home telemonitorization pilot project, in order to evaluate directly the perspective of actual telemedicine users.

The second survey was directed towards internet users, as potential users of telemedicine and concerned their eHealth literacy, their awareness of telemedicine in Portugal and the importance and expectation towards advantages and disadvantages relating telemedicine use.

The benefits and barriers mentioned by experts were similar to those found in literature and other studies. Most experts had positive opinions regarding telemedicine. Bureaucratic issues, financial issues and lack of strategic measures were mentioned often as barriers to the implementation of telemedicine in a large scale.

The survey to COPD patients reflected a high satisfaction from the participants, which confirmed results which had already been reported.

Factor analysis and reliability lead to the conclusion that the original eHEALS scale is uni factorial, with a high reliability value, as it had been verified in other studies. The scores for the internet users group had low results, and no significant relation was found between education and age and eHEALS score.

Concerning telemedicine projects, users seemed to score relatively high the benefits of the telemedicine projects; results for their belief/expectation were low in comparison for every item.

Keywords: telemedicine users, user's perspectives, telemonitorization, interviews, Principal Component Analysis

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Contents

List of Figures

List of Tables

List of Abbreviations and Acronyms

ICT Information and Communication Technologies

PACS Picture Archiving and Communication System

STARPAHC

tPA Tissue plasminogen activator

SMS Short Message Service

ACA Affordable Care Act

ATA American Telemedicine Association

VHA Veterans Health Administration

ISRO Indian Space Research Organization

ARS Administração Regional de Saúde (Regional Health Administration)

SPMS Serviços Partilhados do Ministério da Saúde (Shared Services of the Health Ministry)

DGS Direção Geral de Saúde (General Health Directory)

ACSS Administração Central de Sistemas de Saúde

COPD Chronic Obstructive Pulmonary Disease

KMO Kaiser-Meyer-Olkin Test for Sampling Adequacy

BTS Berlett's Test of Sphericity

1. INTRODUCTION

Society in general is more and more dependent on Information and Communication Technology (ICT). Healthcare is not an exception, with ICT being a powerful tool that allows the necessary efficiency and productivity to the high demand in this field. The uses of ICT in health are numerous, from the health institutions information systems, to the Electronic Health Records and health portals, among others.

On the side of the population, the generalization of internet provides easy access to health information, and informed patients are becoming more and more common.

As for medical professionals, they now have greater access to more and newer information faster, and can use ICT to improve their performances and stay closer to their patients.

The providence of healthcare at a distance – 'Telemedicine' – is not new. But in the technological context in which we are currently living, it is possible to transform healthcare.

The economical crisis has awaken an interest by affordable and accessible care, that telemedicine is expected to help provide. In low income countries, telemedicine offers opportunities to culminate for the lack of resources.

The specific objectives of this work are

- Provide a current global view of how telemedicine is practiced in several contexts.
- Explore what has changed for the actors in healthcare, in this new context of access to information.
- Identify what factors contribute to success of telemedicine projects and which ones are related to the actors
- How does an older aged group interact and is affected by telemedicine?
- Given the lack of divulgation, what is the perspective of the potential users of telemedicine?
- Promote some awareness of successful telemedicine projects in Portugal, and their results.

1.1. Literature Review

The following chapter intends to cover main aspects of telemedicine and telehealth.

First, definitions of concepts telemedicine and related to it will be provided.

A brief mention to mHealth was included. Many innovative approaches of telemedicine rely on mobile devices and tablets. This is a very distinctive feature, comparing to older bulkier interfaces, based on desktops. Secondly, as it will be specified later, in low income countries, internet is mostly assessed through mobile network, much more used than PC's by the general population.

Secondly, results from research concerning three countries is presented. The type of telemedicine implementations in each one will be described, in order to emphasize their differences.

Classifications widely used in literature on the field will be explained as well as three medical applications among the most common, as an example.

1.2. Concepts surrounding telemedicine

Ehealth, “The use of electroninc mean for health provision” is a generalist term, that includes several different technologies, including medical informatics and Electronic Health Records. It is often described as an umbrella, that includes several terms, among which are telemedicine, telehealth, telecare and others.

Broader definitions are suggested by Eng and Eysenbach early in the emergence of the field, with a minor change to the latter, as indicated below:

> “e-Health is the use of emerging information and communications technology, especially the Internet, to improve or enable health and healthcare.”
>
> “e-Health is an emerging field of medical informatics, referring to the organization and delivery of health services and information using the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a new way of working, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology. (adapted from Eysenbach)”

Van dyk describes the relationship between these concepts as illustrated in figure 1.

A definition of telehealth, as used by eVisit (“What Is The Difference Between Telemedicine, Telecare and Telehealth?,” n.d.) is

> “(…) health information services, health care education, and health care services in a broad sense, the term telehealth is an all-encompassing one. “

Figure 1 assumes a strict classification, clearly distinguishing telehealth and telemedicine with telemedicine being a particular case of telehealth, in the same way in which “Medicine” is a particular case of “Health”. (Van Dyk, 2014)

In this line, for example, telenursing is a telehealth service, but not a telemedicine service. On the other hand, on the same level as telemedicine, and included in telehealth, there is telecare. A definition is provided by Telecare Aware Group.

> ” the continuous, automatic and remote monitoring of real time emergencies and lifestyle changes over time in order to manage the risks associated with independent living.”

Telecare refers to services of monitorization and surveillance, such as teleassistency, but that lack the curative property. Telecare Aware Group also mentions

> “Telecare and telehealth can work in a complementary way: telecare sensors being triggered by a user if feeling unwell and the nature of the medical emergency being indicated by telehealth data. (“What is Telecare,” n.d.)

Still included in telehealth are other types of services related to health, such as distance medical education and administrative services related to health.

In this work, telemedicine and telehealth will be referred indistinguishably several times for two reasons: First, other sources, including ATA use the terms without distinction, second, while telemedicine is the focus, several services often called telehealth were also interesting for this work.

Figure 1 – The taxonomy of concepts included in eHealth (Van Dyk, 2014)

1.3 History of Telemedicine

Communication technologies have always influenced the different aspects of our society, including health.

First registries of health related long distance communications involve the use of smoke signs by villages, with the purpose of warning others of an existing epidemic.

Much later, during the 1860's, the telegraph was used to pass health care information to treat wounded soldiers in the American Civil War and arrange their transportation. (Zundel, 1996)

Aaronson, 1879, reported the use of the telephone by a medical doctor to listen and evaluate the cough of an infant. (Eikerlbloom, Robert H Ear Science Institute Australia, Subiaco, 2012)

In the publication “The Tyranny of the Distance”, Geoffrey Blainey the role of the telegraph to reduce the sense of isolation in Australian cities and villages. He references what is considered the first use of the telegraph for telemedicine, After an attack by Aborigines, on Sunday 22nd February 1874, Dr Charles Gosse was requested to attend the Telegraph Office, were he provided advice for the treatment of the wounded. (EIKELBOOM, Robert H Ear Science Institute Australia, Subiaco, 2012)

In the beginning of the XX century, the Danish physician Willen Eithoven performed an electrocardiogram to a patient located 1.5 kilometers from the place. The results from this experience were published in 1906 by Archives Internationales de Physiologie. (Rashid L. Bashshur, PhD and Gary W. Shannon, 2009)

Strehle and Shabde add that information and communication technologies were used to deliver health care, such as consultations, diagnosis, treatment and clinical data transfer. In 1920 there were reports of health care delivered to sailors via radio by Norwegian doctors.(Hurst, 2016)

The invention of the radio revolutionized communication. A Radio News Magazine from 1924 features an illustration of a doctor attending to a patient via video call, under the headline “The Radio Doctor–

Maybe!” At that point, this was only an editor’s vision of the future technology.(Rashid L. Bashshur, PhD and Gary W. Shannon, 2009)

During the World War I radio communications were widely used for medical support and even today, radio support is still used in ships.

In the 1940's in Pennsylvania, radiology images were transferred through the telephone line, becoming the first electronic medical record transfer worldwide. Around 1950 this technology was used to build a teleradiology system that was used in and nearby Montreal.

The advent of motion pictures and modern film technology caused the appearance of plans for video medicine.

Video communication for medical purposes was first used at the University of Nebraska in 1959. A two-way television setup was established to transmit information to medical students across the campus. Five years later, the network was extended to a state hospital, to perform video consultations.

In the early 1960s, telemedicine appeared in urban communities as well, touching down in the world of emergency medicine. The University of Miami School of Medicine partnered with the local fire department in 1967 to transmit electrocardiographic rhythms over radio to Jackson Memorial Hospital in rescue situations. (Rashid L. Bashshur, PhD and Gary W. Shannon, 2009)

Also in the 1960's the National Aeronautics and Space Administration (NASA) monitored the physiologic measurements of astronauts in both spacecraft and space suits during flights. (Welsh, 2002)

In 1972-1975 NASA developed another project, STARPAHC, or Space Technology Applied to Rural Papago Advanced Health Care to deliver health care to the Papago Indian Reservation in Arizona A van carrying medical instruments was staffed by two Indian paramedics and was linked to specialists at the Public Health Service Hospital by a two-way microwave transmission. (Welsh, 2002.)

In 1974 another study by NASA was conducted with SCI Systems of Houston with the purpose of determining the minimum quality of a video transmission needed for a video consultation.

In 1989 the first telemedicine international project was conducted, Space Bridge to Armenia/Ufa, to aid the victims of an earthquake in 1988. (Welsh, 2002)

Murphy and Bird (1974) developed an audiovisual connection between the General Hospital of Massachusetts and the Logan Airport in Boston, which allowed consultations between these places.

After this, several other programs were developed in countries such as United States of America (USA), Canada, Australia, France, United Kingdom (UK), Greece, Italy, Germany, Japan, Switzerland, the Netherlands, Norway and Finland. (Ferguson, E.W., Doarn, C.R. & Scott, 1995)

1.4 Classification of telemedicine services

Telemedicine, as defined by ATA includes a variety of services, including a simple phone call from a doctor providing medical instructions. To better distinguish the services provided, some classifications are used. The most common pf these will be explained over the next sections.

1.4.1 By type of service

Most commonly, telemedicine services are referred to as being Real-time or Synchronous, Store and forward or Asynchronous or Home Telemonitoring services.

Real-time or Synchronous

Includes services that involve direct real-time communication between the parties. Videoconferencing consultations are an example of real-time telemedicine services. Real- time video consultations often make use of peripheral medical equipment, with cameras, which can be connected to allow the distant physician to observe the patient himself.

Real-time telemedicine is useful for doctors who need to see a large number of patients, do frequent follow-up visits or provide immediate care. (What is Telemedicine, 2009)

Store and forward

Refers to a non real-time interaction, commonly for the transmission of medical data, such as images and bio-signals from one party to another. It is especially common for Dermatology, Radiology and specialties that rely on medical images and signals rather than physical examination. (“What is Telemedicine,” 2009.)

Previously, some services were store-and-forward for reasons essentially related to limitations in the connection, such as lack of bandwidth, but can now be performed in real-time. (Wilson & Maeder, 2015)

Home Telemonitoring

Consists on the remote observation and monitorization of a patient. Home health telemedicine equipment usually consists of vital sign capture and in some cases includes video conferencing equipment. It is possible to review patients’ stats and receive alarms from hospital nurse's station. (“What is Telemedicine,” n.d.)

It is common to classify a telemedicine service according to the specialty it is applied to, by joining the prefix “tele” to the name of the specialty.

1.4.2. By nature of the service

Another type of classification that is used, as to do with the nature of the medical service that is being provided:

1.4.3Teleconsultation

Usually involving videoconferencing, in which a specialist in the distant site provides a medical consultation to a patient, usually involving a presenter on the origin site, who establishes the communication and between the patient in the origin site and the medical doctor in the remote site.

Telediagnosis

Asynchronous service in which a specialist in a distant site evaluates a patient in an originating site through images and exams, and sends a report with the generated results back to the originating site. In this category are usually teleradiology and teledermatology services, which rely on image sharing and telecardiology, for medical signal sharing among doctors.

Telesurgery

The realization of surgeries by a physician located in a distant site. There are two main ways by which this can be made. The first way is using video and audio communication, by which one physician helps another performing the surgery on the patient. The second involves the remote doctor performing the surgery himself, using a robotic arm for the effect. Figure 2 presents a system that makes use of a robotic arm.

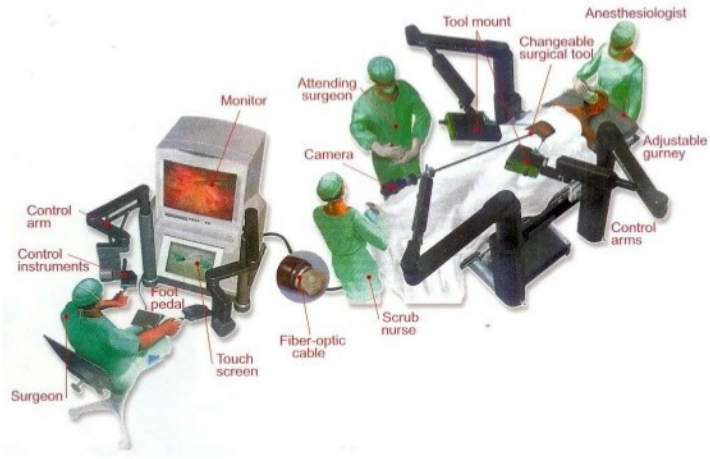


Figure 2 – Robotic system, that allows surgeons to operate at a distance.

Tele-emergency

Delivery of emergency care at a distance, usually in a synchronous manner, from phone calls, to more elaborated services such as telestroke.

Telemonitoring

Use of telecommunication technology to gather the information of patients' condition remotely. The gathering of information can be performed manually, in which the patient records his medical condition

and sends the information to the physician or automatically, in which the patient is continuously monitored. It can be done in a synchronous or asynchronous manner.

1.4.4 By medical speciality

Often telemedicine services are specified by the type of speciality they are being applied to. The name is often a combination of the prefix 'tele' and the name of the speciality.

Not all medical specialities are equally suitable for telemedical applications. Thus, there are specialities in which telemedicine is far more common. Other times, the type of specialities are chosen according to criteria, such as priority specialities, with large demand and lack of specialists.

In the next sections, three applications to medical specialties will be referred in more detail. The choice of these three in particular was related to the amount of information available, and due to the fact that they are among the most popular.

Teleradiology

Teleradiology is defined as the electronic transmission of radiographic images between two geographical locations for the purposes of interpretation and consultation. (Ranschaert & Binkhuysen, 2013)

Teleradiology is by far the most common telemedicine application, and transmission of radiology images between geographical locations has been a practice for more than fifty years.

In the last decade it suffered great improvements, due to the decrease in prices for communications, generalization of internet and advances in medical imaging, recording, viewing and digital capture.

The combination of Picture Archiving and Communication System (PACS) with high bandwidth internet connections has facilitated the transmission of medical images between different locations for diagnostic purposes. The availability of PACS throughout Europe is still uneven and the majority is being used in Nordic countries, UK, the Netherlands and Belgium. (Ranschaert & Binkhuysen, 2013)

In many countries in Europe, teleradiology has become part of the regular work flow to help with the workload balance. This happens usually with hospitals with facilities geographically separated. (Ranschaert & Binkhuysen, 2013)

For countries with PACS integrated in a regional or national network, image distribution can be organized in a cross-enterprise fashion.(Ranschaert & Binkhuysen, 2013)

In some institutions teleradiology is used with the purpose of providing remote off hours radiologic coverage, for emergency reading and sometimes for sub-specialty readings.

Three models for teleradiology usage can be defined:

First, for a single institution, were radiologists use teleradiology services from home (on-call purposes), to obtain second opinions, for obtaining second or expert opinions or to outsource results to other hospitals or teleradiology companies.

Second, for enterprises with multiple facilities, for in-house distribution of workload, to obtain second or expert opinions, or to outsource work to a commercial provider, third, a radiology group, or teleradiology company providing services to several other related or unrelated facilities.

According to a survey, the major use of teleradiology is for image distribution withing the hospital, followed by night-time and weekend readings from home. (Ranschaert & Binkhuysen, 2013)

Telestroke

Acute stroke effective treatment is based on a time sensitive interdisciplinary sequence of events. Application of telemedicine to stroke – Telestroke -is one application of telemedicine to emergency services and is usually based on audio-visual real-time communication, aiming to decrease the response time and consequently increase the chance of survival.

The use of tissue plasminogen factor (tPA) is one of the most effective treatments, provided it is administered 3-4,5 hours after symptom onset. Only 2-4% of acute stroke patients actually receive tPA treatment, usually due to late presentation of the patient or lack of specialists with the expertise to perform its administration.(Dignity Health, n.d.)

Not all hospitals have the resources and personnel to provide adequate emergency stroke care, and these are usually central urban hospitals. (Massaro, Speakers, & Genentech, 2015)

Several models exist for telestroke, however, Hub and Spoke model, also used in other telemedicine applications, is the most common. Hub hospitals are usually located in urban areas, and have advanced capabilities available 24 hours, 7 days a week and in-house neurosurgery capabilities. Spoke hospitals are typically smaller hospitals and do not have extensive neurology support and may or may not have stroke certification. A Hub hospital is connected to one or more Spoke hospitals. (Massaro, Speakers, & Genentech, 2015)

Typical equipment for telestroke systems includes high speed internet with IP or ISDN connection, high quality videoconferencing capabilities (including zoom, tilt and pan cameras with independent operation), CT or brain image transfer capability and secure image formats.

An illustrative telestroke chain of events goes as it follows:

i. The patient presents himself at emergency department after the first stroke symptoms, and is examined by the department physician who initiates the stroke alert.
ii. Blood samples and CT are completed and the Spoke center activates the telestroke hub hotline.
iii. The hub center’s on-call stroke neurologist responds and the telestroke camera system is placed in front of the patient, beginning the consultation.

iv. The stroke neurologist, assisted by the emergency department nurse, interacts with the patient and observes his electrocardiographic results, heart rate, blood pressure, respiratory rate, and oxygen saturation, determining the NIH Stroke Scale.

v. After the completion of the CT, clinical and laboratory exams are finished, the neurologist requests the presence of the emergency physician at the bedside to discuss the care plan, recommending a therapy. Finally the hub stroke neurologist dictates a consultation and faxes it to the spoke center emergency department.(B.M. et al., 2009)

Most recent telestroke applications make use of telestroke robots, mobile units able to dislocate through the hospital, allowing for the specialist in the Hub site to observe the patient closely. This technology is currently used in Dignity Hospitals(“Stroke Treatments,” Dignity Health)

This technology is currently used in Dignity Hospitals, with a specialist located in Mayo Clinic in Phoenix. An example of one of these robots is in figure 3.

Figure 3– Robotic system used in Dignity Health hospitals for telestroke.

Teleophtalmology

Teleophtalmology has been gaining importance as an eye-care modality worldwide, and its use is quite common for screening and specialty referral for common eye diseases.

In pediatric medicine the most common is screening and timely care of retinopathy of prematurity, (ROP), a vascular proliferative disease of the retina that can result in severe complications leading to blindness in preterm infants.(Tehrani, 2014)

Electronic evaluation of ROP currently consists on the acquisition of fundus images, using a digital fiber optic, wide angle color fundus camera, that are then transmitted to the location where they will be interpreted. Besides a fundus camera, image management software, trained personnel, internet access and a specialized ophthalmologist experienced in ROP management are required.

Among the geriatric population teleophthalmology services include diabetic retinopathy screening and referral, age-related macular degeneration and other eye-sight threatening diseases. Glaucoma

screening and comprehensive vision screening and refractive error services are other successfully implemented applications. (Sreelatha & Ramesh, 2016)

Results for teleophthalmology projects have been generally positive, with outcomes similar to those of traditional ophthalmology, also improving the accessibility to patients in remote areas and saving traveling cost and time. (Sreelatha & Ramesh, 2016)

Glaucoma screening projects using telemedicine usually involve stereoscopic digital imaging to take ocular images that are transmitted to an ocular specialist. The main tests reported by studies in literature are optic nerve photography, Optical Coherence Tomography (OCT), Intraocular Pressure (IOP) measurements, central corneal thickness (CCT) measurements, and visual field tests. (Prathiba & Rema, 2011)

Telepsychiatry

Mental illness is a widespread issue worldwide and estimates indicate that the prevalence of neurological and mental disorders is increasing, with a raise of 15% in 2020. (World Health Organization, 2001)

People affected with mental illness often remain untreated and therefore strategies to better deliver mental health services are needed.

Interventions using telephone calls appear to benefit some patients with mild-to-moderate health problems, for example. However it may be more effective to combine telehealth with specific therapy with proven effectiveness, such as cognitive-behavioral therapy. (Savita Malhotra, 2013)

Videoconferencing use in the delivery of mental health services has shown benefits in terms of access to care and user satisfaction. From patients in a random survey that participated in teleconferencing sessions, the large majority reported satisfaction with technical aspects of telepsychiatry and felt comfortable with the telepsychiatry as a mode of contact. (Thomas et al., 2014)

One of the great advantages of remote monitorization is that it allows the physician to check on his patients more often. (Campbell, O'Gorman, & Cernovsky, 2015)

In terms of costs telepsychiatry to distant sites is less expensive than conventional psychiatric treatment and may be as effective across a several diagnostic categories. (S. Deslich, Stec, Tomblin, & Coustasse, 2013)

Promising applications include installation of telepsichiatry systems in schools and correctional facilities.

School systems are using counseling services in the school campus, and they pay these services in an as-needed basis. (S. A. Deslich, Thistlethwaite, & Coustasse, 2013)

As for prisons, access to healthcare is very limited among the inmate population for several reasons. Firstly, the costs of transportation are high. For the transportation of one inmate, prisons usually allocate two staff members, which also brings the risk of leaving the prison understaffed. Additionally,

there are security issues, for the external population the treating facilities. Some professionals are reluctant in treating inmates in their clinics.

This lack of access reflects on the high prevalence of disorders such as depression, anxiety, bipolar disorders and schizophrenia. (S. A. Deslich, Thistlethwaite, & Coustasse, 2013)

Telemedicine programs have been used in prisons in Kansas, Georgia, Ohio, California and Arizona and have proved to decrease costs and improve access to care by inmates. They are also a solution to the disruption of treatments for inmates that are transferred. Additionally, communication is improved between physicians and physicians and other health professionals. (Campbell et al., 2015, S. A. Deslich et al., 2013)

However it remains difficult to judge its effectiveness because there are few clinical outcome studies and the populations adequate for telepsychiatry are limited.

