

Technology Acceptance in Health: eHealth – the perspective of clinicians

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Abstract

Technology has been introduced in the various fields of healthcare. In this dissertation, the goals will be to study the current state of eHealth in the Nacional Health System (NHS), which variables influence its acceptance by the healthcare professionals and how one can improve said acceptance.

That information was acquired using two methods: individual interviews to both experienced specialists and policy deciders in this area to evaluate which topics would be further explored; Internet survey targeting all the physicians and nurses in the NHS. Then, through Principal Component Analysis and linear regression, one attempted to first identify and then correlate the different variables.

Survey results from 151 respondents indicated their perception of: the greatest obstacle to be “Insufficient technological media in the workplace”; the greatest benefit for both themselves and their patients to be the reduction of the number of travels to and from the healthcare institutions; the greatest incentive to be “Incentives for the institutions to acquire telemedicine equipment”; a clear disagreement regarding the adequacy of the strategy for telemedicine in the NHS. An attempt was made to understand the underlying variables and they were built with good correlation between the items that were grouped together to explain them but with low correlations when compared to each other.

The main recommendations that stem from this study are the clarification of the strategy for telemedicine to the healthcare professionals in the NHS and an investment in equipment acquisition to build on top of the professionals’ positive attitude towards telemedicine.

Keywords: eHealth, linear regression, Principal Component Analysis, technology acceptance, technology in healthcare, telemedicine

Resumo

A tecnologia tem vindo a ser introduzida nos vários ramos da saúde. Nesta dissertação, o objectivo é estudar o estado actual da eHealth no Serviço Nacional de Saúde (SNS), que variáveis influenciam a sua aceitação pelos profissionais de saúde e como é que se pode melhorar essa aceitação.

Esta informação foi adquirida utilizando dois métodos: entrevistas individuais a especialistas com experiência e decisores políticos desta área para avaliar que tópicos seriam explorados; questionários pela Internet para todos os médicos e enfermeiros do SNS. A seguir, através de *Principal Component Analysis* e regressão linear, tentou-se primeiro identificar e depois relacionar as diferentes variáveis.

Os resultados dos questionários de 151 profissionais indicaram a sua percepção sobre: o maior obstáculo ser “Meios tecnológicos no local de trabalho insuficientes”, o maior benefício tanto para os pacientes como para eles ser a redução do número de viagens de e para as instituições de saúde; o maior incentivo ser “Incentivos para as instituições na aquisição de equipamentos de telemedicina”; um sentimento de inadequação da estratégia para a telemedicina no SNS. Tentou compreender-se as variáveis intrínsecas e elas foram construídas com boas correlações entre os itens que foram agrupadas para as explicar mas más correlações entre elas.

As principais recomendações que advêm deste estudo são a clarificação da estratégia para a telemedicina aos profissionais de saúde do SNS e o investimento em aquisição de equipamento para aproveitar a atitude positiva em relação à telemedicina desses profissionais.

Palavras-chave: aceitação de tecnologias, *eHealth*, *Principal Component Analysis*, regressão linear, tecnologia em saúde, telemedicina

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List of abbreviations

COPD	Chronic Obstructive Pulmonary Disease
GDP	Gross Domestic Product
ICT	Information and Communications Technologies
NHS	Nacional Health System
OECD	Organization for Economic Co-operation and Development
PCA	Principal Component Analysis
RHA	Regional Health Association
SSMH	Shared Services of the Ministry of Health
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

1. State of the art

1.1. Evolution of the concept of health

The definition of health has evolved through time, with this evolution being linked primarily to the culture of the society that created it. Initially, it was merely seen as the absence of disease and had mostly one component – physical well-being – which was perceived as a “gift from the gods”. Such point of view was supported by and based on the worship, from several societies such as the Ancient Greek one, of deities such as Hygieia, God of Health and Panacea, God of Cure (Scliar, 2007). This concept was later on supported when religions such as Judaism and Christianity, based on the Holy Bible, got more and more popular and disseminated the idea that disease was due to the disobedience of God’s commandments and sin. This way of seeing health was not unanimous, having been contradicted by physicians in Ancient Greece, such as Hippocrates, who thought that “a wise man ought to realize that health is his most valuable possession and learn to treat his illnesses by his own judgement” (Rosen, 2015). Despite this, and due to the strong Christian influence, it would last for several centuries until the end of the Middle Ages. However, in these last centuries, due to the numerous scientific and cultural developments, there have been several updates to the health concept to encompass, not only physical well-being, but also psychological and social well-beings. Currently, the definition adopted by the World Health Organization (WHO) suggests health is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (World Health Organization, 2006).

Just like the definition of health, the practice and purpose of medicine have evolved considerably, with that evolution being due to several factors. Firstly, it has, naturally, kept up with the many different definitions of the health concept. Initially, the practice was associated to the role of the healer, which was performed by religious wanting to calm the fury of the gods. Later on, it was based on the provision of shelter and comfort to the ill-founded, main goals of the European hospitals in the Middle Ages (Scliar, 2007). Currently, medicine is considered “an organized consulting occupation which may serve as the discoverer, carrier, and practitioner of certain kinds of knowledge” (Freidson, 1988) that is the responsibility of multidisciplinary teams part of organizations that communicate with each other and are, usually, under the supervision of the governments of the countries in which they operate.

Secondly, that evolution was intimately connected to the variations on the geographic distribution of the population, which were dependent on the various migrations throughout the centuries, the most important of which, by its geographical reach, being the rural exodus that happened during the Industrial Revolution of the eighteenth century, with its main impacts on people’s lives appearing during the following century. This exodus was due to the invention of numerous technologies that led to the creation of factories in the urban areas, resulting in a sharp productivity increase, which, in turn, resulted in a significant increase of the generated capital in these areas,

attracting workers from the rural areas wanting to increase their standard of living (Jensen, 1993). That migration had such a deep impact that its consequences on the geographical distribution of the population and wealth creation of the developed countries can still be observed. On a national level, Portugal still mirrors this, having a desertification of the inland areas and an increase in coastal and metropolitan populations, mainly in Lisbon (Instituto Nacional de Estatística, 2012), with major consequences on the socio-economic conditions of the population, which are one of the main aspects of the current inequity in healthcare access in Portugal (Barros, 1998). Adding to this, there is a smaller attractiveness of the inland areas to the healthcare professionals, which leads to the institutions located there feeling a shortage of clinicians, which, in turn, contributes to a bigger increase in healthcare access inequalities.

Third and finally, one has to highlight the natural change in medicine thanks to scientific breakthroughs, which have allowed an improvement in the living conditions, the eradication of certain infectious diseases and the early detection of genetic abnormalities, thus contributing to a positive evolution of numerous variables, with the most noticeable being the average life expectancy at birth that, in Portugal, underwent a significant increase from the 71.78 years in 1980 to the 79.20 years in 2010 (George, 2012). However, with this improvement, arise in view on the developed countries new challenges such as the aging of the population and the greater incidence and prevalence of chronic diseases, as well as an increase in the resource consumption in healthcare, in a European and world economic crisis, which requires, at the same time, a cost reduction and an efficiency increase in this area (Callahan, 1996; Sousa, 2009).

1.2. Definition of eHealth/telemedicine

These three aspects suggest a series of challenges countries have to deal with nowadays. To answer said challenges, there have been, in the last decades, some improvement proposals in health services, both on a technical and purely technological level and on an organizational level. This is how eHealth came to be, as a way to practice healthcare remotely, i.e., without the need for the caregiver and the patient in the same room. It has had a tremendous evolution recently thanks to the improvements of the Information and Communications Technologies (ICT), such as cellphones, computers and Internet, and has broadened its spectrum, no longer being confined to remote diagnosis and education and partaking now in previously inaccessible areas, such as treatment and prevention. Due to the huge scope of eHealth, there are numerous definitions for this concept, but the closest one officially acknowledged by the WHO is related to telemedicine and states that telemedicine is “the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities” (WHO Group Consultation on Health Telematics, 1998).

Although the above definition adopted by WHO has managed to tone down the concept debate, there is another controversy around this subject, that has been around since the term

telemedicine was coined but has only become more relevant with the latest developments. Nowadays, with the technologies in health being used, not only for the practice of medicine, but also for other purposes such as nursing and even patient education, several authors have abandoned this term to adopt new ones: e-Health and telehealth. eHealth and telehealth, with the former being more common, are meant to have a broader scope and refer to every specialty in the healthcare area and not just the physicians themselves, as telemedicine suggests but recent studies have shown that the three are being used interchangeably and in a somewhat ambiguous way (Fatehi & Wootton, 2012). For the purpose of this dissertation, to avoid referring to several different terms when approaching the same subject, it was decided only one term would be used for the interactions with healthcare agents. As one can understand from the dissertation title, it is important to notice this study will not be restricted by the telemedicine definition and will instead be looking at the subject from the eHealth perspective and encompass the numerous fields in the healthcare system, from the physicians and nurses to the technicians, never forgetting the ever growing role the patient himself has taken in his own healthcare. However, since this study will be applied to the Portuguese healthcare system, it was decided the most suitable definition to use throughout the main text of this dissertation and in every interaction with healthcare professionals would be the one used by the Portuguese entities dealing with this subject. After performing some preliminary research, telemedicine was the chosen term for this because it is the one adopted by the government entities when regulating these subjects.

1.3. Applications

Telemedicine is thus a complementary way of practicing medicine and improving population health. It is considered a valuable addition both in developing and in developed countries, with its main advantages being explored by both. However, in developing countries, the main purposes are the increase in speed in healthcare access and the associated cost reduction (Wootton, 2008), crucial factors in areas with low income and/or big geographical barriers. As for developed countries, the goals are more related to ensuring the application of the best medical practices, reducing the average stay in hospitals and increasing customers' satisfaction towards clinical acts.

There have been, over the last years, several studies and programs focused on the different areas of telemedicine and applied to diversified socio-economic contexts. In diagnosis, there are recent studies showing telemedicine can reduce in 80% the need of face-to-face consultation on diabetic retinopathy diagnosis, with most of the required consultations being due to the insufficient definition of the image obtained (Mansberger et al., 2013). When it comes to diagnosis in emergency situations, the use of tele-ultrasound equipment for the clinical evaluation of accident victims through the cellphone or tablet of the responsible clinician has already been tested and the greatest limitation now is time-related and not technical and it depends, essentially, on the state of the patient during the exam (Crawford, Mcbeth, Mitchelson, Ferguson, & Tiruta, 2012).

Regarding treatment, there are several studies concerning, for example, telepsychiatry, with various initiatives around the world to use television, telephones and computers to practice psychiatry through videoconference. These technologies have been considered useful to provide increasing

comfort to patients that no longer have the need to move out of their homes or institutions and to give them access to specific treatment programs regardless of the distance. There are, however, some objections by clinicians when it comes to the poor quality of the images and sound issues that, in some cases, do not allow an adequate patient-physician interaction (McGinty, Saeed, Simmons, & Yildirim, 2006), but those shall tend to decrease as technology improves.

Shifting the focus to prevention, telemonitoring has been considered fundamental to follow patients with chronic diseases such as chronic obstructive pulmonary disease (COPD) and heart failure, having the potential to reduce not only the associated mortality rates but also the number of hospital admissions (Grupo de Trabalho de Telemedicina, 2015; Kotb, Cameron, Hsieh, & Wells, 2015), thus having direct impact on the patients' quality of life, further supported by their total satisfaction towards the aforementioned programs.

Lastly, education is one of the oldest applications of telemedicine, since some of the educational tools do not require the image and sound quality previously mentioned other areas did. ICT allow, of course, greater sharing of knowledge and experience between professionals worldwide and the access to e-learning platforms and digital libraries, something crucial to guarantee said professionals have access to information that allows them to keep up with the state of the art in their area, which in turn improves the quality of the service they provide and their personal motivation. In recent decades, several programs have been developed, with RAFT taking the spotlight. RAFT is a platform created between the Geneva University Hospital and ten francophone African countries which allows them to webcast several technical courses as well as videoconferences and teleconsultations, among other activities, and has been very successful, being now discussed with the WHO and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (Bagayoko, Geissbuhler, & Ly, 2007). Another program that deserves credit is the telepsychiatry education program established in Australia, a country with a very significant geographic dispersion, which allows psychiatry and psychology interns in rural areas to acquire specific knowledge from the areas they are going to practice in without foregoing a quality supervision by the most experienced professionals practicing in urban areas (McGinty et al., 2006).

On a global scale, the WHO has, in 2009, distributed questionnaires to gather information about telemedicine from all its member-states. This led to the publication, in 2011 and 2012, of a series of six detailed reports on the various topics regarding telemedicine, from the ethical concerns related to patients' privacy to the online safety of the users and their clinical data, also focusing on the many different applications, from the information systems to the electronic health records, not disregarding the mobile apps for smartphones and tablets. In these reports, just like throughout this chapter, despite exploring several different areas where telemedicine has been an important supplement in healthcare, the WHO highlights four particular ones with a degree of development and actual implementation above all others; these four areas are introduced and defined in Table 1. Among them, teleradiology is presented as the most developed, being used, either in an established way or through pilot-projects, in most of the countries that participated in this survey, with the

remaining areas also having a significant percentage, ranging from the 24% of telepsychiatry to the 41% of telepathology.

Area	Definition
Teledermatology	Use of ICT to transmit medical information concerning skin conditions for interpretation and/or consultation
Telepathology	Use of ICT to transmit the results of digitized pathological exams, such as microscopic images, for interpretation and/or consultation
Telepsychiatry	Use of ICT for psychiatric evaluations and/or consultation through video or telephonic transmission
Teleradiology	Use of ICT to send digital radiologic images, such as X-ray exams, for interpretation and/or consultation

Table 1 – Introduction and definition of the main areas of telemedicine worldwide (World Health Organization, 2010)

Portugal has sought to keep up with the progress of developed countries in this area and has a group dedicated to this purpose – the Telemedicine Workgroup – integrated into the Monitoring Committee of Clinic Informatization, an organization working under the Shared Services of the Ministry of Health (SSMH). This workgroup was formed in 2012, following the creation of the Telemedicine Strategic Plan, and has since then developed several initiatives for the introduction and improvement of health programs in Portugal, in areas as diverse as telemonitoring of COPD or teledermatologic screening (Grupo de Trabalho de Telemedicina, 2015). The first results of the pilot-project around COPD have been disclosed and, although not overwhelmingly positive, have been considered encouraging, with half of the hospitals having a 50% reduction in emergency events and hospitalizations, as well as a 100% patient satisfaction. These results were first disclosed during the II Telemedicine Meeting of the National Health System (NHS), an annual event that aims to show the state of the art of telemedicine in Portugal and where there is extensive discussion on the current implementations and greatest obstacles in this area throughout the country.

In order to promote telemedicine acceptance, there have been some objective measures in Portugal. The first one, created in 2013, states that, for every teleconsultation, regardless of being first or subsequent and programmed or emergent, hospitals are paid ten percent extra than the equivalent face-to-face consultation (Administração Central do Sistema de Saúde, 2016). The second was the creation, in 2015, of the Telemedicine Internal Promotor, who is someone appointed by the institution where they work and whose main goal is to promote the implementation, mostly on the clinical point of view, of telemedicine at their workplace. The third main measure was the signing, in 2015, of a framework agreement to facilitate and potentiate the acquisition of telemedicine services by the different country regions and islands, with its main focus being telemonitoring and teleconsultation services (Grupo de Trabalho de Telemedicina, 2015).

1.4. Obstacles to telemedicine acceptance

As one can observe, there are several advantages of telemedicine, both on a national and international level, presented here, which might lead the reader to question himself why telemedicine is not already assimilated and implemented in its various contexts. The truth is, despite the existence of the previously explained advantages, there are still a number of obstacles which contribute to telemedicine not living up to its full potential. To understand them, one should realize that “the task for every health care system is how to maximize the personal contact at the same time as maximizing the technical input, while all the time operating within a sustainable financial framework” (Wootton, Patil, Scott, & Ho, 2009). From this sentence, one can highlight several points of view one should take into account to study the integration of telemedicine in a national health system: how to do it to guarantee one obtains the necessary information for the patients’ well-being; how to do it without damaging the relationship between healthcare professionals and patients and without disrespecting the rights from both sides; how to do so with a dwindling amount of resources in the current context of demographic aging and international economic crisis.

With respect to the technical standpoint of obtaining and managing information, national health systems usually implement industry-created solutions and are therefore a more passive stakeholder in that regard, but these systems end up playing a major role in managing the obstacles related to the two other points of view. Concerning the patient-clinician relationship, the main concerns for the developed countries are related to patients’ satisfaction and to their privacy and confidentiality of their clinical data, since it is necessary to guarantee that the computerized clinical data of a patient is inaccessible to anyone he did not previously approve. From the financial point of view, there are barriers to entry due to the need for funding of the construction of infrastructures, equipment acquisition or improvement of the existent one, as well as the education of professionals and patients. This is often the most mentioned obstacle in Portugal, due to the already higher health expenditure as a percentage of the Gross Domestic Product (GDP) than the average of the Organization for Economic Co-operation and Development (OECD), despite said variable registering an average decrease of more than 3% per year between 2009 and 2013, one of the biggest reductions among the members of said organization (Organization for Economic Co-operation and Development, 2015).

In addition to the aforementioned obstacles, there is another that stems, in a more direct way, from psychologic and social factors, which is the inertia of the healthcare professionals and the patients and their perception of the effect new technologies might have in their routines. These factors end up significantly influencing the acceptance, by the clinics, of telemedicine, which has been often suggested as the main variable for the successful implementation, expansion and sustainability of this service in the national health systems, being even more relevant than factors which would, in principle, seem more significant, such as technologic problems or lack of resources (Wade, Elliott, & Hiller, 2014). Therefore, it is crucial to understand first what influences the acceptance of new technologies and then if it is possible to predict said acceptance, especially when it comes to telemedicine.

1.5. Technology acceptance models

The study of the acceptance of new technologies is a particular application of a broader field, the study of the attitude of an individual towards a particular task. This study was initially built on top of areas such as psychology and sociology and developed during the twentieth century, with important studies first regarding the measurement of attitudes leading to the proposal of the nowadays most common attitude measurement method: the Likert scales. This method used different measures under the assumption that normal distributions were accurate representations of the five-point scales and simplified the entire process, while maintaining the same reliability as previous standard methods and improving the correlation (Likert, 1932).

However, the first records of studies about the influence of goals in human behavior only date back to the decade of 1950, with 1975 being the year in which the book that laid the foundations of research and study in this area was published. In it, Martin Fishbein and Icek Ajzen proposed the Theory of Reasoned Action (TRA), having initially isolated and identified four major variables – belief, attitude, intention and behavior – and then sought to study them more in depth (Fishbein & Ajzen, 1975). About the beliefs, even though they can be formed through direct observation of a behavior, they usually involve a certain type of deduction by the individual, which means the construction of a belief towards a topic will be dependent on the information said individual has about that topic. Concerning attitudes, they will be related to the beliefs of the individual on the particular topic and the relative importance the individual gives each of them. Finally, the intention to perform a certain behavior ends up depending on the various attitudes the individual has towards it, that is, the evaluation of the positive and negative consequences for the individual of performing said behavior, as well as the existing social norm towards that subject (Ajzen, 1985; Fishbein & Ajzen, 1975).

After this more thorough study of the variables, they then suggested, not only that they could be objectively analyzed and measured through probabilistic models – based on the calculation of conditional probability of two events using Bayes' theorem – but also that they were interrelated, with beliefs resulting in attitudes, attitudes leading to the formulation of intentions and intentions leading to behaviors, which can, in turn, lead to new beliefs due to the fact that its realization allows the acquisition of new information, the main determinant of the formation of a belief. In addition to this form of behavior change, the authors also evaluated the effect of passively supplying new information to the individual, taking into account the effects of the disparity between supplied information and personal beliefs, as well as the effect of the overall attitude of the individual, with the conclusion being that the probability of change grows with the diminution of the aforementioned disparity and with the flexibility of the individual (Fishbein & Ajzen, 1975).

In 1985, Ajzen proposed a new theory in which he considered TRA was a particular case of a broader theory, the Theory of Planned Behavior (TPB), which can only explain the behavior of an individual when said behavior is volitional, performed immediately after the analysis of the individual's intentions and when the possibility of failure is insignificant. TPB has therefore introduced some changes to the TRA model, with the main one being the introduction of a dependency on the

probability of success and failure of the performance and the attitude of the individual towards each of them when analyzing the determinants of attitude. Besides that, attitude was now being expressed as a function of time, which can, among other things, amplify the negative aspects of a behavior or lead to the acquisition of new information, something which, as previously discussed, has direct impact on the formation of new beliefs (Ajzen, 1985).

Parallel to this development, other authors have studied and adapted TRA to other contexts, with the most relevant proposal for the topic in question being the Technology Acceptance Model (TAM), created to study behaviors related to the usage of information systems. TAM postulates two fundamental beliefs that influence the possible adoption of technology which are perceived usefulness – probability the individual thinks there is for the use of the technology to improve his professional performance – and perceived ease of use, that is, the degree to which the individual hopes the use of the system requires no effort (Davis, Bagozzi, & Warshaw, 1989; Davis, 1989). Moreover, based on the studies of several other authors, TAM does not include social norm as a determinant of attitude for two reasons: the use of technology in professional contexts is, in some cases, mandatory, defying one of the assumptions of the TRA; the variable itself has been considered, even by the original authors of the TRA, as the most unreliable and hardest to measure (Fishbein & Ajzen, 1975).

Although this model has gathered tremendous appraisal and has asserted itself as the main instrument for the study of technology acceptance, there are authors who criticize its validity and point out its flaws. The criticism towards it can be essentially divided in three categories. The first is related to the theoretical foundation of the model, with the relation between intention to use and actual use, the consideration of behavior as the main goal and the deterministic nature of the model going against the known mechanism of intention formulation being the main targets of said criticism (Bagozzi, 2007). The second has to do with the methodology used for the TAM tests, with the first limitation being the fact TAM is based on self-reported information by the user instead of real information, something which reduces the reliability of the measurement; it is also mentioned the fact that these tests are often performed in students, a professional category with very specific motivations different than every other; the last limitation about the methodology has to do with the reduced amount of studies in contexts where the use of the information systems is mandatory, the main scenario in professional environments. Finally, the variables themselves and their relationships within the model are also criticized, with real world studies reporting the reduced significance and correlation with behavior intention of particular variables, such as social norm in mandatory settings, and contesting the exclusion of others (Chuttur, 2009).

Since the proposal of TAM, there have been several updates, not only by the author himself but also by others who built on his work. TAM2 was the result of the first changes, now including in the model the main determinants of perceived usefulness i.e. social norm, image or “the degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system” (Moore & Benbasat, 1991), job relevance, output quality and result demonstrability. After analyzing them, the authors concluded social norm was only relevant in mandatory settings. Besides these determinants,

the authors also considered the variables experience and voluntariness significant to predict intention to use (Venkatesh & Davis, 2000).

Later, the Unified Theory of Acceptance and Use of Technology was proposed and it was an attempt to aggregate the main theories at the time and resulted in a model where performance and effort expectancy and social influence were direct determinants of intention to use, while usage behavior was directly determined by intention to use and the facilitating conditions, that is, “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh, Morris, Davis, & Davis, 2003).

These different theories have been used to study ICT adoption, from the use of electronic mail to the prediction of e-commerce behavior. Healthcare is no exception although the studies in this area have been mainly focused on the use of electronic databases and digital libraries (Gagnon et al., 2009). A noteworthy exception, for being one of the few studies who attempted to quantify the adoption instead of merely theoretically explaining it, involved the use of the Theory of Interpersonal Behavior, a theory based on TPB and TAM, to predict telemedicine adoption by the physicians in the telemedicine provincial network of Quebec, Canada (Gagnon et al., 2003). The model managed to explain 81% of the variance in intention to use, with determinants such as patients’ and other healthcare professionals’ perception being considered extremely significant to explain the intention to use. However, one should consider this study had some limitations, namely a low response rate to the questionnaire, a largely superior response rate by the physicians practicing in rural areas when compared to the ones in urban areas and the fact that the sample selection had been made during a congress on the specialty, which might imply the selected professionals had not only interest but possibly experience in this area.

1.6. Research questions

As can be seen throughout this chapter, telemedicine is an area with significant potential to improve healthcare and, therefore, quality of life, in Portugal. However, the current context of economic crisis and the concerns about the sustainability of the National Health System (NHS) impose stricter limits and demand greater ponderation when allocating resources in this area, with these being preferably applied where a good cost-effectiveness ratio is observed. Therefore, it is mandatory to understand if the technical, financial and human resources currently dedicated to telemedicine are being translated into benefits for the general population. As previously stated, one of the key aspects of the success of technology implementation in medicine is the study of said technology acceptance by the healthcare professionals and, thus, that will be the main focus of this dissertation.