In telemedicine there are often concerns about the quality of the diagnosis that is provided, however, a study showed that the accuracy of the telepsichiatry diagnosis varies between 79% and 83% in comparison with face-to-face approach. (Singh, Arya, & Peters, 2007)

Telepsichiatry can have other positive effects, allowing for example a higher continuity of care. A physician provide coverage for peers who were on vacation or unable to attend consultations in an inpatient psychiatric unit of a rural hospital. (Singh, Arya, & Peters, 2007)

Other limitations that it can help overcome are therapy costs, transportation and time constraints. (Rabinowitz et al.)

Comparison of costs between face-to-face and telepsychiatric treatment has mixed results. Although savings were achieved according to some studies, such as those from Mohr, 2009 and Spaulding, Belz, DeLurgio, & Williams. Another study reported that telepsychiatry cost more in an hour than conventional treatment. (Modai et al., 2006).(S. Deslich et al., 2013)

1.5 M-Health

There is no standardized definition of m-Health. The Global Observatory for e-Health opted to define it as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDA's) and other wireless devices”. (mHealth New horizons for health through mobile technologies, 2011).

In the 90's, the PDA's appeared and made it possible for doctors to download medical records, lab results, medical images and drug information. The mobile technology evolved in a very rapid manner since then.

In 2007, Apple presented the I-phone 2G, with its operating system, the iOS. Other operating systems followed, and currently, iOS and Android dominate the market, with their online application stores, that offer or sell a variety of applications. (Silva et al., 2015)

The advent of Smartphones, supporting 3G and 4G mobile networks has made mobile computing an attraction for research and business communities. (Silva et al., 2015)

1.6 The growth of the m-Health market

In 2015 the world population had an estimated value of approximately 7.1 billion and the number of mobile phone subscriptions was in 7,085 billion. International Telecommunication Union. (ITU, 2016)

In 2013, m-Health market was valued in $2.4 billion, but it is forecast to reach 21.5 billion by 2018. Europe is expected to surpass North America, due to the potential for the different healthcare systems to adopt, at scale, technology used in small pockets of the healthcare provider market. (BBC Research, 2014)

With this increasing penetration of Smartphones, the market for m-Health apps is also rising. According to m-Health App Developer Economics, 2015, 75% of people in UK look for health information online, and in less than three years, the number of existing health apps for iOS and android, the leading platforms, has more than doubled in three years, reaching 100,000.

Another related market that is increasing is Wearable Technology, more specifically bio-sensing devices, such as fitness bands, digital hearing aids, blood pressure monitors, and even ingestible devices, often called smartpills. (Deloitte Center for Health Solutions, 2015)

CCS Insight predicts a growth in shipments of wearable devices from 9.7 million in 2013 to 135 million in 2018 with wrist-worn devices such as Apple Watch predicted to account for 87% of the market. (CCS Insight, 2015)

In less than three years, the number of health apps for the platforms Android and iOS has more than doubled. A report in October 2013, based on research by IMS Institute for Healthcare Informatics, examined over 43000 mobile health apps available from the Apple iTunes App Store in June 2013 and concluded that only 23682 had a legitimate health function. 7,407 were aimed at HCPs and 16,275 were aimed at the consumer/patient. Of the health apps available on Android devices, more than 50 per cent achieved fewer than 500 downloads, while five apps accounted for 15 per cent of all downloads in the health category.

Boulos et al., 2014 make an extensive review medical health apps and organize them in the following categories: Apps for medical providers, specialty or disease-specific apps, medical education and teaching and apps for patients and general public.

1.7 M-Health as a telemedicine tool

Mobile phones and tablets, combined with specific applications designed to provide distant healthcare delivery at a distance can be roughly classified in two categories:

- Devices and applications design for the end-user
- Devices and applications that strengthen the health delivery system

The first category includes patient medication reminders, appointment schedulers and personal monitors of vital signs.

Other solutions such as panic buttons, large scale telemonitorization units and large scale notifications, such as vaccination notifications, integrate the second category, since they serve the health system as a whole.
Vaishnav (2014) synthesized a list of the main element who benefit from m-Health strategies:

- Professionals, with degree of mobility
- Populations in remote settings and inaccessible areas, where access might not exist
- Geriatric individuals with limited mobility
- tribal communities and those living within forests
- Professionals active in remote locations, due to the nature of their work
- A set of barriers are considered for the integration of m-Health in health systems:
- Absence of standards for the linkage and compatibility between different platforms
- Expensive communication between satellite and global mobile devices
- Lack f access to 2G and 3G services
- Lack of integration between existing eHealth services in other information systems

1.8 M-Health in Africa

Countries in the African continent suffer from severe shortages in health, which can be attributed to the high population growth, high disease burden, shortages in human resources, extensive rural populations and financial shortages.

Until recently there were strong limitations in the incorporation of technologies in health in developed countries such as the lack of internet access and telephone networking. However, there was a recent explosion in the penetration of mobile technologies, most notoriously in the African continent. (African Health Observatory, 2015)

In many regions of Africa, basic access to healthcare is a challenge and m-Health has the potential to provide remarkable development opportunities.

Governments of low and middle income countries are starting to contemplate m-Health as a strategy for strengthening health systems and achieving Millennium Development Goals. (World Health Organization, n.d.)

The recent economic developments across Africa have also been attracting the attention of stakeholders in the m-Health market and sub-Saharan Africa is predicted to become the fastest growing region in the world. The increase in mobile access, development of high quality networks, healthcare apps and demand for wearable devices are also m-Health investment drivers

Mobile penetration in sub-Saharan Africa is close to exceeding 80%, and mobile phones are being used as important tools for business and services, besides basic communication functions. (Deloitte Center for Health Solutions, 2014)

In contrast to developed countries, where the focus is the reduction of healthcare costs, sub-Saharan African countries and other developing countries need strategies that help attending basic healthcare, diagnosis and disease prevention.

A wide range of m-Health services have been successfully used for treatment compliance, diagnosis and treatment support, some based in technologies as simple as text messaging. More complex applications consist of complete system infrastructures, which allow remote monitoring and audio-visual communication in real-time between patients and providers.

The use of mobile phones by birth attendants in Ghana for reporting post childbirth hemorrhage data was evaluated by Andreatta et al. (2011).

Wakadha et al. (2013) studied the feasibility of a Short message system reminder and mobile phone based conditional cash transfer intended to reach patients in rural Kenya. This system would send a reminder Short Message S to mothers three days prior to the scheduled immunization appointment. Approximately USD $2 would be sent as cash via mPESA, a mobile money transfer platform, to mothers if the child had been vaccinated within 4 weeks of the date.

In other experiments, such as the one made by Neupane et al. (2014), have tried to substitute paper based data collection systems by m-Health systems. The proposed system had the advantage of enabling accurate tracking of referrals and enhancing supervision of community health workers.

Other authors assessed workers experiences in Ethiopia concerning mobile health forms consisting in a list of questions to be asked to mothers coming to the health post or health center for maternal health services. The health extension workers and midwives participating in the study found the electronic forms useful for their work. (Medhanyie et al., 2015)

Applications also exist for disease surveillance, such as MPneumonia, a user-friendly diagnostic and management tool for childhood pneumonia and other childhood illnesses that integrates a digital version of the IMCI. (Integrated Management of Childhood Illness)

Others developed an algorithm with a software-based breath counter to help health professionals to more accurately count a child’s breaths and an off-the-shelf reusable pediatric pulse oximeter to detect hypoxia. (Ginsburg et al., 2015)

Other authors showed that mobile phones were a practical mean of reporting adverse reaction to anti-malarian drugs. (Andreatta et al., 2011)

A diabetes peer support Short Message Service (SMS) based system was used by Adedeji et al. (2011) to provide support to women in Cape Town in South Africa managing their diabetes.

Many applications provide support and educational advice, such as Jamison et al.'s application, that allows users to text questions related to sexual and reproductive health to a server, and Kaufmann,

Keim, & Ph, (2014), that allow communication between mothers and a community health worker, and issues an alert to a health facility and an ambulance in the case of an emergency.

Despite the full variety of m-Health projects in different countries, some with promising results, expanding these projects has proven to be challenging and most do not pass the pilot phase.

Aranda-Jan, Mohutsiwa-Dibe, & Loukanova (2014) concluded that dependency on funding, unclear healthcare system responsibilities, unreliable infrastructure, and lack of evidence in cost-effectiveness are important barriers.

Brinkel et al suggested that in order to accomplish a wide-scale implementation of m-Health projects some basic requirements should be filled: They considered the implementation of services should be driven by the needs of national heath sectors and not by the intense technology market pressure; Secondly it should be kept in mind that ICT are dependent on technologic infrastructures that are often not available or weak in many sub-Saharan African countries.

In a systematic review, Aranda-Jan et al. (2014) analyzed forty-four studies on m-Health projects in Africa. They identified general positive health related outcomes that are due to the accessibility, acceptance and low-cost of the technology, effective adaptation to local contexts, strong stakeholder collaboration, and government involvement. Identified threats were dependency on funding, unclear healthcare system responsibilities, unreliable infrastructure, and lack of evidence in cost-effectiveness. (Aranda-Jan et al., 2014)

1.10 Wearable Devices

Wearable technology includes items, such as jewelry, glasses, clothing and others, incorporating sensors and other electronic technology, from fitness bands that monitor activity and sleep patterns to flexible patches that can detect body temperature, heart rate, hydration level and other physiologic variables.

The adoption of wearable devices is being driven in part by the success of mobile apps and services designed to monitor and improve users' health and wellbeing. (Health wearables: Early Days, 2014)

A study revealed that 50% of the respondents had never heard the term "wearables". Men are more likely to have heard of wearables (53% vs. 45% of women), as unsurprisingly are young people (52% vs. 46% of those over 35). What is perhaps more revealing that globally feature phone users are more likely to be aware of them than smartphone owners (54% vs. 49%).(*Global mHealth & Wearables Report*, 2015)

1.11Comparison between three countries

United States

The U.S. is currently the largest health market ("Enabling Telehealth", 2015) and according to the World Health Organization, it is one of the countries with highest healthcare expenses, valued in

$9,255 per capita and 17.4% as percentage of its Gross Domestic Product in 2013.They are also the leading nation in terms of medical innovation, with high results in terms of drug and medical device introduction.

USA's healthcare system is often criticized for being unsustainable and unable to provide equality in access to healthcare. On the one hand, it has the highest access to MRI and CT scans from the OECD countries. On the other, 11.7 of the population remained uninsured in 2014 and the leading cause of personal bankruptcy in the U.S.A are out-of-pocket medical expenses. (“Obamacare Facts: Facts on the Affordable Care Act,” 2016 & Mangan, 2013)

Another problem face by the US healthcare system concerns the lack of doctors due to restriction on physician trainings. According to Association of Medical Colleges, the USA is expected to face a shortage of 150,000 doctors in another 15 years due to slow rates of graduation and training. (Ruiz, 2008)

Teaching hospitals and medical schools are making efforts to increase the number of doctors, but the shortage is imminent, specifically for primary care physicians.

In 2010 the Affordable Healthcare Act was introduced, with goals such as transforming healthcare financially, technologically, and clinically in order to achieve better health outcomes, lower costs, and improve distribution and accessibility.

Some attention has been brought to telemedicine and telehealth by AHA, due to the potential of providing cost-effective care. Affordable Care Organizations, groups of providers that coordinate the delivery of services together, in particular, are required to have defined quality care processes, reporting on quality and cost measures, and coordination of care through telehealth, remote patient monitoring, and other technology-driven delivery measures. (“Are we there yet? Telehealth, telemedicine, and the ACA,” n.d.)

With ACA, Center for Medicare and Medicaid Innovation (CMI) was also created, wand one of its goals is to test new payment models. Requirements for these models are (1) the promotion of broad payments and practice reform in primary care, including those practices with a focus on patient-centered medical home models; (2) the use of HIT-enabled networks to increase care coordination for those who are chronically ill and at high risk of hospitalization; and (3) the utilization of telehealth services to treat behavioral issues and to improve the capacity of non-medical providers and non-specialized medical providers to provide health services to those with chronic conditions. “(“Are we there yet? Telehealth, telemedicine, and the ACA,” n.d.).

As with other medical innovations, the United States of America are a testing ground for telemedicine developments. According to the American Telemedicine Association (ATA), there are 200 telemedicine networks and 3500 telemedicine service sites. In 2013, 52 percent of hospitals used telemedicine services and another 10 percent were implementing them. (“American Telemedicine Association,” n.d.)

American Telemedicine Association

The American Telemedicine Association was funded in 1993 as a non-profit organization and headquartered in Washington, DC, and is currently is the leading international resource and advocate promoting the use of advanced remote medical technologies. The ATA has the mission of promoting professional, ethical and equitable improvement in health care delivery through telecommunications and information technology, through several means, such as educating and engaging government, payers and public about telemedicine, providing information and services for those who are willing to practice telemedicine, fostering networking and collaboration among allied interests in medicine and technology, promote research and innovation, development of standards and policies, ensuring a strong financial basis for the association to support operations and to create awareness and support.

Specifically, the ATA has several practical guidelines concerning the practice of telemedicine. It has also been focusing on the topic of telemedicine service reimbursement by Medicare and Medicaid, and published a white paper in which details about Medicare coverage are explained and state-specific information concerning coverage of telehealth services by Medicaid.

Veterans Health Administration (VHA)

Within health systems in the USA, The Veterans Health Administration (VHA) is the largest, serving 5.1 million veterans nationwide. (“Veterans Health Administration,” n.d.)

The VHA has explored cost-effective alternatives to healthcare for more than a decade and since 2000 has provided telemedicine solutions. Telemedicine appeared as a lower cost alternative to institutionalization for the large number of veterans with advances age, multiple disease conditions and living and remote regions.

In 2013 202,823 video consultations have been conducted and services were provided to 90,000 patients in their homes. (Sullivan, 2014)

The VHA has been a prototypical example for good practices in telemedicine in developed countries. It does not suffer from some of the barriers that are present to telemedicine in the country, related to licensure and malpractice liability, since as a federal entity, it is not subject to state licensure issues that hinder other providers. It also has a good information technology budget, defined in 2015, of USD $68.4 billion for the department, and $900 million of that goes toward health IT in general and USD $567 million to telehealth specifically. (Sullivan, 2014)

The VHA has a Care Coordination Home Telehealth, a program focusing on providing care to veterans by connecting home to a VA hospital. The essential components of the program are face-to-face orientation, telephone contact with a care coordinator and daily monitoring sessions using a home telehealth device to assess medication, compliance and symptoms. (“Veterans Health Administration,” n.d.)

This program is used for the monitorization of symptoms in diabetes mellitus patients, as shown by (Ngabo et al., 2012)

While among veterans older than 60 years old, most studies focus on treatment of chronic conditions, among younger veterans they focus on mental health, such as depression or post-traumatic stress disorder.(Ruskin et al., 2004) compared outcomes for depressed veterans having face-to-face versus remote treatment. An example of a collaborative model of care for mental illness in VHA was that evaluated by (Fortney et al., 2007) which involved five types of providers: Primary care practitioners located at the VA community-based outpatient clinics, consult telepsychiatrists located at the parent Veterans Administration Medical Centers, an off-site depression nurse care manager, an off-site clinical pharmacist and an off-site supervising psychiatrist.

Kaiser Permanente

Kaiser Permanente is an integrated managed care consortium, based in Oakland, California, United States, founded in 1945.

Currently this group has services for remote primary care, neurology, virtual inpatient rounding, mental health, and dermatology in various stages of implementation. Members are able to send photos of skin conditions or show them to their doctors via video chat. Physicians can view these images and talk to their patients during the video chat or through phone call. They can also send patients an email with a diagnosis and treatment options. 80% of patients who participated in the teledermatology program were likely to recommend it to others and two out of three reported not needing an in-person follow up visit because their issue had been resolved. (Fortney et al., 2007)

In 2015 Kaiser Permanente Ventures invested $10 million in Vidyo (www.vydio.com), a visual communications company that integrates high definition video communications into eel electronic health record systems and workflow.

According Dr. Robert Pearl, executive director and CEO of the Permanente Medical Group and president and CEO of the Mid-Atlantic Permanente Medical Group, by 2018 Kaiser Permanente will perform more virtual visits than in-person office visits. (“Kaiser Permanente’s Dr. Robert Pearl Predicts More Telemedicine Than Office Visits by 2018,” 2016)

North Carolina telepsychiatry network

Twenty-eight counties across North Carolina do not have a psychiatrist, and an additional 18 counties have only one psychiatrist. (Holton, Andrew Brantley, 2014)

The North Carolina General Assembly in July 2013 established the statewide telepsychiatry system. The legislature appropriated USD$2 million for the program for 2013-14 and USD$2 million for 2014-15. The Program is administered by East Carolina University’s Center for Telepsychiatry and e-Behavioral Health. All hospitals licensed to operate in North Carolina are allowed to participate. Of North Carolina’s 108 hospitals, 49 already were already providing telepsychiatry in 2014.

The program was modeled after South Carolina’s use of telepsychiatry that has increased access to care for rural communities.

From 2010-13, the average number of patients treated using telepsychiatry grew from 8.7 to 12.3 per day. The length of stay in emergency departments while waiting for treatment decreased from 48-72 hours in 2010 to less than six hours in 2013. Specific findings in this project were

- Reduction in the length of stay for patients in emergency departments waiting to be discharged from 48 to 22.5 hours.
- Decline in the number of patients who had to return for treatment within 30 days from 20 percent to 8 percent.
- Decrease of 33 percent in the number of commitments to local or state psychiatric hospitals
- Satisfaction levels of 80 percent (Holton, Andrew Brantley, 2014)

Telemedicine on demand companies

Demand for affordable care is increasing due to the aging population, increasing incidences of chronic disease as well as the expansion of insurance coverage through the Affordable Care Act.

Companies such as American Well, Doctor on Demand and Teladoc have been around for more than a decade, but the number of consultations has been increasing rapidly in the last few years.

These companies offer on-demand access to a doctor, relying on the patient's Smartphone or computer to act as a virtual office. In general they charge a certain fee per patient, of which a portion goes to the virtual doctor and another to the company. (Kelly, 2015)

Teladoc was founded in 2002 and offers services via employers and health plans. It has 11 Million members, more than 1,100 board-certified physicians and a $1 Billion valuation. They have a partnership with HealthSpot Stations that allows employers to offer on-site clinics via private kiosks. The consultations have a fixed fee of USD$40, but industry and insurance companies underwrite a large percentage.

Doctor-on-Demand was c-funded by Dr. Phil and is supported by Google and they have 1400 primary care physicians on staff.

While not a replacement for traditional doctor appointments, the size of the market is clearly expanding as both providers and patients become more comfortable in adopting this approach for ailments and symptoms that are not life-threatening, and as the reach expands to include behavioral health and second opinions. (Allen, n.d.)

Australia

Australia is the sixth largest country by area, with a population of approximately 25 million, that mainly concentrates coastal regions, especially in south east of the continent. 85% of the population resides in urban areas by 2010, making it one of the most urbanized countries worldwide. Most cities are located within 50 km of the coastal line, while the middle of the continent has a vast unpopulated area. (Permanente & Stories, 2015)

As other developed countries, Australia has an aging population, with 13% of people aged 65 years, with this number projected to increase to between 23% and 25% in 2056. (Banks et al., 1999)

The Australian healthcare system of consists of two sectors: Medicare system and private health services. The Medicare public system was introduced into the country in 1984 by the government allowing all eligible Australian residents access to free to low-cost health facilities and/or services which are financially funded by taxation called a Medicare levy. (Banks & Togno, 1999)

Telemedicine in Australia

The differences in access to healthcare between urban and rural populations in Australia are striking, with life expectancy being four years shorter in rural settings. In terms of healthcare workers, the number of medical professionals per person is half in rural regions, in relation to urban regions. (The World Bank, Standing Council on Health, 2012)

The Australian government promotes initiatives that aim to attract medical professionals to rural settings, such as scholarships and financial incentives.

Telemedicine and telehealth are also target of investment with the purpose of compensating for these inequalities in access.

The earliest implementation of telehealth started in 1928 with the Royal Flying Doctor Service delivering healthcare services via a 'pedal wireless'.

Bahaadinbeigy et al (2010) evaluated the use of telemedicine in health institutions in Western Australia, and found seven public hospitals that were main providers. Of telemedicine services, all located near Perth, the only large populated city. From 22 private hospitals, 17 used telemedicine and 12% of these used videoconference. Public hospitals had a much higher use, with 86% using videoconference.

Besides videoconferencing services, store-and-forward telemedicine was used most commonly to transmit ECG data, reported by 54% of respondents. Overall the survey noticed a tendency for the increase of the use of telehealth services with the increase of the distance from Perth. (Bahaadinbeigy, Yogesan, & Wootton, 2010)

One of the biggest telehealth initiatives in Australia was the Rural and Remote Mental Health Service, founded in 1996, that started in South Australia and extended to the Northern region soon after. This project uses videoconferencing to support the delivery of primary mental health services to the Australian population, such as inpatient assessment, evaluation of new patients, and reviews. (Raven et al., 2013)

The Health-e-regions is another project, implemented by the University of Queensland Center for Online Health. The aim is to promote awareness of telehealth and to reduce the cost burden on families who need to travel significant distances to visit a specialist in the city. (Alexander & Fraser, 2007, Cameron, Ray, & Sabesan, 2015)

The use of mid-level dental providers and telemedicine to expand access to oral healthcare in Australia has been discussed as solution to directly solve the lack of dental specialists (Estai, Kruger, & Tennant, 2016). They suggested the implementation of models in which a dental team member other than a dentist is trained to provide care, with the support of a dentist via telemedicine. The authors argue mid-level dental providers are suitable for most basic tasks performed by a dentist, but are less reluctant in working in rural areas, their training takes up less resources, and their consultation time is less expensive. For most complicated cases they can either be aided by the dentist via videoconsultation or refer the patient to him.

Cancer is another focus of telehealth, as it is the second cause of death for aboriginal population. As the higher mortality may be correlated to the late treatment, co-morbidities and higher incidence of lethal types of cancer, teleoncology models have been tested in these populations. (Sabesan et al., 2012)

The stage of development of telehealth in Australia also varies among the different states. Queensland and WA have relatively well established state-wide telehealth networks, with broad coverage across a wide range of specialties. Conversely, telehealth services in the NT, ACT, SA and Tasmania are less mature. Victoria and NSW are at a medium stage. (Ministry, 2015)

Even in the jurisdictions with less well developed telehealth services, some specific telehealth-enabled models of care are relatively mature and well integrated (e.g. telepsychiatry in SA and telestroke in Victoria).

Queensland has over 2000 systems in over 200 hospitals and community facilities across the State.