Telemedicine acceptance, however, is too broad of a topic to study on its own. To analyze quantifiable data and gather valid opinions, one should establish narrower topics to study, which will work as the research questions of this dissertation. First and foremost, especially in the initial stages of this research, it will be interesting to understand what the opinion of the healthcare professionals on telemedicine is. This will be the broader of the subjects that will be analyzed here but it has the potential to confirm the significance of the other variables. Next, it is important to study which variables

influence, both positively and negatively, the acceptance of telemedicine and their relative importance to the professionals. This is linked to what is perhaps the most complex question, which is how to increase the acceptance and further adoption of telemedicine. The answer to this question should stem from the study of the relevance of the different variables, as well as the possible incentives and existing barriers influencing them and will hopefully produce practical and concrete suggestions. It would also be interesting to see how two particular factors affect this adoption: the first one is medical specialty and can be linked to the advancements in technology and the benefits they can provide to each different area of healthcare; the second is age and aims to realize how different this acceptance in different age groups is, something particularly significant when one realizes most of the relevant technologies being mentioned have appeared in the last three decades, when some of the physicians currently practicing had already completed their studies and had already a few years of experience, which means they had to learn how to use them from anew.

1.7. Research perspectives

This study will be made according to two broad perspectives of research: qualitative and quantitative research. It is possible and common to produce scientific research using only one of them, but they can and should be used together, with qualitative research being a very useful way of gaining an in-depth understanding on the subject and to help produce hypotheses and quantitative research being fundamental to gain concrete data to support more thorough analyses. There are, in fact, authors who claim that the most solid hypotheses and theories to analyze stem from the analysis of previously gathered data since they are more likely to resemble reality (Glaser & Strauss, 1967). In fact, to accommodate this, there has been a third angle of research or paradigm emerging in the last decades, one that aims to combine the best of both worlds to approach complex researches with different types of data that require quantitative and qualitative methods to be extracted: that paradigm is called mixed methods research, also referred to as mixed research. Due to its broader scope, there are several different definitions in the literature for this paradigm. They have in common the combined use of both quantitative and qualitative methods but they diverge in how much these should be integrated and depend on one another for the research to be considered mixed. These definitions were all analyzed in a review and the authors of said review decided to propose a new one, which will be used here: “Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g. use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration.” (Johnson, Onwuegbuzie, & Turner, 2007) Therefore, to better understand mixed research, one should first delve into the study of qualitative and quantitative research.

In its essence, qualitative research is based on three different and very broad areas – sociology, ethnography and psychology – and has been founded and continuously improved through advancements in both. From sociology, it has gathered the notion that to better understand the individual's way of seeing his surroundings, one has to empathize with him. From ethnography, it picked up the knowledge that, to better understand a person's culture, one has to not only observe but

also be embedded in it (Hammersley & Atkinson, 2007). From psychology, it has gained methods to access human's subconsciousness, which allows researchers to go beyond an individual's verbal expression and access the true motives of their actions (Birks & Malhotra, 2006). To apply these principles, investigators use a variety of methods, such as focus groups, individual and group interviews, case studies or even field observations.

From its foundations, qualitative research has grown to be considered an "unstructured, primarily exploratory design based on small samples, intended to provide deeper insight and understanding" (Birks & Malhotra, 2006) and has recently taken a significantly bigger role thanks to the many changes societies have been going through. However, it is heavily criticized due to a number of issues related to subjectivity, such as: sample bias, that usually stems from the small samples that are either not diversified enough or not statistically significant; the inherent researchers' bias, that cannot be fixed unless they are included in a group that can provide intel on the data or code the data so that the replier can be unidentifiable; inability to obtain the same data from the same group of repliers when changing the method of research, since each provides a different type of data that is not directly comparable to the others (Barbour, 2001).

On the other hand, quantitative research aims to get quantifiable data through the use of survey techniques such as live interviews or ones performed with the assistance of telephone or computer or questionnaires through postal or email and through observational techniques, with each of them having its advantages in fields as diverse as the flexibility of data collection, the sample control or the replier's perception of anonymity (Birks & Malhotra, 2006). Although some of these techniques can help collect some qualitative information such as the repliers' feelings towards the topic or their context, they are usually not anchored in solid context information and can be classified as somewhat meaningless as they cannot caption the sample's culture or context, which can lead to a failure in understanding the results. This is why quantitative research benefits from the context and initial sample exploration qualitative research provides.

In this dissertation, qualitative research will be first employed to gather more information about the healthcare professionals' opinion on telemedicine and to gather some additional information on topics such as their perception on the utility of these technologies in their job or its future in their specialty. Then, once the variables to study are confirmed as valid, one will resort to the survey to reach a larger sample and collect statistically valid data and further analyze it.

2. Materials and methods

As previously stated, this research will make use of the mixed research paradigm in an effort to answer the main questions discussed in the state of the art without neglecting the context one needs to properly interpret them. Therefore, the methods and thus the materials will be divided into two categories: qualitative research and quantitative research. The former will mainly be used in the first stages of the study, in a broader and more exploratory phase, to validate and potentially ameliorate the hypotheses, while the latter shall be used to give the concrete data to analyze the more specific variables that influence the technology acceptance in health. To better understand which methods belong to each angle of research, they will be presented and explained in different chapters. Despite such decision about their display, it should be emphasized that they were not created without taking one another into consideration and these connections will be made clear whenever necessary.

2.1. Qualitative research

This dissertation aims to study technology acceptance in health, that is, the technology acceptance by healthcare professionals. To do so, there are three main professions one should focus on: physicians, nurses and healthcare technicians. These are all classes with long work periods, up to twelve hours in a row in some cases and, sometimes, a rotating schedule, which turns predicting and scheduling appointments during free times a difficult task. Moreover, these professionals spend a great percentage of their work time in contact with the patients, whose privacy they must ensure at all times, which leaves them with little time left for other tasks during work time. This combination of factors by itself has the potential to invalidate a few of the already mentioned qualitative research methods due to the unique schedules and privacy concerns. Therefore, after considering these aspects and thinking how to approach this phase of the research, it was decided there would be some self-imposed pre-requisites to select the method: the interactions with the professionals must be short not to interfere with their work schedule; they should require the least possible amount of professionals simultaneously to avoid complex schedule overlaps; they should not disturb the professional-patient relationship.

With these limitations, methods such as focus groups, group interviews, case studies and field observations were considered unfeasible and, therefore, ruled out. It was then decided that the method of choice for the qualitative portion of this study would be the individual interview.

2.1.1. Individual Interview

It is true that the individual interview is not considered the main marketing research technique unlike the focus groups, it does not allow the collection of a great amount of data from multiple sources at the same time like the group interviews nor does it allow the direct observation of a target's action like the field observations.

However, there is one thing this method excels at: it creates a greater bond and, therefore, more trust between the interviewer and the interviewee, which allows the discussion of more personal

topics, which the interviewee might have felt uncomfortable discussing in public. That is particularly important in some of the aspects one will approach further on, such as the interviewee's perception of others' opinions or his perception of the boss's opinion on this topic. Besides this extremely relevant benefit, individual interviews also help dealing with some of the constraints strongly related to the professional classes in analysis, such as: hectic schedules, because these busy professionals can barely accommodate one short interview, let alone a focus group; heterogeneity, because, when organizing a group method such as focus groups or group interviews, the best information stems from discussion between more similar persons, since the participants need to feel comfortable with each other, which is something particularly difficult to achieve considering the above constraints (Gibbs, 1997); interviewer reflection, by excluding every other task and any other interaction other than with the interviewer, the interviewee has time to ponder each question as long as they want, which will hopefully lead to more complete answers and a better understanding of his stance on the matter he is being questioned about (Birks & Malhotra, 2006).

Now that one has established the method to use, it is important to notice the steps one should follow in its application.

2.1.1.1. Situational Analysis

First, the interviewer should have extensive knowledge and be extremely comfortable with the topic he will be exploring in his interviews. This is particularly important in individual interviews as opposed to other techniques because the influence and skill of the interviewer here are the main factors to make up for the relative lack of structure of the method. To prepare this step, first the author decided to approach these interviews only after having studied extensively the state of the art, to better understand the context of telemedicine in Portugal. The other pre-requisite, the influence and skill of the interviewer, was improved in two ways: the decision to prepare the semi-structured interview guide to avoid derailing the interview and make sure every important topic was approached, while still giving room for the interviewee to express his feelings and thoughts on the matters; preparation of each interview with a script review the day before and anticipation of possible answers and transitions pending on each answer. While these measures should enhance the interviewer's qualities, nothing replaces actual experience interviewing. It was thus natural to notice that there was on-the-job learning, with the first interviews serving as a learning ground for the remaining ones.

2.1.1.2. Criteria selection

After this enhancement of the interviewer's capacities, one should pick the common characteristic which the interviewees should have (Merton, 1990). In this case, the chosen characteristic was experience with telemedicine: it was decided that every interviewee should have been involved in a telemedicine program in his professional career. This criteria was chosen for one primary reason: there is not, as previously seen, a plethora of literature on telemedicine in Portugal from where to extract the needed information for this dissertation, which means these interviews were being regarded as a very important learning tool after the study of the existing literature and as this study's main source of information in technology acceptance in health. Although it would be interesting

to understand outsiders' perspective on telemedicine, they would not be able to give the most informed insight on what influences the acceptance of technology. This does not mean this portion of the healthcare professionals was disregarded entirely but it ended up being vastly outnumbered, as will be seen.

To interview healthcare professionals with experience in telemedicine, one could contact the Telemedicine Workgroup in the Shared Services of the Ministry of Health (SSMH), for more centralized help and the potential to find interviewees with not only experience in working with telemedicine but also in policy discussion in this area. The downsides are that one would risk having a more uniform take on the subject, with less diversified opinions and a significantly more biased opinion on policy issues. The other option would be to contact healthcare institutions or the professionals involved in this type of projects. The downside here, besides the natural time constraints due to more dispersed potential interviewees, is the potential to have only a practical view on the subject and its day-to-day application and missing out on the analysis of the more global strategy. Acknowledging that both approaches had their merits, and in an attempt to mitigate their downsides, it was decided the desirable was a mix of professionals more involved in policy discussion and professionals working with telemedicine in their daily routines.

Therefore, the author decided to follow two different paths. On one hand, it was decided every hospital within twenty kilometers radius would be contacted to ascertain their availability to suggest professionals to be interviewed. This resulted in a total of eleven hospitals being contacted, with two replies obtained: one being a confirmation of the reception with the information it had been forwarded to the administration board, with no follow-up; the other was a final reply rejecting the request. The author also contacted the higher instances in the Ministry of Health, among other government entities, but there was no answer whatsoever.

On the other hand, the author decided to attend the eHealth Summer Week, which occurred in Lisbon in the end of the month in which this stage started. It was a week-long event organized by the SSMH that grouped together national and international healthcare professionals with the major policy deciders and specialists in this area in a series of presentations and discussions on the various topics of telemedicine around the world.

The selection of the interviewees was therefore based on two subjective criteria to match either of the previously specified groups: how comfortable they seemed with the applications of the various technologies in their specialty; how influent they were on the decision policy of the implementation and diffusion of telemedicine in Portugal. There were a total of seven contacts made during that week – two to policy deciders and five to professionals using telemedicine regularly – with six of them resulting in individual interviews. Around this time and, considering the initial amount of established contacts, it was decided ten would be the desirable number of interviews for this stage; therefore, one would need to obtain four more relevant contacts.

As will be seen in the next section, every interviewee in this initial sample was asked to refer other professionals who could collaborate on this project. This question was asked to be able to obtain

different perspectives on the same specific project/policy the interviewee was involved in because said different perspectives can help mitigate personal bias towards a specific matter, thus giving more objective data concerning said matter. This is the principle behind the snowball or chain referral sampling method which has, in fact, been considered “a method uniquely designed for sociological research because it allows for the sampling of natural interactional units” (Biernacki & Waldorf, 1981). However, one cannot consider the referral method used in this dissertation as pure snowball sampling because it did not fulfill a series of criteria previously determined by the literature (Goodman, 1961): the initial sample was not chosen randomly, it was handpicked by the author obeying to a series of objective criteria; each person was asked to refer other people and not a specific number of people previously determined and requested to everyone; the so-called first stage, that is, the people referred to the author by interviewees in the initial sample, was comprised of only three interviewees instead of the total amount of referred people. The contacts of the people who ended up not being interviewed were kept and they were asked to participate in a later stage of this dissertation.

To complete the group of ten interviewees, an interviewee with extensive policy experience in telemedicine was chosen. This interviewee’s extensive knowledge of the Portuguese National Health System (NHS) was due to his numerous participations within the government, namely his participation on the elaboration of the national health plan for the period of 2012-2016.

2.1.1.3. Elaboration of the interview protocol

When approaching this stage of the preparation, there was a choice to be made, regarding how structured one wanted the interviews to be and therefore how standard the protocol for each and every one of them should be. Due to the time constraints explained before, the most unstructured type of interview – the informal conversational interview – was excluded from the options because it was decided that, considering the feedback of the approaches to the potential interviewees, the interview should not last longer than thirty minutes. Then, between the standardized open-ended interview and the general interview guide approach, the latter was chosen for three main reasons: it encourages a more informal conversation, while still ensuring every relevant topic to the interviewer is discussed; it allows the interviewer to reword the previously prepared questions according to the interviewee’s answers to previous questions and thus creates a more personal context; it allows some flexibility between interviews, not demanding the same approach for all of them and allowing the interviewer to tailor the guide to the interviewee (Turner III, 2010). To add to this last point, in this stage, there was a background investigation of each interviewee and their specialty to be able to collect relevant information from their experience with telemedicine or policy making. This naturally leads to the interview guide being tailored to the interviewee. Therefore, the interview guide creation process described in this chapter will be the one that led to the creation of the more general skeleton, on top of which every adaptation was then made.

The protocol for the interview always started with the introduction of the interviewer, mentioning his college and his degree. Then, to provide context to the interviewee, the author did a brief two minutes presentation of this dissertation, revealing its scope and main objectives. When applicable, the author would apologize for the possibility of the interview delving into the same themes

the interviewees had talked about in their presentations during the eHealth Summer Week. Next, the interviewee would be asked if he accepted the recording of the interview. Recording was deemed useful for two main reasons: it reduces the amount of errors when analyzing the data and it allows a faster pace of the interview, making it more fluid and natural (Boyce & Neale, 2006). Then, the interviewer would start going through the guide, which will be analyzed later in this section.

After finishing the questions on the guide and making sure the interviewee did not have anything else to add about the subjects discussed, the interviewer would first thank the interviewee for his contribution. Then, the interviewee would be made aware of the next stage of the research i.e. the questionnaire and would be asked about his interest to collaborate in it as well. To finish the protocol during the interview, the interviewer would ask the interviewee if he knew someone whose collaboration could be valuable for the current research.

2.1.1.3.1. General interview guide

The general interview guide itself comprised fifteen questions, the maximum number of questions considered recommended for such a method (Boyce & Neale, 2006) and it can be consulted in Appendix 1 in Portuguese and Appendix 2 in English.

It naturally started with a question about the interviewee's workplace and his job to gain some information about his specialty and daily routines. Then, the interviewee would be asked if he knew the concept of telemedicine and, if so, how he would define it and how interested he was in this area. These three questions were the ones that told the interviewer how well-informed and how comfortable the interviewee was and whether more specific or even speculative topics could be approached or not.

The next block of questions started with the use of telemedicine in the interviewee's practice and the frequency as well as the objective tasks in which he used said technology. These first few questions were crucial to gain information on the number of telemedicine projects being developed, sometimes in an inter-institutional scope that usually are not advertised enough. It also unveiled two different hospital-driven initiatives to create or adapt technology to get specialists – cardiologists in both cases – closer to the general public. They were important exploratory tools that usually led to probe questions about said programs.

The next two questions about to have were standalone and each paved the way to major discussions about two areas. The first question was intended to evaluate the satisfaction with telemedicine and intended to, at the same time, ascertain the perceived utility of the telemedicine tools to the overall clinical practice of the interviewee. Despite this topic alone being a good conversation sparker, the question did have another purpose: to allow the interviewee to delve, without any negative connotation by the interviewer, into what the possible obstacles or barriers to the use of telemedicine in his practice were. This question ended up providing crucial information concerning the specific variables that influence acceptance, which was later explored in the questionnaire stage of this research.

The second question pertained to the perceived benefits the interviewee attributed to the use of telemedicine in his practice. This question not only highlighted the objective benefits of the technologies in the interviewee's specialty but it was usually answered in a way that allowed, through the interviewer's interpretation, the prioritization of said benefits by their relative influence to the interviewee. This, again, contributed to the discussion of the variables influencing telemedicine acceptance while also giving ideas about possible marketing of the technology to professionals within the same physical context or specialty.

Then, the guide shifted more towards the future of the technology in health, first by discussing the apps for smartphone and/or tablet and the willingness of the interviewee to embrace them, which often resulted in replies conditional on two factors: the degree to which the professional thought apps could influence his future practice and, therefore, how serious they would have to be seen; a series of pre-requisites to consider their use in healthcare which were later explored in the questionnaires. The second was broader and intended to shed some light on a number of topics, with the most obvious one being the analysis of the possibilities for the technology to improve procedures in the interviewee's specialty, but it also gave a chance to observe more subjective clues such as tone and enthusiasm.

Taking advantage of the positive and hopeful mood that usually stemmed from the last topic and the empathy already established, the interviewees were then asked two more sensitive and objective topics: how they perceived their bosses' opinions about telemedicine and whether they received any financial incentives to start using or increase their use of telemedicine. These more sensitive topics were some of the reasons that led to the choice of this method as previously stated, with the former helping to understand what the interviewee's perception of the subjective norm about this subject was – and that is one of the most often studied variables of technology acceptance (Ajzen, 1991; Gagnon et al., 2003; Venkatesh & Davis, 2000) – and the latter being a very objective question about the perhaps most often mentioned incentive in professional contexts.

Since these last topics usually got the interviewees debating the potential obstacles to telemedicine acceptance in their workplace and the importance of incentives versus the importance of the sheer willingness of the professionals to increase said acceptance, the next question meant to know what was, in the interviewee's opinion, the main obstacle to the acceptance of telemedicine. It was not a question to specifically get into one of the more objective topics, but it was meant to be a catch-all question which, with its broader nature, could potentially lead to the discussion of any remaining subject the interviewee might have wanted to talk about and it did bring attention to the more obscure motives to reject telemedicine, which were explored later on.

To end the interview, the interviewees were asked their age group. Due to the reduced number of interviews, this particular data was not meant to be statistically analyzed but to provide a general perspective of how professionals in each age group saw telemedicine.

2.1.1.3.2. Most frequent adaptations

In this section, the most common changes made to the general interview guide will be discussed and explained. However, it is important to refer changes such as different wording of the questions or different probe questions will not be mentioned; the former was allowed due to the choice of the general interview guide approach, which gives flexibility to adapt the questions' wording to the interviewee's previous answers and that flexibility was often used to make the interview more personal and fluid, while the latter are not part of the interview guide itself because they originated during the interviews to explore potentially interesting subjects and are, therefore, outside of the scope of this chapter.

The first change was an inclusion of a follow-up question, due to the concerns involving the use of apps in the daily routine and the pre-requisites the first interviewees thought were necessary to even consider the use of an app. The question was asked mainly to understand which entity should guarantee the certification of the apps to be used in healthcare and was mostly asked to policy deciders and, besides its obvious purpose, it got the interviewees to discuss the influence of the main institutions connected to telemedicine and the articulation, not only between themselves but with the clinicians, which provided some clues about implementation strategy explored later on.

The second change was applied only to policy deciders and it focused on exploring their institutions' roles within healthcare policy, their scope, main goals and articulation with either the technical or the clinical side, depending on which institution the interviewee belonged to. Not only did this provide additional information to understand the context of these interviewees, it also helped understanding the main institutions such as the Telemedicine Workgroup, the SSMH and the Ministry of Health, as well as the flow of the policy decisions and the discussions needed before each of them gets approved.

The third change was perhaps the one that benefitted the most from the background study and had to do with objective questions about the specific pilot-projects of telemedicine in Portugal, namely the chronic obstructive pulmonary disease (COPD) and the more recent teledermatology one. It attempted to go beyond the results usually advertised and started with the subjective evaluation of the project by the interviewee to proceed for more specific questions such as the difference in acceptance between geographic regions, the low acceptance of certain specialties and how to work around these issues. It had a follow-up question attached which aimed to understand the path between these pilot-projects and a future national telemedicine network but the answers to this last question were not considered relevant enough to explore in the questionnaires with this network almost being considered a mirage at such a distance.

The final change was introduced after the general mentality regarding telemedicine was mentioned in all the first three interviews and it proved to be a pertinent question, as well as a good introduction to the following one, thus providing a smoother transition. It had to do with the perception of the interviewee about the colleagues' opinion on telemedicine and aimed, in a more specific way, to evaluate the social norm on the subject. It was grouped with the one about the biggest obstacle to the

technology acceptance and they were both moved to the end of the guide. They ended up generating important information and were deemed relevant enough to be explored later on.

2.1.1.4. Data analysis

Having prepared the interview protocol, one had to decide how said interviews would be treated. There are two main methods to extract data from interviews to further analyze them: transcription and review (Boyce & Neale, 2006). Since this was still an exploratory stage, it was decided having the exact sentences by the interviewees was not the most important; the most important was to get their ideas and capture their points of view, while, at the same time, not missing the opportunity to keep important citations to further delve into because “it seems more reasonable to transcribe only as much and only as exactly as is required by the research question” (Flick, 2009). Therefore, it was decided the interviews would be reviewed with notes taken about every answer given and divided by the main topics detailed in the interview guide section, with such notes being complimented, wherever necessary, by particularly significant citations. The reviews were done while listening to the full record on the day of the interview, to avoid forgetting the context of some of the recorded moments.

The notes were then analyzed to look for patterns in each topic and to extract and further discuss the most relevant sections, which can be seen in later chapters. There are a few authors that argue that, in order to reduce interviewer’s bias, other researchers should be brought to analyze the notes and the criteria being used to analyze said notes (Boyce & Neale, 2006; Turner III, 2010). However, given the early stages of the research and the reduced number of interviews, the most important at this point is not to extensively analyze the data obtained in a more systematic way, it is to use the information obtained to gain knowledge and understand which questions should be asked to the broader sample, when making the questionnaires. As such, it was decided there was not a significant need for third parties’ reviews.

2.2. Quantitative research

As previously stated, qualitative research was used in a more exploratory way to gain more knowledge about the subject and context before delving deeper into the study of technology acceptance in health. Therefore, it is only natural that the results of the qualitative methods, i.e. the individual interviews, were analyzed prior to any other decision regarding the quantitative stage was made. Those results will be detailed and discussed later on but were taken into account when making several decisions during this stage of the research and that will be pointed out throughout this chapter.

There are two main types of quantitative methods: observations and surveys. When considering using observations to study healthcare-related questions, the limitations and concerns described in the previous section, that is the scheduling issues due to very unique working periods and the ethical concerns regarding patients’ privacy, arise again. Moreover, for this stage of the research, the goal was to get to more professionals, which means it would be impractical to conduct dozens of observations with a single researcher, while still meeting the deadlines of this dissertation. That limitation led to the chosen method for this stage of the research being the survey.

2.2.1. Survey

Having chosen to use a survey technique, there were a number of decisions to be made, regarding the target, mode of administration of the questionnaire, its design and, finally, its distribution. Each of those decisions was far from being clear-cut and demanded the consideration of several factors and a number of trade-offs, which will be detailed in each of the following sections.

2.2.1.1. Target

The goals of this dissertation require one to study the opinion of healthcare professionals in Portugal to know what are their opinions on telemedicine, their perceptions on its benefits and shortcomings and how one can act on that to ultimately improve telemedicine acceptance. Taking this into account, the first instinct would be to approach every single healthcare professional, from the physicians and nurses to the pharmacists and technicians, as it would make the dissertation more thorough. However, perfect is the enemy of good and, in this case, reaching out to every professional in every work class would also mean three things: less time devoted to gathering responses for each class; less available time to analyze said responses for each class; more questions or less objective questions to be able to reach to every class. Thus it was decided the survey would encompass only a portion of the healthcare professionals. As previously stated, the main factor for the success of telemedicine is clinician acceptance, which led the author to realize that, after the decision to focus on only some of the classes, the more relevant ones for this study would be the clinicians, which are the physicians and the nurses (Wade et al., 2014).

2.2.1.2. Mode of administration

Once the target audience for the survey had been decided, it was time to decide how the questionnaires would be administered. There were three main options: personally, telephone, and mail. Doing it personally or using the telephone tends to have one major advantage: it allows for a greater empathy between the researcher and the respondent, which enhances the chances of the respondent accepting to reply and committing to the questionnaire till the end, thus improving the response rate, that is the percentage of individuals who accept replying out of the ones contacted to participate in the survey, and the completion rate, which is the percentage of respondents who complete the survey compared to the ones who started it. However, they both have several disadvantages: the first one is the difficulty of obtaining the contact of the respondent to then approach him, as telephone numbers are usually not on the institutions' websites and people are less likely to give them when contacted by someone unknown to them; the second one is time-related, as both of these require scheduling with the respondent and the administration itself tends to last longer due to the need to create empathy first; the third one is a logistics problem related to the personal interviews as these demand the presence of the researcher and the respondent in the same room, which is a daunting requisite for a national study with a single author.

On the other hand, even though it might contribute towards less empathy, which might impact the response and completion rates, the administration by mail allows a faster and more dispersed administration, with the advantage of email being the primary contact available to outside researchers.