In South Australia, in the 2013/14 financial year, there were just under 10,000 conferences with approximately 4,000 clinical consultations using telehealth facilities. (Inquiry into telehealth services in Queensland, 2014).

India

India is one of the world's largest countries and the second most populous nation worldwide, with 3,287,590 square kilometers. It is constituted by 29 provinces and 6 union territories. (“India country profile,” 2015)

Despite the economic growth over the last decades, India still contains the largest concentration of people living under the World Bank's international poverty line of US$1.25 per day.(“Poverty and Equity,” n.d.)

Healthcare quality in India is quite variable, approaching western standards in major populations, which are becoming main providers in medical tourism, but with rural populations suffering major shortages.

Only 2% of doctors are in rural areas – where 68% of the population live. (Britnell, 2015)

Qualified and experienced healthcare professionals are reluctant to practice in rural areas, as they are less lucrative and under-equipped. Inexperienced health professionals practice in rural areas but tend to migrate to urban areas as soon to as they gain experience. (Jarosławski & Saberwal, 2014)

About 80% of the population depends on non-allopathic medicine and a study of the Indian pharma has concluded that the penetration of modern medicine in the country is only of 30%. (Jarosławski & Saberwal, 2014)

Telemedicine in India

Telehealth initiatives have been used to address the major inequalities in the access to healthcare, answering the lack of care in rural and semi-rural areas.

Currently there are more than 400 telemedicine projects in India, according to Telemedindia, n.d..

The entities responsible for the majority of the telemedicine implementation are India Space Research Organization (ISRO), the Department of Information Technology of the Ministry of Communication & IT and the Ministry of Health and Family Welfare, State Governments and medical institutions. (International Telecommunication Union, 2011)

The ISRO started the use of telemedicine in 2001, through Indian satellites, connecting rural, remote and medical college hospitals and Mobile Units to major specialty hospitals in cities. The Mobile Units are vans that provide diverse medical services of specialties such as Ophthalmology, Cardiology, Radiology, Diabetology, Mammography, General medicine, Women and Child healthcare.

The Apollo Telemedicine Foundation, which owns the Apollo group of hospitals, based in Chennai, India was one of the first receiving international healthcare accreditation in the country and has a telemedicine network. It is credited with being the first to setup a Rural Telemedicine center in 1999 in Aragonda (in Andhra Pradesh). Today, ATNF has emerged as India's single largest provider in the area of Telemedicine with over 125 peripheral centers including 10 overseas.

Jarosławski & Saberwal in 2014, conducted semi-structured interviews in 28 organizations, to evaluate their use of eHealth. Of these organizations, 24 had care services at a distance, I.e. telehealth services. Two distinct types of programs were provided, for rural and semi-rural, and to urban areas.

Rural telemedicine programs were mainly based on four types of healthcare points:

- **Stationary clinics** – Connected to central hospitals, build by the government, or that already existed and were equipped to provide telemedicine consultations;
- **Outreach vans** – Mobile units which work independently or in cooperation with a clinic, carrying nurses, a physician or a technician, a small pharmacy and basic medical equipment and allowing teleconsultations.
- **Healthcare workers** – Provided with mobile phones with applications to help prenatal patients. These workers often receive small amounts of money to bring patients to centers to perform teleconsultations.

- **Mobile applications** - For example health games that can be played in lower end mobiles or SMS's for behavior change. (Jarosławski & Saberwal, 2014)

Among programs focused urban users, some companies focus on primary and preventive care, creating awareness about health, diet and fitness, and working for behavior change. They may also enable web-based consultations, with the patient reaching a nurse, a doctor or an ambulance from home.

As mentioned above, the ISRO is one of the major providers of telemedicine in India, and still makes use of Indian Satellites. While satellite communication is still used, the equipment is bulky and cannot be easily taken to remote locations and its use is becoming obsolete.

Another type of connectivity involves the (public sector) Indian Railways. Most of the tracks are hooked up to the landline telephone network, and one public sector initiative locates projects near railway lines for this reason.

A survey concerning the type of internet connection in Indian health institutions concluded that 60% of the respondents used Satellite connectivity (384 Kbps to 512 Kbps), around 25% used ISDN (128 Kbps to dual line 256 Kbps), 8% used ADSL (256 KBPS) and 8% used HDSL (1 Mbps).PSTN and wireless 2G and 3G links were used by only one institution each.

Main findings concerning the three countries

The following table, summarizes aspects concerning the three countries discussed above, for a brief comparison:

Table I – Comparison of US, Australia and India

	United States	Australia	India
Population	Very High Income	Very High Income	Low Middle Income Nearly 40% of population lives below the poverty level
Implementation level	Most mature telehealth in the world More than 200 networks connecting more than 3000 sites (according to ATA) Half of American hospitals have some telehealth service Some difficulties in interoperability due to	Different telehealth development degrees in different states Focused on specialist consultation to rural and remote areas Numerous pilot projects, lead usually by few motivated implementers	Commercial adoption of telemedicine in its infancy Teleconsultations, and telemedicine projects providing specialty consultations in clinics and mobile vans Telehealth networks for imparting skills training and academic health education to remote

	differences in EHR		medical staff from virtual class rooms Several pilots over the last decade, have provided some experience and learning No interoperability between most services established; each network uses their own health record system.
Technology	Point-to-point connections using private high speed networks Technologically very developed	National Broadband, that has the potential to improve delivery of health services Technologically very developed	Internet acquired mostly Satellite connectivity Great inequalities between urban and rural areas access Most primary and secondary health facilities are not computerized Global IT hub and global provider
Organizations	American Telemedicine Association – Information on telemedicine, policies and recommendations for providers VHA – Largest home telemonitoring provider Large private institutions-Kaiser, Maio clinic Several direct to patient services: Teladoc (www.teladoc.com) Doctor on Demand (www.doctorondemand.com), etc.	Telemedicine Australia Ministry of health website State institutions Lack of interest by private sector	IRSO Center for Development of Advanced Computing Universities Large private institutions, connected through telemedicine to other countries- Apollo Hospitals
Main barriers and difficulties	State dependent laws: Licensing issues for	Different degrees of development in different	Communication issues: 22 official languages

	those who want to practice in more than one state Inconsistent reimbursement policies except for Medicare Medicare's reimbursement policy mostly applied to rural areas and require patient to be at the clinic	states Lack of reimbursement for some services, particularly home telemonitorization Lack of inter connectivity between existing state and territory networks	less than 100 million urban computer literate only 65,38% of the population is literate 0.25 to 2.3 per 1000 people nearly 40% of population lives below the poverty level 0.25 to 2.3 health workers per 1000 people Some rural telehealth services with low use, due to the shortage of electrical power supply Although Smartphone use is increasing, most platforms are based on desktops
Opportunities and areas of expansion	Need for productive healthcare: Aging population ACA increased number of people with access to insurance – increase in the demand Shortage of health workers Efforts to unify licensure and increase reimbursement	Increasing availability of consumer oriented solutions Increased support for older age care, which includes telemedicine Use of social networks to support health providers and receivers	Satellite connectivity provided for free by IRSO Development of Advanced Computing (CDAC) developed low cost Telemedicine and Hospital information systems applicable to general telemedicine Great recent increase in telecommunications access Great recent increase in Smartphone ownership

1.12 Portugal

EHealth in Portugal

Society of information is a concept, described in Portuguese for the first time in Green Book for Information Society (1997), as the integration of information technologies as a fundamental aspect of society. (Carrasqueiro, 2007)

In the year 2000, Plano Saúde XXI was the first health plan specifically focused on the improvement of health services through the use of ICT. The general objective was to “Elevate the qualification level of the Portuguese citizens, Promote employment and Social Cohesion”. Specific goals included using ICT to improve efficiency and productivity of services and to produce statistical information that could be used to monitor the populations’ health level, through Information Systems.

Concerning broadband connection, there was a growth of 16% between 2004 and 2012, in which 96% of institutions reported having broadband internet access.

In his publication Monteiro (2007) compares 1997 to year 2007.

Among the major changes, the author points out:

- Gradual implementation of intranet as cooperation tool in hospitals
- Implementation of clinical information systems and digital medical image archiving in hospitals and health centers
- Development of the presence of the health system on the internet through the construction of websites.

In 2005, the Portal da Saúde (https://www.sns.gov.pt), the official health ministry website began its activity and as mentioned before, later in 2007, Linha Saúde 24(www.saude24.pt) appeared.

The current organization responsible for eHealth tools in the National Health System is the Shared Services of the Ministry of Health (SPMS – Serviços Partilhados do Ministério da Saúde – http://spms.min-saude.pt/).

Telemedicine in Portugal

The concept of telemedicine in Portugal first was promoted during a successful conference in AIMS (Advanced Informatics for Medicine) conference by DGXIII of EU, 1994.

In 1999, CIEDT (Commission of Accompaniment of the Strategic Initiative for the Development of Telemedicine) was constituted. This organization, along with the Ministry of Health proceeded to promote telemedicine. (Matos et al 2014)

Along the years, several projects appeared, mostly financed through organization such as PIDDAC, (Program of Investment and Expenses and Central Administration) Saúde XXI, INTERREG, POSIC and POAP.

Cunha in 2004 commented on these type of implementations, characterized by their dispersion and isolation, that is a consequence of a lack of global strategy in what concerns telemedicine implementation.

Despite this impression, since 2001 there have been some efforts to promote telemedicine at a national level. Four study groups were created, respectively in 2001(dispatch no. 24 142/2001), 2005, 2007 (Dispatch no. 6538/2007) and 2013 (Dispatch no. 357/2013), to promote telemedicine, with goals that evolved in time, from identifying existing projects, to proposing legislation and most recently proposing more concrete implementations.

Matos et al (2014) elaborated a list of all the telemedicine experiences in Portugal.

The author also calculated the installed capacity of telemedicine, numbering not only the number of platforms (she used the term platforms for the set of equipment one needs to perform a telemedicine service) but also distinguishing the ones that are active, through a survey directed towards 187 health service providers in Portugal (which is not a sample, but the whole universe), 121 from the national health service, 45 private, 9 social institutions and 4 military institutions.

Recent action of the GTT

The formation of GTT was announced, along with a set of other groups, by dispatch no. 8742/2012. GTT is currently one of the working groups of CAIC in SPMS.

In 2013, important specific orientations concerning telemedicine activities were published, with the goal of promoting the formation of a telemedicine network.

A set of specialties that should be prioritized were:

Dermatology, Physiatry, neurology, cardiology, Pediatric Cardiology and Pneumology.

Further, it was recommended that whenever possible, hospitals should promote the use of teleconsultations and telemonitoring with collaboration of the health centers in the same region, or with hospitals from the rest of the country. Telemedicine services were to be contracted by ARS and factorized by providing entities.

The dispatch nominates ARS, SPMS, DGS and ACSS as regulator entities of telemedicine functions.

Operational concepts were provided by the type of telemedicine services that were to be provided by public health institutions:

- **Tele-screening /Store and forward Tele-consultation** – Currently applied to dermatology
- **Real-time Tele-consultation** – With an established network currently working in Alentejo.
- **Tele-monitorization** – Currently being applied to COPD, as a pilot, with plans to expand to other medical conditions.

1.13. The actors in telemedicine

As mentioned by Mevish P. Vaishnav (2014) people involved in telemedicine projects influence the outcomes of these projects.

One of the goals of this work is to evaluate the roles that the “users” of telemedicine assume. By “users” both patients and doctors will be concerned, depending on the service.

In tele-consultations, for example, a more active role will be assumed by the doctors, both the presenter/consulting and the consultant. In this particular case, these are the elements, maybe supported by other health professionals, who deal with the technology. Consequently, in this case they are those who are more susceptible to be more influenced by technical issues. Patients are still “users” in the sense that they benefit from the service. They might have objections against the teleconsultation, such as fear or distrust. However, their role is definitely more passive. They might influence to some degree the service, but not in such a practical manner as the doctors.

Other services, such a telemonitoring, will involve a more active role from the patient, or his carers in his place. On the other side of the line, the doctor or health professional in charge will have an active role too. In this case, objections by the patient/carer will have a deeper effect on the service. Also, his natural objection and distrust will also have a deeper effect on the service.

Advanced Encounter model for teleconsultations

LeRouge, et al (2012) modeled the relations established by actors in the specific case of real-time teleconsultations, following traditional service delivery concepts and adapting them to the context of telemedicine interactions. They analyze the strength of the links between the actors and classify them as “tight” when there is repeated or intense contact between service actors or “loose” when there are infrequent or superficial interactions.

They define the actors involved in telemedicine as patient, providers, the presenter and the technology.

They thus define a new type of service relationship called Advanced Encounter, as represented in figure 3.

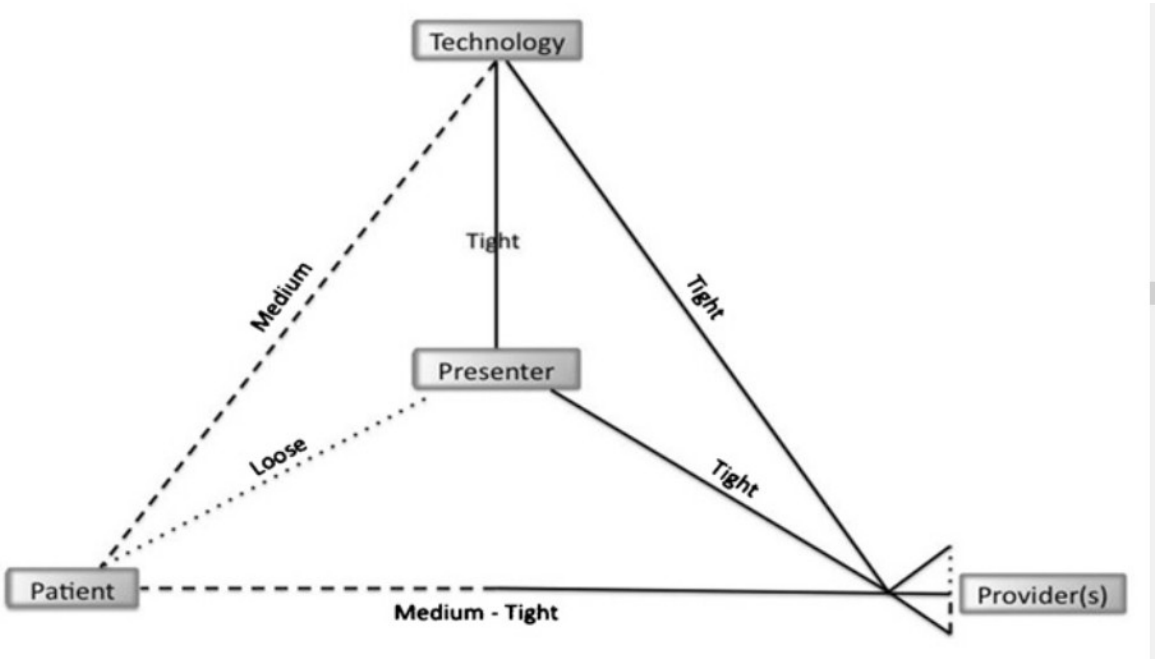


Figure 3 – The advanced encounter, as described by LeRouge et. Al 2012

Provider and patient: Medium to tight link – The confidence needed for the successful telemedicine encounter seemed to depend on one's confidence in the provider's expertise and understanding of the patient's condition.

- The Physician should take time to introduce himself with a brief overview of his credentials.
- Patients did not expect the encounter to be as "speaking with a friend" but satisfaction was improved if the encounter was enjoyable

Provider and Technology: Tight link - It is of great importance that the provider can focus on providing the service, rather than figuring out the technology.

- Equipment should be ergonomic and easy to maneuver.

Patient and Technology: Medium - It is not a tight link in the sense that the patient usually does not interact directly with the technology, however, his role should not be minimized by classifying the link as a loose link and equipment handling should be physically comfortable for the patient. In the author's research, the most notable aspect of patient interaction with technology was the videoconferencing system visual feedback. This feedback made the patient more comfortable about what the doctor was seeing on the other end.

Aspects concerning the patient

Some works have focused on the opinion of patients who telemedicine services, and inquiry them concerning their satisfaction with the overall service and aspects such as technical issues and quality of the interaction with the health professionals.

In a pilot investigation, Robinson, et al (2015) assessed perceptions of acute care telemedicine of 100 stroke patients who had tele-consultations with a neurologist following a stroke. 38% of the patients considered their treatment to be excellent, and 30% considered it to be above the average. Describing the effectiveness of the technology that was used, 89% of the patients did not experience a single technical problem and 95% had no problems understanding the neurologist during the consultation. Generally, the study demonstrated a high level of satisfaction. (Robinson, Turner, & Wood, 2015)

In another study, Parkinson's Disease patient's perspective was evaluated at Toronto Western Hospital, Movement Disorders clinic, using a structured telephone interview. Users reported an average of $200 in cost reduction, an average of 209 minutes in travel time reduction, and an average reduction of 160 km in distance traveled to clinical appointments per clinical visit. From the 34 users participating in the study, only five chose to discontinue telehealth treatment, and reported the inexperience of the personnel as major reason. However, close to 90% of the users felt highly satisfied with the technology, and over 80% reported satisfaction over the several aspects of the quality of care. (Qiang & Marras, 2015)

The influence of patient engagement

Patient engagement is defined by Angela Coulter as the cooperation of patients and health providers to “promote and support active patient and public involvement in health and healthcare and to strengthen their influence on healthcare decisions, at both the individual and collective levels.”

Barello et al., 2015 reviewed how patient engagement is assessed in different studies and concluded that different authors use different measures of engagement. In this work they say that patient engagement is complex and not restricted to the adhesion of patients to treatment, arguing that it has three main dimensions:

- Behavioral dimension – related to all the actions taken by the patient to face the disease and the treatments, i.e., what the patient does
- Cognitive dimension – what the patient knows and understands and how he views his disease, treatments and its developments and monitoring, meaning what the patient knows and thinks
- Emotional dimension- concerns the psychological reactions of the patient when adjusting to the disease and the changes in lifestyle that are attached, meaning what the patient feels. (Barello et al., 2015)

The influence of patient's engagement can be considered at several levels:

- **Direct care level –** The first level of interaction; describes the values, opinions of individual patients which influence his own healthcare. Most of these aspects are also related to his

interaction with medical professionals; other activities include the patient making research concerning health, or participating in community based activities such as support groups.

The amount of information in this level varies from a point where the patient is only passively receiving information from the physician to one in which the patient acts as an active member in the care team, making decisions and actively managing his health. (Carman et al., 2013)

- **Organizational design and governance level -** Considers the contribution of the patient's values and perspectives in the design and governance of health institutions. At a high level of participation, patient's contributions are valuable, helping to set goals and agendas for the organization. (Carman et al., 2013). An example is the Dana-Farber Cancer Institute, where family members have participated as members in continuous improvement teams and even taking part in hiring and staff training(Ponte et al., 2003)
- **Policy making level -** Development, implementation and evaluation of national and local policies. The patient engagement is a public or citizen engagement and their expectations are taken in consideration by community leaders or policy makers, such as the employers, governments and representatives when making decisions. The interaction can be made individually by patients or by means of their representatives such as consumer organizations.(Ponte et al., 2003)

Reports exist demonstrating that patients who are engaged in their own health receive better outcomes.

For most applications as found in literature, while patient's satisfaction and perspective is evaluated, they do not have a much different role than the one in traditional medical encounters; in teleconsultations, for example, the doctor interacts with the equipment and with the remote provider, not the patient. However, technologies seem to be walking towards having patients participating in a more active manner; as mentioned, in the US many companies provide consultations services directly to the patient, without a presenter. It would be interesting to understand how telemedicine encounters centered in patients depend on their engagement, or on the other hand, how they contribute to higher levels of engagement by these patients.

Aspects concerning health professionals

It has been shown that medical professionals play a major role in the sustainability of telemedicine projects. (Wade, Eliott, & Hiller, 2014) propose "clinician acceptance" as a key factor for sustainable telehealth services, based on their multi-factor meso-level model. Other factors related to clinicians were clinician workforce availability, positive beliefs about telehealth, good relationship between professionals and clinician's demand for services.

Paul & McDaniel (2016) tried to understand what were significant drivers influencing healthcare continued participation of physicians in teleconsultation projects. Their study included telemedicine networks, consisting of a university-affiliated health sciences center as the hub and smaller healthcare facilities as the spokes.

In this study, he found two fundamental key drivers in the continued participation of clinicians in telemedicine projects:

- **Time-constraints** – While clinicians could tolerate additional demands on their time in the short-run, on the long run these demands strongly limited their continued participation in telemedicine projects.
- **Sense of professional isolation of the remote site healthcare providers –** This feeling was a consequence of lack of healthcare resources available on the spoke sites. This sense of isolation" was further reinforced by how they perceived these limitations negatively impacting their ability to provide quality care

Previous work on the perspectives of the health professionals

Levine et al (2014) tried to examine the perspectives of primary care providers about how novel telemedicine technologies might best be used in the management of older adults with chronic non-cancer pain. The majority of participants were aware of telemedicine but had limited experience using it. However, the majority stated that they would be willing to try it.

The perceived barriers to this implementation were the uncertainty about how to manage the overload of data generated, concerns that patients or caregivers would be unwilling or unable to use devices, that physicians would be unwilling or unable to use devices and that medical providers would be less willing to use telemedicine if rules regarding reimbursement and liability were not strictly established.

The facilitators perceived by the physicians were low-cost and user friendly design of technology, the fact that the population of technologically literate older adults is increasing, proof of utility of said technology, specific and quantifiable data and pre-assessment of the patient.

Kolltveit et al. (2016) explored health care professionals' experience in the initial phase of introducing telemedicine technology in caring for people with diabetic foot ulcers. The benefits experienced by healthcare providers were increased wound assessment knowledge and skills, improved documentation quality and increased communication between primary healthcare providers.

A survey conducted by The Robert Graham Center, the American Academy of Family Physicians and Athem evaluated the opinions of primary care physicians about the use of telemedicine.

Findings were that physicians in rural areas were more likely to use telemedicine (29% vs 11%). Also, doctors who use telemedicine are younger, and had practiced for less than ten years.

The survey also found that telehealth users are more likely to provide obstetrical, emergency room, and major procedural care than non-users. (Robert Graham Center, n.d.)

Overcoming barriers related to telemedicine users

As mentioned, telehealth projects often rely on a large scale participation of its users, patients or health professionals. Thus, the performance of these users plays a role in the outcome of the project.

The sustainability of the project, in particular, depends on its large scale adoption because of the high volume, low margin business model of ICT sector.