There were also two other relevant factors taken into consideration: first, as previously stated, some of the questions being asked in this study, such as the professional's perception of his colleagues' opinion, his perception of his bosses' opinion and his opinion on the national strategy for telemedicine, are relatively sensitive topics to discuss unless one has a very high trust or perception of anonymity; secondly, this study was not funded by any institution, which means the author relied on personal funds only, meaning the overall budget was considerably limited, something that also contributed for the final choice, since mail surveys are, traditionally, the least expensive ones (Birks & Malhotra, 2006). Considering this study was on a national scale, had allocated a relatively short period of time of a month for this stage, which reduced the available time for each interview and time for travels, and involved some sensitive questions, it was decided mail administration would be the one with the potential to provide more and more accurate responses and thus give the possibility for better insight and a more thorough analysis.

The last decision about the mode of administration was between traditional mail, mail panel and electronic mail. Traditional mail involves sending a physical copy of the questionnaire to preselected professionals, which means one would first have to contact them and ask their address, print and then send the questionnaire, wait for it to arrive and for the respondent to reply and then wait for a possible return of the questionnaire. This would have taken a tremendous amount of contacts to first acquire relatively sensitive personal information and then a massive amount of work from the respondents, who have already been identified as particularly busy in the previous chapters. It was decided these two aspects were counterproductive and would cancel out many of the advantages mail surveys have. "A mail panel consists of a large, nationally representative sample of households that have agreed to participate in periodic mail questionnaires, product tests and telephone surveys." (Birks & Malhotra, 2006) There is no such association for physicians and nurses, which means the mail panel was never a real possibility for this dissertation. This means the most appealing general alternative was electronic mail due to a number of reasons: it allows for a faster dispersion of the questionnaires, it takes a very limited amount of time to reply, does not require any other action from the respondents and maintains their anonymity.

Electronic mail survey, however, might be a misleading characterization, because this does not forcefully involve emailing the questionnaire to the respondents. In fact, electronic mail survey comprises this alternative, email survey, but it is also used to refer to Internet surveys, that is, the use of Internet platforms to distribute and process the questionnaires online (Birks & Malhotra, 2006). This was the chosen mode of administration for this dissertation. There were many available platforms for this task, with an informed decision pending on the structure and logic of the questions on the questionnaire.

2.2.1.3. Questionnaire design

After deciding the target and mode of administration, it was time to elaborate the questionnaire. To do so, first the author considered the most concrete limitations transmitted by the interviewees during the exploratory stage: healthcare professionals are bombarded with questionnaires and they tend to bypass them unless they identify with the cause; healthcare

professionals are extremely busy and have very reduced available time, with the desirable average time length for such an activity being five minutes. As one can understand, these limitations enhanced some aspects of the design, such as the importance of appealing to the potential respondents, through several factors: an attempt to create empathy with either the approach or the introductory text of the questionnaire; making sure the questions were as relevant and as interesting for them as possible so they could clearly understand the focus of the questions and the scope of the study in general; limiting the average duration of the questionnaire to the desired five minutes to ensure they did not have the feeling they were wasting too much free time, which helps improving the completion rate of the survey.

This section will be divided into three categories: elaboration of the questions, platform decision and questionnaire customization.

2.2.1.3.1. Elaboration of the questions

This questionnaire had several iterations, including two preliminary versions, which were first discussed on a technical plane, having improved unclear and poorly worded questions, as well as the occasional double-barreled question and was then cleared for testing with clinicians. The questionnaire itself was distributed online and its colors and page display shown in this dissertation are the same as the ones displayed to the respondents, with the questions themselves, their order and the overall structure being available for consultation in Appendix 3, in Portuguese, and Appendix 4, in English.

Before any question, in the beginning of the questionnaire, an introductory text was included, to explain the purpose of the questionnaire and the study it was a part of, as well as its author and his contact information. It also assured the respondent that any information provided in this questionnaire would only be kept by the author and would always be treated in a confidential way.

The first question of this questionnaire had to be related with the definition of telemedicine. It wanted not only to evaluate the healthcare professional's knowledge about this subject, but also provide some context to the following questions. The most obvious choice would be to make an open-ended question to have the most reliable way of knowing how familiarized the respondent was with the definition. However, judging from the replies obtained to that exact question during the exploratory stage, where telemedicine definitions took between a few seconds and a few minutes to transmit; this was highly undesirable for an opening question and would place tremendous pressure on the remaining ones to still fit the five minutes limit. Therefore, it was decided against asking this in an open-minded way. Instead, the respondents were asked how much they agreed with the notion of familiarization with the concept of telemedicine. To evaluate this, a five-point Likert scale was used; it was debated whether more points were needed to properly evaluate such an important notion but it was ultimately decided against it.

To maintain the consistency during the questionnaire, every scale in this questionnaire is a five-point Likert scale. In addition to this, despite the recommendations by some of the major authors

of order changes in these scales during the questionnaire to test the respondent's attention and the reliability of his answers, the time limitation, on one hand, and the notion of trust the researcher wanted to transmit to the respondents, on the other, prevailed with the scales appearing always from the most positive answer on the left to the most negative one on the right of the scale (Birks & Malhotra, 2006).

The second question wanted to measure the respondent's attitude towards telemedicine, that is, how interested he was on the subject. It is a question that comes from the exploratory stage and that will contribute to understand what the overall attitude towards the subject in the National Health System (NHS) is.

The third question aimed to understand the potential of telemedicine in the specialty of the respondent. This question is directly linked to one of the research studies of this dissertation and aims to understand the overall difference in potential across specialties. It is a catch-all question for this subject but it will, together with later questions, help the author understand the existing differences between specialties and what explains them.

The fourth question introduces the matrix type of question, that is, the one with multiple sub-topics to analyze within the same area. This question focused on the perceived clinical, technological, psychological or social limitations respondents could attribute to telemedicine and how much each of them impacted their perspective of telemedicine, namely: the lack of studies about telemedicine, lack of benefits for the clinicians, low applicability of the technology for the respondent's area, insufficient technology in the respondent's workplace, lack of clarification of the clinicians' responsibility when using telemedicine, potential of reduction in the number of jobs in this area in the future and reduction of patients' satisfaction. The alternatives were all referred by interviewees during the exploratory stage and each was related to one studied or misconceived negative aspect often mentioned. They can also be translated to variables that influence negatively the acceptance of telemedicine, another of the research questions of this study.

The fifth question was one of the latest additions to the interview guides and attempted to measure the perception by the respondent of the social norm surrounding this subject. As previously stated, this variable is often insignificant in mandatory settings, but the truth is those mandatory settings are the minority and nowadays telemedicine in Portugal is still largely dependent on the clinician's will to use it. Therefore, this variable seemed significant for this study and extremely relevant to be analyzed here.

The sixth question wanted to dig deeper on the main focus of the clinicians, that is, their patients and aimed to see how much the respondent agreed with each of the benefits telemedicine could bring and intended to prioritize them, with said benefits having been collected from the previously realized interviews. Those benefits were the reduction in time and costs regarding patients' travels to the healthcare facilities, reduction of the maximum response time in healthcare access, greater equity in healthcare access and the increase in patients' satisfaction. As one can imagine, this is a very sensitive question as it involves, not only the respondent's perception but also his patients'

geographical, financial and social context, and it had the potential to shed some light over which benefits the NHS should market to turn telemedicine into a more helpful tool for the patients, in the eyes of the clinicians.

The seventh question intended to ask about the respondent's previous participation in telemedicine projects. As seen in the interviews, contact with the technology and the on-the-job realization of its benefits for both the clinician and the patient can heavily improve one's perception about telemedicine and this question was needed to analyze that. In case of a positive response, the respondent would then be asked to judge how successful said participation had been, which was meant to compliment the above intention.

The ninth question focused on the present and asked about the participation in any current telemedicine program. It was naturally a question with a few follow-ups but it could, on its own, give an idea of the percentage of clinicians currently using telemedicine in the NHS.

The tenth question asked about which kind of telemedicine program that participation contributed for, either inter-institutional partnerships or national pilot-projects. This curiosity stemmed from the exploratory stage with the realization of the importance of the institutions' entrepreneurship to overcome their own shortcomings, e.g., geographical and financial, compared to the scarce number of national programs in Portugal.

The eleventh focused on the frequency of use of the technology with the scale used reflecting the frequency of a series of inter-institutional partnerships described during the interviews, as well as the national pilot-projects presented by the NHS.

The twelfth question intended to study another main variable with usually a great significance in technology acceptance studies, that is, the perceived utility for the respondents of telemedicine in their job. It is often a variable that shows a strong correlation with actual usage and was thus included in this question.

The thirteenth question was the last one pending on the answer "Yes" to question nine and aimed to understand the satisfaction with the telemedicine tools used in the current project the respondent participates in. Despite the inexistence of enough information on inter-institutional partnerships to compare reported satisfaction by institutions and this survey, the question might provide some relevant feedback on the reported satisfaction with the national pilot-projects.

The fourteenth question approached the apps topic, aiming to understand which three factors surrounding them were more relevant for the respondent: the need for certification of the produced results; the possibility of remote access to the patients' files; the possibility of remotely editing patients' records. The first factor was clearly the most reported concern about apps in the interviews but the other two were also mentioned.

The fifteenth question was one of two consecutive questions about more sensitive topics. It asked the respondent what his perception of the clinical and managerial administrations' opinion on

telemedicine was. It is only natural that a professional tends to be more willing to adopt a new habit if he perceives it as something positive for the administration, as that might bring him more benefits. Despite the disappointment towards this question's results in the exploratory stage, it was still deemed as relevant for this questionnaire as the exploratory stage only dealt with professionals using telemedicine, which might make them less prone to negative opinions by their administrations.

The next question inquired about the adequacy of the strategy for telemedicine in the NHS. It was included after some of the interviewees reported two different things: lack of a coordinated strategy between the more technical Telemedicine Workgroup and the more clinician national coordinators for the NHS; lack of articulation between the Telemedicine Workgroup and Shared Services of the Ministry of Health (SSMH), in general, and the hospitals' management boards. This is naturally something too complex to discuss in a mere question and the intricacies of this topic alone could merit its own questionnaire but it is relevant to know how the perception about this topic by the healthcare professionals, together with the answer to the previous question, might affect their overall perspective about telemedicine.

The seventeenth question was a matrix question about the importance of various incentives to promote telemedicine acceptance, mostly for the respondent, but also for his institution. The first three comprised financial incentives, on one hand, and workload and specific objectives reduction during the period of adaptation to the new technologies, on the other. The last incentive was geared towards the institutions instead and was meant to help them acquire the needed equipment, thus overcoming the entry barrier to the introduction of telemedicine; it ended up being brought to the conversation during most of the interviews and was, therefore, added as an option. This question has a clear connection to what the most ambitious goal of this dissertation is, which is suggesting measures to promote telemedicine acceptance.

The next question is the last matrix question and, just like the sixth question, it aimed to give insight on the benefits of telemedicine. Unlike said question, however, this question was focused on the perception of the benefits for the respondent himself. It gave the opportunity for the clinician to reveal what he thought he could gain the most by using telemedicine: improving his ability to monitor the patients, travel less, spend less time elaborating reports and updating processes, consult with other colleagues when confronted with certain cases, improve his relationships with his colleagues, improve his education and, overall, improving his productivity.

Finally, question nineteen ended up being the only open-ended question of the main part of the questionnaire and it was meant to act as an optional, catch-all question, where the respondent could write what was, in his opinion, the greatest obstacle to telemedicine acceptance in Portugal. Just like in the interview guide, it ended up being important having this space of the respondent to compliment his previous answers. In addition to this, it also allowed the respondent to discuss any other topic the author might not have considered, as this was a far larger target than the one in the exploratory stage, yielding potentially very diverse opinions from the entire country. Finally, this question also had the indication for the respondent to address any general concern about the

questionnaire here, thus following the recommendation that every questionnaire should have room for comments (Birks & Malhotra, 2006).

After what was considered the main part of the questionnaire, there were five extra questions for some context and to allow the statistical analysis and, although they're not really providing any information on telemedicine, they provide the required context to the main part of the questionnaire and allow the researcher to address the last two goals of this dissertation, that is, the study of the influence of age and specialty in telemedicine acceptance.

The first three questions were related with the profession of the respondent, asking whether the respondent was a physician or a nurse, his specialty and if he had any leadership role. It was considered whether or not specialty should have been displayed as a list of all the available ones extracted from the official sources, since it would make processing the information a lot easier, but it was ultimately decided against for logistical purposes, as the display ended up being too cluttered. Then, the respondent was asked about his age group; there were six age groups displayed, to allow for some general contextualization and the groups were preferred over age itself to provide a greater sense of anonymity. Besides, this broader response did not interfere, in any way, with the study of the variation of telemedicine acceptance with age, since the appearance of the nowadays discussed technologies occurred in the last two to three decades, making the most important division to be considered here the one between respondents below fifty years old and above that limit. Finally, the questionnaire ends with the question about the Regional Health Association (RHA) of the respondent. This was deemed relevant after a few policy deciders in the eHealth Summer Week reported significant variations in the acceptance of the most recent national pilot-project involving teledermatology, with regions such as Algarve having a much larger acceptance than the remaining ones.

There were a few other small decisions, which led to the sequence of questions included here, mainly regarding their order, which shall be mentioned here. The first decision involved the transition of the five questions about the respondent's professional context from the beginning to the end of the questionnaire, to first allow him to understand the study and be compromised with it before accepting giving their personal information. The second decision involved the two questions about the benefits of telemedicine, the first about the patients' and the second about the clinicians'. These were originally consecutive questions but, in the latest stages of the design, it was decided they would be set further apart to prevent any confusion about the different perspectives according to which the author wanted the respondent to reply. The final decision, not connected to the order, was about mandatory and non-mandatory questions, where naturally the questions pending on other answers were all deemed non-mandatory as to avoid preventing the advancement of the questionnaire in case of answers that didn't lead to them being shown. There were other questions deemed non-mandatory, such: as question nineteen, which had the longest average answers in the exploratory stage and had the greatest potential to lead to either incompleteness of the questionnaire due to excess of time spent or irrelevant answers due to lack of additional things to include here; questions twenty-two and twenty-four, about leadership roles, which was possibly the least relevant question of the five, and RHA, because it was

expected it would not be significant enough to be statistically analyzed, so as to give the respondent the perception he did not have to provide every personal information asked if he was not comfortable with it and still participate.

2.2.1.3.2. Platform decision

Having reached a decision about the final version of every question, it was time to decide which Internet platform would be used to spread the questionnaire. There are free and paid platforms that perform the desired job, with the main differences between them being: customization, with the possibility of using certain themes to make the questionnaire more appealing; display on the screen, making the questions and alternatives, especially in what concerns matrix questions, look less cluttered; possibility of introduction of logic in questions, that is, allowing the respondent to jump to selected questions based on his answer to others.

After researching several platforms' websites and watching videos with tutorials and questionnaire manipulation on such platforms, the vast available choice was reduced to two: the free Google Forms and the paid SurveyMonkey. The author decided to insert his questionnaire in both to better ascertain the pros and cons of each one, thus improving the quality of the final decision.

The first platform the questionnaire was tested on was Google Forms. Despite technically allowing every question and the introduction of logic in questions in an acceptable way, aesthetically, this platform did not provide many options. The first quarrel was with the limitation of only about half of the screen being used for the questions themselves, which led to cluttered questions and scales; this was particularly relevant in the significantly longer matrix questions that did not look appealing to the respondent and the scales with the longest descriptions, which ended up having to take three lines due to the display choices of the platform. It also forced the author to attribute a description for every point of the Likert scales, despite the intention of only doing so for the extremes.

Next, the author tested SurveyMonkey. It was obvious from the beginning a payment would have to be made due to the major limitations without it but, on the other hand, it provided a plethora of options, such as many different themes, which made it vastly superior aesthetically to the other alternative: the questionnaire occupied nearly the entire screen, making everything, particularly the matrix questions, look more clean and less cluttered; it was possible for Likert scales to only have descriptions in the extremes; it allowed the author to give customized messages for each required question not answered, providing the questionnaire with possible embedded troubleshooting tools. The author ultimately decided to choose SurveyMonkey as the platform for this survey.

2.2.1.3.3. Questionnaire customization

With the platform chosen, it was time to focus on the more aesthetical details of the questionnaire. These might not be as important as the content for the intended analysis but they can contribute to better response and completion rates by making the questionnaire more appealing and clean, allowing the respondent not only to accept replying but also focus more on the questions. To that end, the theme "Sky" – a light blue theme – was chosen over the white background.

The other major decision was about page breaks, that is, how to divide the questionnaire in a few different pages to allow the respondent to track their own progress, since these page breaks would bring the possibility of introducing progress bars, valuable instruments to show the respondent how he is progressing and how close he is to the end, thus allowing him to estimate how long it will take him to finish this task. It was decided the first page would include questions up until the first inquiry about practical experiences with telemedicine, that is, question seven. The second would include questions eight, in the case of a positive answer to question seven, and nine. The third page would be the longest, with ten questions if the respondent answered positively to question nine, about the existence of current experiences with telemedicine. It then ended with the open-ended question. Finally, page four was devoted to the five complimentary questions for more statistical purposes.

2.2.1.4. Distribution

To distribute the questionnaires and reach the maximum number of potential respondents, there were two types of approaches used: the first one targeted individuals, the second one targeted organizations. The first one included the author's personal contacts acquired before the beginning of this dissertation, as well as the contacts obtained during the exploratory stage, in which all the interviewees agreed to participate in the questionnaire stage. As these replies were being requested on a personal level, with no other obstacle to overcome or previous approval required, the number of confirmations received may not be equal to the number of replies obtained, and it is likely there were respondents who participated without confirming it.

The second type of approach involved contacting a vast number of institutions and it started with the public hospitals in Portugal, with all of them being contacted, which amounted to sixty-three contacts, from which there were a total of fourteen replies, five of them resulting in collaborations. After exploring this main source, there were several other institutions contacted, such as: the seven RHA, with two replies obtained, with one being successful while, in the other, the process never led to any result; the five biggest private hospitals, from which the author obtained two emails confirming the reception, but no follow-up contact; every healthcare center in the Algarve and Alentejo RHA, amounting to seven contacts, with three replies obtained, all demanding approval from the RHA itself; both the Order of Physicians and the Order of Nurses, with one reply rejecting the participation; every physician-oriented investigation department in the Faculty of Medicines of University of Porto and University of Lisbon with no replies.

3. Results

In this section, the results of this dissertation will be revealed and discussed. Like the previous one, this section will be divided in two: qualitative research results, which will detail the findings of the individual interviews and their further application to the questionnaire design that ensued; quantitative research results, which will analyze the answers to the questionnaires and attempt to use them in order to explore the research questions presented in the state of the art. Both sections will explore two different targets, with the qualitative one exploring the opinions of policy deciders and professionals with practical experience, while the quantitative one will be analyzing both physicians' and nurses' perspectives.

3.1. Qualitative research

3.1.1. Sample characterization

As previously stated, a total of ten interviews were made in a span of twenty-five days. They were made to both experienced clinicians and policy deciders, with the goal of apprehending as much as possible from the clinical applications to the ethical barriers and geographical differences, while at the same time attempting to understand the path that leads to the approval and clinical use of a technology.

To begin this analysis, it is interesting to first detail two characteristics about the chosen sample for this stage: the age and the specialty of the interviewees. These should not only provide the adequate context for the data that follows, but also give the reader a general idea of the average characteristics of the more involved professionals in this area, as these contacts were mostly acquired during a renowned specialty event.

The age distribution of the chosen interviewees is detailed in Table 2. As one can see, there is a mixture of several people within different age groups, which should provide opinions both from people who grew up with technology and have, therefore, a more technological mindset and people who were educated in a different paradigm and were used to a different clinical practice and had to posteriorly learn how to incorporate technology in their routines.

Age group	Number of interviewees
20-29	0
30-39	2
40-49	2
50-59	4
60-69	1
>69	1

Table 2 - Number of interviewees per age group

There is an unrepresented age group, which would be extremely interesting to approach but was not, for two main reasons. The first has to do with how the required academic degrees for these classes are structured: nurses have a minimum of four years in college, which means they will, at best, start practicing in their early twenties, while physicians need to go through a minimum of six years, with two to four extra years according to their specialty of choice, which means they will come out of college with twenty-four years old at best and in their late twenties at worst. The second has to do with the contacts being acquired in a renowned specialty event, with the approaches being made mostly to the speakers due to the stated intention to guarantee their knowledge and experience on the subject; in practice, this means there was a focus towards professionals with more years of clinical practice. This does not, in any way, mean this age group was disregarded in this dissertation, as the survey that followed targeted clinicians with all kinds of experience with telemedicine, with the only condition being working in Portuguese institutions, thus removing the mentioned limitations to these clinicians' participation.

The other main factor to provide context for this analysis is the interviewee's specialty, which is detailed in Table 3. It is no surprise to notice that, if one were to compare the data in this table with the one in Table 1, there would be two overlaps in dermatology and pathology, with a third possible one in psychiatry due to the formidable academic background of one of the interviewees. This is not coincidental as, after the elaboration of the state of the art, there was a particular will to study the main areas identified by the World Health Organization (WHO) as more prominent around the globe, which resulted in more attendance to lectures that addressed topics within these subjects.

Specialty	Number of interviewees
Cardiology	2
Dermatology	1
Epidemiology	1
Geriatrics	1
Internal medicine	2
Pathology	3

Table 3 - Number of interviewees per specialty (note: one of the interviewees is not a clinician, their area of expertise was included here due to their extensive experience and collaboration with specialists)

The focus on cardiology can be explained with the aforementioned incoming national pilot-project in this area, with both the author and the clinicians being particularly interested in seeing how the project will work out and who will ensure its success, which contributed to the scheduling of a few discussions on this subject. The other specialty with two interviewees was internal medicine, although in this case, that was coincidental, as both of those interviewees are policy deciders and, although their opinion as specialists was requested and respected, they were primarily chosen for the policy discussion aspect.

3.1.2. Analysis of the responses

The analysis will be, as the chapter explaining the elaboration of the interview protocol, following the order of the questions in the interview guide, grouping them by main topics whenever applicable. Those topics were defined during the coding stage of the interviews, in which all interview records were listened to and the opinions of the interviewees were separated to fit the respective codes.

3.1.2.1. Definition and interest

The first topic to be addressed is the definition. It is perhaps the most well-defined topic if one considers the WHO definition as standard but it did not produce consensual responses by the interviewees. The responses ranged from the textbook ones to deeper ones approaching topics such as the necessity, or absence of it, of technology, as well as the changes it introduces in the patient-clinician relationship. However, all of them include two important points commonly associated to telemedicine: “care” and “distance”. The most common description was, in fact, “the delivery of medical care at a distance”, which is, as one might see, very similar to the beginning of the definition adopted by WHO.

Although the most common definition included the medical perspective, that point of view was not shared by all the interviewees. It was, in fact, only mentioned by physicians, with the majority of them not involved in policy discussion. The scope of the term was actually one of the most debated topics in the entire interview guide, with some of the arguments resembling the ones discussed in the state of the art of this dissertation: technologies used no longer apply only to the medical practice, being now employed by all kinds of healthcare professionals, such as nurses and technicians; with the dissemination and cost reduction of these technologies, patients themselves are now massively adhering to them and can and want to participate in their own healthcare, being now active participants in such topic instead of merely following others’ recommendations. The following definition accurately represents the main topics argued by those who refute the WHO definition: “The generic designation is reductive because... the concept of telemedicine... started to be connected to all professional classes, being useful to all but, above all else, giving a completely different role to the patient and to his possibility to participate... That evolution, in my point of view, is notable and completely changes the original concept, making it more attractive and versatile.” (Manuel Lopes, personal communication, July 6, 2016)

The last subject discussed in this section was the interviewee’s interest in the subject. It is a particularly subjective question made to a potentially biased sample of professionals, who were, in the majority of the cases, interested enough to voluntarily go to an event about this topic. Perhaps because of that, the objective answers to this question ended up being the least relevant part of the opinion most of the interviewees emitted about the topic, but the justifications they gave for their interest did provide clues as to what the main personal advantages of telemedicine were for them. They ranged from objective performance boosts in some cases to greater benefits to the patient in others. These justifications will naturally be analyzed further ahead.

3.1.2.2. Frequency of use

These questions were obviously geared towards the specialists because they were the ones who had implemented telemedicine in their daily practice. Three of them use telemedicine in their daily practice, with both specialists in pathology engaged in a partnership working solely through this technology and the third being a cardiology specialist reporting, among other things, the use of a smartphone app regularly monitoring the condition of his patients' pacemakers and alerting him in case there is a need to intervene. In fact, this specialist says he feels the need to keep up with the development of this area because cardiology is one of the specialties which benefitted the most from technology development and that, in fact, "currently, most of the treatments are performed with technology instead of pharmaceuticals" (Carlos Morais, personal communication, July 5, 2016). Another interviewee uses telemedicine one day per week as part of a national pilot-project on dermatology and states he could never make as many consultations during the time he dedicates to telemedicine if he allocated said time to face-to-face consultations.

As previously stated, this block of questions had a deeper understanding of the current national initiatives on telemedicine as its main goal but ended up being remarkably relevant to uncover the hospital-driven initiatives that often go slightly unnoticed during the national events. One good example of those hospital initiatives is the one by Hospital Prof. Doutor Fernando Fonseca, EPE, in which the cardiology service is attempting to improve its relationship with the healthcare centers within its geographical area by creating, together with its own technical department, a communication platform to reduce the need for specialists' travels and ease the access of the physicians in these centers to more specialized knowledge typically unavailable to them, which, with time, contributes to the improvement of their own knowledge on the subject. This fact was also noticed by an interviewee from the cardiology service of the Centro Hospitalar e Universitário de Coimbra who participated, a few years ago, in an experiment with two healthcare centers: "In the beginning, my colleagues brought me relatively simple things to discuss... After two, three months, they stopped bringing that type of cases because they already knew what I was going to say. So there was, clearly, a learning experience related to how they should deal with that type of cases." (Lino Gonçalves, personal communication, July 20, 2016) This project is set to be resumed with four healthcare centers in late 2016, building on top of the already mentioned one and absorbing some of the know-how of the chronic obstructive pulmonary disease (COPD) project detailed in a previous chapter.

3.1.2.3. Perceived utility and main benefits

Before analyzing the responses to the two following questions, there is one consideration to be made regarding the first. This question's main goal was to evaluate the interviewee's satisfaction regarding telemedicine while judging his perceived utility of the tools for his clinical practice. However, possibly due to the way the question was phrased, the fact is most interviewees' responses' focus was not themselves but the overall specialist population, thus effectively making the perceived utility question having the same goal as the following one regarding the main benefits of telemedicine. This does not mean the question was effectively useless as its secondary goal of easing the interviewees into discussing the greatest downsides of the telemedicine tools they use brought to the table several

important considerations, which shall be discussed later on. These have the potential to give objective topics for policy deciders to analyze and discuss which might, in turn, improve the overall acceptance of telemedicine, one of the main goals of this dissertation.

Regarding the question about the main benefits of telemedicine in the interviewee's area, this was naturally one of the subjects the interviewees liked to discuss the most, due to their overall enthusiasm towards this topic. It was also an important topic to delve into as it allowed the author to understand first-handedly if the reported benefits studied and discussed in the state of the art were also being praised or even perceived as such in the Portuguese reality. The most discussed benefits were grouped according to how many interviewees referred them and can now be checked in Table 4.

Benefit	Prevalence
Reduction of time spent by patients to access healthcare	7
Consulting with other clinicians to improve knowledge on specific diseases	4
Improved monitoring of the patients	4
Reduction of money spent by patients to access healthcare	4
Reduction of waiting list in healthcare facilities	3

Table 4 - Most discussed benefits of telemedicine and their prevalence among the sample

As expected, among the most highlighted benefits were the reduction of time, both in scheduling the procedures and in the actual travels to the institutions, and money, both for the patients and the institutions. These are some of the most advertised benefits of telemedicine even though, when it comes to costs, it is not something widely studied or even quantified yet. It is also worth noting that, despite the introduction of technology in the patient-physician relationship, the benefits for the patients are among the most reported ones, which can only help to relieve the concerns expressed by some interviewees and better summed up as: "ICT are support tools that do not substitute a contact or a connection between people..." (Adelaide Belo, personal communication, July 18, 2016)

The remaining two benefits present in Table 4 may not seem direct benefits for the patient but they will both, ultimately lead to better patient care. The first has to do with the greater possibility of discussing cases with other professionals and can be seen in two different perspectives: in the first, the general practice physician consults a specialist to improve patients' triage, which ultimately contributes to the other benefits also present on the table, such as reduction of time and money spent by the patients and, in turn, contributes to the increase of the specialist's knowledge about that disease; the second can be exemplified with the case of the specialist dealing with a patient coming from a different geographical area with a disease he is not used to deal with consulting a specialist of that geographical area with ample experience in said disease, who can assist with potentially more precise and practical advice than the ones which could be obtained online.

The other indirect benefit present in Table 4 is the possibility to better monitor a patient with the help of technology. This has obvious benefits for the patient as it can give him comfort and safety knowing he is being watched and he will be helped if anything happens but it also brings benefits for

the clinicians as they can gather more information which allows them to make better-reasoned and well-timed decisions, thus effectively contributing to the improvement of their success rate.

As one might imagine, the benefits discussed so far were not the only ones mentioned by the interviewees; there are some, more specific to the specialty or area of interest of the interviewee, that were mentioned by some within a specific area. It is the case of sample preservation, mentioned by both active pathologists, which means that, with the use of technology, the patient samples are kept safe inside healthcare facilities and only photographs, scans and other indirect sources of information travel across institutions. Also worth noting is a benefit that contributes to the already discussed greater possibility of consulting between clinicians, which is the greater bonding between clinicians allowed by this technology, in which both sides can see each other, talk extensively about their cases and access each other in a faster and easier way which, in turn, contributes to the creation of a personal relationship between them. As one can imagine, this means they will both feel more comfortable consulting each other and a very productive cycle can be created.

3.1.2.4. Apps and the future of telemedicine

This section used the smartphone and tablet apps as the starting point for a discussion about the future of telemedicine in the specialty or area of interest of the interviewee. When the interviewees were asked about the possibility of incorporating apps in their daily routine, the responses went from the complete and utter rejection to the enthusiast acceptance and even admittance of an already existing daily use. The rejections happened essentially due to two concerns: lack of integration with the already existing information systems, which would only increase the amount of work for the clinician without any valid benefit; potentially exaggerated use of them, thus contributing to a metaphorical “slavery” to the smartphones and the excessive amount of information they can generate and transmit. Besides these individual concerns, there was one that ended up being common to a few interviewees, which was the need to certify these apps before they could be used by the clinicians, as “If the app is not certified in a way that tells me the data it provides is credible and I can act upon it, I do not have any interest in it.” (Manuel Lopes, personal communication, July 6, 2016) These concerns were considered interesting enough to explore on a larger scale and this topic was therefore included in the survey that ensued.

This certification can be made, according to the interviewees that brought the subject up to discussion by either private or public entities but this cannot be regulated by the governments as the sheer number of apps that appear per month is too big to properly analyze. There is, according to Henrique Martins, a European model in the making about regulating apps in the health sector and that model will be heavily based on the industry self-regulation in what concerns safety and performance. There will have to be a rating mechanism with a first layer of regulation by the users, the clinicians, eventually approving them or not for clinical use (Henrique Martins, personal communication, July 29, 2016). The clinicians and the patients will then, through their own use, decide which ones will be successful.

Besides these concerns, there were also some very positive opinions about the possibility of integrating more apps on the clinicians' daily routine. The first one concerned the bias reduction these tools can bring as they can effectively attenuate the differences in observation of a particular piece of information, such as a wound; where one clinician might think it has a particular color and has a specific depth, another might see a slightly different color and measure a different depth and this means the same wound can currently be classified in different categories by different clinicians. The second one saw apps as a way to ease the communication between clinicians, thus potentiating the consulting between them. The last had to do with the freedom associated with telework; apps might allow clinicians to work from anywhere in the globe, which contributes to the enrichment of their personal life and overall happiness.

In what concerns the potential of telemedicine, there is somewhat of a polarization of the opinions of the interviewees: specialists see it as improving several different aspects of their daily routine, from the possibility of greater accumulation of knowledge on the same geographical place to the ever growing scope of the institutions that destroys barriers in healthcare access and the improvement in communication between institutions; although this isn't consensual among the policy deciders and one of them had an overall positive insight, the fact is the majority had far more negative views on this topic, with one going as far as saying telemedicine has a huge potential only if the clinicians decide to shift the way the National Health System (NHS) currently works because "As long as you tolerate that a person can go home during a month and no one calls her, no one contacts her, because she will eventually return there physically, no one will actively attempt to contact her." (Henrique Martins, personal communication, July 29, 2016)

3.1.2.5. Orientations and incentives

The next question was meant to discuss orientations regarding telemedicine from the specialists' higher-ups and it was one of the last to be included because, during the eHealth Summer Week, there were quite a few speakers mentioning management decisions as one of the complicated barriers to overcome and it was decided this effect would be interesting to study here. Contrary to what was expected from that sample, no interviewee mentioned opposing views from the management as an answer to this question. This does not necessarily mean it is not an issue due to the small sample considered here and to the particular sensitivity surrounding this subject but its absence did pave the way to a more technical and financially-oriented discussion of this subject. Having that in mind, the vast majority of the interviewees mentioned they felt a clear orientation towards a progressively increasing adoption of telemedicine, specifically due to two major factors: the feeling that a major production of legislation about telemedicine during the past year means it is the preferred path to go and, therefore, the one they would prefer to follow; the notion that, with the 10% increase in the payment for teleconsultations, when compared to the face-to-face ones, hospital administrations have now a greater than ever interest in promoting the adoption of these techniques as the consequences of their use are now more tangible and meaningful than they previously were.

When it comes to incentives, as stated in the previous chapters, this question was originally more geared towards personal financial incentives for the clinician regarding his adoption of

telemedicine in his daily practice. It was, however, clear from the very first interview that this was not the main type of incentive in the clinicians' mind when it comes to telemedicine. The most referred incentive by the specialists was the funding of the acquisition of the technologies themselves. As previously mentioned, the entry barrier for this field is an extremely pressing issue and, for three of the specialists in this sample, it was the greatest way to promote telemedicine as the price of the required equipment to start pilot-projects has often been their doom.

This does not mean there were no referrals to personal financial incentives. There were some mentions of these with every specialist confirming there was no other financial incentive other than the previously mentioned one. There was, however, one concern that should be noted: Paulo Nicola mentioned that, so far, incentives have been focused on the clinician's productivity alone, instead of the increase of health indicators he possibly contributes to or the improvement of his work conditions thanks to these technologies and that this is something that needs to be discussed (Paulo Nicola, personal communication, July 19, 2016).

3.1.2.6. Obstacles to telemedicine acceptance

The last question of the general interview guide was, without a doubt, the most anticipated one as it had the potential to not only complement the discussion surrounding technical and financial barriers, which might not have been thoroughly debated in the previous questions, but also uncover more obscure reasons to reject telemedicine. The structure of this section will be like the one used for the benefits, with Table 5 displaying the most referred obstacles by the interviewees, followed by a discussion of each of them with mentions of other less mentioned but relevant obstacles in-between.

Obstacle	Prevalence
Ignorance from the clinicians about the benefits of telemedicine	4
Lack of interest / conflicting interest regarding this area	4
Drastic changes to the current workflow	3
Inadequate information systems	3
Lack of an adequate strategy to support telemedicine	3

Table 5 - Most discussed obstacles to telemedicine acceptance and their prevalence among the sample

As surprising as it may seem, the main two factors referred during this stage were not directly linked to any technical or financial aspect and were instead linked to the clinicians' thoughts and feelings towards telemedicine. Despite not being significant due to the small sample being analyzed here, the psychological aspect as the main barrier to telemedicine acceptance was also hinted by other authors analyzing, for example, the success of the implementation of telemedicine services in Australia (Wade et al., 2014).

The first of those factors is ignorance about the benefits of telemedicine. As can be seen throughout this dissertation, there have been several studies showing the benefits of telemedicine but the truth is, according to the interviewees, those improvements are not widely known by the community. This has been acknowledged by the Telemedicine Workgroup with the dissemination of

information to both the clinicians and the general population being among the planned measures to increase telemedicine acceptance over the next few years.

The second factor consists of two different obstacles being grouped together because they are ultimately tied to the same underlying cause: perception of utility. When mentioning the lack of interest of the Portuguese clinicians or even the conflicting interests of said clinicians when it comes to the implementation of technologies in health, there was a myriad of objective topics discussed and they concerned both healthcare institutions and the clinicians themselves; however, during the discussion of this topic, only clinicians' interest will be analyzed, with the institutions' interest being discussed later on.

One of the most debated topics was the feeling that telemedicine might lead to the end of face-to-face consultations, which have been the main clinical act for centuries. This might be connected to another mentioned preoccupation which is related to the fear of the loss of power and ultimately the loss of the job itself due to the perception of increased volatility, ultimately meaning clinical acts are not restricted to the geographical location or time availability of the clinicians of a determined area (Paulo Varela, personal communication, July 12, 2016). This opinion is shared by other interviewees, but it is ultimately summed up by this extremely relevant citation: "Healthcare professionals have had an overvalued role for many years as the great power holders and the ones with the capacity to intervene in health and currently we are starting to realize that, even though we are a very important asset, there are many others who participate in health decisions and that should be called to take their place." (Manuel Lopes, personal communication, July 6, 2016)

The next obstacle on the table is deeply connected to the story of healthcare briefly discussed at the beginning of this dissertation. For centuries, clinicians have had a practice which, despite colossal changes due to advancements in all fields of health, has always relied on the five senses: hearing, sight, smell, taste and touch. Even though their relative importance has changed throughout the years, they have had a decisive presence on the different stages of healthcare, from diagnosis to treatment; telemedicine changes that. Telemedicine has been altering the way clinicians do their job by creating physical distance between the healthcare professional and the patient, which means senses such as touch are losing part of their role in healthcare. This is not what the introduction of technology attempts to do and the acknowledgement of that is the amount of work put into interfaces which allow one to feel the touch of someone else physically distant. Another aspect within this obstacle has to do with the perception that, in its initial stages, telemedicine does create additional work for the clinician. This perception was confirmed by the interviewees with clinical experience, who said that, during the first five to six months, there is indeed an increase in the amount of work, either due to the adaptation to the workflow change or due to the increase in referrals by the referencing general practice physicians before they acquire the required knowledge to deal with those conditions. The last aspect is related to the current mentality surrounding the Portuguese NHS and is related to the "non-acceptance that patients can be treated without having them physically... Healthcare professionals have not internalized people only go to the hospitals and healthcare centers because

they really have to and that is how it should be.” (Henrique Martins, personal communication, July 29, 2016)

The fourth obstacle listed on Table 5 is the first technical issue on the list and comprises the problems with the information systems currently in use across the NHS. There are some complaints regarding the reference system with its speed and attachment size limitations being mentioned, with specialists claiming it is not prepared for the inclusion of images, something crucial nowadays. This is compounded by criticism to the PDS live platform that is not allowing the direct communication between clinicians. Said complaints been countered by another interviewee claiming the way to go would be globally accepted platforms such as Skype. There were other complaints regarding the communication between the existing information systems within an institution with a significant number of reported cases in which information can't flow between departments thanks to this incompatibility of the systems. To end the technical details of this obstacle, the graphic cards of the computers in the NHS are mostly outdated, which ends up leading to a difficult time processing more complex files such as the image results from diagnostic exams.

The last obstacle on the table was explicitly mentioned by three interviewees and that is the reason for the accounted prevalence there but, if one were to include every indirect mention of it without the explicit words used to describe it, it would have been the most prevalent obstacle in this sample of interviewees. The lack of strategy encompassed two main paradigms, local and national strategy. The lack of local strategy was essentially attributed to the hospitals' administrative councils and the departments' teams: the former have shown signs of poor articulation with each other because “they have yet to figure they do not own themselves and they are part of a national health system. Until they understand that, they will have some trouble fitting in any strategy.” (Henrique Martins, personal communication, July 29, 2016); the latter was mainly due to the required support structure on a team to accommodate the extra work telemedicine brings because, according to the interviewees, it takes a dedicated staff member to spend some hours of his weekly schedule reviewing the reports of the monitored patients and making sure that data is properly interpreted and that work cannot be destabilized by the natural holidays or other periods of absence of that particular staff (Lino Gonçalves, personal communication, July 20, 2016).

When it comes to national strategy, the criticism is different with the lack of a neutral, politically-independent entity able to provide a more solid source of knowledge and therefore safety and trust on the subject being appointed as one of the main causes because, even though most healthcare professionals agree telemedicine is indeed a positive thing, this strategy cannot be created within a four-years period, the duration of a government mandate in Portugal. While there were indeed claims that the national strategy was clear and that what was left to do was institutions and professionals agreeing to follow it, that opinion was restricted to a few policy deciders, not having echo on the specialists and even being contradicted by another policy decider. Lastly, the apparent lack of knowledge about the Portuguese reality portrayed in unrealistic goals for telemedicine displayed by some policy deciders in their public interventions was pointed out as a discouraging point as it did nothing but widen the gap between deciders and specialists.

3.2. Quantitative research

In this section, there will be a thorough analysis of the Internet survey distributed, as previously explained, to both individuals and institutions throughout the country. This analysis will be preceded by a characterization of the sample to provide some much needed context and then with the statistical analysis of the questions in the survey. Prior to those steps, there are two interesting statistics which shall always be discussed when presenting online surveys.

The first and most significant is the response rate, which is the number of individuals who responded to this survey out of the number of individuals who were part of the survey's sample. For this survey, the chosen distribution method was the online platform SurveyMonkey and, after that, there was a decision about how to distribute the link to the survey to the maximum number of physicians and nurses while being sure they worked in Portugal and guaranteeing their anonymity. While methods such as social media or inclusion of the link within a site had the probability to attract more respondents, they did not do much to restrict the possible viewers to the two professional classes the survey was designed for. On the other hand, while tracked emails allowed the author to make sure only the targeted individuals had access to the survey, thus guaranteeing they belonged to the targeted professional classes and worked in Portugal, it did not provide the anonymity which was considered desirable to leave the respondents as comfortable as possible to answer potentially sensitive questions. The ultimate decision ended up being the link distribution, which allowed the author to restrict the targets while, at the same time, guaranteeing the required anonymity.

However, despite having been considered the most adequate for this dissertation, this method is not without its flaws and the most relevant of those is the impossibility for the author to know who responded to the survey. This means there is no possible way to know who received the link, which means there is no way to calculate the response rate. One could attempt to circumvent this limitation by considering the number of individuals in the sample was the number of physicians and nurses in Portugal; that is, however not a valid claim, as it fails to account unemployed members of these professional classes or the employees of the smaller private institutions which were not considered, among other factors. Therefore, for the purpose of this dissertation, this indicator will not be calculated.

The other interesting indicator to test the adequacy and acceptance of the survey by the respondents is the completion rate, which is the number of respondents who finished the survey out of the number of respondents who started it. In this case, there were a total of 151 respondents, with 137 of them completing the survey, which means the completion rate is 90.7%. While there cannot be inferences about validity of the survey or its questions by analyzing this indicator, this completion rate does suggest that the vast majority of the individuals interested in responding found it valid and adequate enough to dedicate the required time to complete it.

Another subject to consider when considering the completion rate of the survey is the decision of what to do with the incomplete responses. There were a total number of 14 incomplete responses, with 8 of them only responding till question 13 and the other 6 responding till question 19, thus leaving

only the characterization questions behind. The author had two options: either exclude the incomplete responses from the statistical analysis altogether or count them for the questions they did contribute. Given all of the incomplete responses have information related to particularly relevant questions such as the ones related to the professionals' attitude, barriers and social norm, they were, after a thorough debate on the subject, considered significant enough to be included.

3.2.1. Sample characterization

As for the interview stage, an initial characterization of the sample will be made to allow the reader to get some context before analyzing the bulk of the data. This characterization will consist in the analysis of the responses to the last five questions of the survey, which will give information about the professional class of the respondent, his specialty, whether or not he has a management role, his age group and lastly the Regional Health Association (RHA) the institution he works for belongs to. Due to their placement on the last page of the survey and, unlike the other responses, the ones concerning the sample characterization include only complete responses, which means they give an exact idea of who were the individuals who gave the bulk of the responses of the remaining survey.

Starting with the professional class, the initial goal for this sample was to obtain an equal amount of responses from physicians and nurses. However, as soon as the survey distribution began and the first results arrived, it was obvious that would not be the case, with a significantly greater number of responses coming from physicians. The final numbers can be consulted in Table 6.

Professional class	Number of responses
Physician	115
Nurse	22
	137

Table 6 - Number of responses per professional class

Before delving into the class distribution, one should analyze the total number of responses first. The first thing to consider is the number of responses is only a fraction of the total number of physicians and nurses working in Portugal, which is, according to the latest stats, 65721 (Serviço Nacional de Saúde & Administração Central do Sistema de Saúde, 2016). This means the sample is less than 1% of the possible targets and therefore there simply is not enough data to perform valid conditional analyses based on characteristics such as age or specialty, which was one of the initial goals of the study. That will be made obvious over the next few pages when one analyzes the number of respondents in each category of age group and specialty. Despite this, the fact that the sample size is higher than 100 means one can, according to most authors, perform valid factor analyses, which will be explained and performed later on (Hair, Black, Babin, & Anderson, 2009).

As one can observe, the sample for this survey ended up being heavily physician-oriented, despite no distinction or preference made during its elaboration or distribution. This will naturally mean the conclusions one can draw from this survey will be more adjusted to the physician's class, as is the sample. As for what can explain such a disparity on the sample between both classes, there is a

number of reasons, with the first being the interview sample's heavy bias towards physicians, with only one nurse participating in it. As previously explained, this was not the author's intention but the number of potential interviewees at the time of the selection consisted of mostly physicians and that ended up influencing the final pool of interviewees. Not only that but these interviewees ended up referencing a fair amount of other professionals, the vast majority of which physicians as well, which contributed to the increase of the number of responses from this class. The second reason has to do with how the survey was distributed by some of the institutions who contributed for this project, with the survey being directed to the clinical director and director of nursing, with a greater interest being shown by the clinical directors. The last reason is linked to the available time and conditions these professionals have to reply to these initiatives; while physicians usually have their own office with computer, which allows them to participate in these studies during their breaks if they desire to do so, nurses do not have this possibility. Unless they decide to use their smartphones or tablets to participate in these surveys during work hours, they cannot do so.

The next question to analyze is the specialty of the respondents. This was, due to the unappealing nature of the more standard alternatives, such as dropdown menus or lists, an open-ended question; this means there might be some responses which cannot be considered valid, either for inexistent matches with the known specialties or incomprehensible abbreviations. In this case, there were four respondents whose specialty could not be determined. The complete list of the thirty-three specialties would be something unnecessarily extensive and would not add any significant value to the main text; therefore it was decided only the six most common specialties would be listed, because they do give an idea of the most common perspective acquired during this survey. Those six specialties and their prevalence among the sample can be seen in Table 7.

Specialty	Number of respondents
Dermatology	6
General Practice	38
Gynecology	6
Internal Medicine	15
Neurology	6
Pediatrics	8

Table 7 – Six most mentioned specialties and their prevalence among the sample

The most common specialty in this survey was general practice, with its prevalence being far superior to the second most common one. However, it is interesting to focus on both of them because they can provide an interesting point of view to analyze during the next section: how are the physicians whose practices require they contact with other specialists the most watching telemedicine? Between these two specialties, there are more than fifty respondents among the ones whose practice can be enhanced the most if they use telemedicine to its potential. Besides those facts, having these two specialties as the most common is only natural if one considers those are the two specialties with the greatest number of physicians in the NHS (Serviço Nacional de Saúde & Administração Central do Sistema de Saúde, 2016). In third place, pediatrics is a specialty which can

bring great insight due to the vast experience acquired in international partnerships, mainly with the Lusophone African countries; even though those projects are outside of this dissertation's scope, it will still be interesting to consider the point of view within a specialty with this know-how.

Following specialty, the respondents were inquired about whether they had any leadership roles. While the responses to this question cannot be individually analyzed to obtain responses to any of the research question, they can be considered together with others such as the ones related to the efficiency of the strategy for telemedicine and the importance the clinic management confers to telemedicine to study the individual variables which may influence telemedicine acceptance. The responses to this question and their distribution can be consulted in Figure 1.

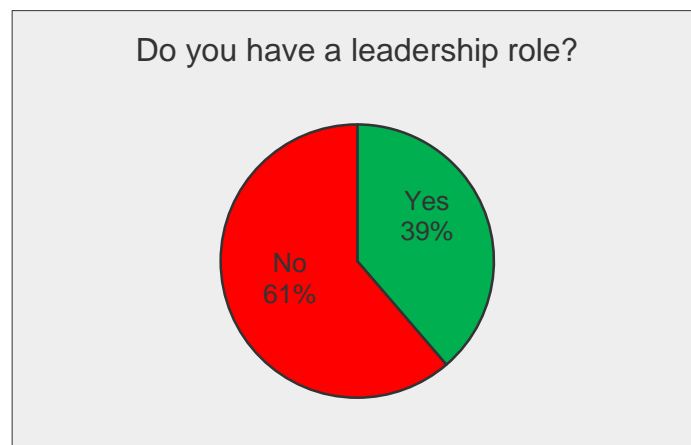


Figure 1 - Percentage of respondents with leadership roles

The next question to analyze is related to the respondents' age and it is an interesting factor to study if one considers one of the research questions of this dissertation is how age can influence telemedicine acceptance. The distribution of the sample among the age groups can be consulted in Figure 2. As can be seen, there is a pretty even distribution of age groups, which can only increase the chances of gathering perspectives which can be common to professionals of different ages; the only exception is the one corresponding to the oldest age group, which had no respondents. That is not necessarily an issue because that category was included to make sure every possible respondent, including some past the retirement age had an option, but the National Health System (NHS) does not include data for physicians and nurses above 70. When it comes to the main difference one wants to study, the one between professionals below and above their fifties, one can see 59% of the sample within the age groups below 50 and 41% above that mark, which should give a good perspective on how the different variables influence the various groups.

To end this sample characterization, one should now focus on the geographic distribution of the responses obtained because, as was often hinted during the attended conferences on telemedicine, there are significant differences in enthusiasm and overall interest on the matter depending on where the professionals are standing, with the regions with wider areas to cover having greater implementation rates than the others. This issue has also been mentioned during the

interviews, with one interviewee stating this might also help to explain why some institutions do not show significant interest in these technologies' implementation.