Accepting and adhering to the involved technology is usually seen as a first barrier for projects. Users might rely on a previously used method, and be reluctant to accept the new technology. Among clinicians, a certain skepticism is common towards telemedicine. Assuring the clinicians of the reliability of the technology and capacity of providing enough information for an adequate clinical decision is fundamental

A common strategy to facilitate this acceptance, is making technology more user–centered, and focused on quality makes the following recommendations:

- Determining the value of the project for society and actors, by emphasizing its advantages
- Adopt technology according to the users' needs.
- Realizing that as with innovations in other industries, in the health industry adoption follows an S shapes logistic growth curve. This, along with frequent monitoring of the adoption should be helpful to establish better strategies in future implementations.
- Showing evidence of cost effectiveness
- Providing education, through someone with an enthusiastic attitude and enough skill on the use of the technology
- Keep client records specifying end-usability, quality certification and legal requirements should be taken into account
- Encouraging clinicians to include telehealth sessions in their practice through training
- Financial and professional incentives for health professionals, upon using the technology.
- The placement of equipment should take into account convenience for the users.
- Following user privacy and consent protocols
- Showing evidence of cost effectiveness
- Establishing fixed methodology established for satisfaction surveys conduction, to allow periodic analysis.

Technology acceptance model (TAM)

TAM is a model based on the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1977), which aims to predict the acceptability of a certain technology, and to identify the modifications that should be imposed to said technology in order to make it acceptable. It was developed by Davis in 1986.

According to TAM, two main factors are determinant in the attitude of an individual towards a technology:

Perceived usefulness: The degree to which an individual believes the use of the technology will result in an improvement to his performance

Perceived ease of use: The degree to which the individual believes that adopting the technology will be effortless.

The following list explains the links in the TAM model, and the consequences that advent from those connections:

- TAM states that the use of an information system is determined by behavioral intention, but as postulated by the Theory of Reasoned Action, behavioral intention is determined by the individual's attitude towards the use of said system and by the perception of its utility.
- Perceived usefulness and perceived ease of use influence one's attitude towards the technology
- Behavioral intention to use is determined by the attitude, but also directly influenced by the perceived usefulness: This results in that an individual might decide to adopt the technology, despite not liking it, if it appears to be useful.
- Perceived usefulness and perceived ease of use are also connected directly: Between two technologies with similar characteristics, the individual will perceive the easiest to use as more useful.

Venkatesh & Davis, (2000) explained the influence of perceived ease of use over attitude through two main factors: Self-efficacy and instrumentality.

Self-efficacy is a concept defined by Bandura, 1977, stating that the greater the ease of use, the greater will be a user's sense of efficacy. Efficacy plays a main role in intrinsic motivation (Bandura on 1982).

The original Davis's model, despite having been empirically validated, only comes to explain 4% to 45% of the variance in the outcome, as demonstrated in 2006 by McFarland & Hamilton, 2006). Several authors made alterations to the model, in order to find underlying factors that explained the perceived usefulness and perceived ease of use, such as TAM2 was proposed in 2000 by Venkatesh & Davis and Mcfarland and Hamilton (2006).

Overall, neither the original model nor the posterior reformulations lead to complete explanations to the observed variance in technology acceptance. However, they all agree in that computer efficacy affects perceived ease of use, which in turns is strongly related to perceived usefulness.

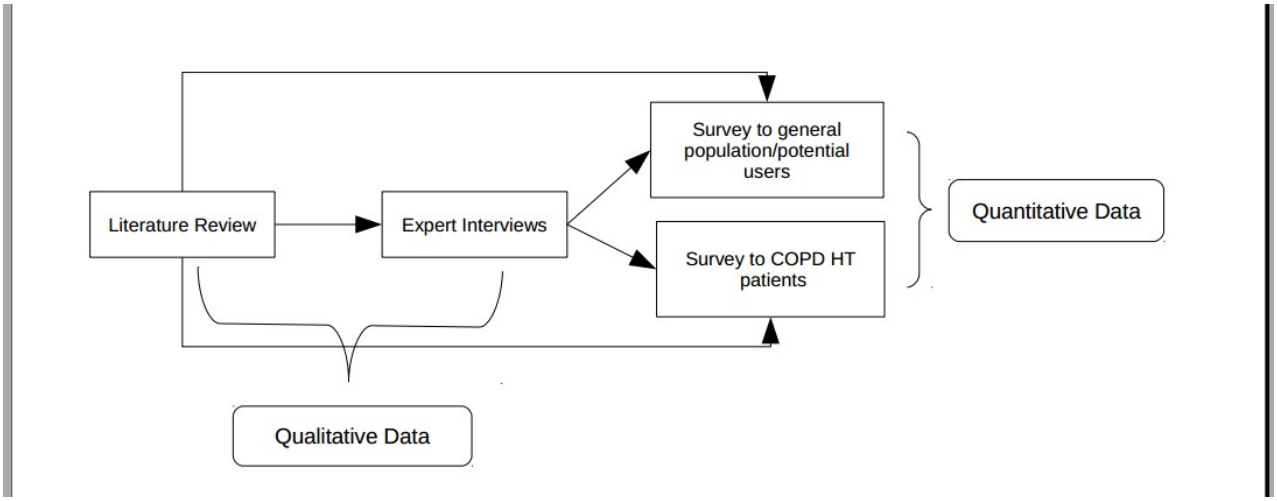
2. METHODOLOGY

The theme chosen for this investigation - “The acceptance of technology in medicine – 'Telemedicine' – The perspective of the users” - is quite vague premise and therefore one of the main tasks of this work was to attempt to synthesize important aspects of telemedicine, Information Communication Technologies (ICT), and how people adhere to them.

A mixed methods approach was chosen, i.e., involving both qualitative and qualitative methods. Qualitative methods are useful for the development of hypotheses, and these hypothesis can be generalized or tested making use quantitative approaches (Flick, 2009).

The initial phase of this project had essentially an exploratory character. Exploratory research focuses on collecting either secondary or primary data and using informal or unstructured procedures to interpret them. Usually it does not incorporate many of the characteristics or principles of the scientific method.(Creswell, 2003)

The scheme that was followed during this project is illustrated in figure 4.



The first step of this work consisted on a literature review, which was performed more intensely in the beginning of the project, but was an ongoing process, as the different phases were informed by existing literature on the concerning subjects.

The interviews were planned and elaborated next, when some base knowledge had been acquired.

For quantitative research, two surveys were elaborated.

The first survey was directed towards a group of adult patients with severe COPD, who have been participating in a pilot home telemonitorization project since 2013, concerning their opinions on this service.

The second survey was directed towards the general internet user population. This survey approached two separate topics. The first part concerns the trust of these users on searching health topics on the

internet, through a scale named eHEALS. The second part intended to evaluate the respondents' opinions concerning Portuguese telemedicine projects, in particular the importance they attribute to the advantages coming from these projects and also the expectation they have concerning whether these advantages, or positive aspects will actually happen.

In each of these steps will be explained in more detail.

2.1 Expert Interviews

Interviews are a common method of research in several areas, such as marketing, psychology and sociology.

Semi-structured interviews are a compromise between structured and unstructured interviews, and have been very common over the last years. Despite having a set of small topics or questions that are to cover over the interview, the researcher still keeps most questions open, allowing the interviewee to explain his whole line of thought. Semi-structured interviews are a useful method to answer more vague research questions, which do not involve fixed quantitative variables. (Flick, 2009)

For this research, semi-structured interviews were the method of choice and the best fitting type of interview for the beginning of the research.

Despite having some knowledge on the topic acquired through the literature there are several aspects that are not so present on the literature or not easily found, specifically those concerning the experiences and opinion of professionals on telemedicine and the implementation of telemedicine in Portugal. Semi-structured interviews were essential to understand the dynamics of the process of implementation of telemedicine and how the several entities view telemedicine and eHealth.

Particularly, in this work the interviews were directed to experts on the field of research. An expert is a subject that has experience or knowledge on the topic of the interview. The expert and his relation with the topic are the focus of the interview as an authority is associated with their opinion on that subject. It is common for the expert to represent the views of a company or organization on the theme.(Littig & Vienna, 2013)

The planning of the interviews included being aware of some of the risks of this type of approach. More than other type of semi-structured interviews, expert interviews require a very active role from the interviewee. Experts will usually be busy people with tight schedules, and therefore sticking to the accorded duration is important. The interviewer should have some knowledge on the topic, in order to not appear uninformed and to understand what questions should be asked at a certain point. When trying to reach a subject that represents an organization, it can be difficult to choose who to interview and to have their contact. Many entities or organizations will require asking for authorization, or will have confidentiality issues. In this type of interview it is easy for the subject to digress more on his own personal experiences often not related to the subject, which requires the action of the interviewer. (Flick, 2009)

2.2 Theoretical sampling

Theoretical sampling can be defined as the process of collecting, coding and analyzing data in a simultaneous manner in order to generate a theory. This sampling method is closely associated with grounded theory methodology. (Flick, 2009)

In theoretical sampling, the sample size is not defined by statistical significance, but rather by what is called theoretical saturation; in this, the process of interviewing stops when no more theoretical concepts appear.

Another characteristic is that the interviewees are not chosen beforehand. The decision of who to interview next should take into account the needs for the investigation. Thus, each interview should be analyzed right after being administered, helping the researcher to evaluate what should be done next.

Theoretical sampling should end with a phenomenon called theoretical saturation, the point in which new interviews do not bring new information.

Contacts of possible experts were acquired in the following ways:

- Literature review
- Organization websites
- Approaching speakers in conferences on the topic of telemedicine and eHealth
- Snowballing (asking the interviewee for contacts of interest)

2.3 Grounded theory

The original version of grounded theory was outlined by Glaser and Strauss (1967) in their book The Discovery of Grounded Theory: Strategies for Qualitative Research on the discovery of grounded theories. Its key components are summarized by Hood (2007):

> “1 - A spiral of cycles of data collection, coding, analysis, writing, design, theoretical categorization, and data collection.
>
> 2 - The constant comparative analysis of cases with each other and to theoretical categories throughout each cycle.
>
> 3 - A theoretical sampling process based upon categories developed from ongoing data analysis.
>
> 4 - The size of sample is determined by the 'theoretical saturation' of categories rather than by the need for demographic 'representativeness', or simply lack of 'additional information' from new cases.
>
> 5 - The resulting theory is developed inductively from data rather than tested by data, although the developing theory is continuously refined and checked by data.
>
> 6 - Codes 'emerge' from data and are not imposed a priori upon it.

7 - The substantive and/or formal theory outlined in the final report takes into account all the variations in the data and conditions associated with these variations. The report is an analytical product rather than a purely descriptive account. Theory development is the goal“.

The analysis performed over the set of interviews was loosely based on the procedure used in grounded theory. A set of important topics, which in grounded theory correspond to the initial codes, were decided. Then, for each paragraph and each interview, one or more of these codes was applied, or a new code was generated. In some circumstances, a topic which was too specific or too general was changed.

The codes in each interview were compared and common topics were grouped.

2.4 Contacting the experts

Experts were contacted through email, telephone, and in some cases approached directly after speaking on conferences.

The place and time of the interview were scheduled according to the availability of the interlocutors. Most interviews were conducted in public spaces or in their place of work. In one case the interview was made by telephone and in other it occurred in the residence of the subject (who is a COPD patient).

Interviewees were told the interview had an expected duration of 20-40 minutes, and permission for recording the conversation using a telephone app was requested.

2.5 Interview guide

Before the beginning of the interview process, a guide was elaborated, as it is habit for semi-structured interviews, with essential questions that should be asked to an expert relating their views on telemedicine and eHealth. This guide was adapted several times, as some of the questions needed reformulation for being too vague. After other interviews, some points were raised and appeared of interest, leading to some questions being added. In the aftermath, the list of main topics covered in every interview was:

- Interviewee’s work or functions, in particularly those related to telemedicine
- Projects related to telemedicine
- Advantages the interviewee perceived on his/her telemedicine project(s)
- Barriers and difficulties the interviewee perceived on his/her telemedicine project(s)
- Attitudes of other elements (colleagues, doctors, patients, organizations)

- Whether attitudes of other elements influenced outcome
- Importance and opinion on telemedicine in general and its importance
- What could be improved in the Portuguese case, in several levels and in particularly at a strategic level

Additionally, before each interview a brief research was made on each subjects' previous or present work and some questions were added concerning them.

2.6 Interview analysis

Each interview was fully transcribed. After rereading the transcript, a summary was made in order to eliminate speech marks and summarize some ideas.

The process of analysis followed what is recommended by grounded theory analysis.

The basic idea of the grounded theory approach is to read (and re-read) a textual database (such as a corpus of field notes) and "discover" or label variables (called categories, concepts and properties) and their interrelationships. The ability to perceive variables and relationships is termed "theoretical sensitivity" and is affected by a number of things including one's reading of the literature and one's use of techniques designed to enhance sensitivity.

Coding is a great part of grounded theory. Codes are representative of concepts, ideas and connections.

Several attempts were made for the coding of the transcripts. At the beginning, there was a set of initial codes, which were substituted or modified during the analysis.

In this work, each transcript was separated by paragraphs or ideas expressed by the interviewee. From these, those that expressed ideas that seemed relevant, or that seemed to contribute to answering the research questions were kept. This process was repeated, until there was a consistent list of quotations or ideas. With the help of Excel spreadsheet, these concepts were listed and reread, in order to find most suitable ways of classifying or separating the concepts, using codes or colors.

2.7 Survey to COPD telemonitorized patients

A survey was elaborated to obtain the opinions of patients of COPD who had participated in a telemonitorization project.

According to numbers reported by a publication and some of those involved in the project, there were 15 patients for each institution. The total of the patients answering the report was of 66.

Since this number is already quite small, we attempted to reach the whole population rather than a sample.

Main characteristics of the population were already known, as a satisfaction survey had previously been administered by SPMS.

2.8 Construction of the survey

The elaboration of the survey took into account the profile of the COPD patients, in particular the population who the survey was directed to: ages between 50-80, most of them having the basic level of education. In this way, there was an attempt to have explicit and simple questions, with simple language.

The survey was elaborated in a text editor (Libre Office). Since the great majority of patients does not use an email account, nor devices with internet access, it was excluded the hypothesis of sending the survey through this mean.

Despite the efforts to maintain the survey at an accessible level, the respondents had difficulties in the interpretation of the questions. This issue could have been solved by interviewing a patient before elaborating the survey, which was not feasible in this case.

Initially, the survey was planned to be complete in 10 minutes, however, it turned out to take approximately 20 minutes to complete. The fact that the researcher was somehow unaware of the type and level of difficulties felt by patients in the interpretation contributed for this. Thus, respondents had to be oriented in the completion of the questionnaire, and questions had to be read and explained often more than once.

After the first six patients were administered the questionnaire, one question was eliminated, as it was somewhat ambiguous and caused confusion in several patients.

The choice of topics for the survey required listing aspects of telemonitorization. Some of these aspects were based in literature available concerning telemonitorization projects, while others were directly inspired by aspects noted in articles and reports concerning this specific project.

The full questionnaire can be found in appendix.

Table II organizes the questions in aspects of interest they were supposed to measure.

Only three questions address the actual health benefits felt by the patient. This has to do with the fact that most specific benefits had already been reported in other works of evaluation of this project.

In some of the groups, items attempt to compare attitudes of patients concerning a certain aspect at different points in time, or comparing their family's feelings and their own. For example topic F1 inquiries about patients concerns with technical issues and F2 about his families; Topics D evaluate difficulties felt and D3 questions about the expectation of the patient concerning difficulty; In P, in which privacy invasion is assessed, again the respondent is asked about his expectation and what he actually felt during the service.

Table II – List of items used in the survey directed towards COPD telemonitorized patients;

F – Fear for the quality of the service	• F1 Before being telemonitorized, I feared something might go wrong with the service • F2 Before being telemonitorized, my family feared something might go wrong with the service
D – Technical difficulties	• D1 Indicate the difficulty level of using the Smartphone/Tablet for the telemonitorization tasks • D2 Indicate the level of difficulty of using the medical equipment for the telemonitorization tasks • D3 Indicate the level of difficulty that you anticipated those tasks to have. • D4 Did you need help performing the tasks for the telemonitorization?
S – Feeling of safety	• I feel safer for knowing that my health is being monitored • My family feels safer for me, for knowing that my health is being monitored • I feel that I need less direct surveillance by my family, now that I am being telemonitorized
L – Increase in knowledge about the disease	• I have learned how to better understand signs that my health is getting worse. • Due to the regular contact with health professionals, I have obtained useful information concerning my disease
H – Health benefits	• During telemonitorization, I comply better with my doctor's instructions. • I have avoided visits to health institutions during telemonitorization • I value being able to avoid going to health institutions
P – Feeling of privacy invasion	• Before being telemonitorized I feared that I might have feelings of privacy invasion • I feel my privacy invaded
St – Satisfaction	• The number of times I have been contacted by medical professionals during telemonitorization was appropriate • There were situations in which I feel that direct contact with medical professionals would have been preferable • There were situations in which I felt dissatisfied with the

telemonitorization service

2.9 Administration of the survey

Elements from each of the four groups were contacted through email.

With two groups, communication was established and permission was provided to contact participants from the project, Vital Mobile and Hope Care.

In the case of Hope Care, a confidentiality term concerning the patient's personal data (Appendix) was also elaborated and signed.

Before administration, one of the elements from the Vital Mobile group agreed to revise the survey.

As mentioned, and as it was later stated by elements of different groups, it was not feasible to send the survey through email.

For 6 patients, from Vital Mobile group, the survey was administered by the researcher directly. For other 9 patients, the survey was send through mail, and patients were notified previously by phone. In the case of Hope Care, an element of the project agreed to distribute surveys during the visits to the patients.

2.10 Analysis of the survey

Responses were analyzed using IBM SPSS Statistics (IBM Corp, n.d.).

Frequencies, means, standard deviations and modes were calculated for each item.

Despite the small sample size, two independent groups could be distinguished, since nine patients belonged to a group and 13 to another. Thus, Mann-Whitney test was performed, in order to evaluate differences between the two groups.

It is important to mention that some items had a scale that was inverted, i.e., 5 being a “worse” value than 1. In these cases, new inverted variables were coded, and the letter “n” was added to the original code. Thus for example, St4 will be analyzed as St4n.

Another issue with the survey is the fact that not all items use the scale “Totally Disagree” - Totally Agree” levels. In fact, items D1, D2 and D3 ask about difficulty level, 5 being “Very easy” and 1 being “Very difficult”. This is more problematic in the case of item D4, where the respondent is asked for the frequency of needing to ask for help. It is not uncommon to treat likert scales as ordinal scales, i.e., to assume that levels 1-5 are equidistant. However, assuming the distance is the same between “Never” and “Rarely” and “Rarely” and “Occasionally” can be erroneous.

The scale was transformed from the original 5 point likert scale to a binary, top-box scale (i.e., positive vs non-positive answers).

2.11 Survey to internet users

A survey was elaborated through Google forms, directed towards internet users.

In order to achieve a high response rate, the decision was to distribute the survey through email and social networks. Four organizations of patients were also contacted and asked whether they could post the link for the survey on their website or Facebook page. Two organizations agreed to share the link, but no answers were recovered from their efforts.

The only requirement to answer the survey was to be aged older than 18.

Facebook was by far the most successful means of capturing respondents. Respondents were asked to forward the questionnaire to family and friends that could be available to participate.

2.12 Construction of the survey

One of the concerns addressed during the building of the survey was that there was no assurance as to whether respondents were familiarized with telemedicine or how it has been used in Portugal.

The decision was to provide short explanations concerning each group of questions, and then ask the respondents opinion.

The first part was also included consisting on a set of questions belonging to a scale developed by Cameron D. Norman in 2006 named the scale eHEALS (Norman, 2006), the eHealth literacy scale. The purpose of inserting this scale was to attempt to relate the use of the internet, with the opinion on telemedicine and help to understand if the fact that one deals often will increase their acceptance for other technologies. It is composed of 8 questions. Two items were also added to the scale, UL4 and UL5.

The second part of the survey had four groups of questions.

- The first group asked whether the subject was familiarized with a concept of telemedicine and if they knew of any projects in Portugal.
- The second, third and fourth group asked questions concerning the advantages and disadvantages of Teledermatology triage, Teleconsultation, and Telemonitorization, respectively. Before each of these parts, brief explanations concerning these projects were included, as they are relatively unknown.
- The final part of the survey included questions concerning demographic information and also asked whether the person suffered from a chronic disease or knew someone close who did. This was intended to evaluate whether someone with experiences on the impairment caused by chronic disease would be more willing to accept telemedicine, as it aims to increase accessibility to healthcare.

2.13 Distribution of the survey

The questionnaire was build using Google Forms, tested with two subjects and corrected.

The link was sent to several people through social networks (Facebook), along with a note asking for the collaboration by answering and forward to others. In order to provide some variety to the sample, groups of patients and organizations of chronic disease patients were contacted, and asked to publish the link on their social network pages.

The link was also sent to some people through email.

The privacy settings of the form were adjusted so that there was no need to enter a Google account in order to participate.

In order to avoid missing answers, the settings of each question were changed to “required answer”.

The poll was active from 6th to 26th September 2016.

2.14 Analysis of the survey

SPSS Statistics (IBM Corp.) was used to analyze the results from the survey.

Means, modes, standard deviations were used to describe the sample.

Pearson's correlation was used to understand whether specific items, not belonging to the same group were related or not and whether their relationships should be further evaluated.

In order to understand if there were relations between certain variables, some of these relations were tested.

Parametric tests make assumptions considering the type of distribution of the variables being tested. In particular, ANOVA related tests assume normality. Also, our sample is of 127, and divided in subgroups will be smaller; ANOVA is robust for violations of normality if the sample is large enough. As this is not the case, the option was to use non-parametric tests.

To test for differences in subgroups of the sample (for example male vs female or “Higher Education” vs “Non-Higher education”) Mann-Whitney test was used. As Mann-Whitney test assumes that distributions of subgroups have the same, or at least similar variances, Levene's test of variance homogeneity was used to confirm results, in the cases in which subgroups presented significant differences in mean ranks.

For group UL, Principal component Analysis was used for dimension reduction, and to test for the presence of common factors.

This was followed by reliability testing using Cronbach Alpha.

This combination of tests was used again during the analysis of the second part of the survey.

Finally, respondents were classified using k-means clustering, according to their scores in one of the PCA experiment results.

2.15 Factor and reliability analysis

SPSS Statistics (IBM Corp.) was used to analyze the results from the survey.

Means, modes, standard deviations were used to describe the sample.

Pearson's correlation was used to understand whether specific items, not belonging to the same group were related or not and whether their relationships should be further evaluated.

In order to understand if there were relations between certain variables, some of these relations were tested.