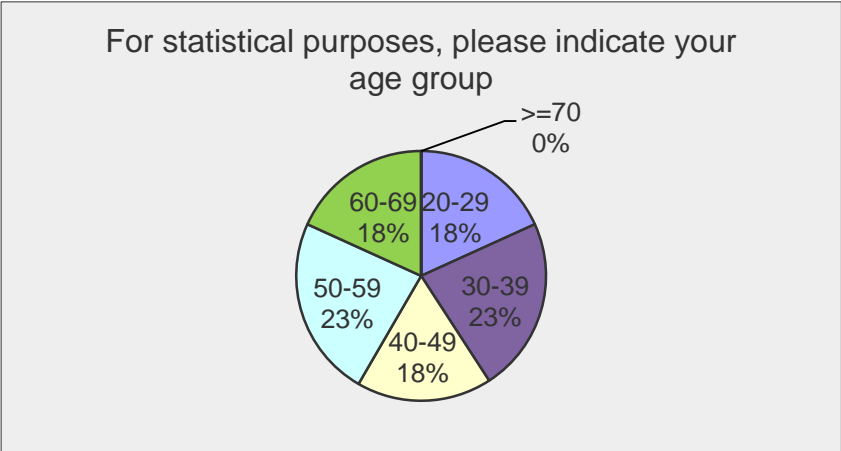


Figure 2 - Percentage of the sample belonging to each of the age groups

The distribution of the respondents according to the RHA can be consulted in Figure 3. As a previous note, this question was not mandatory for one main reason, which is the realization after a conversation with one of the interviewees that some physicians and nurses are in national leadership roles (also referred to as central services) and thus do not belong to any RHA; making this a mandatory question would either exclude them from the sample or lead to wrong data.

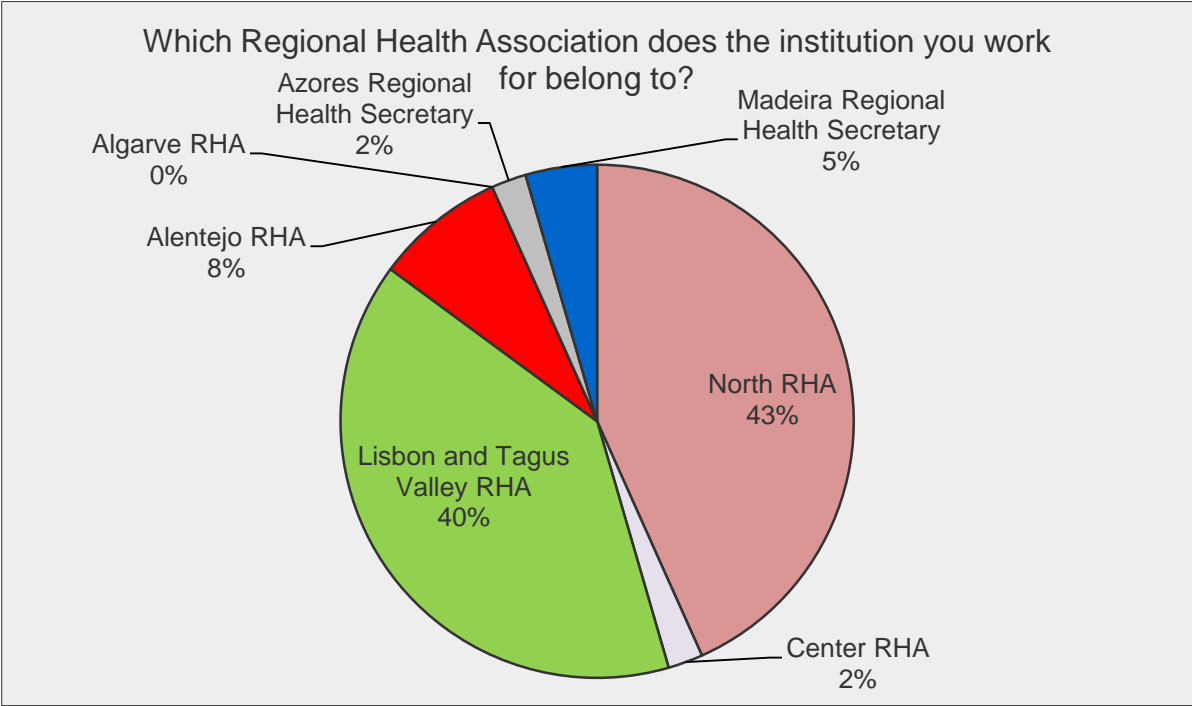


Figure 3 - Distribution of respondents according to the RHA they belong to

The graph, as one can observe, shows a great polarization with the North RHA and the Lisbon and Tagus Valley RHA having a much greater number of responses than the others. This should not come as a surprise as these RHA are also the ones with more professionals in the NHS (Serviço

Nacional de Saúde & Administração Central do Sistema de Saúde, 2016). Their percentage is higher than the one in the NHS, with both amounting to 83% of the total number of complete responses in this stage, while their real contribution to the total amount of professionals only amounts to 70%. Other than this difference, there are two other RHA whose percentage of respondents is worth analyzing. Center RHA is underrepresented, with only 2% of the total responses of the sample, while in reality it includes around 20% of the professionals. This underrepresentation can be explained by the lack of institutions from that RHA interested in participating, with all of the responses coming from interviewees or references they provided. The other RHA worth looking at is Algarve, which got no responses whatsoever; this is particularly baffling when one considers they were undoubtedly the most complimented RHA during the eHealth Summer Week, with several awards given to their institutions. They were also the RHA with most replies to the contacts made by the author but no contact ended in a partnership, with every institution demanding RHA approval and the RHA itself leaving the process pending till the date of submission of this dissertation, which means there is no data from what is one of the regions with better records in telemedicine-related activities.

3.2.2. Standalone Analyses

Having provided the much needed context to look at the main part of the survey, it is now time to analyze the results of the individual questions before one can move on to see the big picture.

The first question had to do with the familiarization of the respondents with the concept of telemedicine and the results can be seen in Figure 4. One can observe the vast majority of them – 106 out of 151 – reported having a good notion of what telemedicine is, with only 4 having the perception they really didn't know it.

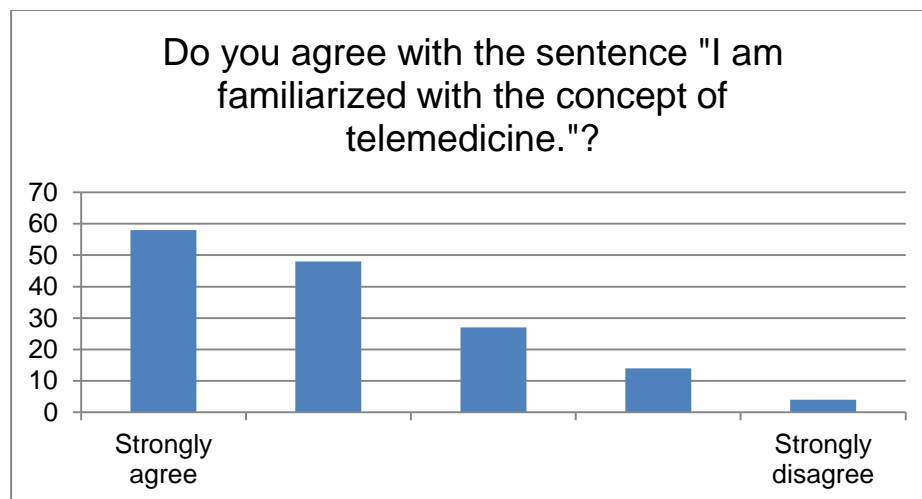


Figure 4 - Familiarization of the respondents with the concept of telemedicine

Next one will analyze the attitude of the respondents towards telemedicine, displayed in Figure 5. This is, just like the previous one, a question where one cannot make any comparison with the interviews, as that sample was naturally biased towards positive results here. Overall the responses here were quite similar to the previous question, with 110 out of the 151 respondents reporting they were interested in telemedicine and only 2 reporting a complete lack of interest in it.

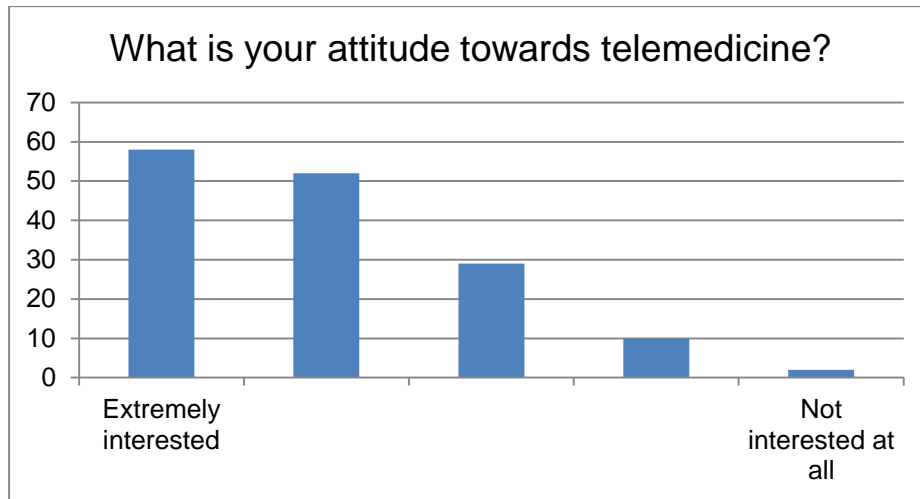


Figure 5 - Attitude towards telemedicine

Concerning question 3, related to the clinician’s perception of the potential of telemedicine in his specialty, the results are in Figure 6. This question continues the trend of the first two, with an overall positive response: 88 out of the 151 respondents reported at least good potential for telemedicine in their specialty, something that was somewhat predictable after reading the various articles about telemedicine and its applications. These three questions were the ones more geared towards the evaluation of the feelings of the respondent about this subject and, looking at the data, it seems clear the vast majority of the respondents are aware of telemedicine, interested in it and they think it has potential to improve their areas, which gives a good starting point to this analysis.

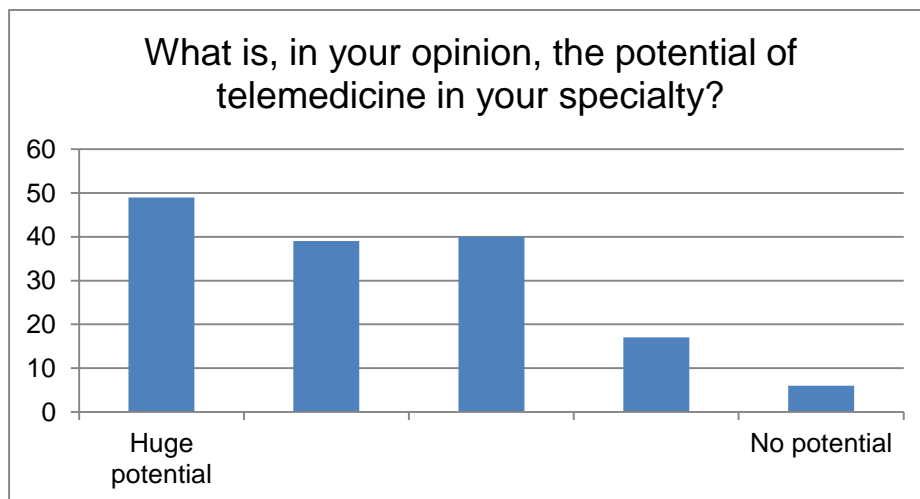


Figure 6 - Potential of telemedicine in the respondents' specialty according to them

Looking at question 4, it was time to study the potential obstacles to the use of telemedicine by the respondents. Due to the big number of items, the display of the results would take over too much space if one were to identify each item in the plot. The items are displayed in Figure 7 following the same order as the one in Appendix 4. To start this analysis, one cannot overlook the great deal of importance attributed to items 4 and 5, corresponding to “Insufficient technological media in the workplace” and “Lack of clarification of the clinician's accountability”, two items that are not directly

related to telemedicine itself, but to the technical and administrative support it requires to function properly. “Lack of studies about its usefulness” and “Reduction of patient satisfaction” had a lower number of respondents considering them important but they were considered a relevant barrier. On the other hand, “Technology without major applications in the clinical practice” was considered the least important barrier and therefore the one least likely to contribute to a lower use of telemedicine.

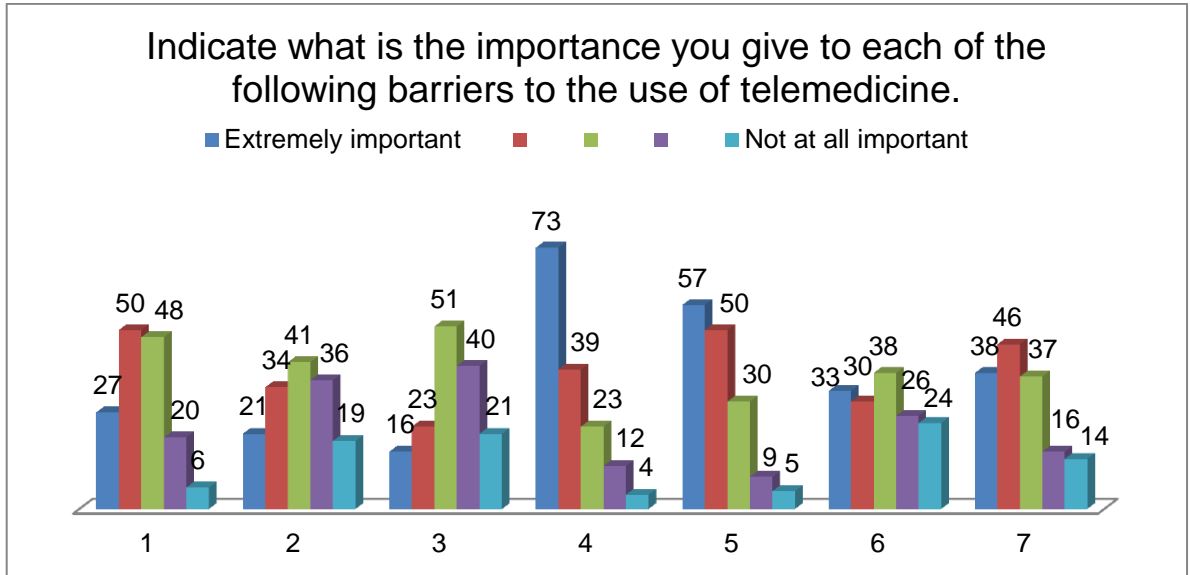


Figure 7 - Importance of the different barriers to the use of telemedicine

Question 5, whose results can be consulted in Figure 8, attempted to study the social norm felt by the respondents, which is the pressure they felt from their colleagues to comply with the use of telemedicine. Overall, despite the sample being geared towards the interest in telemedicine, one cannot ignore the 75 respondents not feeling any particular attitude from their colleagues regarding this subject. This goes well with what some interviewees said about the subject, that other professionals felt it was “something others were doing” (Henrique Martins, personal communication, July 29, 2016).

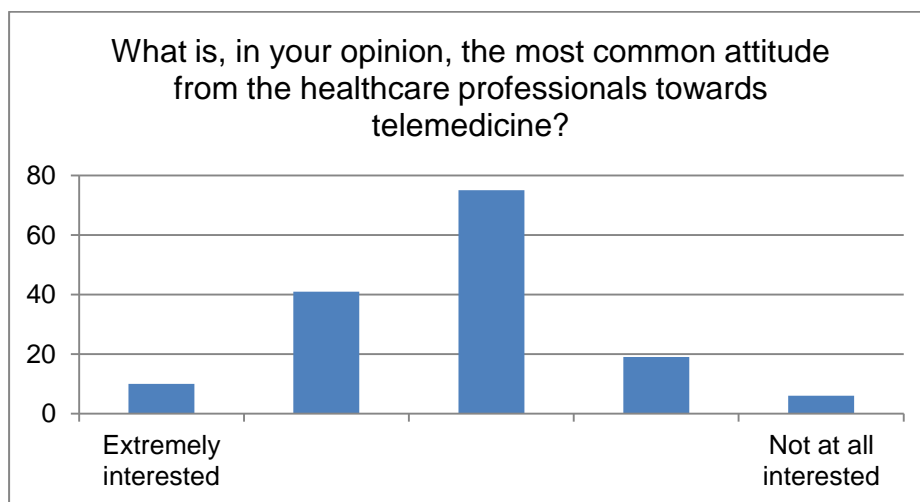


Figure 8 - Respondent's perception of his colleagues' attitude towards telemedicine

When analyzing question 6, the goal was to understand what were, in the clinicians' perspective, the most relevant benefits telemedicine could bring to their patients. The data can be consulted in Figure 9 and, once again, to allow a better display, item names were omitted and can be consulted in Appendix 4. From the analysis of the plot, there is one item that immediately stands out, which is "Reduction of time spent in travels to and from healthcare institutions", with 91 respondents out of the 151 strongly agreeing with it and only a total of 11 respondents disagreeing this reduction is a benefit of telemedicine. Besides this item, two other items should be emphasized: "Reduction of total costs associated with travels" with 126 respondents agreeing patients save money in traveling to and from healthcare institutions thanks to telemedicine; "Reduction of the maximum response time in healthcare access" with 115 respondents stating they think telemedicine can contribute to the shrinkage of waiting lists in healthcare. It is interesting to notice the three items the respondents agreed with the most are also the three most easily measurable, with the respondents being significantly more hesitant in considering more intangible topics when it comes to these benefits.

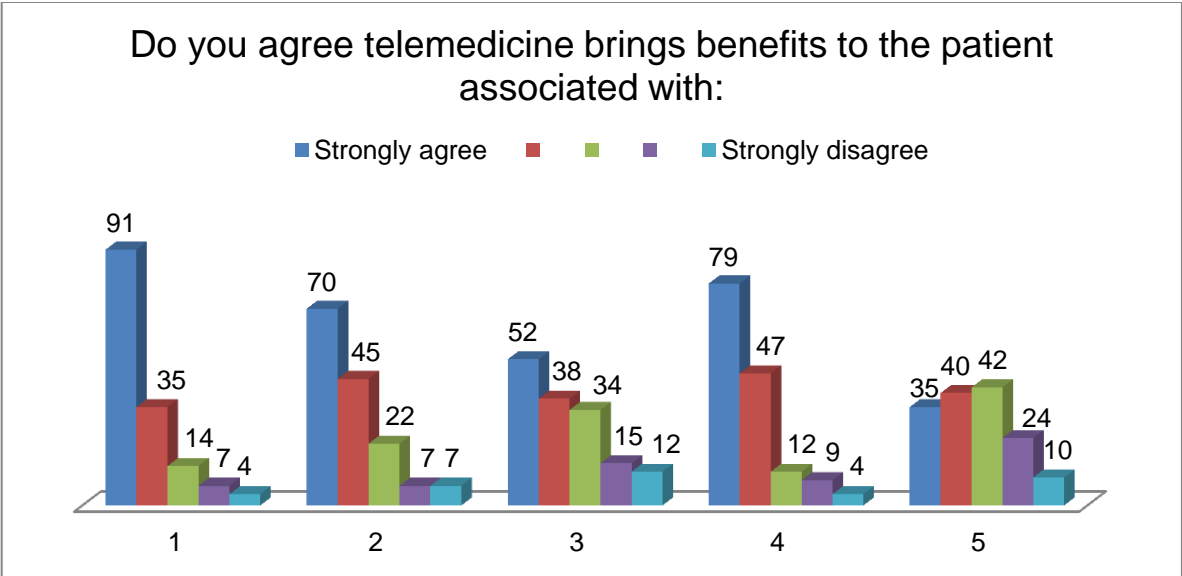


Figure 9 - Relevance of the patient benefits according to the respondents

Moving on, one gets to the binary questions and the questions whose appearance on the survey was conditional on the responses to the binary questions. There are two binary questions on the survey and a total of five conditional ones. Despite the possibility for some interesting analyses, the very low number of responses invalidates any attempt to include these questions as part of a bigger analysis.

The first binary question was question 7, regarding past participations in telemedicine projects. The responses showed how uncommon telemedicine still is in the NHS, with the numbers being available for consultation in Figure 10. The vast majority of the respondents had never participated in a telemedicine project, which can be explained by one of two things: the relatively low number of national projects in telemedicine, which restricts the number of specialties and even professionals who can use it; the different definitions of telemedicine, which might lead to a difference between actual and reported telemedicine usage, as was noted during the interviews stage. To give readers a

reference for the next question, 44 respondents reported they had already participated in a telemedicine project.

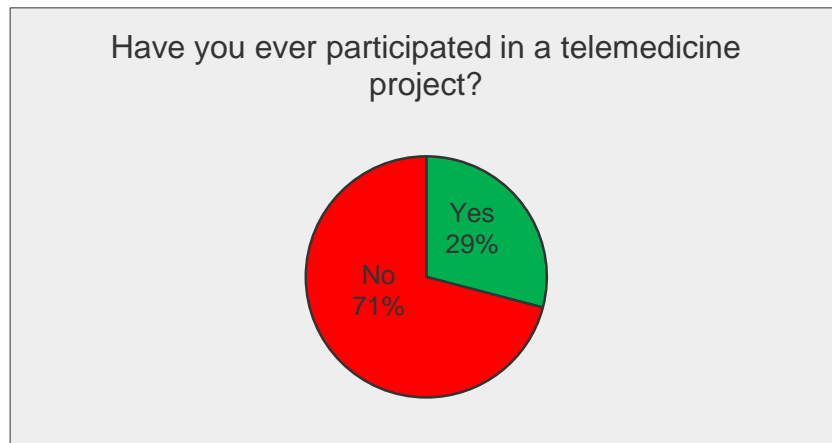


Figure 10 - Percentage of respondents with previous experience in telemedicine

Starting with the previous 44 respondents, it is now time to see how many of those considered the project they were part of a success. Out of the 44 respondents who saw this question, 40 replied to it, with the frequency of each response being displayed in Figure 11. As one can see, out of the 40 respondents, more than half – 21 – considered the project they were in a success, with 10 of those being extremely satisfied with it. On the other hand, 10 respondents considered the project was not successful, with 3 of those considering it a major unsuccess. This graph suggests the same tendency of the interviews stage, with the majority of the professionals who had been part of a telemedicine project considering them successful. To end this analysis, it should be said that it would have been interesting to analyze if past participations in telemedicine projects have any influence on the affinity of the respondents towards it but that would have required a greater number of responses.

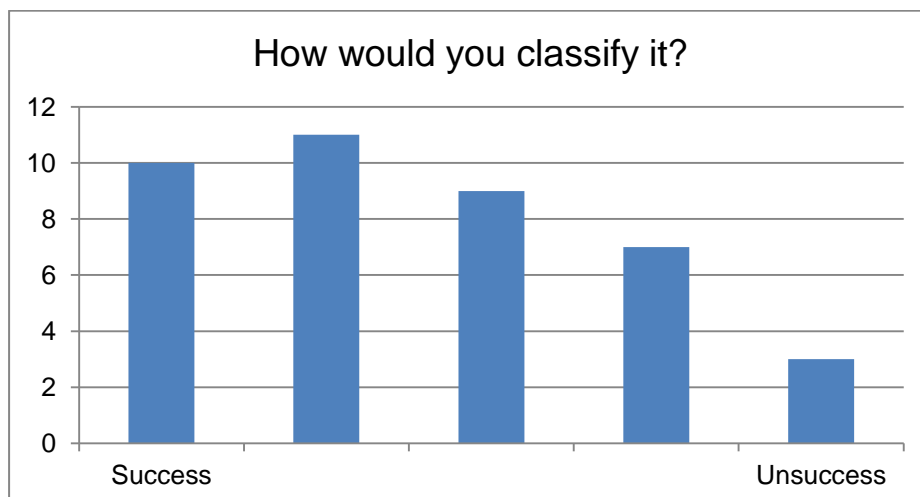


Figure 11 - Graph showing the success of the telemedicine projects the respondents participated in

With the past dealt with, it is time to know the percentage of respondents who use telemedicine nowadays. That number can be seen in Figure 12 and depicts a very similar reality to the

previous one, with a total of 42 respondents reporting they currently use telemedicine as opposed to the 40 who reported they did so in the past. Once again, the fairly reduced number of positive responses is a major limitation on what can be done with the following four questions that were conditional on a positive response here.

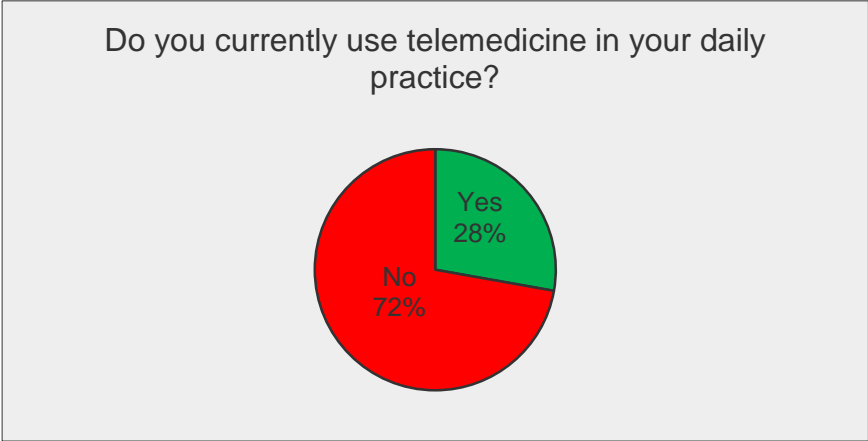


Figure 12 - Percentage of respondents who currently use telemedicine

The first conditional question pretended to analyze the type and scope of the projects the respondents are involved in, with both types being reported during the interviews stage. The results can be seen in Figure 13 but before looking at them, it is important to mention one potential problem with them: there might have been some confusion about this question, as it is possible the national pilot projects might have been misunderstood as inter-institutional partnerships, even though the latter alternative was meant to be interpreted in a more restrict way. There was one respondent who contacted the author after he submitted the survey mentioning this topic and this might have indeed skewed the results of the question towards the inter-institutional partnerships side. Other than that, the hospital-driven alternatives do have, as previously seen, great significance, with the institutions wanting to use technology to bring some of its benefits to the daily routines of their professionals. On the other hand, the national pilot projects tend to have a restrict participation either due to their scope covering only a few specialties or to the reduced number of institutions invited to participate and test the concept.

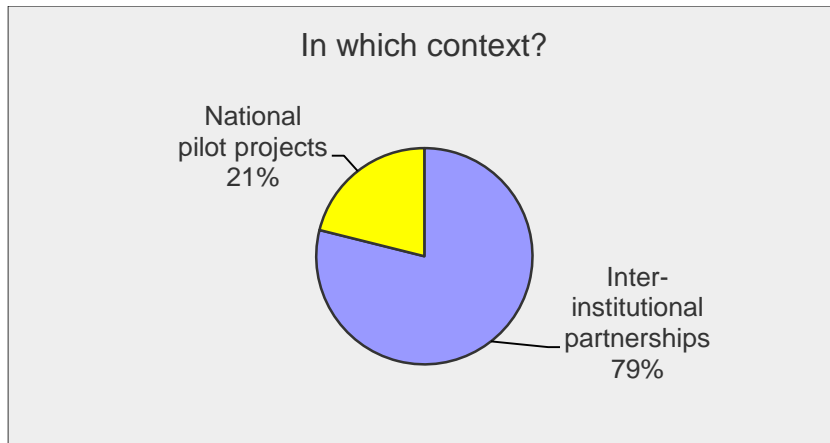


Figure 13 - Types of projects respondents are part of and their percentage

The next aspect of these projects to analyze is their frequency. The interviews brought a better understanding of the projects that currently exist and are complimented in Portugal and the reported frequency of those was essentially daily and weekly, which sparked some interest to possibly investigate it on a national level. The frequency of the telemedicine use can be checked in Figure 14. The most reported frequency was Weekly, with more than half of the respondents checking that option, which was to be expected if one considers the broadest national project nowadays is the teledermatology one which involves essentially general practice physicians and dermatologists who are, according to Table 7, the first and fourth most common specialties of the sample. The next most common frequency is Daily, the second most common frequency among the interviewees.

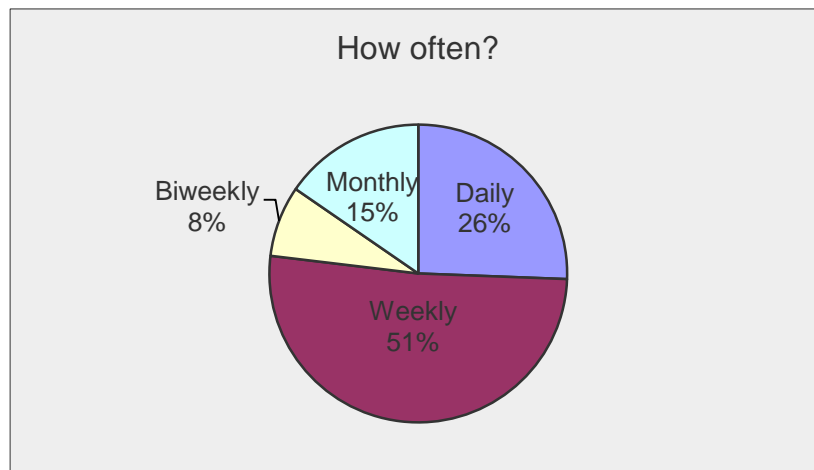


Figure 14 - Frequency of telemedicine use by the respondents

The third conditional question had to do with the efficiency of the used telemedicine tools. The responses can be seen in Figure 15 and show that the majority of the respondents using telemedicine consider those tools efficient. 20 out of the 39 respondents reported this, with only 9 considering said tools inefficient, 5 out of those having an extremely negative opinion on this subject. Overall, this is a good indicator for the way telemedicine is being used in the NHS.

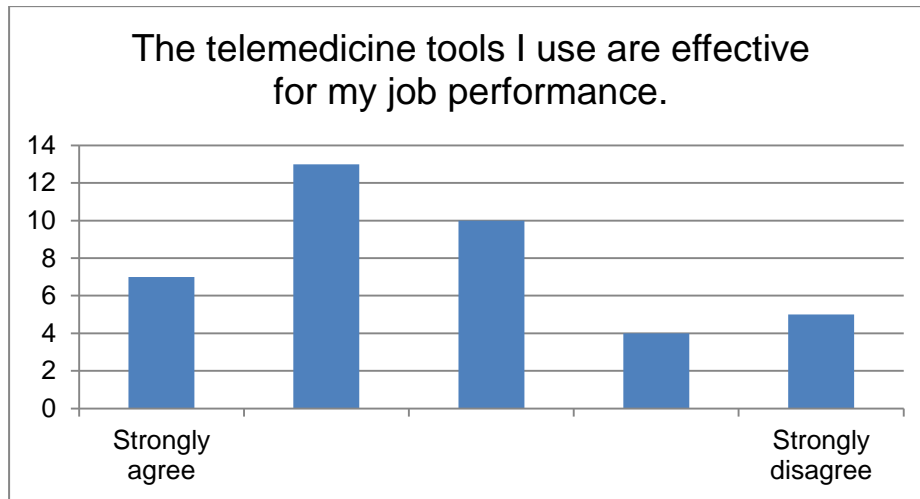


Figure 15 - Efficiency of the telemedicine tools used by the respondents

To end these conditional questions, there was an interest in knowing how satisfied the respondents were with said tools, particularly when one considers workflow-related aspects and information systems were among the most reported obstacles to telemedicine acceptance during the interviews, as can be seen in Table 5. The responses can be seen in Figure 16 and, despite slightly positive, should in fact deserve some consideration as there is a low number of extremely satisfied respondents and a significant number of unsatisfied ones, with a total of 23 out of 39 respondents not reporting any satisfaction towards these tools.

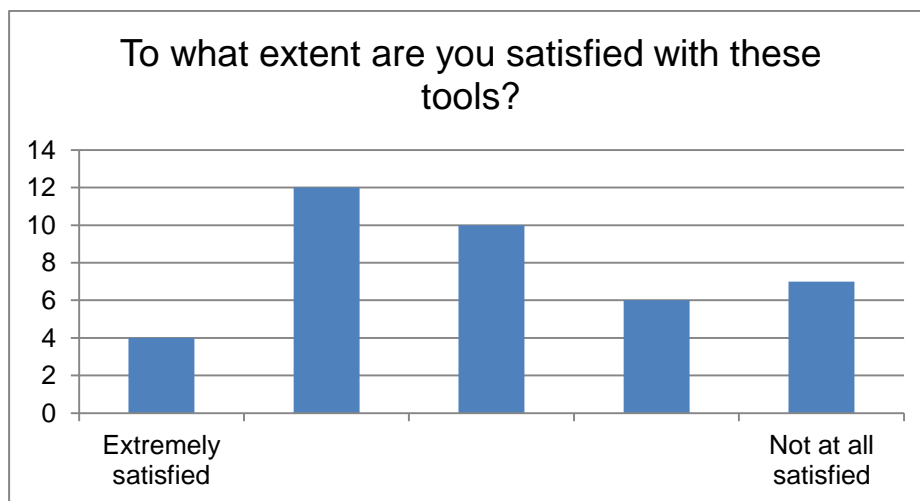


Figure 16 - Satisfaction of the respondents regarding the telemedicine tools they use

While on the topic of the telemedicine tools used by the respondents, it is important to focus on one particular set of tools, which have asserted themselves as predominant in both everyday use and, as mentioned during the interviews stage, healthcare. The results of question 14, about the importance of three topics regarding apps, can be consulted in Figure 17. All three items were considered very important and there was no item with more than 9 respondents disregarding it. It would have been interesting to question the respondents about the possible security issues brought up during the interviews stage whenever this question was being debated because, judging only by

the numbers, it did not seem to have a significant impact in the respondents' opinion regarding topics such as the certification of the produced results or the edition of data from anywhere.

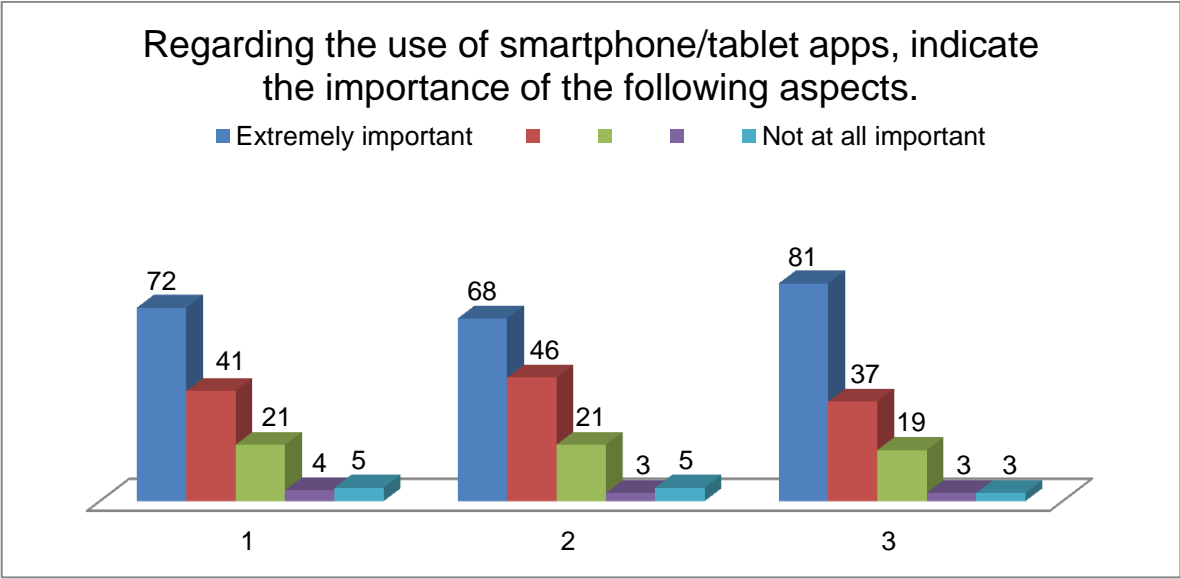


Figure 17 - Importance of some aspects related to apps according to the respondents

The next question which will be analyzed is question 15, related to the importance management gives to telemedicine. As previously stated, this was a question assumed to have great interest before the interviews stage but that ended up having very unanimous responses during that stage. Despite that, the author decided to include it as part of the survey to get a larger amount of data on it, with the results being available in Figure 18. The most common answer was, by far, the neutral one, with 53 out of the 143 respondents marking it. Among the others, the majority confirmed what the interviewees had hinted; management usually gives a good deal of importance to telemedicine as it now has a financial impact on their organization.

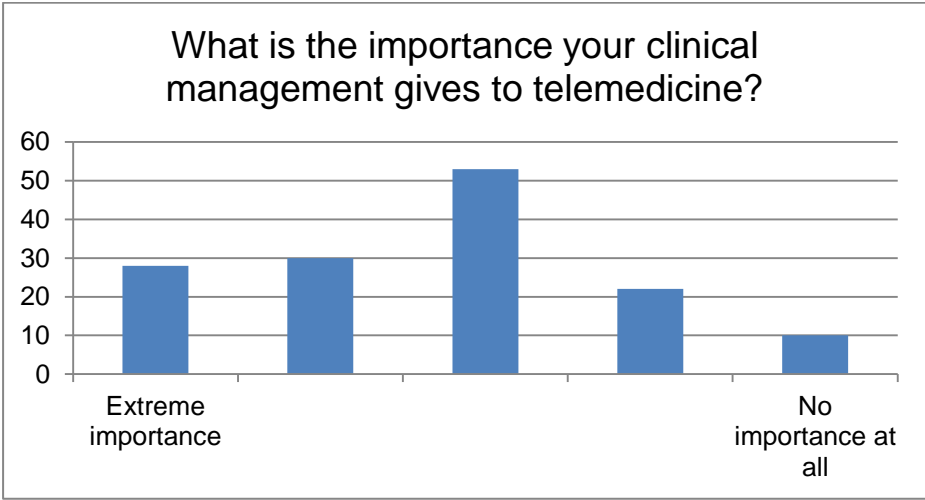


Figure 18 - Perception of the importance of telemedicine to the respondents' management

The next question to analyze is question 16, related to the respondents' perception regarding the adequacy of the strategy of telemedicine in the NHS, which was one of the most mentioned

obstacles during the interviews stage, as stated in Table 5. The responses regarding this question can be consulted in Figure 19 and it confirms the tendency of the interviews, with a whopping 64 respondents out of the 143 manifesting their negative opinion towards the national strategy for telemedicine and only a total of 20 respondents reporting a perception of adequacy regarding it. When one considers the indication from the interviews and such a clear result from the survey, there are enough signals hinting at significant problems on the strategy for telemedicine in the NHS and that those problems might be having an impact on how professionals face this subject.

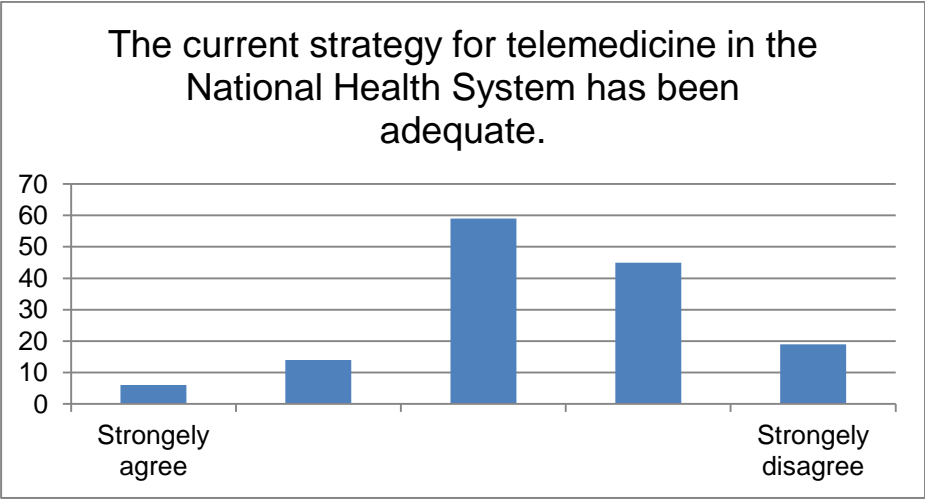


Figure 19 - Adequacy of the telemedicine strategy in the NHS

When discussing strategy, it is important not to overlook the incentives and that is exactly what the next question aims to study. Question 17's purpose was to know which incentives were more important to the respondents and the results can be seen in Figure 20 (to check the items' names, please check Appendix 4). "Incentives for the institutions to acquire telemedicine equipment" is the item that stands out the most, with 121 out of 143 respondents considering it important, which was to be expected as it was also the most referred incentive during the interviews stage since it allows the institutions to overcome the initial financial barrier and start with the telemedicine programs. The other curious information to extract from this question is the fact that "Financial incentives for the clinician" was considered the least important incentive, which might be another factor to look at as it is often the most referred incentive. It could be advisable to adjust the strategy for telemedicine in the NHS to give more importance to the other items instead.

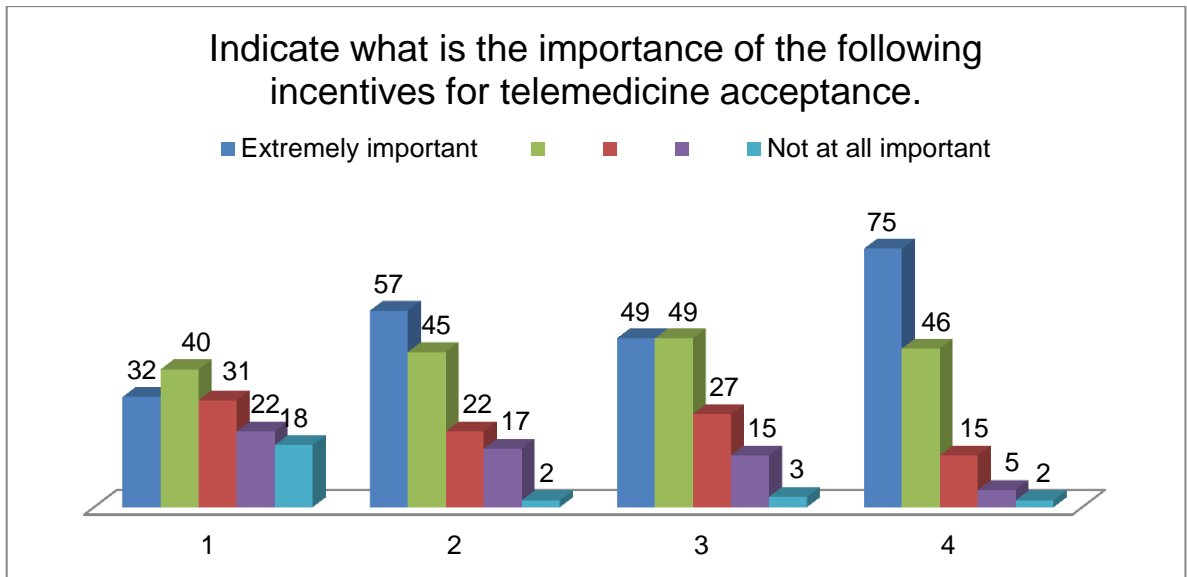


Figure 20 - Importance of the different incentives for telemedicine acceptance

Moving on to question 18, it is time to analyze how important each clinician benefit is to the respondents. The results are in Figure 21 and, before anything else, it is important to mention all the benefits had more respondents agreeing with their association with telemedicine than disagreeing with it, which shows, once again, the prior investigation in this topic was adequate to the reality in the NHS. The first item one should discuss is “Reduction of the number of travels” with a total of 117 out of the 143 respondents agreeing it is a benefit associated with the use of telemedicine. Also noteworthy are the number of positive responses regarding items “Possibility of greater patient monitoring” and “Greater possibility of consulting on concrete clinical cases”, two of the most mentioned benefits in conferences on telemedicine and, as a natural consequence, two of the most advertised topics. It is also important to notice the three most agreed upon benefits are the ones most closely related to the factual definition of the term telemedicine, with most of the others being either an increase in metrics, such as the “Productivity increase” or more intangible subjects, such as the “Strengthening of bonds between clinicians”, which ended up being the item which attracted the least amount of attention in this question.

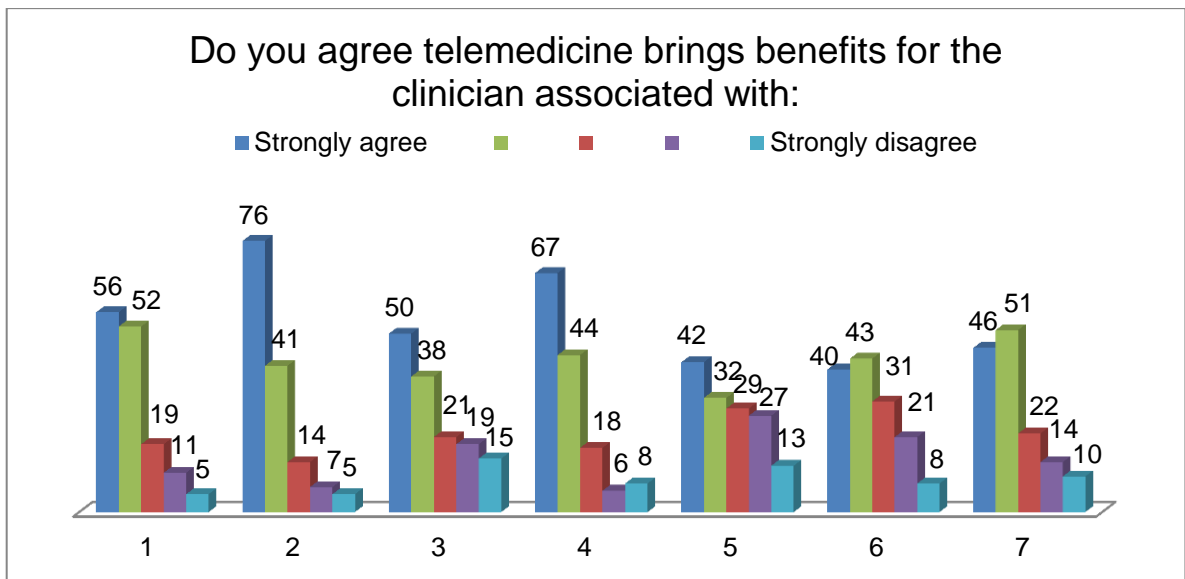


Figure 21 - Relevance of the clinician benefits according to the respondents

To finish this analysis of the isolate questions, one shall discuss question 19. It was the only open-ended question of the main part of the survey and it was not mandatory, having a total of 57 responses. The question had, as previously stated, multiple goals, from being a catch-all question to being a space for general comments about the survey and it certainly fulfilled those goals, with a fair number of responses being used to discuss other subjects, not directly related to the survey's goal. However, after a brief analysis of the responses, there was no significant additional information mentioned enough for its inclusion here to be considered relevant, as most of it was overlapping information already thoroughly discussed during the analyses of the remaining questions.

3.2.3. Principal Component Analyses

Now that each question in the survey was analyzed and its results discussed, it is time to try to understand the bigger picture. To further analyze the data of the 19 questions that constitute the bulk of this survey, there were, as one might imagine, several different techniques one could use and a number of correlations one could study. For the most complex questions, such as the ones with multiple items, it was assumed that, as previously discussed, there were underlying variables for the questions and each question could contribute differently to their study. To do so, the questions were all analyzed by the author to identify the variables they attempted to study and which correlations one could find between the different questions and those variables. Therefore, the goal was to start from the questions given to the respondents and go to the variables, thus drastically reducing the number of dimensions of this study and giving a bigger picture, making it easier to find the correlations one wanted to study from the beginning.

The task one wanted to accomplish was therefore defined and it was only a matter of picking the methodology for this analysis. There were essentially two main parts in this analysis: the dimension reduction part, to identify the underlying variables and reduce the number of dimensions of the study and the correlation study part, to check how the most relevant variables were related to each

other. To study the first part, the chosen methodology was the Principal Component Analysis (PCA), which is, to some authors, the basis of multivariate data analysis (Esbensen, Geladi, & Wold, 1987). There is a lot to discuss about the methodology itself, including a myriad of equations with matrices and even geometrical details which could be a section of their own. However, those technical details were not considered relevant enough for this dissertation, with only the goals of the methodology being detailed, to give the reader an idea of how PCA contributes to the dimension reduction one wants. According to the literature, the main goals of PCA are “to extract the most important information from the data table, compress the size of the data set by keeping only this important information, simplify the description of the data set, and analyze the structure of the observations and the variables” (Abdi & Williams, 2010).

Over the following pages, the different underlying variables will be studied, with a detailed explanation of why they were chosen, the questions that contribute to their study and the PCA analysis which supports the correlation to both the underlying variable and the other questions. Once again, despite the generation of several different graphs and tables once this analysis is executed, only some were considered relevant enough to be included and discussed here and those are the total variance explained, the scree plot and the component matrix. To test the validity of the assumptions, the Cronbach's Alpha index was calculated for each PCA executed, with the information regarding the variation of the index with the deletion of a particular item being included wherever considered relevant. This does not mean there were no other prior analyses made, such as checking the Kaiser-Meyer-Olkin Measure of Sampling Adequacy to make sure it was above the recommended 0.5 (Hair et al., 2009).

3.2.3.1. Affinity

The first variable which will be analyzed is affinity towards telemedicine, which revolves around the familiarization with the concept but also the attitude and interest towards it. On a first approach, the author considered this variable was explained by questions 1, 2 and 3 and performed a PCA analysis for those questions. However, after further discussion, the possibility of question 5 contributing to this variable was considered since, despite its wording implying it was not directly related to the respondent's own feelings, the truth is it was considered as a more adequate way to study the possible fear of the respondent towards the potential of job loss telemedicine might bring. Therefore, the PCA analysis which will be detailed here will study the possibility of questions 1, 2, 3 and 5 explaining the variable Affinity.