Parametric tests make assumptions considering the type of distribution of the variables being tested. In particular, ANOVA related tests assume normality. Also, our sample is of 127, and divided in subgroups will be smaller; ANOVA is robust for violations of normality if the sample is large enough. As this is not the case, the option was to use non-parametric tests.

To test for differences in subgroups of the sample (for example male vs female or “Higher Education” vs “Non-Higher education”) Mann-Whitney test was used. As Mann-Whitney test assumes that distributions of subgroups have the same, or at least similar variances, Levene's test of variance homogeneity was used to confirm results, in the cases in which subgroups presented significant differences in mean ranks.

For group UL, Principal component Analysis was used for dimension reduction, and to test for the presence of common factors.

This was followed by reliability testing using Cronbach Alpha.

This combination of tests was used again during the analysis of the second part of the survey.

Finally, respondents were classified using k-means clustering, according to their scores in one of the PCA experiment results.

2.16 Cluster analysis

For the best result in the PCA and Cronbach Alpha analysis for the telemedicine projects group of items, clustering was applied to the factors extracted.

Two methods were used: 2-step clustering and k-means clustering.

3. RESULTS

In the following sections, main results for each of the methods used will be presented. Some additional results will be presented in Appendix.

3.1 Main findings on the expert interviews

The list of subjects who were interviewed is presented in table III.

Table III – List of experts interviewed;

ID	Occupation	Relation with telemedicine	Time/date	Approximate duration (m)
Expert 1	Medical Neurologist	Teleneurology project, 1999-2001	18:00, 21/04/2016	47
Expert 2	Sociology PhD, expert in Health ICT	Academic work in telemedicine, Health IT specialist, occupation at SPMS	18:00 02/05/2016	36
Expert 3	Medical intensisvist	Implementation of telemedicine in Instituto Marquês de Valle Flôr, between Lisbon and Sao Tome e Principe	13:00 04/05/2016	40
Expert 4	Member of GTT	Implementation of telemedicine in Azores	10:00 28/06/2016	36
Expert 5	Specialist in cardiac surgery at Hospital de Santa Marta	Provides consulting services using telemedicine	10:00 23/05/2016	29
Expert 6	Anatomo-Patologist	Member of GTT, involved in several telemedicine projects in SPMS	10:00 28-07-2016	45 m
Expert 7	General Physician	Master of Science in Clinical Research, Instituto de Medicina Preventiva, Lisbon	13:30 29/08/2016	42
Expert 8	Pulmonologist at Local Health Unit of Alto Minho (ULSAM	Medical responsible of the Vital Mobile group in the SPMS's COPD	24/08/16 13:00	1h 15m

	)	telemonitorization		
Expert 9	Dermatologist at Local Health Unit of Guarda (www.ulsguarda.min-saude)	Consultant specialist in Teledermatology Screening	21/08/16 16:00	23

A set of commonalities were found during the analysis of the interviews. Most important aspects are summarized in the following sections.

3.1.2 Definition of telemedicine

All experts were familiarized with the definition of telemedicine as presented in literature, which was expected, as each expert was somehow related to telemedicine.

Expert 2, being an investigator on the subject, provided an overall picture of the benefits and purposes of using telemedicine; the definition used by this subject was

> "(…) a big hat, which can include several types of services, teleconsultation, telediagnosis, telemonitorization(…).

The expert added, however, that

> "There is actually no consensus(...)"

When speaking of telemedicine, experts tended, however, to focus on telemedicine as yet another tool used in a larger context of healthcare provided in a more effective manner, with an increased communication. For example, Expert 3 added that telemedicine is not about making a video conference, and one should refer to telemedicine, with an emphasis on the increase of accessibility.

3.1.3 Benefits of telemedicine

Experts were inquired directly about benefits that they perceived for telemedicine.

Overall, experts agreed on the benefits that telemedicine was supposed to have, such as increased access, lowering costs and commodity.

Equity of access

Providing the same quality of care to all population is one of the problems telemedicine aims to help solving. Expert 2 mentioned:

> "It avoids long waits for speciality consultations (…). It allows the optimization of all sorts of services. It allows the existence of teams at a distance (…) to provide a better service, cheaper (…).

> Improves access, and in some way it increases equity in the national service. Equity, in the sense of providing the right care at the right time to who needs it”
>
> “Not equality, but equity. I believe it [telemedicine] helps providing the right type of care, to the ones who need it at the right time (...)”
>
> “Overall, it is about proximity. It reduces distance in space and time. It allows for relationships to thrive when they couldn't without it. Building a team is feasible, even if the members are in different countries (...)”

Expert 6 states his view on telemedicine, which reflects the view of the GTT on telemedicine and is also based on the concept of equity

> “I think it is something very humanistic. It is about improving access, providing equity”

For Expert 1:

> “It makes all sense in specialities that are more difficult, in which there are few doctor, because you solve a complicated issue at once.”

Although she was strict in that physical contact with the doctor is always better, she conceded

> But if you have to travel a big distance for that, when you can see your doctor on tv (...)”

Decreasing Costs

A discussion that is common in the context of telemedicine is the costs associated with the savings provided by telemedicine, versus the costs of implementing the system, that include the installation of equipment, training the staff and other adaptations to the already existent systems.

Only one expert mentioned this concern with the financial investment. Other experts did not mention this concern, and those who had participated in implementations seemed to believe that the investments made were easily covered by the returns.

For Expert 3, turning to telemedicine was a more affordable alternative. In his project, that involves providing care in Sao Tome e Principe many exams cannot be performed in the country, due to the lack of staff or equipment. The patient has to be evacuated for many procedures, which is a major financial burden. He added that this evacuation is also not beneficial for the patient, who will usually travel alone and as the process usually takes a reasonable amount of time. This is also bad for the patient, who does not know anyone in the country and has to come alone. Teleconsultations allow for an examination by a specialist that in many cases avoids the evacuation. If a certain exam is needed, either it is performed via teleconsultation or it is annotated on a list for the next mission to Sao Tome and evacuation is really a last resource.

Expert 8, concerning cost saving, mentions the high costs of emergency internments:

> “There is a lot of money involved when a patient is committed. For these [COPD] patients going to the hospital is tiring, and there is a higher risk of infection.”

One of the main measures of success in this project was the reduction of the number of visits to emergency rooms and the reduction of costs associated. The expert also added that costs, which in telemonitorization concern installing patients houses with the equipment, are easily covered, if the number of emergency internments is decreased.

Formation of health professionals

Teleconsultations between Hospital Ayres Menezes and IMVF, as mentioned by expert 3 have a double purpose. Besides filling the demand for specialized care each week in Sao Tome, they intend to be a learning tool for general practitioners and non-specialist professionals who ask for the advice of the experts in Portugal.

Expert 9 also mentioned that one of the major benefits of telemedicine was this formative component, specifically for the context of family doctors and general physicians who participate in teledermatology consultations.

> "It has an important role for the formation and specialization of general practitioners"

Commodity for patients

According to Expert 9, the main reason for their use of teledermatology was actually motivated by the fact that their population is of advanced age groups, and for them it would be better not to travel too far for consultations.

> "When given the choice between a regular consultations and a teleconsultation, they choose the teleconsultation, because that means they do not have to dislocate".

Commodity is one of the main benefits for telemonitorization patients in the project of Expert 8. COPD is a debilitating disease and one of the symptoms is a constant exhaustion, which limits patients' activities. A visit to the hospital involves a lot of effort, for the patient and the carer who is helping him. Avoiding these visits is a major factor of satisfaction with the service. Another aspect promoting this comfort is the feeling of safety felt by both patients and families. Expert 2 mentioned the case of a patient's wife, who did not feel comfortable leaving the house due to her husband's condition.

Expert 1 believes direct contact is always better, but adds that if the patient has to travel long distances for a doctor visitation, then telemedicine is a good enough alternative.

Expert 3 stated that keeping healthcare close will help increase not only access, but efficiency of the whole healthcare system. For him, healthcare centers should be able to provide a full set of care that currently is only available in hospitals or private clinics.

3.1.4 Barriers

Fear of medical error

Another common matter in a discussion concerning telemedicine is the fear that doctors will be more susceptible to commit mistakes when observing patients via telemedicine.

> "There is some fear of medical error (..) but it does not seem like a great problem unless it is a life or death situation"

Expert 2 mentions that there should be some control over the information flux, in both ends of the communication.

In IMVF, a consultation requires two sides to fill in a report, and these sides should agree.

Expert 8 stated that for example his patients have the nurses' phone number and vice-versa

> "Nurses do work in Intensive Care Unit and that is their priority when they are there. Patients also know this. So they have their phone numbers and they can call if something happens"

Expert 9 mentioned that one of the problems specific to dermatology is that

> "We photograph the patient's whole body. One of the advantages that a conventional consultation has, but not a [store and forward] teleconsultation is that normally we can see something that the patient might not have noticed, in another part of the body. Here we just really see what they are complaining about. "
>
> "Palpation is not possible, either"

and also

> "Sometimes the quality of photography lacks some quality"

Telemedicine is not a medical specialty, it is a mean of communication and as mentioned by Expert 7,

> "This all (benefits of telemedicine) depends on the speciality" "telemedicine it is not a recipe for everything"

The fear of medical error is a factor of demotivation. There have been no episodes mentioned by any of the professionals inquired in this work related to mistakes committed during the use of telemedicine, but there is a real need to keep track of information procedures, as with any other medical act.

Expert 9 added

> "Sometimes colleagues want to send images through their personal phones for example. I have to remind them that this is not a friend's conversation, it is serious work"

3.1.5. Factors of success

Sharing responsibilities with other health professionals:

General Physicians and family doctors

When referring to the teledermatology project, Expert 9 also mentions that while the formation is an advantage for GP's, and many of them are happy to assume the increased responsibility, others do not adhere, one of the reasons being the increased workload.

Expert 4 mentions that for the project in Azores, one of the benefits they were expecting was a reduction of the role of the GP's in the decision to send patients to the hospital.

These two view illustrate a change in roles, particularly of the General physicians and Family doctors.

In the project of IMVF, currently teleconsultations in Hospital Ayres Menezes are made between a medical specialist in Portugal and a General physician, who works at the hospital. Majority of staff in Sao Tome is not yet specialized, and many are technicians. A vital part of their work has been trusting them with a part of the workload.

Nurses

When talking about how medical professionals see telemedicine, Expert 2 mentions that during her doctoral thesis, she had taken the impression

> "I was inquiring professionals to see how they adhere to technology. Nurses adhere brutally, they make a point in knowing how to use things."

Expert 8, on the other hand, talked about the involvement of the nurses, as a first line of care, as one of the strongest points of his project. The expert said that one of the strong points in their project was the involvement of nurses as a first line of care to assist the patients.

> "Once you learn how to work with nurses. It is different from working with physicians, just because they are much more susceptible to liability. So we needed to make protocols for everything, to protect them. They know the patients, and they do most work, they call patients as soon as some value is abnormal. I only intervene when there is pulmonary infection."

Partnerships with technology providers

Several companies provide health services at distance, both for particulars and for homes and for companies and projects.

Both Experts 3 and 8 projects involved partnerships with companies that were responsible for the technical aspects.

Expert 3 strongly attributes the good results to the partnership with PT-innovation. The platform they chose in the beginning was Medigraf, because it respected their needs for a platform that did not need a lot of bandwidth to function properly. But at the time Medigraf was considered an obsolete platform

and Expert 3 actually said it was less a telemedicine platform and more of a telecommunication platform. It was after the agreement with PT that it was adapted to its current version. Currently, it is works on any laptop tablet or Smartphone, and it has a Skype like environment, that includes space for patient registration, DICOM and other format files, it allows capturing videos and photos on both sides of the conversation, as a chat service, allows annotations on images among others. Other adaptations have been made, such as possibility to connect laryngoscopes and other instruments with video probes

Expert 8 attributes the success to the cooperation with Vital Mobile and … how important their syn tony was.

> "They were not there just to sell their equipment. [an element from the technical team] knows patients by name, and for these people to use the system properly, a lot of learning and effort was involved and technical support and patience. In other groups I feel like the companies overwhelmed the clinical part in many ways.(…)
>
> "We made a point in not making this an emergency line."

Adapting to the circumstances

A commonality between the two recent projects of Experts 3 and 8 is an underlying sense of adapting to the context.

When inquired about factors that motivated the good results, Expert 8 described how important it was to understand these patients' lives, and their situation and to adapt the functioning of the project to them.

> "We have 2 [patients] with high school education, the rest have elementary school. Five had never used a cellular phone, the rest did only in a very residual manner"

He also mentioned that more than often higher authorities who have the responsibility for decisions concerning projects do not understand the reality lived by these patients

> "They think, OK I have this technology and now I just solved it all and it does not work like that"

he added

> "For these patients, it was a huge challenge to get them to be able to type their axial temperatures on the Smartphone, since the thermometer does not connect to it."
>
> "We trained for months before the start of the project, from April to October" "[The responsible for technical support of vital mobile] knows patients by name" "it requires a lot of patience and effort".

Expert 8 added that the word of order was simplify.

> "At first they all wanted to try it. Then they started to see that it was looking too difficult. So we opted to keep it as simple as possible. They basically only have to keep the Smartphone charged and turned on. They were told to keep it out of the reach of small children and relatives who might try to use it. Even this required a lot of assistance. "

For Expert 7, adapting to circumstances reflected on the choice of platform. He mentions choosing Medigraf, which at the time was considered almost obsolete, due to the low bandwidth requirements, and low price. Internet in Sao Tome is expensive and until recently was acquired via satellite.

3.1.6.How culture and social aspects influence telemedicine adoption

Cultural and social factors were discussed during most of the interviews, as factors influencing telemedicine adoption.

For Expert 1, as a culture we might be more or less willing to implement something:

> "Just like we do not use public transportation or bicycles, we drive cars". There does not seem to be a direct resistance towards telemedicine, just as there is not resistance towards using public transportation or bicycles. But it is not a priority for us as a society, and thus will not be a priority for governmental forces, even if they agree that it is important and beneficial.

Expert 2 comments that Portuguese population has an advanced age and low level of education. One would expect these to influence the adoption of technologies. However, she also mentions an increase in a group of more informed patients, who make some research on health, and ask questions to their doctors.

Expert 8 also mentioned this gap, between those who own four Smartphones and those who never used one.

3.1.7 Patients perspective

Experts 4 and 9 both found that patients are surprisingly accepting of telemedicine. For Expert 4, patients are more than willing to try it, if this means that they have to wait less for a consultation.

> "Patients accepted really well. I thought they would have objection but they don't. (…) in dermatology and nephrology."

> "I was surprised at first that they took it so well.(…) When asked to choose, they will choose the telemedicine if it means they do not have to move"

Expert 7 stated that

> “It depends on the circumstances” and that “In some situations, the patient might think he is entitled to the presence of a doctor(…) Presence of the doctor is associated with quality(...)”

Concerning the teleneurology project in 1999, Expert 1 referred

> “General physicians and patients liked it a lot, it is always bad to have to send patients to the hospital”

Expert 9 says she was impressed when she started working in telemedicine with how patients accepted it. A hypothesis is that, as mentioned by Expert 5

> “Telemedicine is more directed towards relations between doctors than relations between doctors and patients.”

Perhaps the role of patients is passive. There is a generalized trust in medical doctors, and patients will not oppose to telemedicine, especially if it won't imply that they have to make an effort themselves.

Expert 8's project involves a more active role by patients, and thus the level of technological literacy of patients did reflect on the project. He mentions

> “First they all wanted to try it”

> “They started fearing that is was getting to complicated”.

As a solution, the team made a great effort in keeping it simple, with the use of the Smartphone on a bare minimum, a lot of technical support and a lot of training. He was astonished when “These patients started to discuss their values with me “

3.1.8.The Portuguese healthcare model

Many of the experts mentioned the issue of the health model used in Portugal. In particular, both Experts 3 and 6 pointed out that the model currently being used for the path made by patients in the healthcare system is more suited to critical patients. However, as mentioned by Expert 6, the paradigm of health is completely changed, and currently the issue is how to deal with older population, suffering from chronic disease. There is a need for continued care that is not being attended. Chronic patient's exacerbations and inability to get a consultation with a specialist on time cause their regular visits to the emergency room, in which the costs are much higher. Expert 3 talk about the lack of access, which is not dependent on the distance. He says that there is a generalized lack of access, even for those who live close to a hospital, and that the problem is in the system and the organization.

Other experts spoke about the lack of structural policies.

> “Health institutions are full of problems that are not strategic, but have to do with the daily activity. There is a lack of time to deal with other strategic issues (...).”

Expert 5 had the opinion that

> “Portugal has a great lack of structural policies, they talk a lot about decentralization, but unfortunately we can't afford that. It would be better to work as a network, having big hospitals communicate with peripheral ones. Here [Hospital de Santa Marta, Lisbon] we receive all south of the country for cardiac surgery, we are not connected to any of those institutions.”

Expert 7 mentioned that changing the model that is being used will stimulate the use of telemedicine.

> “A model based on… will make the benefits of telemedicine more appealing”

He also stated

> “Institutions will hardly adopt it if it is not financially advantageous (...)”

and Expert 1, mentioned, referring to technologies that are adopted

> “(…), things that make money (…)”

Both Experts 3 and 6 specifically addressed the current healthcare model

Expert 6, in particular, stated

> “The health paradigm is completely changed (...)” “Our system provides care for critical patients, and currently the main problem are chronic patients” mentioning the need for continued care, and easier access to these patients.

Expert 3 mentioned the cycle made by many patients: They have a problem, and that cannot be solved in a healthcare center. The waiting lists for a specialty consultation are huge and the patient either ends up not going or getting worse and going to the Emergency Room. Often he will be interned. A problem that could be solved in a fairly easier manner will now be more severe, and costs, specifically with internment, are much higher.

Telemedicine is also based on the assumption that it is better for patients, specifically older aged and chronic patients, to stay at home, and have their continued care there.

3.1.8.Communication

Expert 2 brought to light the fact that there are often communication problems concerning patients’ records between hospitals and healthcare centers. For Expert 3, a good communication between health care centers and hospitals would be essential.

Expert 5 stated

> “We receive here most patients from the south region of Portugal” “We do not have contact with any of those institutions”.

As for Expert 6, he mentioned that telemedicine is only one of the aspects of a new model of health that relies on a greater level of communication

"It is not the people who travel, it is the information"

Concerning the perfect integration of telemedicine he stated

"Telemedicine is perfectly implemented when we no longer talk about telemedicine, because it is a default option for care."

3.1.9. Portuguese eHealth literacy

When asked about the eHealth literacy of Portuguese patients, Expert 1 stated

"(…) comparing technological literacy from children in Portugal [with the rest of Europe] it is not that great. It is medium low (…) Many people think they are great, but they are not that good. Other thing is, you may be able to use gadgets and smartphones, but that is not necessarily literacy, whenever something more complicated comes, people do not know what to do"

But added

"I have patients who forget their exam results and they say it's ok, they will send it through email, from their Smartphones (...)"

As for Expert 2,

"Everybody uses Smartphones, Facetime (...)"

"Doctors have to know how to react to these patients, who read and are informed, and want to know why they read about this treatment which is better and they are not using it (...)"

"Portugal (…) has a handicap (…) older population, low education levels (...)"

Expert 4 said

"(...) Everybody uses Smartphones and tablets. (...)"

(referring to patients) "If they can't use it, the grandson, or son will help them.(…) they don't find it strange, specially here, where everybody has a relative living in the US or Canada, and speak to them by Skype.

3.2 Survey to COPD patients

The sample was, as mentioned, extracted from a group of COPD patient who are participating in telemonitorization project.

The choice of this population had the intention of evaluating the interaction with ICT of a group with extreme characteristics: Older age, with the majority being between 71-80 years old (N=12), low education level, most having only Elementary school education (N=13); additionally, it was known that most of these users did not own a Smartphone, and some had never had a mobile phone before.

Also, telemonitorization involves the patient performing a set of tasks that include manipulating the devices, thus, the respondents effectively had dealt with telemedicine in a direct manner.

Among the sample acquired, the 22 respondents belonged to one of two groups, from different teams participating in the project: 13 to Vital Mobile, patients of Hospital de Viana do Castelo and 9 from Hope Care, from the project in Hospital de Coimbra.

The main characteristics of the population are described in table V.

Table IV – Distribution of users in the COPD telemonitorization project by company

		Group		
		Hope Care	**Vital Mobile**	**Total**
		N	**N**	**N**
Gender	Male	7	12	19
	Female	2	1	3
Education Level	None	0	1	1
	Elementary	3	10	13
	High School	3	1	4
	Higher Education	3	1	4
	Total	9	13	22
Age (years)	[40-50]	1	0	1
	[51-60]	3	1	4
	[61-70]	0	3	3
	[71-80]	4	8	12
	>80	1	1	2
Who Answered	Patient	6	8	14
	Other	3	5	8

In order to compare differences between the answers of the two groups, Mann-Whitney test, which compares the medians from samples was used. For $p<0,05$, it is considered that the differences between the medians of the groups are significant.

Variables for which this happened were:

- F3 – Vital Mobile had a higher value of median
- U – Hope Care had a higher value of median

- S1 and S2 – Vital Mobile had a higher value of median
- H1 and H2 – Vital Mobile scored higher
- L3 – Vital Mobile scored higher

Interpretation of these results is not free of risk, as the samples being used are quite small, even though Mann-Whitney test, being non-parametric and making no assumptions about the distributions is appropriate for such cases.

Another factor that might have influenced the results has to do with the comprehension of the respondents. There was the opportunity to interact with some of the patients, in particular 6 patients from Vital Mobile. While they were visibly satisfied with the service and its benefits, they reported having already a good relation with their physician, and being very trustful towards experimenting telemonitorization. On the one hand, this might ave influenced the results, as patients tended to be eager to answer positively. On the other hand, the results are still evaluating somehow a degree of satisfaction with the service, which undoubtedly contributed to its success, and thus this is indicative that the relationship with those involved does contribute to the success of the projects.

Apart from these issues, Vital Mobile patients were older (even though performing Mann-Whitney test, this difference is not significant, as p>0,05) than Hope Care's. For Hope Care, patients filled the questionnaire themselves and for Vital Mobile only … did it.In item F3 Vital Mobile patients scored higher in the value of the families/carers opinion concerning telemonitorization than Hope Care's patients. Education levels were also different, and Mann-whitney test confirms the median of the education level for Hope Care's patients is higher than Vital Mobile's patients. Overall, it might be that improvements were felt more positively by Vital Mobile patients, and they might tend to answer higher in items related to feelings of safety. For Hope Care, also more patients reported now using Smartphones more often, as opposed to Vital Mobile, which is also in line with the former argument.

3.3 Survey to internet users

A convenience sample of 127 responses was acquired.

The number of female respondents (n = 73, 56,6%) was slightly superior to the number of male respondents(N=55, 43,3%).

Subjects had ages between 18 and 86 years old with M=35,65, SD=16,02.

The curve of the age distribution had a Skewness of 1,274 and Kurtosis of 0,741.

Concerning their education level, 98 respondents (77,2%, 33,9% being male and 43,3 % being female) reported having higher education, 26 (20,5%, 7,9% male and 12,6% females) said they had “Highschool Education” and three respondents (2,4%) reported having “Elementary School” level education. As the number of respondents belonging to the “Elementary School” was quite small, respondents were regrouped in having “Higher Education” or “Non-higher Education”.

The same phenomena applies for the distribution of ages, as it is confirmed by the skewness of the distribution.

The high education level and low age of the respondents might be due to the mean used for the distribution of the survey, which was social network website Facebook.

Finally, respondents were asked whether they suffered from a chronic disease and whether they had a close friend or relative suffering from one. Despite the small sample size, specifically for older age groups, there is an expected increase in proportion in the number of respondents with chronic diseases versus those without with the increase in age group. Overall, 29,9 %(n=38) respondents reported suffering from a chronic disease and 53,5% (n=68) reported knowing someone suffering from one. From the 52 male respondents 34,5 % (n=19) suffered from a chronic disease and from the 72 females, also 15% (n=19) were chronic disease patients. Mann-Whitney test was used on “Chronic disease patients” vs “Non-chronic disease patients”. Since U=1076, n=19, n=19, p=0,001, it appears to be a significant difference between the mean ranks. Levene's test was performed next, in order to understand whether the distributions have the same median and can be compared.

3.3.1 Modified user health literacy scale

The second part of the survey consisted of ten 5-point likert items. From these, 8 belong to a scale called eHEALS. Other two items, UL4 and UL5 were added to the scale.

UL4 attempted to understand whether the health and internet literacy of the respondents reflected on how they searched for health information. As it was verified later, this item was not formulated as it was meant, simply because one can use a search engine too look for information, and that does not influence whether or not they can evaluate their quality properly.

As for UL5, it meant to understand whether there was a relation between the language used for searches and the health literacy level. Perhaps the answers would have been more informative if the question asked whether respondents preferred t look for pages in English.

Means, and standard deviations for each item are presented in table…. For every item, minimum value attributed to each item was 1 and maximum was 5.

Highest scores were achieved for item UL4 – and lowest for item UL2 -

From the original scale, the item with highest score was UL9.

Mann-Whitney test was performed, dividing the sample in two groups, according to their answers to item T1. Only for the answers to items UL1, UL6 and UL10 were any significant differences noted. For item UL6, the mean rank for T1=No is 52,37 and for T1=yes is 67, thus H1:UL1(T1=No)<UL1(T1=Yes) and as the p=0,03<=0,05, we reject H0.

For UL6 (mean rank of T1=No is 50,81 and T1=yes is 67,4) and for UL10 (mean rank of T1=no is 58 and T1=yes is 65,54) the same happens. For these items, people who knew the definition of telemedicine scored higher in items UL1 – UL6 – and UL10 -

The same test between performed, but by grouping respondents according to their answers to item T2: (T2=yes) and those who didn't (T2=No)

The results indicate that those who answered yes, scored higher in the items UL2(T2=No, 59,48, T2=Yes, 77,41), UL3(T2=No, 60,85, T2=Yes, 73,36) and UL10 (T2=No, 60,78, T2=Yes, 73,56), but for other answers, differences between the groups were not significant.

No significant differences were observed in the answers to UL items, when grouping the respondents according to their education level or whether they had a chronic disease.

3.3.2 PCA and reliability analysis for UL items

PCA was to the User literacy scale (items UL1-UL10), as modified by adding items UL4 and UL5.

It was revealed that data was separated in two factors. The first factor, which explained 45,487% of the variance, contained all items, except for UL4 and UL5. The second component contained UL4 and UL5.

In theory, the user literacy scale was built to have one dimension; the fact that UL4 and UL5 are clearly separated from the original eight items indicates that these items are not evaluating the same aspect as the rest.

Reliability was also tested for items in each of these two groups. For the first component, the value of alpha was of 0,851. This value is reasonable, as it is over the 0,7 minimum established.

The one factor structure found for the original eHEALS scale (without items 4 and 5) was expected, and in line with results found in other studies (Nguyen et al., 2016).

The value for reliability is of 0,851, which is acceptable (above 0,7). Rosalie van der Vaart (2013) and De Caro W & Marucci AR (2016) acquired higher values, of alpha = 0.903 and alpha=0,9 respectively. A possible explanation might be that the samples used were much more homogenous than the one used for this work (the second for example, was specifically administered to a group of undergraduate nurses).

For the second component, the value of alpha was of 0,299. This value is indicative that a scale constituted only by UL4 and UL5 is not reliable. The decision was to exclude UL4 and UL5 from the analysis.

3.3.3 eHEALS scores

The scores for eHEALS were computed as the sum of the means of each item in the original scale.

The value obtained for the scale was of M=25,93, SD= 6,20.

For Paige, et al (2016).The average self-reported eHealth literacy score in this sample was of 30.34 (SD = 5.30; min = 8, max = 40), when applying the test specifically to 811 participants having at least one chronic condition, higher than the one obtained in this case, of 25, 93. They report a mean age of 47,24 (SD=17,10); in terms of education, higher than ours and they mention that more than 70,2% reported at least some college level education. Thus, the respondents are older and the ones in this work appear to have a higher education level. Since this sample was of chronic disease patients, mean and SD were computed for ULS scores of the subgroup owing a chronic disease. For this sample, the group with a chronic disease had a ULS of M=26,07, SD=7,06). Mann-Whitney test was later applied, in order to understand whether this difference was significant.

3.3.4 Relation between ULS and demographic variables

Mann-Whitney test was performed between subgroups formed by binary variables (CD1 – having a chronic disease, CD2 – Knowing someone with a chronic disease, education – Having higher education or not) in order to understand whether differences in mean ranks of these groups had any significance.

There was no significant difference in ULS scores for respondents who had a chronic disease (n1= “Yes”) and those who did not (n2=“No”) (U = 1647,0, n1= 38, n2 = 89, p = 0,816 > 0,05). Levene's test for homogeneity of variances was performed. P = 0,236 >0,01, thus the variances are assumed to be equal in this case

For gender subgroups, no differences were found (U = 1968,5, n1 = 55, n2 = 72, p= 0,956).

Since there is no certain of whether the two subgroups have the same variance, Levene's test for homogeneity of variances was performed.

For variable T1 (Knowing the definition of telemedicine), there were also no differences between groups (n1=”No”, n2 = “Yes”), U=1053, n1 = 26, n2 = 101, p = 0,120)

For T2 (Being aware of Portuguese telemedicine experiences, n1= “No”, n2 = “Yes”), there were o significant differences (U= 1251, n1 = 95, n2 = 32, p= 0,135).

Education level (n1= “Higher Education”, n2= “Non-higher Education”) also did not seem to make a difference in terms of ULS score (U=1367, n1 =95 n2=32 p=0,761).

There was some expectation concerning the relationship between ULS and age, and education level, but none was detected in this sample. Rosalie van der Vaart, MS, 2013, also did not found a relation between education level, age and the score. However, for example, Choi & Dinitto, 2013, who analyzed a sample of 980 in-bound older adults did detect a significant negative relation between eHEALS and age.

Mann-Whitney test was chosen for being non-parametric, which was considered adequate to our sample, since parametric tests assume normality, and in a sample which is small, violations of normality can provide invalid results. Mann-Whitney does assume the same variance for the groups distributions, which was verified for CD1; another issue is that the subgroups tested did not have the same size. While Mann-Whitney test can be performed in different size samples, it loses statistical power as the differences between these groups get higher.

3.3.5 Perspective on Portuguese telemedicine projects

Overall, “Importance” items, I.e., “A” items, had higher means than “Belief/Expectation” items, for all three groups TD, TC and TM.

To understand whether this differences were significant, Wilconxon test for two related samples was used, to compare each pair of items in terms of their medians. (i.e., comparing TD1A vs TD1B, TD2A vs TD2B, etc.)

For most pairs of variables, the difference was considered significant, since $p<0,05$ for all cases.

The exception was the pair TD5A vs TD5B, with $p = 0,439>0,05$, indicating no significant difference between the medians of these items

The conclusion is that respondents consistently rated items important, but they rated their expectation of those aspects actually happening lower.

It is thus natural that the respondents are skeptical concerning the benefits of these projects.

3.3.6 PCA and reliability analysis

The sheer number of items used in this part of the survey lead to doubts about how to organize items to perform Principal Component Analysis.

The initial idea of the work was to have two items for each sentence in the survey. Each sentence described a positive or negative aspect of one telemedicine project. For each sentence, the first item was coded with letter A and inquired about how important the respondent considered that item and the second inquired whether the respondent believed that this aspect would happen.

After several combinations of items to which PCA was applied, the best result was achieved when the analysis was performed two times, once for the items A and the second to items B.

Another decision was to exclude items concerning negative aspects, i.e., those items that evaluated the importance and belief in disadvantages concerning each project.

As opposed to positive aspects, negative aspects mostly did not share significant correlations.

After several experiences with PCA and alpha calculation, it was concluded that negative items influenced the results negatively: They were poorly correlated with positive items and also with each

other in some cases. The final decision was to exclude all negative aspects and perform PCA and the rest of the analysis only on positive items, divided in the following manner:

1. TD1-3, TC1-3 and TM1-3 for A
2. TD1-3, TC1-3 and TM1-3 B

Thus, applying PCA two times, one to all A items and the other to all B items.

For 1.,one factor over 1 was estimated, explaining 64,839% of the total variance. The reliability value obtained for this factor was of alpha = 0,936.

For 2. two factors with values over 1 were obtained. The scree plot has its main inflexion on the second factor, thus two main factors were extracted. The two components (coded PC1B and PC2B) explain 55,101% and 12,752% for the original solution and 35,252% and 32,601% for the Varimax rotated solution respectively. Together they explain 67,853 % of the variance.

Standardized regression scores were calculated as variables, coded PCA, PCB1 and PCB2.

3.3.7 Classifying the respondents

Cluster analysis over PCA, PCB1 and PCB2 was performed in order to find a classification for the respondents.

Two variables were created from the scores for respondents on the factors A, B1 and B2. These variables were coded PCA (principal component A), PCB1 and PCB2 (principal components 1 and 2 of B).

Using a clustering method should provide a classification of respondents according to their scores, first in terms of the factor A and in terms of the scores for the two components in B.

While k-means is a more robust clustering method, it requires a number of clusters to be specified.

Thus, 2-step clustering analysis provided by SPSS was used, using Schwarz Baysian.

2-step clustering

The Importances attributed to each variable for the classification of users contributions from variables in 2 step clustering are presented in table .

- Cluster 1 contains 59 members and cluster 2 contains 68 members.

2-step clustering includes an evaluation of the model quality. In this case, the classification provided by SPSS was “Fair”, close to “Good”, with a value of 4,9.

K-means clustering

As it is recommended to test clustering analysis for its stability k-means clustering was performed, specifying 2 clusters, the number obtained with 2-step clustering, in order to understand whether the results obtained were similar.

The two clusters obtained were Cluster 1 containing 76 members and cluster 2 containing 51 members.

Even though the cluster numbers are inverted (I.e., the k-means cluster 1 corresponds to 2-step clustering cluster 2 and vice-versa), the values of cluster centers and number of members per cluster are relatively similar. The number of members in the corresponding groups are also not very different.

In the following table VI, results from each clustering method are presented.

Table VI – Cluster centers and memberships for each of the clustering methods used;

Cluster number			**1**	**2**
Clustering Method	**2-step**	PCA	-1,23	0,45
		PCB1	-0,84	0,31
		PCB2	-0,81	0,29
		Nº members	68	59
	k-means	PCA	0,58	-0,87
		PCB1	0,36	-0,54
		PCB2	0,52	-0,77
		Nº members	76	51

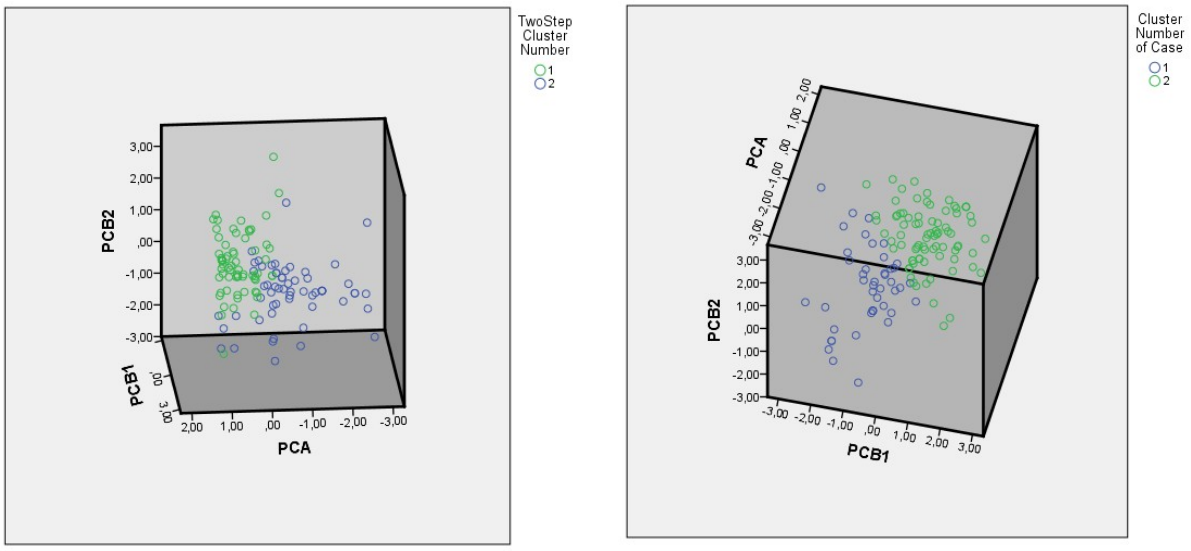


Figure - Graphic representation of the clusters, in the dimensions PCA, PCB1 and PCB2;

4. Discussion

4.1. Expert Interviews

The set of interviews performed was useful to acquire a general perception of the opinion of those who are linked to telemedicine.

As mentioned in the Methods chapter, the sampling for the interviews was intended to stop with theoretical saturation, i.e. a state in which no new information is being acquired. In this work, while at some aspects a state of saturation was achieved, some aspects remained open, and further interviews could have provided new points of view useful to the discussion.

It is important to notice that many of these aspects are actually part of a specific population, constituted by people who belong to related organizations, such as the health ministry. As such, they share a lot of similar ideas, due to the fact that they will often attend the same conferences and have the same sources of information. This might have influenced the research in the sense of achieving an early theoretical saturation point.

An aspect that was interesting was that experts belonging to different organizations, with different goals, shared similar views, concerning benefits and factors of success in telemedicine.

Another interesting point was to notice that while all experts agreed in some points, experts who participated in project implementation directly had different views than those who only participated as consultants, or whose knowledge was theoretical.

This set of interviews also lacks the participation of medical professionals with experience as presenters in telemedicine, i.e., general physicians or family doctors who ask for advice to medical specialists. While the interviewees in this case were able to describe the attitudes of these elements, this does not substitute their direct opinion.

As for patients, an idea that was extracted was that while the patients are likely to agree with telemedicine when they do not have to deal with the technical issues, their cooperation is more difficult to have in projects that involve their direct action, such as telemonitorization.

4.2. Survey to COPD telemonitorized patients

The decision to direct the first survey towards a set of participants of a telemonitorization project had the purpose of extracting information regarding the perspective of a set of users who had an active participation in telemedicine.

For this specific population, the characteristics also made it an extreme case, in that, due to their age and social context, these respondents had a low experience of interaction with Information Technology, most of them not having a Smartphone for example.

In developed countries, the health paradigm is currently older aged patients, living in remote areas. However, having the opinion of these people is not easy, as they are not susceptible to answer surveys through distribution methods such as email. In this work, the goal was to extract as much information as possible about the factors that lead to the satisfaction of these patients.

Other reports regarding this project have been done, and general satisfaction had been confirmed; in this survey, the items concerned specific aspects that were hipothised to contribute for this satisfaction.

In some cases, this hypothesis were confirmed as satisfaction factors, such as reduction in internments, increased feelings of safety and learning about the disease. Other aspects were seen by patients as relevant.

For example, an items asked whether patients had started to use IT for other tasks. For most patients, this was not the case. By their attitudes, it was noticeably that for them using the Smartphone or tablet was yet another treatment method, and was far from being a leisure tool.

4.3. Survey to Internet users

Another survey was directed towards internet users, using Facebook for distribution, since it is a simple method for the divulgation of the survey, and an easy method for achieving high response rate.

Most respondents were not expected to be familiar with telemedicine experiences in Portugal, as the divulgation is very limited for these projects. These respondents were also not expected to have direct experience with telemedicine.

However, in a future were telemedicine is a part of healthcare, these are the potential users and it was considered interesting to know their points of view.

The respondents were first evaluated in terms of their eHEALS scale value. The mean achieved was low, considering the high education level of the sample and low age.

Since the results were not significantly correlated to those of the second part of the survey, no further conclusions were taken.

For the second part of the survey, that concerned the perspective of respondents concerning telemedicine projects in Portugal, from the percentage of those who knew any telemedicine projects in Portugal, the lack of divulgation of these initiatives is clear.

This lack of divulgation could be related to the low values of belief/expectation demonstrated concerning the benefits of telemedicine.

Another trend was that while there seemed to be high correlations concerning advantages of telemedicine projects, the same did not happen with disadvantages. In practice, this means that respondents who answered a certain value for a positive aspect, were likely to have similar answers to benefits concerning other positive aspects. However, the value attributed to negative aspects was not

related to the value attributed to other negative aspects. In terms of advantages, there seems to be some agreement concerning how important and likely advantages of telemedicine are, but not disadvantages.

5 CONCLUSIONS

The main intent of this work was to explain this new context of telemedicine, that differs from that that existed a few years ago. Technology has changed how healthcare is seen; telemedicine is only a tool for the providence of healthcare, and has been used before. However, the access to Information Technologies is more and more democratized, and opportunities arise to make patients in charge of their own health.

Telemedicine is not a unique formula. The type of applications that are currently being used are different in developed and developing countries, and so are the goals and improvements sought.

Despite these differences, in each of these different contexts, some applications are more successful than others and understanding what factors lead to this success was yet another objective of this work.

The approach used here was a sequence of methods, in which the previous method informed the following. In this manner, literature review provided a context for the interviews and these provided context for the surveys that followed.

A main lesson learned in this work is that, as any other project, telemedicine projects are highly dependent on the motivation of the teams involved, and specifically of how the project is built for the users it intends to serve.

Implementers that are motivated and have strategic vision seem to play an important role in the success of projects.

Form the survey to COPD patients and from the views of experts it was noticeable that there is a gap between what idealistically the supporters of telemedicine believe and what can actually be done. In a perfect world, technologies could be perfectly used in a natural manner by all. In the real world, several difficulties arise. This does not mean that a half solution cannot provide improvements.

While all motivation of implementers cannot compensate for the lack of resources, or the characteristics of the population, divulgation of telemedicine projects in Portugal could be an effective way of building a path for a future in which IT can be even more supportive of healthcare. Examining the numbers reported by some projects leads to the obvious conclusion that telemedicine has confirmed benefits, with very few disadvantages. However, the general population is not at all aware of their existence, which justifies their skepticism when inquired about the general benefits of telemedicine.

For future work, recommendations would be to focus literature review in Portuguese projects. The literature review conducted in this work was focused on a global perspective. While apparently not much can be found concerning Portugal, a lot of projects and initiatives are being held, with results that deserve attention.

Another recommendation would be to focus on the perspective of general physicians and family doctors. By what was described, the intention that comes with telemedicine involves a whole system change, from a system ready to answer to critical patients' needs, to one that focuses on continued and older aged care, which is the current health paradigm in Portugal. Experts seem to believe that the functions of family doctors and general physicians will be specially altered. Studying their views on these alterations could be interesting.

Overall, works that focus on how to adapt the current healthcare to something more adapted to chronic patients and continued care are needed, and telemedicine appears as yet another tool.

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7 APPENDICES

Appendix A - Two successful cases of telemedicine implementation

Case 1 -Telemedicine in Instituto Marquês de Valle Flôr – Project "Saúde Para Todos"

Insituto Marquês de Valle Flôr (IMVF) is a non-governmental organization founded in 1951, which focuses its intervention in Portuguese speaking countries. IMVF provides humanitarian help in several areas, such as education, public health and culture. The final goal is to promote the country's self-sustainability.

IMVF's action has been most noticeable in Sao Tome e Principe, where they act since 1988. This is a unique case of an organization being involved in almost the totality of a countries health system. Since the beginning of their action, numbers show that Sao Tomé has seen major improvements in health indicators such as, especially in relation to other sub-Saharan African countries.

First, IMVF's action in Sao Tomé was self-funded, but currently they have support and funding from Fundação Calouste Gulbenkian, Direcção Geral de Saúde in Portugal and the European Union and a partnership with São Tomé e Príncipe government.

One aspect that is notable in the intervention of IMVF in Sao Tome e Principe is their efforts in promoting the autonomy of the country. Their situation has improved greatly over the years but true sustainability will only be reachable with their economic independence from international aid. IMVF highly promotes the need to make use of local human resources, and invest in their formation and education. Also they have pushed to increase responsibility of health expenditure on the population.

Another important aspects is their concern with the sustainability of the projects. The cost recovery program that started a few years ago has allowed to increase the accountability of the population that makes use of the healthcare. This not only allowed to understand the districts were recovery of expenses was better, and to accommodate extraordinary resources, that do not depend on public funding and whose management is made by health deputes, to sanitary districts. Despite these efforts, true sustainability of the health system of Sao Tomé e Principe will only be reachable once the country has an economic activity level that secures its independence from international aid.

Sustainability is essential in this project, as the available budget is tight. Sao Tomé currently invests 20 % of their budget in health, which is a similar proportion as what occidental countries invest. However, in absolute numbers their expenses often surpass gains, as their PIB is much lower.

Health expenses also tend to be quite unstable, which is a consequence of the real lack of a strategic management, which would guarantee the continuity of policies and resource allocation and an incapacity by São Tomé government to reach national and international resources that fund its governmental activity.