Starting this analysis, it is important to take a look at Table 8. There, one can observe that, out of the four components analyzed, the first one has a much higher eigenvalue than the others, which represents “the amount of variance accounted for by a factor”. To better understand just how much of the variance this component accounts for, one should take a look at the next column to realize component 1 accounts for 56.466% of the variance of the variable Affinity. Since there was a pre-established limit of an eigenvalue of 1 to extract the other components, none of the others shows up on the right half of the table.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.259	56.466	56.466	2.259	56.466
2	.736	18.408	74.875		
3	.705	17.636	92.511		
4	.300	7.489	100.000		

Table 8 - Total Variance Explained for Affinity

To have a better notion of the variation of the eigenvalue between the different components, one should check Figure 22. Here, one can see there is clearly only one component with an eigenvalue above the pre-established limit of 1. Because the eigenvalues were standardized and had a value of 1, components which end up with a value below that after the PCA account for less variance than the original variable and thus will be disregarded from the rest of the analysis.

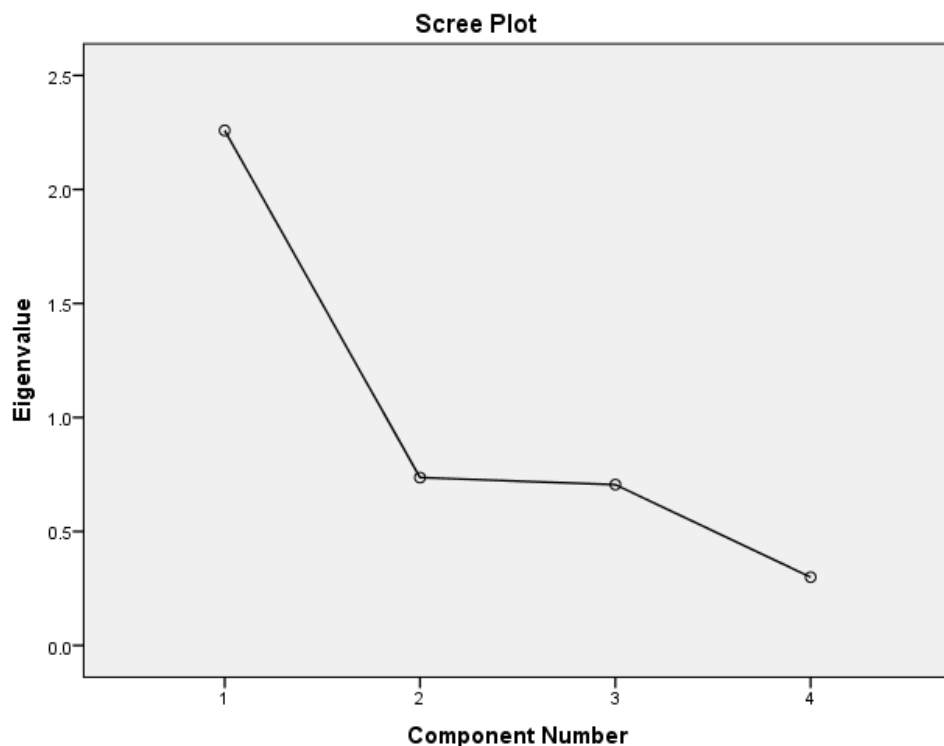


Figure 22 - Graph of the eigenvalue against the component number for Affinity

Now that it was determined only one component was worth looking at, it is interesting to see how the 4 different items one started with are related to said component and how much each of them accounts to explain it. As a prior note, just like for the eigenvalues, there was a pre-established minimum limit for the correlations to show up in the component matrix, which was 0.3. The component

matrix can be consulted in Table 9. From that table, the first thing to make sure is that every item's score is above 0.6, thus meaning its inclusion in the final component adds value to it. After that, one can realize the question that contributes the most to explain the variable Affinity is question 2, regarding the respondent's attitude towards telemedicine. This was to be expected if one considers it is the question that is more directly related to the feelings of the respondent. The question with the next highest score is question 3, which asks about the potential of telemedicine in the respondent's area. It is the other question more related to the respondent's personal thoughts about telemedicine and its future impact in his life. The remaining two questions, despite having high enough scores to be considered valid and useful in explaining the underlying variable, do not have scores as high as the first two, which makes sense if one thinks one has to do more about pure knowledge about the topic and less about the personal feelings towards it and the other is related to others' feelings instead of the respondent's.

	Component
	1
What is your attitude towards telemedicine?	.872
What is, in your opinion, the potential of telemedicine in your specialty?	.797
Do you agree with the sentence "I am familiarized with the concept of telemedicine."?	.671
What is, in your opinion, the most common attitude from the healthcare professionals towards telemedicine?	.642

Table 9 - Component matrix for Affinity

Now that the PCA analysis is finished, it is worth checking its reliability. To do so, the Cronbach's Alpha index was calculated and its score can be seen in Table 10. Most authors argue that an index of at least 0.6 is recommended to consider an analysis reliable, with some even standing by the value 0.7 (Hair et al., 2009). As can be seen, this analysis can be considered reliable, with an index of 0.734.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.734	.736	4

Table 10 - Cronbach's Alpha index for Affinity

The variable Affinity is, from now on, considered explained by these 4 questions, with the scores indicated in Table 9.

3.2.3.2. Obstacles

The next variable to analyze is related to the numerous possible obstacles associated with the introduction of telemedicine on the professionals' clinical practice. It was assumed this variable was explained by question 4. The eigenvalues of the components can be consulted in Table 11. As can be seen, unlike the first variable, there are three components with an eigenvalue above the required value of 1, even if two barely fulfill such requirement. The noticeable difference between the eigenvalue of the first component and the other two can be observed on the variance they explain, with the first component explaining 40.568% of the variance of Obstacles and the second and third explaining 16.307% and 15.091%, respectively.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.840	40.568	40.568	2.840	40.568
2	1.142	16.307	56.875	1.142	16.307
3	1.056	15.091	71.966	1.056	15.091
4	.657	9.393	81.359		
5	.582	8.319	89.678		
6	.443	6.327	96.005		
7	.280	3.995	100.000		

Table 11 - Total Variance Explained for Obstacles

This data can be analyzed in a more graphic way on the scree plot shown in Figure 23 **Erro! A origem da referência não foi encontrada.** The plot does not have the recommended "elbow shape", with components 2 and 3 being above the pre-established minimum limit for the eigenvalue. As previously mentioned, the components below this limit will be disregarded from now on.

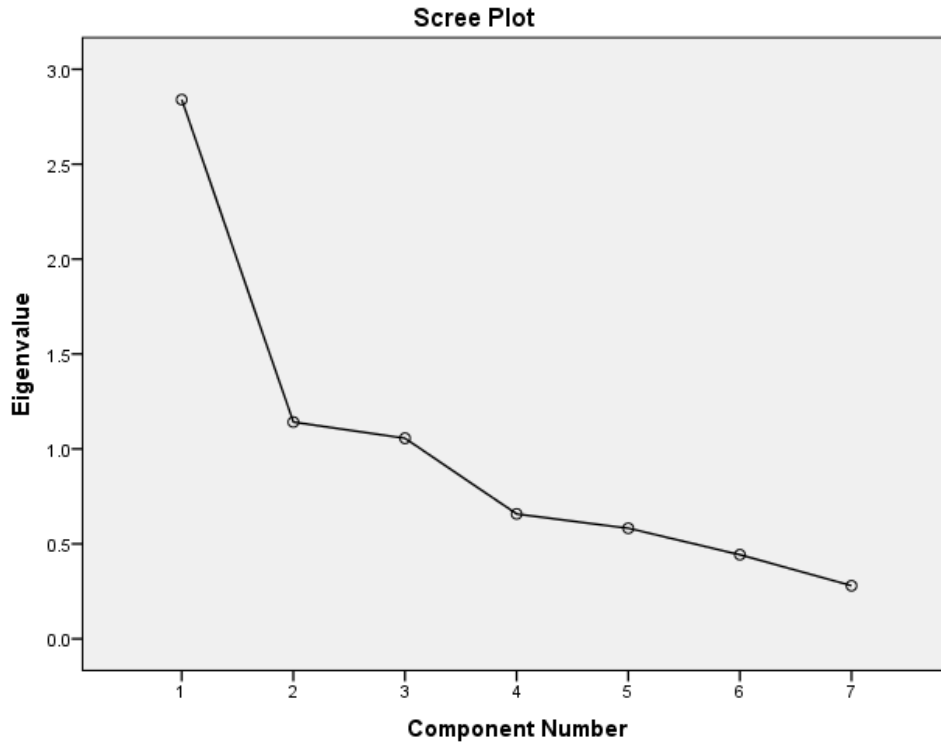


Figure 23 - Graph of the eigenvalue against the component number for Obstacles

Moving on to the component matrix present in Table 12, one should now carefully analyze the scores of each item part of the three components in question. Looking at all the components, component 1 clearly stands out from the group for a number of reasons: first, it is the only component where all items have a correlation score above the pre-established minimum of 0.3; second, it is the only component with only positive values, which indicates all the items have a positive correlation with the component; third, it is the one whose scores have the greatest absolute values. This does not mean this component is the perfect match for what one is trying to accomplish here: not all the items have a correlation score above the recommended 0.6, with one of the items barely above the limit to be displayed. Moving on to the other components, there are several problems with them, with the main one being a significant percentage of the correlation scores for the displayed items being below the recommended.

Considering all the above, there was a decision to make on the number of components to consider from now on when referring to Obstacles. As previously said, the type of research being used here is neither pure qualitative nor pure quantitative, with both being used together to accomplish better results. This is one of the cases where, despite the heading of the section, there was a subjective decision involved, with the main goal of dimension reduction and the correlations score value weighting and leading to the consideration of component 1 as the sole component explaining the underlying variable. This was not an easy decision as one should be extra careful with these subjective calls and therefore there will be further on a deeper analysis of the reliability of this analysis, with the study of the inclusion or exclusion of the items with lower component scores being discussed.

	Component		
	1	2	3
Technology without major applications in the clinical practice	.756	-.451	
Lack of advantages for the clinician	.735	-.448	
Reduction of patient satisfaction	.721		
Lack of clarification of the clinician's accountability	.649	.502	
Potential of job reduction for future clinicians	.635		-.498
Lack of studies about its usefulness	.509		.663
Insufficient technological media in the workplace	.354	.564	.570

Table 12 - Component matrix for Obstacles

Moving on to the reliability analysis, the first thing to do is to look at the Cronbach's Alpha index, displayed in Table 13. The value of 0.745 is above the widely accepted limit of 0.7 and therefore the analysis of these items can be considered reliable.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.745	.743	7

Table 13 - Cronbach's Alpha index for Obstacles

Unlike the previous variable, as previously said, there will be another validity measure taken into account to understand how much sense it makes to analyze these seven items together and include them under the same component. To do so, it was decided to calculate the Cronbach's Alpha index if any of the items were to be deleted, with the resulting table being Table 14. Most of the items had a correlation score above the recommended 0.6 when they were analyzed during the PCA and one can observe deleting any of them from this analysis would reduce its validity, which means it does not make sense to consider doing so. The two items which one will now focus on are "Lack of studies

about its usefulness” and “Insufficient technological media in the workplace”, with the worst results on the component matrix: the former was slightly below the recommended score and one can see deleting it would actually cause a small reduction of the index, with its inclusion being therefore justified; the latter is the most interesting case, as it had an extremely low correlation score, which suggests it could make more sense to analyze it separately from all the other items as it did not contribute that much to explain the underlying variable. In fact, when analyzing Table 14, one can realize the deletion of this item was the only one which would contribute to an increase from 0.745 to 0.759 of the Cronbach’s Alpha index. Despite this fact, the truth is the item was indeed indicated as an obstacle for the acceptance of telemedicine during the interviewees, which only contributes to think it explains the underlying variable and, after further analysis, it does not fit into any other category, while, at the same time, showing some correlation to this one. Considering this and despite the acknowledgement that it would be acceptable to remove it from this component and even from this analysis altogether, the item shall be considered as part of the component that shall explain the variable Obstacles from now on.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Lack of studies about its usefulness	15.4503	22.303	.736
Lack of advantages for the clinician	14.9868	19.440	.693
Technology without major applications in the clinical practice	14.7947	19.551	.687
Insufficient technological media in the workplace	16.0662	23.249	.759
Lack of clarification of the clinician's accountability	15.9338	21.036	.708
Potential of job reduction for future clinicians	15.1192	19.666	.720
Reduction of patient satisfaction	15.4901	19.358	.691

Table 14 - Item-total statistics

3.2.3.3. Patient benefits

The next variable to be analyzed is Patient benefits, which was assumed to be explained by question 6. The eigenvalues and total variance can be consulted in Table 15. Starting this analysis, it

can be observed this is by far the most clear-cut case in this chapter, with only one component having an eigenvalue above 1 and with said component explaining 72.3% of the variance. With such a great difference, it does not make sense to consider any other component.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	3.615	72.300	72.300	3.615	72.300
2	.560	11.207	83.507		
3	.349	6.973	90.480		
4	.276	5.512	95.992		
5	.200	4.008	100.000		

Table 15 - Total Variance Explained for Patient benefits

The distribution of the eigenvalues for each component can be consulted in Figure 24, which displays a scree plot with the desirable “elbow shape”, with component 1 far above the recommended value and all the others below that limit, with each component accounting for less variance than the previous ones, which further suggests the decision to disregard them from now on is correct.

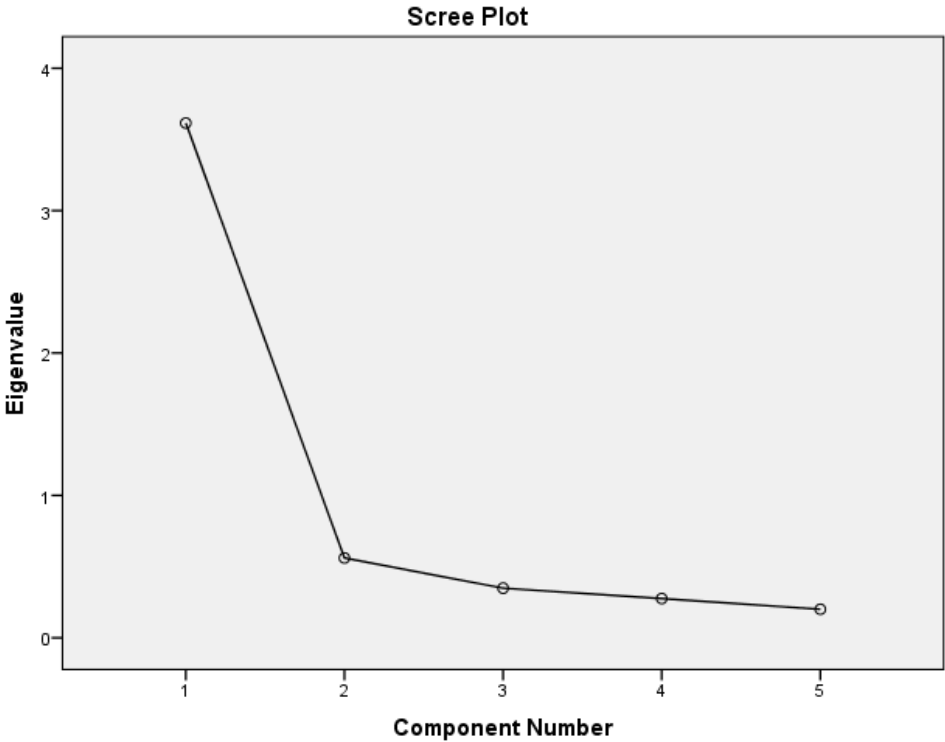


Figure 24 - Graph of the eigenvalue against the component number for Patient benefits

With the component to be used identified and isolated, it is now time to focus on how each item contributes to explain the variable. The component matrix can be analyzed in Table 16. This matrix and its components can be used to confirm every item in this question belonged together and they can all be used to explain Patient benefits. This strong correlation between the component and the variable demonstrated by such a set of high correlation scores can be explained by the fact that these items were all mentioned during the interviews stage and that was the main reason why they ended up being included, which only provides more evidence to support the previously mentioned Grounded Theory which states one should first get more involved with the topic and let that involvement dictate the hypotheses and only then study it (Glaser & Strauss, 1967). To go over the scores themselves, they are all well above the recommended 0.6, offering no doubt they all contribute to explain Patient benefits.

	Component 1
Reduction of the maximum response time in healthcare access	.871
Reduction of time spent in travels to and from healthcare institutions	.864
Greater equity in healthcare access	.862
Reduction of total costs associated with travels	.861
Greater patient satisfaction with healthcare	.791

Table 16 - Component matrix for Patient benefits

To test the reliability of this PCA, one should now take a look at the Cronbach's Alpha index of this set of items, which can be consulted in Table 17. The 0.901 index is just the final proof that this set of items belonged together and this was a reliable assumption.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.901	.904	5

Table 17 - Cronbach's Alpha index for Patient benefits

3.2.3.4. Apps

The following underlying variable to analyze is denominated Apps and is related to the main concerns referred during the interviews stage regarding the implementation of smartphone/tablet apps. This variable will be explained by question 14, with the eigenvalues and variance of the components being displayed in Table 18. This is another clear-cut case, with component 1 being the only one with an eigenvalue above 1 and explaining 78.533% of the variance of the underlying variable.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.356	78.533	78.533	2.356	78.533
2	.367	12.217	90.750		
3	.277	9.250	100.000		

Table 18 - Total Variance Explained for Apps

This distribution can be seen on the scree plot in Figure 25. This plot shows what was previously described, with one component being by far the most relevant and the others not explaining enough variance to be considered significant, being therefore disregarded from now on.

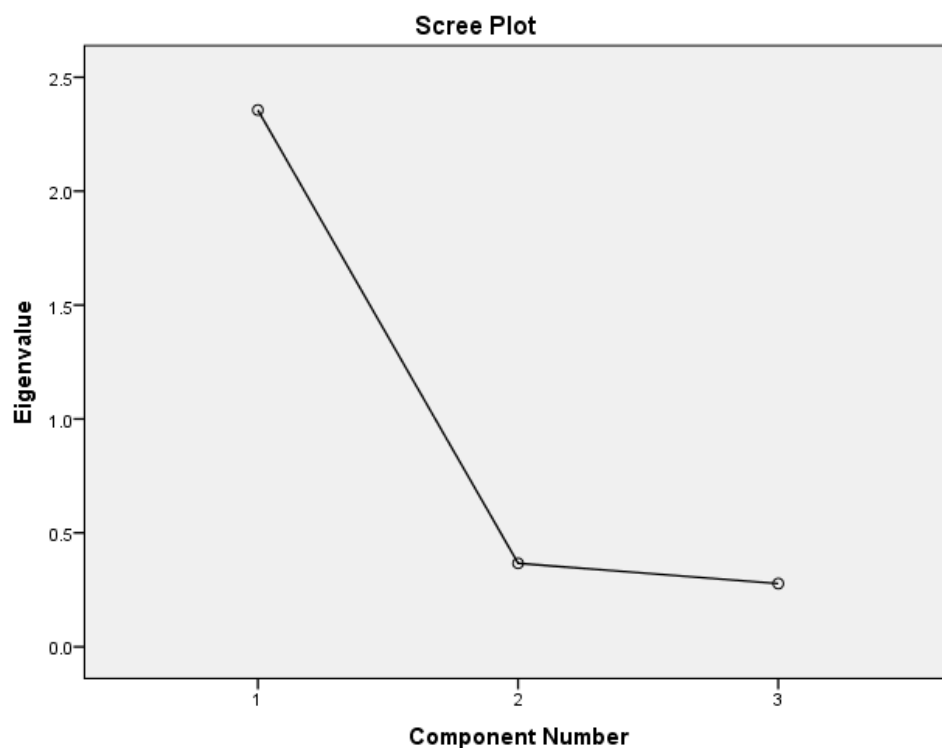


Figure 25 - Graph of the eigenvalue against the component number for Apps

Now that one has settled on component 1, it is time to focus on the correlation scores of each item part of this component and those can be found in Table 19. Just as for the previous variable, this component matrix displays a set of component scores all well above the recommended values, showing the strong correlation each item has with the underlying variable. This gives confidence to proceed with the PCA analysis. Once again, it cannot be emphasized enough the impact the input provided by the interviewees had in this question design, being only natural that it led to such good results.

	Component 1
Integration with the remaining information systems including data insertion and edition.	.896
Possibility of access by the clinician from any device.	.896
Certification and guarantee of the produced results.	.866

Table 19 - Component matrix for Apps

Last but not least, one should check the Cronbach's Alpha index to be certain of the reliability of analyzing this set of items together. That index can be consulted in Table 20. With an index of 0.862, it is fair to say the analysis is extremely reliable and one can trust the presented dimension reduction process realized here, which means the variable Apps will, from now on, be represented by the component 1 introduced here with the correlation scores in Table 19.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.862	.863	3

Table 20 - Cronbach's Alpha index for Apps

3.2.3.5. Incentives

One shall now look at one of the presumed ways to increase telemedicine acceptance, Incentives. This variable will be explained by question 17 and the first stats about its components can be found in Table 21. Component 1 is the only one which respects the pre-established limitation of an eigenvalue above 1 and will therefore be the only one considered. It can alone explain 65.096% of the variance of the variable.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	2.604	65.096	65.096	2.604	65.096
2	.704	17.601	82.696		
3	.555	13.887	96.584		
4	.137	3.416	100.000		

Table 21 - Total Variance Explained for Incentives

To better see this distribution of eigenvalues, one should analyze the scree plot in Figure 26. The plot, despite the proximity of the eigenvalues of two components, still has the wanted “elbow-shape”. As previously said, the remaining components do not account for enough percentage of the variance.



Figure 26 - Graph of the eigenvalue against the component number for Incentives

Looking more closely at component 1, one will now analyze its component scores, which are displayed in Table 22. Unlike the former two variables, there is something relevant to take into account when looking at this component matrix because, while the other items are well above the recommended 0.6, there is one item that may raise some concerns and it is interesting to discuss it. The item “Incentives for the institutions to acquire telemedicine equipment” has the lowest correlation

score, despite being above the recommendations. This item was also the most referred response during the interviews stage despite not having to do with the initial intent of the question, as previously mentioned. It was decided it would be in this question despite not fitting in the “personal incentives” category with the other items due to that prevalence and the fact it is a good fit in this component further suggests that is the case.

	Component 1
Reduction of goals in other tasks during the adaptation period	.906
Reduction of other tasks during the adaptation period	.901
Financial incentives for the clinician	.751
Incentives for the institutions to acquire telemedicine equipment	.639

Table 22 - Component matrix for Incentives

Looking at the Cronbach’s Alpha index now, which is present in Table 23, it is possible to see the reliability of the analysis of this set of items is beyond any doubt, being clearly above the recommendations and ending the analysis of this variable.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.809	.814	4

Table 23 - Cronbach's Alpha index for Incentives

3.2.3.6. Clinician benefits

The last PCA analysis which will be performed in this dissertation concerns the variable Clinician benefits and will consist on the analysis of question 18 of the survey. The eigenvalues and variance associated to the seven generated components can be seen in Table 24. Once again, component 1 alone has an eigenvalue fulfilling the requirement and can explain 65.673% of the variance of the underlying variable.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	4.597	65.673	65.673	4.597	65.673
2	.689	9.838	75.511		
3	.512	7.315	82.826		
4	.380	5.422	88.248		
5	.361	5.152	93.400		
6	.296	4.230	97.630		
7	.166	2.370	100.000		

Table 24 - Total Variance Explained for Clinician benefits

To confirm the data of the above table and the distribution it suggests, one shall look at Figure 27. Despite the whopping seven items, the plot has the wanted shape and all components but on will be disregarded with the analysis having only component 1 in mind from now on.

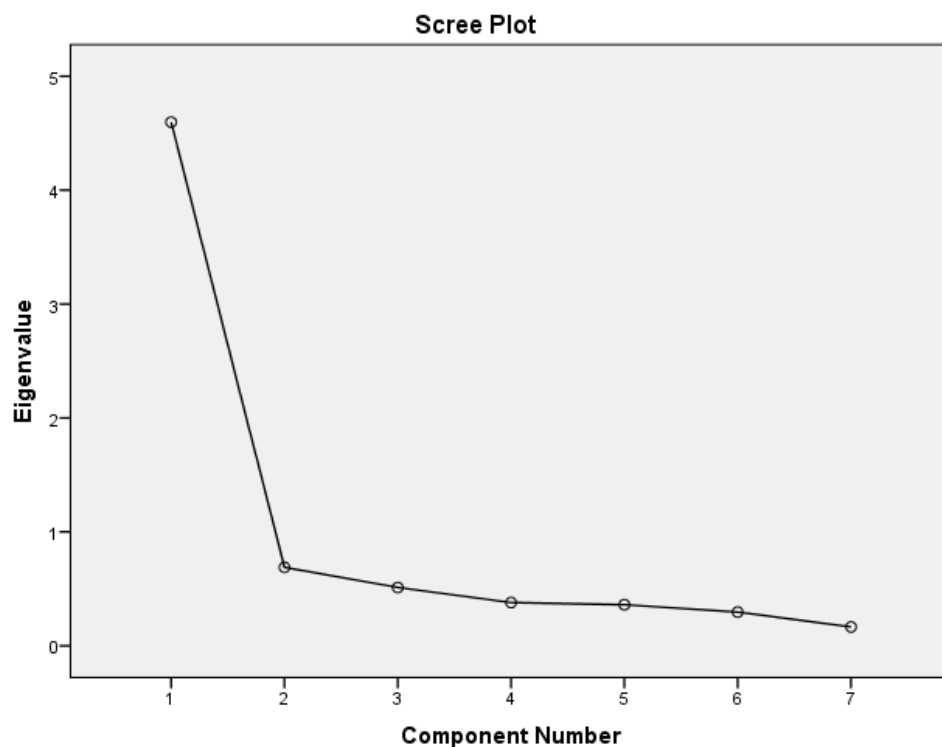


Figure 27 - Graph of the eigenvalue against the component number for Clinician benefits

To further analyze this component, the component matrix will be displayed in Table 25. The correlation scores presented here are among the best of all the PCAs, not only because they are all

above the recommendations but also because their values are very close to each other. This serves only to confirm how representative the interviews were of the general classes, with all the items corresponding to benefits suggested by, at least, one interviewee.