One of the critical aspects of the health system of São Tomé e Príncipe is the shortage of human resources, specifically specialized professionals. The size and capacity of the country make it unable to secure adequate formation of professionals. Most of those working in the country come from Cuba,

Portugal, Mozambique and Brazil and those born in São Tomé who specialized often immigrate and do not return.

Escola de Formação de Quadros de Saúde (EFQS) do Ministério da Saúde de São Tomé e Príncipe

has enabled the formation of several types of health professionals, such as nurses, statistical analysts, technicians. The number of professionals is still an issue that difficulties the management of activities.

The use of Telemedicine in IMVF

According to Dr. Paulo Freitas, President of IMVF, the decision to adopt telemedicine in IMVF came from a true necessity.

São Tomé has seen an increased coverage of primary healthcare over the last years, but the lack of medical doctors, and the fact that most of them are located in Hospital Ayres Menezes, makes providence of specialized care a great issue. This need is more noticeable now, since the epidemic profile of the country has changed: With improvement of primary health conditions, there has been an increased percentage of cases of non-transmittable diseases, such as chronic diseases, oncological disease, mental health and neonatal morbidity that already constitutes 2/3 of death causes.

There has been an effort to make several types of medical procedures available in the country, such as mammography. Despite this, some patients inevitably need other types of care and have to be evacuated to Portugal to receive them. Evacuation takes a heavy financial burden, as costs include patient transportation, housing and internment and is usually uncomfortable for the patient.

One of the specific goals of IMVF is reducing the number of evacuations to Portugal. Telemedicine allows for specialists in Portugal to observe the patient and perform exams at a distance, or request resources to perform those exams in the country during the next field mission, leaving evacuation as a last resource.

The second great advantage of telemedicine use in IMVF is the possibility of providing local non-specialized doctors, who present the patient to the Portuguese specialists, with specialized formation.

March 2011 marked the first teleconsultation between the Hospital Ayres Menezes and Portuguese specialists and is currently a regular practice.

Cooperation with PT-innovation

An important aspect for IMVF's telemedicine practice was the choice of a platform. First, the price had to be accessible; most importantly, a huge requisite was that it should not require wide band to work properly. Until recently, Internet access in São Tomé e Principe was acquired via satellite, making the connection prices very high.

The decision was to use Medigraf, produced by PT. At the time it was a platform that could be better described as a telecommunication instrument, more than a telemedicine one, and some considered it to be obsolete. Its advantage came from its low price and the fact that it required 2Mb to function.

PT-innovation, IMVF and Universidade de Aveiro (Altis Labs) cooperated to upgrade the platform, in order to achieve a set of functions needed to provide medical care.

This included a PACS system, real time and store and forward communication, allowing the participants to access clinical data from their location simultaneously, and including specialized medical tools, such as stethoscope and otoscope. The latest improvement is called TELEYE and allows complete ophthalmologic exams, with the collaboration between a Portuguese ophthalmologist and a technician in São Tomé e Príncipe.

The second version of Medigraf was launched in June 2013.

Currently, there are 74 units installed in Portugal, 2 in Angola, 1 in Cape Verde and 2 in Sao Tome e Príncipe.

Figure A1 – Distribution of Medigraf platforms in continental Portugal

Between March 2013 and June 2015 50 thousand exams were introduced in the system and were the base for numerous teleconsultations and distance formations, surpassing the predicted results.

Most notably, since the incorporation of telemedicine there has been an impressive 50% reduction in the number of sanitary patient evacuations, 81.5% reduction in costs for the Portuguese health Ministry and of 20%of the budget from health of São Tomé e Príncipe.

Recognizing the benefits arriving from the use of telemedicine, IMVF intends to strengthen this use with five distinct activities:

1)Gathering the necessary technical and material resources to promote specialized care

2)Reinforcing of technical and material resources t promote assistance and continued care at a distance

3)Improving the efficacy and efficiency of the sanitary evacuation process

4)Promoting the development plan and improving Healthcare in Hospital Ayres de Menezes

5)Training the boards of administration of São Tomé e Príncipe's National Health System .

The target of this program are the 769 professionals and health technicians as well as all the population in São Tomé, as user of the system.

Case 2 – COPD patients home telemonitorization project

Home telemonitorization has been seen as a promising tool for the management of chronic disease patients.

COPD is a chronic breathing disease, responsible for the reduction of the caliber of the air ways (??) and destruction of pulmonary tissue. Common symptoms are cough, expectoration, difficulties breathing. The condition tends to become worse with time, and prognostic is specially affected by exacerbations. COPD patients suffer from severe fatigue and physical limitations, which also lead to depressive symptoms.

Application of telemonitorization to COPD is specially important to prevent the exacerbations by detecting early symptoms.

In 2013, GTT published a dispatch defining the main areas of action of telemedicine in Portugal one of their priorities being telemonitorization, appropriate to provide continuous care and prevention to the increasingly aged population. This implementation currently is limited to COPD patients, but there are concrete plans to implement pilot studies for other diseases, such as cardiac insufficiency., as well as to expand COPD telemonitorization beyond pilot regime.

The full project considered five groups, geographically dispersed through the country. Each group had 15 COPD patients, a hospital in charge of clinical aspects and a company that covered technical aspects.

The hospitals involved were: Hospital de Viana do Castelo (Unidade Local de Saúde do Alto Minho - ULSAM), Hospitais da Universidade de Coimbra (Centro Hospitalar Universitário de Coimbra) and Hospital Pero da Covilhã (Centro Hospitalar Cova da Beira), Hospital de Portalegre (Unidade Local de Saúde do Alto Alentejo) Hospital de Faro (Centro Hospitalar do Algarve). Fifteen patients were selected in each hospital by the attending physician. Each of this hospitals, cooperated with one company: Vital Mobile Health Inc., Hope Care SA, Altran Portugal, Linde Portugal Ltda and Tunstall Ibérica S.A

The criteria on which the choice of patients, monitoring conditions and program objectives were chosen according to established guidelines, notably some recommended by the ATA.

Specific goals were the following for all groups:

i) Raise the quality of services provided to citizens, making them feel continuously monitored in their illness; ii) Reduce at least 2 annual admissions for health degradation of the patient; iii) Reduce 3

episodes of exacerbation with visit to the Emergency Room (ER) per patient in the program; iv) to follow continuously patient conditions allowing timely reaction to postpone/prevent the possible clinical deterioration.

Each patient was supplied in his/her house with the following devices:

Blood pressure measuring device, pulse oximeter, thermometer, pedometer, heart rate monitoring device, Mobile phone.

The report was published after preliminary results, and in it the authors mention the results, which were already very positive.

Even though the established rules were the same to all groups, some aspects were not specified, and were left for each group to decide, which provided some variability in the results, and different dynamics between elements of the groups.

The project has since then been prolonged for more two years, in pilot regime.

For the group of Vital Mobile, there was the possibility of recovering more information specific to their approach as a group. This included interviewing the responsible pulmonologist doctor (in the expert interviews) and interacting with some of the patients of that group, which allowed for an improved understanding of their perspectives.

Appendix B Groupings for Principal Component Analysis

1) I) Computing variables TDA

TD5A and TD4B were excluded, since the communality matrix demonstrated that a value of 0,261 (<0,5).

For the set (TD1A TD2A TD3A TD4A) 1 principal component with a value over 1 was extracted, explaining 60,587% of the variance. All components were above 0,5 the lowest being TD4A with 0,642. The alpha was calculated and a value of 0,774, susceptible to achieve 0,794 with the elimination of TD4B.

1 COMPONENT: TD1A, TD2A, TD3A, TD4A

ii) Computing variables TCA

For TCA1-TCA4 set, communality value of TC4A was only of 0,327, which is indicative that this variable should be eliminated. Reliability was still computed, both with and without TCA4. Despite the low communality value for TC4A, reliability was of 0,804, which is reasonable. With the elimination of TC4A, a value of 0,867 was achieved.

The final decision was to eliminate TC4A. One component was extracted, explaining 79,367% of the variance.

1 COMPONENT: TCA: TC1A, TC2A, TC3A;

iii) Computing variable TMA

TM5A had a communality of only 0,164 and thus it was excluded.

Without this item, one component is extracted, explaining 72,420% of variance. Alpha was of 0,869.

1 COMPONENT: TMA: TM1A, TM2A, TM3A, TM4A

iv) Computing variable TDB

All communality values were above 0,5, between 0,625 for TD3B and 0,722 for TD5B.

Two components with a value over 1 were extracted: The first, explains 45,184% and 35,757%, for the original solution and the Varimax rotated solution respectively. The Scree plot indicates that the major inflexion happens at the 2nd component, leading to the decision on retaining the two components.

Observing the rotated component matrix, the first component has higher contributions from items TD1B, TD2B and TD3B and the second from TD4B and TD5B. A reason for this separation might be associated with the fact that items 4 and 5 relate negative aspects and the other to positive aspects. Alpha was calculated for the second component, but the value was of 0,535. Reliability is only of alpha=0,705 for the first component which might be related to the fact that there are only two items in the set.

Thus, from PCA one component resulted, explaining 63,694% of the variance.

1 COMPONENT: TDB - TDB1, TDB2, TDB3

v) Computing variable TCB

One component that explains 58,368% of the variance is extracted. For reliability, an alpha of 0,721 is achieved, but TC4B was excluded, since this made alpha increase to 0,823. When TC4B is excluded, the component extracted explains 75,126% of the variance.

1 COMPONENT: TCB – TC1B, TC2B, TC3B

vi) Computing variable TMB

One principal component was extracted. Items TM5B and TM4B had communality values of 0,275 and of 0,331 respectively. After retaking the test without TM4B and TM5B, the decision was to exclude both.

In this manner, one component is extracted, explaining 75,107% of variance. Reliability of this set is alpha=0,831.

1 COMPONENT: TMB: TM1B, TM2B, TM3B

2) i) Computing variables TD1 and TD2:

Joining all TD items results in 3 components extracted with values over 1, explaining 42,163%, 14,543% and 10,244% of variance and 32,976%, 17,478% and 16,496% of variance for the original and Varimax rotated solutions respectively. Since in the Scree plot the major inflexion of the curve happens in the second component, the third was excluded.

In the rotated solution, the first component has higher contributions from items TD1A, TD1B, TD2A TD2B TD3A and TD3B and the second from TD4B and TD4A.

TD5A and TD5B contributed for a third component. The decision was to eliminate this component. First, the scree plot inflexion curve happens before the 3rd component, second, values for items TD5A and TD5B as a set are low. When these two items are added to the second component, reliability also decreases.

Thus, the 2 former components were kept, explaining variances of 48,385% and 15,604% and 41,516% and 22,473% for the original and Varimax rotated solutions respectively.

Reliability of the first component was of 0,844 and of 0,811 for the second component.

COMPONENT 1: TD1A, TD1B, TD2A, TD2B, TD3A, TD3B

COMPONENT 2: TD4A, TD4B

ii) Computing variables TC1 and TC2:

For TC items, two components over were extracted. Explaining 51,884% and 17,157% and 47,09% and 21,951% of variance for the original and rotated solutions with Varimax respectively. The inflexion of the Scree plot happens from the second component to the third, supporting the decision to retain two components. The second component has highest contributions from TC4A and TC4B and the first from the other items. Reliability values were of alpha = 0,886 for the first component and for the second alpha = 0,764.

iii) Computing variables TM1 and TM2:

Three components were extracted with values over 1, explaining 49,562%, 14,421% and 10, 187% and 32,182%, 25,359% and 16,629 % of variance for original and varimax rotated solutions respectively. As the inflexion of the scree plot happened in the second component, the third component was excluded. The first component has highest contributions from and the second from TM2B TM1B TM3B TM1A and TM2A and the second from TM4A, TM4B and TM3A. The third component, which had contribution from TM5A and TM5B was excluded, due to the inflexion curve rule stated above.

Performing PCA again without TM5A and TM5B results in two components, with explained variances of 59,183%, 12,974% for the original and 40,839% and 31,318% for the rotated solution.

Reliability values were of 0,895 for component 1 and 0,795 for component 2.

3) i)

Items A

Communality values are all above 0,5 and thus we accept the model.

SPSS estimated 1 components over 1 which explains 64,839% of the total variance.

The major inflexion of the curve happens in component 2. However, the last factor with a value over 1 is the first, thus the decision is to only account for one component.

Reliability: 0,936

ii)

Applying the method for B, two components over zero were extracted. The first component (PC1B) explains 55,101 and 12,752 for the original value and 35,252% and 32,601 for the Varimax rotated solution respectively, which together explain 67,853 % of the variance. This value is slightly above the limit of what it was set to accept for the PCA factor analysis.

Communality value is higher than 0,4 for every variable in the set.

Reliability:

1st: 0,843

2nd 0,852

Appendix C - UL analysis

Inverting items UL4 and UL5

It was experimented the inversion of items UL4 and UL5. These items correspond to the sentences “I use mostly search engines to find information concerning health” and “I prefer to search for information concerning health in pages from Portugal”. As mentioned before, it is ambiguous whether rating these prepositions higher corresponds to a higher literacy in health and skill in seeking for health information or not.

As correlation obtained between UL5 and other variables was negative, perhaps UL5 was inversely correlated with other items. Thus it was experimented the inversion of UL5, using variable UL5n.

Values of correlation between UL5n and the other components remain negative and additionally UL5n correlated negatively with UL4.Results also did not improve with the inversion of UL4n, using the same process.

Appendix D Additional outputs for COPD patients

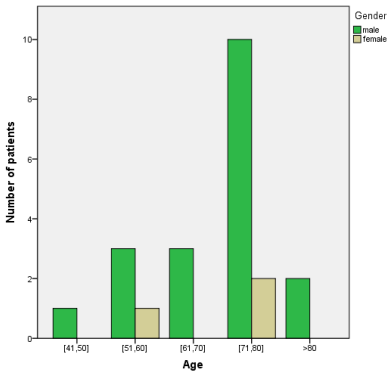


Figure D1 – Distribution of ages of 22 COPD telemonitorized patients

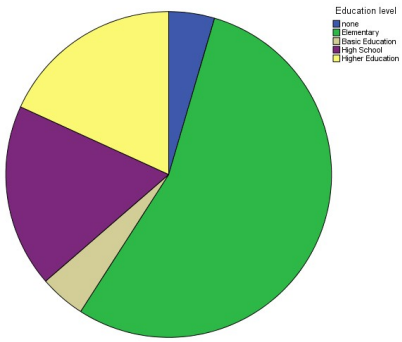
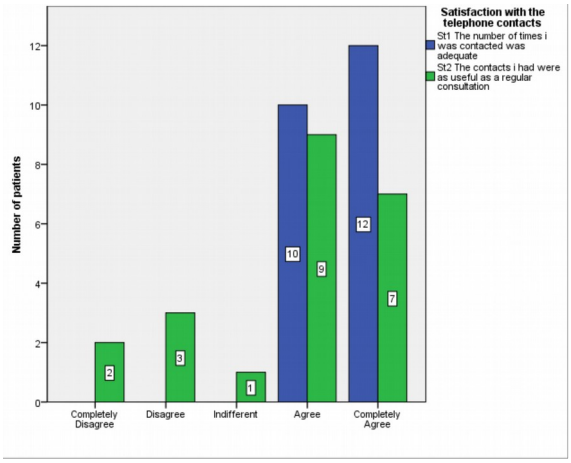
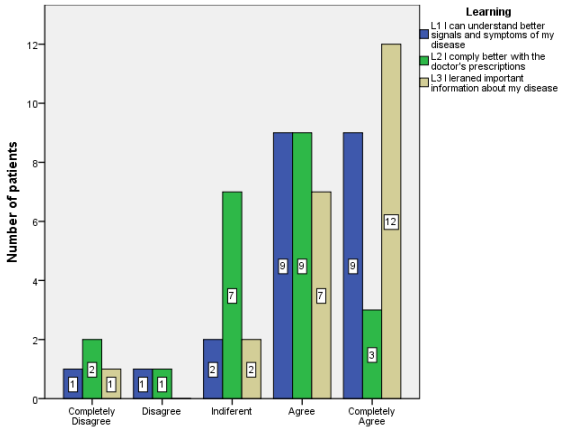


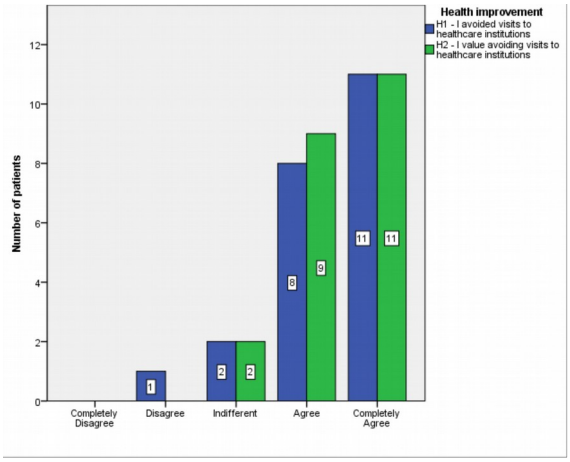
Figure D2 – Distribution of education levels of 22 telemonitorized COPD patients

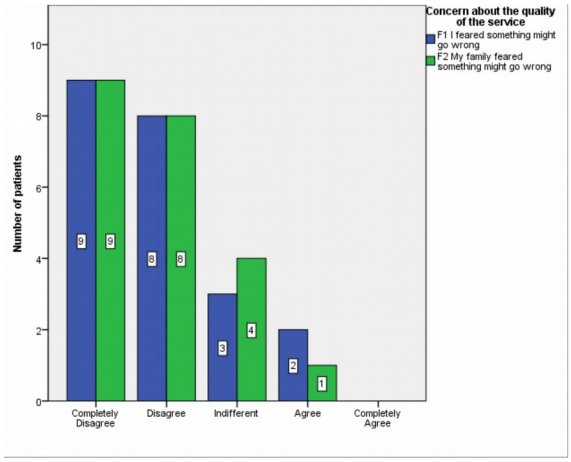
Plots in figures D1 and D2 concern distribution of ages and education level of the 22 COPD patients included in the survey

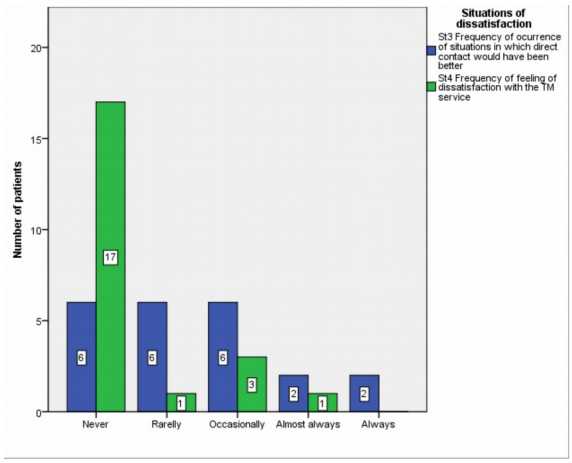
The following histograms contain the distributions of the answers of the COPD patients to the survey.

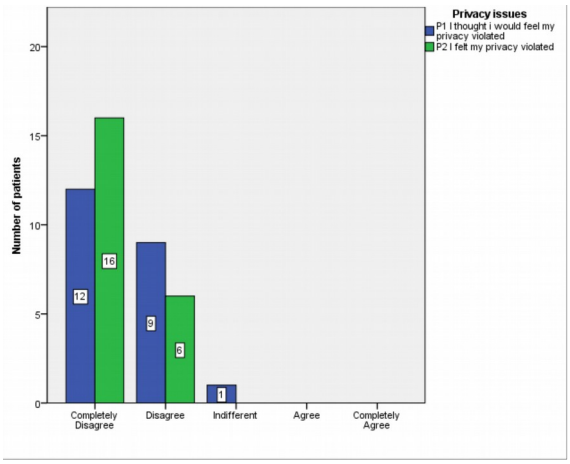


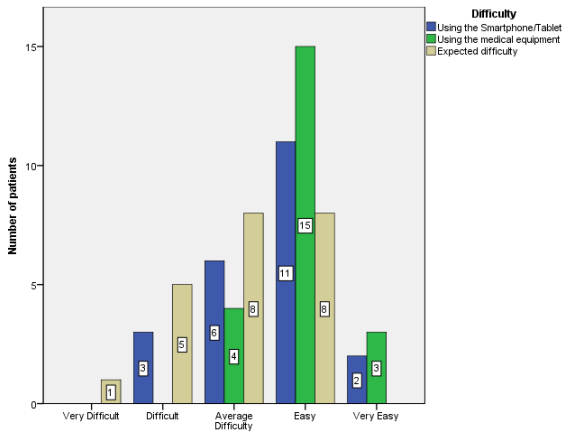


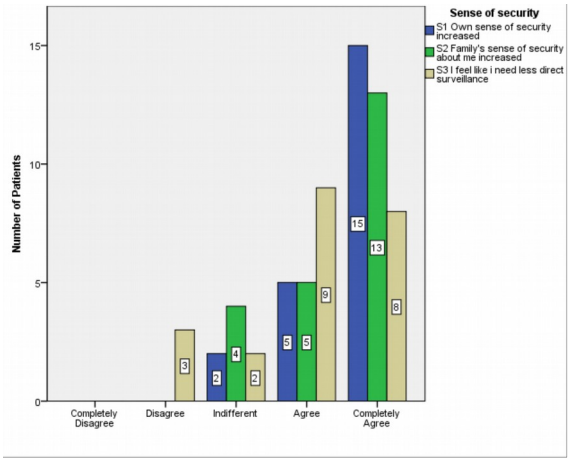












Figures D1 – D8 – Distribution of answers for items in the variables for 22 telemonitorized COPD patients, respectivelly Satisfaction with the telefhone contacts, Learning, Health improvement, Concerns about the quality of the service, Situations of dissatisfaction, Sense of security, Difficulty and Privacy issues;

Main outputs for the PCA analysis for the perspective on Portuguese telemedicine projects

	TD1A	TD2A	TD3A	TC1A	TC2A	TC3A	TM1A	TM2A	TM3A
TD1A	2,792	-1,469	-,422	-1,181	1,102	,256	-,838	,318	-,322
TD2A	-1,469	3,554	-,390	,500	-2,463	,391	,347	-,247	-,016
TD3A	-,422	-,390	2,593	,822	-,457	-2,199	-,115	,168	,558
TC1A	-1,181	,500	,822	4,057	-2,029	-1,700	-,763	,136	,404
TC2A	1,102	-2,463	-,457	-2,029	4,386	,155	-,617	,027	,025
TC3A	,256	,391	-2,199	-1,700	,155	5,278	,526	-1,572	-1,565
TM1A	-,838	,347	-,115	-,763	-,617	,526	4,556	-1,807	-1,559
TM2A	,318	-,247	,168	,136	,027	-1,572	-1,807	3,229	,191
TM3A	-,322	-,016	,558	,404	,025	-1,565	-1,559	,191	2,849

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,836
Bartlett's Test of Sphericity	Approx. Chi-Square	924,477
	df	36
	Sig.	,000

Communalities

	Initial	Extraction
TD1A	1,000	,598
TD2A	1,000	,578
TD3A	1,000	,511
TC1A	1,000	,730
TC2A	1,000	,667
TC3A	1,000	,748
TM1A	1,000	,761
TM2A	1,000	,654
TM3A	1,000	,589

Extraction Method: Principal Component Analysis.

Component Score Coefficient Matrix

	Component
	1
TD1A	,132
TD2A	,130
TD3A	,123
TC1A	,146
TC2A	,140
TC3A	,148
TM1A	,150
TM2A	,139
TM3A	,132

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,836	64,839	64,839	5,836	64,839	64,839
2	,896	9,961	74,800			
3	,669	7,436	82,236			
4	,487	5,414	87,650			
5	,347	3,852	91,502			
6	,334	3,713	95,215			
7	,203	2,260	97,475			
8	,121	1,339	98,814			
9	,107	1,186	100,000			

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,871
Bartlett's Test of Sphericity	Approx. Chi-Square	615,566
	df	36
	Sig.	,000

Communalities

	Initial	Extraction
TD1B	1,000	,583
TD2B	1,000	,741
TD3B	1,000	,495
TC1B	1,000	,665
TC2B	1,000	,762
TC3B	1,000	,686
TM1B	1,000	,755
TM2B	1,000	,786
TM3B	1,000	,633

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
TD2B	,861	
TC2B	,820	
TD1B	,683	,341
TC1B	,670	,466
TD3B	,618	,336
TM2B		,878
TM1B	,332	,803
TM3B		,759
TC3B	,529	,638

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

A Telemedicina na perspectiva do utilizador

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Este inquérito é anónimo e as suas respostas serão alvo de uma análise agregada, respeitando a sua confidencialidade.
A sua opinião é muito importante.
Obrigada.

Catarina Simões

email: catarinamaria_simoes@hotmail.com
Orientada por: Prof. Carlos Lucas de Freitas

1. Antes de ser telemonitorizado no domicílio, pensei que este serviço poderia correr mal.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

2. Antes de ser telemonitorizado no domicílio, a minha família/cuidador pensou que este serviço poderia correr mal.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

3. A opinião da minha família/cuidadores, relativamente à telemonitorização no domicílio foi decisiva.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

4. Foi difícil usar o smartphone/tablet para realizar as atividades de telemonitorização no domicílio?

Muito Difícil	Difícil	Dificuldade média	Fácil	Muito fácil

5. Foi difícil usar os equipamentos médicos para realizar as atividades de telemonitorização no domicílio?

Muito Difícil	Difícil	Dificuldade média	Fácil	Muito fácil

6. Antes de começar a realizar essas tarefas, qual era o nível de dificuldade que achava que teriam?

Muito Difícil	Difícil	Dificuldade média	Fácil	Muito fácil

7. Necessitou de ajuda para realizar as tarefas relativas à telemonitorização no domicílio?

Nunca	Só no inicio	Ocasionalmente	Quase sempre	Sempre

8. Passei a utilizar mais o smartphone/tablet para outras tarefas/atividades, por já ter que o usar nas tarefas da telemonitorização no domicílio.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

9.Sinto maior segurança, por saber que estou a ser telemonitorizado por profissionais de saúde.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

10.Os meus familiares/cuidador sentiram maior segurança por saberem que estava a ser telemonitorizado por profissionais de saúde.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

11.Sinto que preciso de menos vigilância direta por parte dos meus familiares/cuidador por estar a ser telemonitorizado.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

12. Aprendi a perceber melhor sinais de que o meu estado de saúde está a piorar, por estar a ser telemonitorizado.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

13. Por estar a ser telemonitorizado, cumpro melhor as indicações do meu médico (incluindo a medicação prescrita).

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

12. Evitei muitas idas a instituições de saúde por estar a ser telemonitorizado no domicílio.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

13. Valorizo muito poder evitar idas a instituições de saúde por estar a ser telemonitorizado no domicílio.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

14. Por ter contacto regular com os profissionais de saúde, durante a telemonitorização no domicílio, obtive informações úteis sobre a minha doença.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

15. Antes de ser telemonitorizado, tive receito que a minha privacidade fosse comprometida ao utilizar este serviço.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

16. Tenho sentido a minha privacidade comprometida, por estar a ser telemonitorizado.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

17. O número de vezes que foi contactado por via telefónica por profissionais de saúde durante a telemonitorização foi adequado.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

18. Os contactos telefónicos que tive durante a telemonitorização no domicílio foram tão úteis quanto uma consulta presencial teria sido.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

19. Houve situações em que sinto que é melhor o contacto pessoal com um profissional de saúde em vez do serviço de telemonitorização no domicílio.

Nunca	Raramente	Ocasionalmente	Muitas vezes	Sempre

20. Descreva o exemplo de uma situação destas.

21. Houve situações em que me senti insatisfeito com o serviço de telemonitorização no domicílio

Nunca	Raramente	Ocasionalmente	Muitas vezes	Sempre

22. Descreva um exemplo de uma situação destas.

_____

23. Qual é o seu centro de saúde de referência?

_____

24. Quem responde a este questionário?

O próprio	Um familiar/cuidador	Outro
		Quem? _____

25. Em que faixa etária se encontra

20 - 30	31 - 40	41 - 50	51 - 60	61-70	71-80	>80

26. Qual é o seu género?

Feminino	Masculino

27. Qual é o seu nível de escolaridade?

Nenhum	Ensino primário	Ensino básico	Ensino secundário	Estudos superiores

28. Qual é a sua profissão? Se se encontra reformado, que profissão exercia antes de se reformar?

---

29. Vive acompanhado por um adulto (ou adultos) na sua habitação?

Não	Sim	Quem?

30. Se existe algum comentário que considere importante, acerca do serviço de telemonitorização no domicílio, bem como acerca deste questionário, por favor indique no espaço seguinte.

Fim

Muito obrigada pela sua colaboração.

Catarina Simões

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Escala eHEALS

A primeira parte deste inquérito destina-se a obter o seu valor numa escala designada por eHEALS, que procura aferir a sua opinião e
experiência sobre a utilização da Internet para obter informações sobre
saúde.

A escala é a seguinte: 1-discordo completamente 2-discordo 3- indiferente 4- concordo 5-concordo completamente

1. **A Internet é útil para me ajudar a tomar decisões sobre a minha saúde.** *
   Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

2. **Sei quais são as páginas sobre saúde disponíveis na Internet.** *
   Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

3. **Sei onde encontrar páginas úteis sobre saúde na Internet.** *
   Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

4. **Uso principalmente motores de pesquisa para encontrar informações sobre saúde na Internet.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

5. **Prefiro procurar informação sobre saúde em páginas de Internet Portuguesas** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

6. **Sei como usar a informação que encontro na Internet sobre saúde para meu benefício.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

7. **Consigo distinguir entre páginas de elevada qualidade e de baixa qualidade sobre saúde na Internet.**
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

8. **Sei como usar a Internet para responder às minhas perguntas sobre saúde.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

9. **Tenho as competências necessárias para avaliar as páginas sobre saúde que encontro na Internet.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

A segunda parte deste questionário destina-se a avaliar o seu

conhecimento e opinião sobre o conceito de "Telemedicina" e sobre as

práticas de Telemedicina em Portugal.

A escala é a seguinte:

Este aspecto é importante/preocupante? 1-nada importante/nada preocupante 2-importante/preocupante 3-indiferente 4-muito importante/muito preocupante

É provável que aconteça? 1-muito improvável 2-improvável 3-medianamente provável 4-provável 5- muito provável

10. **Sinto-me confiante ao usar informação encontrada na Internet para tomar decisões sobre a minha saúde.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

Telemedicina - definição

"Transferência de actos médicos à distância, recorrendo às Tecnologias da Informação e Comunicação."

11. **Esta definição corresponde à noção que tinha de telemedicina?** *
Mark only one oval.

- ◯ Não
- ◯ Sim

12. **Conhece algum projecto ou prática de Telemedicina em Portugal?** *
Mark only one oval.

- ◯ Não
- ◯ Sim

Tele-rastreio dermatológico

É um modelo de saúde de Telemedicina já praticado em Portugal. Um doente dirige-se ao centro de saúde com uma lesão na pele. Ao invés de o referenciar para o dermatologista, o médico de família fotografa a lesão e envia as imagens e uma explicação ao dermatologista. Há dois resultados possíveis:

1) O dermatologista faz um diagnóstico usando apenas o conteúdo transferido, este diagnóstico é transmitido pelo médico de família, em conjunto com o respectivo tratamento, ao doente.

2) O dermatologista considera as imagens inconclusivas e pede que seja então referenciada uma consulta de dermatologia convencional com o doente.

Classifique os seguintes aspectos acerca do Tele-rastreio Dermatológico, quanto à importância e quanto à

probabilidade de se verificarem, numa escala em que 1 é Nada Importante/Nada provável e 5 é Muito importante/Muito provável.

13. **Reduz os tempos de espera das consultas de dermatologia.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que esta redução aconteça?					

14. **Evita deslocações desnecessárias dos doentes.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

15. **Compensa a falta de dermatologistas em alguns locais do país.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que compense?					

16. **Pode induzir o dermatologista em erro devido à baixa qualidade das imagens e ao facto de este não poder fazer a palpação (sentir com as mãos) da lesão.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que o dermatologista possa ser induzido em erro?					

17. **Os doentes podem recusar que lhe sejam fotografadas algumas zonas corporais.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que aconteça?					

Teleconsulta em tempo real

O médico de família verifica que o doente necessita de uma consulta de especialidade. Se for adequado, a consulta é feita pelo mesmo médico de família e no centro de saúde, mas em vídeoconferência com o médico especialista num local distante.
Tal como no caso do Tele-rastreio, ou é dado um diagnóstico definitivo na Teleconsulta, que é transmitido pelo médico de família ao doente, ou o especialista requisita uma consulta presencial com o doente para avaliar melhor o caso.

Classifique os seguintes aspectos acerca do Teleconsulta

em tempo real, quanto à importância e quanto à probabilidade de se verificarem, numa escala em que 1 é Nada Importante/Nada provável e 5 é Muito importante/Muito provável.

18. **Reduz as listas de espera para consultas em várias especialidades.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que esta redução aconteça?					

19. **Evita deslocações desnecessárias por parte dos doentes.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

20. **Compensa a falta de médicos especialistas em algumas partes do país.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

21. **A qualidade da videoconferência pode induzir o médico a fazer um diagnóstico incorrecto.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que o médico seja induzido em erro ?					

Telemonitorização no domicílio

Modelo de telemedicina, especificamente destinado a pessoas com incapacidade física permanente ou doenças crónicas.
O doente possui um smartphone ou tablet. Este aparelho liga via bluetooth a um conjunto de equipamentos médicos (por exemplo, balança, medidor de tensão arterial, medidor de glicémia e termómetro) e por rede móvel ao hospital ou instituição de saúde.
O doente usa o equipamento conforme indicado pelo médico para medir os seus valores.
Quando um ou mais valores se encontram fora dos parâmetros, um médico ou enfermeiro contacta o doente ou a família, fornecendo o cuidado necessário.

22. **Reduz a frequência das deslocações a instituições de saúde por parte de pessoas que têm a saúde fragilizada.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

23. **Reduz o número de internamentos, porque permite detectar problemas do doente precocemente.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

24. **O doente e a família sentem-se mais confiantes, por saberem que existe uma vigilância permanente.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

25. **As doenças crónicas afectam sobretudo pessoas mais idosas, que podem ter maior dificuldade em utilizar o equipamento.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que aconteça?					

26. **Algumas pessoas podem considerar que a sua privacidade é posta em risco.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que aconteça?					

Perguntas demográficas

27. **Tem alguma doença crónica?**

Mark only one oval.

- Sim
- Não

28. **Tem algum familiar ou amigo próximo que sofra de uma doença crónica?**

Mark only one oval.

- Sim
- Não

29. **Qual é o seu género** *
Mark only one oval.

- Masculino
- Feminino

30. **Qual é a sua idade?** *

_____

31. **Qual é o seu nível de escolaridade?**
Mark only one oval.

- 1º ciclo
- 2º ciclo
- 3ºciclo
- Secundário
- Superior

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Orientada por: Prof. Carlos Lucas de Freitas

1. Antes de ser telemonitorizado no domicílio, pensei que este serviço poderia correr mal.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

2. Antes de ser telemonitorizado no domicílio, a minha família/cuidador pensou que este serviço poderia correr mal.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

3. A opinião da minha família/cuidadores, relativamente à telemonitorização no domicílio foi decisiva.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

4. Foi difícil usar o smartphone/tablet para realizar as atividades de telemonitorização no domicílio?

Muito Difícil	Difícil	Dificuldade média	Fácil	Muito fácil

5. Foi difícil usar os equipamentos médicos para realizar as atividades de telemonitorização no domicílio?

Muito Difícil	Difícil	Dificuldade média	Fácil	Muito fácil

6. Antes de começar a realizar essas tarefas, qual era o nível de dificuldade que achava que teriam?

Muito Difícil	Difícil	Dificuldade média	Fácil	Muito fácil

7. Necessitou de ajuda para realizar as tarefas relativas à telemonitorização no domicílio?

Nunca	Só no inicio	Ocasionalmente	Quase sempre	Sempre

8. Passei a utilizar mais o smartphone/tablet para outras tarefas/atividades, por já ter que o usar nas tarefas da telemonitorização no domicílio.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

9.Sinto maior segurança, por saber que estou a ser telemonitorizado por profissionais de saúde.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

10.Os meus familiares/cuidador sentiram maior segurança por saberem que estava a ser telemonitorizado por profissionais de saúde.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

11.Sinto que preciso de menos vigilância direta por parte dos meus familiares/cuidador por estar a ser telemonitorizado.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

12. Aprendi a perceber melhor sinais de que o meu estado de saúde está a piorar, por estar a ser telemonitorizado.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

13. Por estar a ser telemonitorizado, cumpro melhor as indicações do meu médico (incluindo a medicação prescrita).

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

12. Evitei muitas idas a instituições de saúde por estar a ser telemonitorizado no domicílio.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

13. Valorizo muito poder evitar idas a instituições de saúde por estar a ser telemonitorizado no domicílio.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

14. Por ter contacto regular com os profissionais de saúde, durante a telemonitorização no domicílio, obtive informações úteis sobre a minha doença.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

15. Antes de ser telemonitorizado, tive receito que a minha privacidade fosse comprometida ao utilizar este serviço.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

16. Tenho sentido a minha privacidade comprometida, por estar a ser telemonitorizado.

Discordo completamente	Discordo	Indiferente	Concordo	Concordo completamente

17. O número de vezes que foi contactado por via telefónica por profissionais de saúde durante a telemonitorização foi adequado.

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19. Houve situações em que sinto que é melhor o contacto pessoal com um profissional de saúde em vez do serviço de telemonitorização no domicílio.

Nunca	Raramente	Ocasionalmente	Muitas vezes	Sempre

20. Descreva o exemplo de uma situação destas.

21. Houve situações em que me senti insatisfeito com o serviço de telemonitorização no domicílio

Nunca	Raramente	Ocasionalmente	Muitas vezes	Sempre

22. Descreva um exemplo de uma situação destas.

_____

23. Qual é o seu centro de saúde de referência?

_____

24. Quem responde a este questionário?

O próprio	Um familiar/cuidador	Outro
		Quem? _____

25. Em que faixa etária se encontra

20 - 30	31 - 40	41 - 50	51 - 60	61-70	71-80	>80

26. Qual é o seu género?

Feminino	Masculino

27. Qual é o seu nível de escolaridade?

Nenhum	Ensino primário	Ensino básico	Ensino secundário	Estudos superiores

28. Qual é a sua profissão? Se se encontra reformado, que profissão exercia antes de se reformar?

---

29. Vive acompanhado por um adulto (ou adultos) na sua habitação?

Não	Sim	Quem?

30. Se existe algum comentário que considere importante, acerca do serviço de telemonitorização no domicílio, bem como acerca deste questionário, por favor indique no espaço seguinte.

Fim

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saúde.

A escala é a seguinte: 1-discordo completamente 2-discordo 3- indiferente 4- concordo 5-concordo completamente

1. **A Internet é útil para me ajudar a tomar decisões sobre a minha saúde.** *
   Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

2. **Sei quais são as páginas sobre saúde disponíveis na Internet.** *
   Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

3. **Sei onde encontrar páginas úteis sobre saúde na Internet.** *
   Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

4. **Uso principalmente motores de pesquisa para encontrar informações sobre saúde na Internet.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

5. **Prefiro procurar informação sobre saúde em páginas de Internet Portuguesas** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

6. **Sei como usar a informação que encontro na Internet sobre saúde para meu benefício.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

7. **Consigo distinguir entre páginas de elevada qualidade e de baixa qualidade sobre saúde na Internet.**
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

8. **Sei como usar a Internet para responder às minhas perguntas sobre saúde.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

9. **Tenho as competências necessárias para avaliar as páginas sobre saúde que encontro na Internet.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

A segunda parte deste questionário destina-se a avaliar o seu

conhecimento e opinião sobre o conceito de "Telemedicina" e sobre as

práticas de Telemedicina em Portugal.

A escala é a seguinte:

Este aspecto é importante/preocupante? 1-nada importante/nada preocupante 2-importante/preocupante 3-indiferente 4-muito importante/muito preocupante

É provável que aconteça? 1-muito improvável 2-improvável 3-medianamente provável 4-provável 5- muito provável

10. **Sinto-me confiante ao usar informação encontrada na Internet para tomar decisões sobre a minha saúde.** *
Mark only one oval.

	1	2	3	4	5	
Discordo completamente	◯	◯	◯	◯	◯	Concordo completamente

Telemedicina - definição

"Transferência de actos médicos à distância, recorrendo às Tecnologias da Informação e Comunicação."

11. **Esta definição corresponde à noção que tinha de telemedicina?** *
Mark only one oval.

- ◯ Não
- ◯ Sim

12. **Conhece algum projecto ou prática de Telemedicina em Portugal?** *
Mark only one oval.

- ◯ Não
- ◯ Sim

Tele-rastreio dermatológico

É um modelo de saúde de Telemedicina já praticado em Portugal. Um doente dirige-se ao centro de saúde com uma lesão na pele. Ao invés de o referenciar para o dermatologista, o médico de família fotografa a lesão e envia as imagens e uma explicação ao dermatologista. Há dois resultados possíveis:

1) O dermatologista faz um diagnóstico usando apenas o conteúdo transferido, este diagnóstico é transmitido pelo médico de família, em conjunto com o respectivo tratamento, ao doente.

2) O dermatologista considera as imagens inconclusivas e pede que seja então referenciada uma consulta de dermatologia convencional com o doente.

Classifique os seguintes aspectos acerca do Tele-rastreio Dermatológico, quanto à importância e quanto à

probabilidade de se verificarem, numa escala em que 1 é Nada Importante/Nada provável e 5 é Muito importante/Muito provável.

13. **Reduz os tempos de espera das consultas de dermatologia.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que esta redução aconteça?					

14. **Evita deslocações desnecessárias dos doentes.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

15. **Compensa a falta de dermatologistas em alguns locais do país.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que compense?					

16. **Pode induzir o dermatologista em erro devido à baixa qualidade das imagens e ao facto de este não poder fazer a palpação (sentir com as mãos) da lesão.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que o dermatologista possa ser induzido em erro?					

17. **Os doentes podem recusar que lhe sejam fotografadas algumas zonas corporais.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que aconteça?					

Teleconsulta em tempo real

O médico de família verifica que o doente necessita de uma consulta de especialidade. Se for adequado, a consulta é feita pelo mesmo médico de família e no centro de saúde, mas em vídeoconferência com o médico especialista num local distante.
Tal como no caso do Tele-rastreio, ou é dado um diagnóstico definitivo na Teleconsulta, que é transmitido pelo médico de família ao doente, ou o especialista requisita uma consulta presencial com o doente para avaliar melhor o caso.

Classifique os seguintes aspectos acerca do Teleconsulta

em tempo real, quanto à importância e quanto à probabilidade de se verificarem, numa escala em que 1 é Nada Importante/Nada provável e 5 é Muito importante/Muito provável.

18. **Reduz as listas de espera para consultas em várias especialidades.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que esta redução aconteça?					

19. **Evita deslocações desnecessárias por parte dos doentes.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

20. **Compensa a falta de médicos especialistas em algumas partes do país.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

21. **A qualidade da videoconferência pode induzir o médico a fazer um diagnóstico incorrecto.** *
Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que o médico seja induzido em erro ?					

Telemonitorização no domicílio

Modelo de telemedicina, especificamente destinado a pessoas com incapacidade física permanente ou doenças crónicas.
O doente possui um smartphone ou tablet. Este aparelho liga via bluetooth a um conjunto de equipamentos médicos (por exemplo, balança, medidor de tensão arterial, medidor de glicémia e termómetro) e por rede móvel ao hospital ou instituição de saúde.
O doente usa o equipamento conforme indicado pelo médico para medir os seus valores.
Quando um ou mais valores se encontram fora dos parâmetros, um médico ou enfermeiro contacta o doente ou a família, fornecendo o cuidado necessário.

22. **Reduz a frequência das deslocações a instituições de saúde por parte de pessoas que têm a saúde fragilizada.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

23. **Reduz o número de internamentos, porque permite detectar problemas do doente precocemente.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

24. **O doente e a família sentem-se mais confiantes, por saberem que existe uma vigilância permanente.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto importante?					
É provável que aconteça?					

25. **As doenças crónicas afectam sobretudo pessoas mais idosas, que podem ter maior dificuldade em utilizar o equipamento.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que aconteça?					

26. **Algumas pessoas podem considerar que a sua privacidade é posta em risco.** *

Mark only one oval per row.

	1	2	3	4	5
É um aspecto preocupante?					
É provável que aconteça?					

Perguntas demográficas

27. **Tem alguma doença crónica?**

Mark only one oval.

- Sim
- Não

28. **Tem algum familiar ou amigo próximo que sofra de uma doença crónica?**

Mark only one oval.

- Sim
- Não

29. **Qual é o seu género** *
Mark only one oval.

- Masculino
- Feminino

30. **Qual é a sua idade?** *

_____

31. **Qual é o seu nível de escolaridade?**
Mark only one oval.

- 1º ciclo
- 2º ciclo
- 3ºciclo
- Secundário
- Superior