	Component 1
Greater possibility of consulting on concrete clinical cases	.841
Improvement of the clinical education	.840
Possibility of greater patient monitoring	.828
Strengthening of bonds between clinicians	.823
Reduction of the number of travels	.801
Productivity increase	.770
Reduction of time spent in bureaucratic tasks (e.g. update of clinical processes and reports)	.764

Table 25 - Component matrix for Clinician benefits

To end this section, one will check the reliability of this set of items. The index can be seen in Table 26 and, with a value of 0.910, it leaves no doubts about how reliable a PCA with this set of items is.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.910	.913	7

Table 26 - Cronbach's Alpha index for Clinician benefits

3.2.4. Correlations between variables

With the underlying variables now defined and the components which explain them described by the correlation components of its items, it is now time to see if there is any correlation between the

variable, to ultimately see if one can use any variable to predict the other. As one might imagine, it would neither be feasible nor adequate to perform analyses with all the combinations of the six obtained variables because, not only are fifteen analyses too much, but it also does not make sense to compare every variable as most combinations do not have any apparent correlation. The variable one is interested the most is Affinity and therefore the correlations that will be studied here will always be attempting to predict it using other variables, namely the Patient benefits and the Clinician benefits.

There were a number of alternative methods to study the correlations between the variables and there was some investigation made to choose the most appropriate one for this case. Eventually, the chosen one ended up being linear regression due to how intuitive and simple it is, which is extremely relevant to explain the results to professionals with varying degrees of understanding in math. As with the PCA, explaining the method in a more mathematical way would be something out of the scope of this dissertation and it is more adequate to explain its goal and mention the most important aspects of it.

The goal of simple linear regression is to analyze the relationship between a single dependent (criterion) variable and an independent (predictor) variable. To perform this technique, the researcher must first guarantee two things: “the data must be metric or appropriately transformed, and before deriving the regression equation, the researcher must decide which variable is to be dependent and which remaining variables will be independent.” (Hair et al., 2009)

3.2.4.1. Affinity and Clinician benefits

The first correlation to be studied is the one between Affinity and Clinician benefits, with the goal to see if one can perform the feelings of a clinician towards telemedicine from his feelings towards the benefits he might get out of accepting it in his daily routine. Table 27 contains the main statistics for this analysis. Despite the presence of R and R square, the information one will look at will be the adjusted R square because it takes into account the sample size and number of variables in the study, unlike the perhaps more popular R square. While the value of 0.298 is undoubtedly low, it does not mean it cannot have any use for the intended purpose. This value means the variable Clinician benefits can predict the variable Affinity around 15% better than a theoretical constant variable which, when considering the difficulty in predicting human behavior, with some authors considering R square values below 0.5 normal, cannot be disregarded. The value of the Durbin-Watson test being between 1.5 and 2.5 means there is no autocorrelation in the data (Hair et al., 2009). The standard error of the estimate means the values of the regression are close to the regression line.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.550 ^a	.303	.298	.84008827	2.056

Table 27 - Main statistics for the linear regression of Affinity and Clinician benefits

The coefficients generated by the above linear regression can be consulted in Table 28.

Unstandardized Coefficients		Standardized Coefficients		
B	Std. Error	Beta	t	Sig.
-.014	.070		-.198	.843
.551	.070	.550	7.821	.000

Table 28 - Coefficients of the linear regression of Affinity and Clinician benefits

3.2.4.2. Affinity and Patient benefits

The other correlation which will be studied here is the one between Affinity and Patient benefits. One knows, from both the interviews stage and the survey responses, that patient benefits are something the clinicians are extremely interested in and it is interesting to study how much the potential benefits for the patients can improve the feelings of the clinicians towards telemedicine. The main statistics of this linear regression can be consulted in Table 29. In it, one can observe the adjusted R square has a similar value to the other linear regression performed, sitting at 0.297. This means the variable Patient benefits can explain around 15% of the variance of the variable Affinity, which, again, does add value when compared to a constant variable. The result of the Durbin-Watson test shows there is no autocorrelation in the data, which gives some assurance about the performed analysis.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.549 ^a	.301	.297	.83873238	1.952

Table 29 - Main statistics for the linear regression of Affinity and Patients benefits

As for the coefficients, they are displayed in Table 30.

Unstandardized Coefficients		Standardized Coefficients	
B	Std. Error	Beta	t
3.818E-17	.068		.000
.549	.068	.549	8.014

Table 30 - Coefficients of the linear regression of Affinity and Patient benefits

4. Discussion

After all the results were analyzed, it is now time to focus more on its discussion. This will not be a point-by-point discussion, as those were made as the results were being presented. Instead, this section will be used to group the most relevant conclusions and findings and discuss them to hopefully provide some relevant information to policy deciders on how to improve telemedicine acceptance.

The first point that needs to be emphasized is the eHealth vs telemedicine debate, which might seem like a paradox for anyone who reads the title and then the text itself. As previously stated, both terms are used nowadays and, sometimes, they are being used interchangeably (Fatehi & Wootton, 2012). However, if one were to consider their pure definition, eHealth has a greater scope and focus on everything technology can do related to everyone involved in healthcare, while telemedicine focus on the physicians' part of the job. That is why, in the author's opinion, the term eHealth is the more fitting one for this dissertation's scope and that ended up being confirmed more than once during the realization of the interviews thanks to many discussions on this subject. However, one has to consider this dissertation is applied to the Portuguese reality and, therefore, its main target resides in Portugal. Considering that the most relevant official organizations working on this subject have telemedicine in their names or official documents, it was decided this would be the term used throughout the dissertation.

The second point one has to focus is that there is not much if one wants to **read articles everything surrounding**, but not directly related to, telemedicine. To be more objective, the bulk of the academic work on telemedicine focuses on its technical aspects and their direct applications to healthcare and several examples of that can be found throughout the state of the art of this dissertation. That means other relevant aspects such as the study of the financial gains of its use are somewhat deprecated, which makes it that much harder to overlook the significant financial barriers concerning equipment acquisition since there is no specific evidence-based counter-argument for them. In addition to that, another relevant type of studies such as telemedicine acceptance ones are overlooked and there was not much to work on top of, something the author hopes to mitigate with this study.

Moving on to the research questions, one will now analyze how well they were studied and whether this dissertation helped to understand them or not. **The first one intended to understand the healthcare professionals' opinion on telemedicine and there are several sources in this dissertation to understand that, from the interviews of both policy deciders and specialists with major experience on the field to the survey with 151 responses providing information on several different topics regarding telemedicine.** The various responses were analyzed to create insight on those topics and better understand the professionals' feelings and how they responded to several main questions, such as the obstacles, incentives or potential benefits for them and the patients, which makes the author think this question was properly dealt with. It is interesting to notice aspects such as insufficient technological media being the main obstacle for the survey respondents, assistance in equipment acquisition being

seen as the main incentive to increase telemedicine acceptance or reduction of the number of travels being the most agreed upon benefit for both clinicians and patients.

The second research question had to do with the study of the variables that influence positively or negatively telemedicine acceptance. Despite the incapacity to attain data concerning the most adequate measure, actual usage of telemedicine (Chuttur, 2009), with the closest metric being reported frequency of use, it was possible to add to this study in two different ways: the first was by analyzing the responses to the surveys and identifying the ones with the most positive feedback, thus giving the information of what was more relevant to the respondents; the second was through the dimension reduction analyses, by identifying the underlying variables explained by some questions of the survey. The underlying variables Affinity, Obstacles, Patient benefits, Apps, Incentives and Clinician benefits were all considered explained by the chosen questions, with overall excellent correlations between their items. The exception was the item “Insufficient technological media in the workplace” for the variable Obstacles. This does not mean it is not an obstacle and that is reinforced by its classification by the respondents as the most important barrier but it means that, when grouped with a set of barriers directly connected to the core of telemedicine, it might have been considered out of place as a supporting problem and not a core one. In the absence of usage data, Affinity was considered the variable that resembled it the most and there was an attempt to see how well the variables Patient benefits and Clinician benefits could predict it. The results, despite significant, were not good enough to draw any conclusions with both variables only explaining around 15% of the variance of Affinity, with further analyses and possible variable adjustments needed.

The next question was perhaps the most ambitious and was related to the analysis of trends in the obtained data to lead to the production of objective measures to increase telemedicine acceptance. In this topic, the first and perhaps most important suggestion stems from the identified distance between policy deciders and specialists on this subject during the interviews and the confirmation of that during the survey and it is the inadequacy of the strategy being used for telemedicine in the National Health System (NHS). It was among the most identified obstacles during the interviews stage, as can be seen in Table 5 and it went on to be the question with the greatest number of negative responses of the survey, as seen in Figure 19. This does not mean there is no clearly defined strategy for the NHS and there are organizations doing relevant work on this and a few references to documents that support it throughout the dissertation, but it might mean that strategy is not being transmitted to the ones who have to execute it, thus giving the perspective of a lack of strategy. To reduce this feeling, there needs to be a greater communication between the more central decision-making groups and the clinicians.

Moving on to other suggestions, there is one measure which should be analyzed in greater detail and that is the investment in equipment for healthcare institutions, as that is the most important barrier for the acceptance of telemedicine according to the interviewees and the respondents of the survey. There are a few questions on the survey suggesting the respondents' mindset is favorable to the use of telemedicine and this might translate into the acceptance of telemedicine, should the main obstacles be dealt with first. There should also be a more intense propagation of the notion that

patients are, indeed, interested in telemedicine. It is possible to see in Figure 7 and Figure 9 that respondents have a strong opinion regarding the impact of telemedicine in patient satisfaction with their services. Interviewees had a very different perception with some of them even mentioning that, once patients felt what telemedicine could add to their lives, they did not want to go back to the more traditional care. This could be done either through the use of feedback surveys to patients involved in telemedicine programs or through the dialog with patients associations to transmit to the clinicians their will to accept these technologies.

The two last research questions that were related to the impact of age and specialty in telemedicine acceptance could not be properly investigated for one main reason: there were not enough responses to the survey to be able to have a significant sample with the categories of age group and specialty represented enough to be valid. This means there can only be qualitative considerations on these topics: the first one is that the most involved specialties seem to be general practice physicians and the dermatologists, who are the ones more connected to the national initiatives, such as the teledermatology program currently being applied. Despite the low number of dermatologists in the sample, this consideration gets further support as this is the specialty being complimented and awarded the most during the national meetings to discuss telemedicine.

4.1. Research limitations

Now that the bulk of the work in this dissertation has been presented, it is interesting to look back and analyze the main limitations found, not only to help the reader understand some of the directions followed by the research, but also to provide some hints to future researchers in this area about possible obstacles they will have to overcome. Overall, there are three limitations one should pay attention to.

The main limitation during this research was getting to the healthcare professionals. There was no problem in discussing the subject with them and, when one could get to talk to them, the vast majority would show interest for the research and collaborate without any sign hesitation. However, their contacts are obviously not publicly available and, apart from public events such as the eHealth Summer Week, to get to the professionals, one has to get past the healthcare institutions and this is where the problem resides. Most of the healthcare institutions in the NHS did not show any interest in collaborating with this research, not even replying to the contacts for the interviews stage and the survey. This limited the total number of professionals one could get to talk with and it was the major constraint which led to the lack of significance in the sample.

The second limitation has to do with the vastly different number of responses from both classes targeted during the survey stage, with the vast majority of the responses coming from physicians and only 22 coming from nurses, as can be seen in Table 6. This naturally means the conclusions one was able to draw from the responses should be looked at having the physicians in mind, as they are the significantly more represented class in this sample. This difference was already noticeable in the interviews sample, with the reason being that most of the speakers during the eHealth Summer Week were physicians and it should be dealt with by a more specific targeting

method than Internet survey, since professionals might have a tendency to respond to these surveys during their work time and nurses usually do not have an assigned office to be responding, which might reduce the probability they will do so.

The last relevant limitation occurred when institutions actually replied to the contacts and it has to do with the different process each institution has to approve collaborations with this kind of researches. There is no standard way for a researcher to approach them with all the information they require, which means one has to contact each institution to know what their method is and this naturally increases the time and effort required for this process and decreases the attention given to each of them. The differences in response times can go from a waiting period of less than a week for the approval and distribution of the survey to a waiting period of three months to even get the reply to the initial contact. When it comes to documentation, there are institutions asking for a document with scope, main goals, activity plan and chronogram and others asking for more than a dozen of documents which require approval from three different entities within the institution. These are obviously incompatible with the available time for the elaboration of a Masters dissertation.

4.2. Future work

This dissertation attempted to explore one understudied topic of research: technology acceptance in health. It ended up providing some relevant information but it could not acquire a significant sample to further explore the trends noticed during the interviews. This means the first recommendation for future researches in this area is to perform a larger study targeted for these professionals and attempting to study the effects age and specialty have on the intention to use telemedicine. The larger sample should also allow the study of more conditional topics in greater detail, such as the success of telemedicine projects and how it influences the professionals' attitude towards telemedicine in general.

The second recommendation is to extend this study to the healthcare technicians as they are gaining an increasingly higher relevance in this process and having to learn how to deal with larger amounts of information, thus being an important part of the process of supporting physicians and nurses in accepting and using technology.

The third recommendation has to do with the financial impact of the introduction of technology in the NHS. There are barely any studies on this topic worldwide and the ones that do study costs and technology in health cannot meet the standards, not realizing basic analyses such as cost utility ones (Whitten et al., 2002). Despite cost reduction being a common argument to support telemedicine and eHealth in general, there is no scientific evidence that it happens, which means all the financial-related information policy deciders have at their disposal is the myriad of initial costs that comes with them, such as equipment acquisition, staff allocation and the temporary performance reduction during the adaptation period. There needs to be solid evidence that these technologies contribute to reduce costs in healthcare as that would be a valuable argument in this context of financial struggle worldwide.

The fourth and final recommendation of this study is to explore the issue surrounding the strategy for telemedicine in the NHS. It was perhaps the greatest problem this study identified and it showed most physicians and nurses which participated have a significantly different opinion regarding strategy from most of the policy deciders interviewed. This is particularly relevant when discussing an activity with substantial initial costs and temporary increases in workload for the professionals, two factors that can contribute to a reduction of actual use of these technologies.

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Appendices

Appendix 1 – Guião de entrevistas geral

Em que serviço trabalha e quais as suas funções?

Conhece o conceito de telemedicina?

- Se sim, como o define?

Qual o seu grau de interesse nesta área?

Na sua prática clínica, usa a telemedicina?

- Com que frequência?
- Em que situações?

Considera as ferramentas de telemedicina que usa instrumentos eficazes para o desempenho das suas funções?

Quais os principais benefícios da telemedicina na sua prática?

Como é que encara a possibilidade de incorporar *apps* na sua rotina?

Qual é, na sua opinião, o potencial da telemedicina na sua área?

Ao nível das direcções clínica e administrativa, quais as orientações que tem em relação a esta área?

- Tem incentivos financeiros para incorporar a telemedicina na sua prática clínica?

Qual é, na sua opinião, o maior entrave à aceitação da telemedicina?

Qual a sua faixa etária?

Appendix 2 – General interview guide

What is the service you work for and what are your tasks?

Do you know the concept of telemedicine?

- If so, how would you define it?

What is your interest in this area?

In your daily practice, do you use telemedicine?

- How often?
- In which context?

Do you consider the telemedicine tools you use effective to perform your tasks?

What are the main benefits telemedicine brings to your practice?

How do you see the possibility of using apps in your routine?

What is, in your opinion, the potential of telemedicine in your specialty?

What are the orientations your clinical and administrative management give about telemedicine?

- Do you have financial incentives to use telemedicine in your daily practice?

What is, in your opinion, the greatest obstacle to telemedicine acceptance in Portugal?

What is your age group?

Appendix 3 – Questionário

Estudo da aceitação da telemedicina

Obrigado por aceitar participar neste questionário a ser tratado no âmbito de uma dissertação de mestrado em Engenharia Biomédica no Instituto Superior Técnico, com o título "Aceitação de tecnologias na medicina em Portugal – telemedicina – perspectiva dos profissionais". Nenhum dado incluído neste questionário será fornecido a terceiros e serão todos tratados de forma confidencial.

André Ferreira
contacto: andre.e.ferreira@tecnico.ulisboa.pt

(orientador: Professor Carlos Lucas de Freitas)

* 1. Concorda com a frase "Estou familiarizado com o conceito de telemedicina."?

Concordo completamente Discordo completamente

* 2. Qual a sua atitude em relação à telemedicina?

Muito interesse Nenhum interesse

* 3. Qual é, na sua opinião, o potencial da telemedicina na sua especialidade?

Potencial enorme Nenhum potencial

* 4. Indique qual a importância que atribui a cada uma destas barreiras ao uso da telemedicina.

	Muito importante				Nada importante
Falta de estudos sobre a sua utilidade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Falta de vantagens para o clínico	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tecnologia sem grandes aplicações na prática clínica	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meios tecnológicos no local de trabalho insuficientes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Falta de clarificação da responsabilização dos clínicos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potencial de redução de postos de trabalho para futuros clínicos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redução da satisfação dos utentes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 5. Qual é, na sua opinião, a atitude mais comum por parte dos profissionais de saúde em relação à telemedicina?

Muito interesse Nenhum interesse

* 6. Concorda que a telemedicina traz vantagens para o utente associadas a:

	Concordo completamente				Discordo completamente	
Redução de tempo gasto em deslocações às instituições de saúde	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redução do tempo máximo de resposta no acesso aos cuidados de saúde	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maior equidade no acesso aos cuidados de saúde	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redução de custos totais causados pelas deslocações	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento da satisfação em relação aos cuidados de saúde prestados	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 7. Já participou em algum projecto de telemedicina?

- Sim
 Não



Seg.

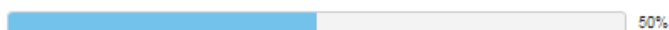
Estudo da aceitação da telemedicina

8. Como o classificaria?

Sucesso					Insucesso
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 9. Actualmente, na sua prática clínica, utiliza a telemedicina?

- Sim
 Não



Ant.

Seg.

10. Em que âmbito?

- Parcerias inter-institucionais
- Projectos-piloto nacionais

11. Com que frequência?

- Diariamente
- Semanalmente
- Quinzenalmente
- Mensalmente

12. As ferramentas de telemedicina que uso são eficazes para o desempenho das minhas funções.

Concordo completamente Discordo completamente

13. Até que ponto está satisfeito com estas ferramentas?

Muito satisfeito Nada satisfeito

* 14. Quanto ao uso de apps de smartphone/tablet, indique qual a importância dos seguintes aspectos.

	Muito importante				Nada importante
Certificação e garantia dos resultados produzidos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Possibilidade de acesso do clínico a partir de todos os seus dispositivos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integração com os restantes sistemas informáticos incluindo entrada e edição de dados	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 15. Qual a importância que a sua direcção clínica atribui à telemedicina?

Muito importante Nada importante

* 16. A estratégia actualmente em curso para a telemedicina no SNS tem sido adequada.

Concordo completamente Discordo completamente

* 17. Indique qual a importância dos seguintes incentivos para a aceitação da telemedicina.

	Muito importante			Nada importante	
Incentivos financeiros para o clínico	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redução de outras tarefas durante o período de adaptação	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redução de objectivos noutras tarefas durante o período de adaptação	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incentivos para as instituições na aquisição de equipamentos de telemedicina	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 18. Concorda que a telemedicina traz vantagens para o clínico associadas a:

	Concordo completamente			Discordo completamente	
Possibilidade de maior monitorização dos utentes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redução do número de deslocações	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Redução de tempo gasto nas tarefas burocráticas (e.g. actualização de processos clínicos e de relatórios)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maior possibilidade de consultoria sobre casos clínicos concretos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fortalecimento de relações entre clínicos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Melhoria da formação clínica	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento da produtividade	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. Qual é, na sua opinião, o maior entrave à aceitação da telemedicina em Portugal?

(Caso tenha algum comentário sobre o questionário, faça-o aqui)



Ant. **Seg.**

* 20. Qual a sua profissão?

- Médico
- Enfermeiro

* 21. Qual a sua especialidade?

22. Exerce funções de chefia?

- Sim
- Não

* 23. Para fins de análise estatística, pedia-lhe que indicasse a sua faixa etária.

- 20-29
- 30-39
- 40-49
- 50-59
- 60-69
- >69

24. A instituição onde trabalha pertence a que Associação Regional de Saúde?

- ARS Norte
- ARS Centro
- ARS Lisboa e Vale do Tejo
- ARS Alentejo
- ARS Algarve
- Secretaria Regional da Saúde dos Açores
- Secretaria Regional da Saúde da Madeira



Ant.

Concluído

Appendix 4 – Questionnaire

Study of telemedicine acceptance

Thank you for agreeing to participate in this survey to be analyzed within a dissertation for the Masters in Biomedical Engineering in Instituto Superior Técnico, with the title: "Technology acceptance in medicine - telemedicine' - the perspective of the professionals". None of the data inserted in this survey will be supplied to third-parties and they will all be analyzed confidentially.

André Ferreira
contact: andre.e.ferreira@tecnico.ulisboa.pt

(supervisor: Professor Carlos Lucas de Freitas)

* 1. Do you agree with the sentence "I am familiarized with the concept of telemedicine."?

Strongly agree Strongly disagree

* 2. What is your attitude towards telemedicine?

Extremely interested Not at all interested

* 3. What is, in your opinion, the potential of telemedicine in your specialty?

Huge potential No potential

* 4. Indicate what is the importance you give to each of the following barriers to the use of telemedicine.

	Extremely important				Not at all important
Lack of studies about its usefulness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of advantages for the clinician	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology without major applications in the clinical practice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient technological media in the workplace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of clarification of the clinician's accountability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potential of job reduction for future clinicians	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction of patient satisfaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 5. What is, in your opinion, the most common attitude from the healthcare professionals towards telemedicine?

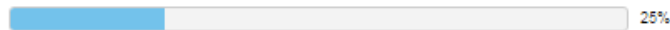
Extremely interested Not at all interested

* 6. Do you agree telemedicine brings benefits to the patient associated with:

	Strongly agree				Strongly disagree
Reduction of time spent in travels to and from healthcare institutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction of the maximum response time in healthcare access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Greater equity in healthcare access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction of total costs associated with travels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Greater patient satisfaction with healthcare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 7. Have you ever participated in a telemedicine project?

- Yes
 No



Next

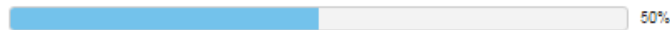
Study of telemedicine acceptance

8. How would you classify it?

Success					Unsuccess
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 9. Do you currently use telemedicine in your daily practice?

- Yes
 No



Prev Next

10. In which context?

- Inter-institutional partnerships
- National pilot projects

11. How often?

- Daily
- Weekly
- Biweekly
- Monthly

12. The telemedicine tools I use are effective for my job performance.

Strongly agree Strongly disagree

13. To what extent are you satisfied with these tools?

Extremely satisfied Not at all satisfied

* 14. Regarding the use of smartphone/tablet apps, indicate the importance of the following aspects.

	Extremely important				Not at all important
Certification and guarantee of the produced results.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Possibility of access by the clinician from any device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integration with the remaining information systems including data insertion and edition.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 15. What is the importance your clinical management gives to telemedicine?

Extreme importance No importance at all

* 16. The current strategy for telemedicine in the National Health System has been adequate.

Strongly agree Strongly disagree

* 17. Indicate what is the importance of the following incentives for telemedicine acceptance.

	Extremely important				Not at all important
Financial incentives for the clinician	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction of other tasks during the adaptation period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction of goals in other tasks during the adaptation period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incentives for the institutions to acquire telemedicine equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 18. Do you agree telemedicine brings benefits for the clinician associated with:

	Strongly agree			Strongly disagree	
Possibility of greater patient monitoring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction of the number of travels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction of time spent in bureaucratic tasks (e.g. update of clinical processes and reports)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Greater possibility of consulting on concrete clinical cases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strengthening of bonds between clinicians	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improvement of the clinical education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Productivity increase	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. What is, in your opinion, the greatest obstacle to telemedicine acceptance in Portugal?

(In case you have any comment about the survey, write it here)



* 20. What is your job?

- Physician
- Nurse

* 21. What is your specialty?

22. Do you have a leadership role?

- Yes
- No

* 23. For statistical purposes, please indicate your age group

- 20-29
- 30-39
- 40-49
- 50-59
- 60-69
- >69

24. Which Regional Health Association does the institution you work for belong to?

- North RHA
- Center RHA
- Lisbon and Tagus Valley RHA
- Alentejo RHA
- Algarve RHA
- Azores Regional Health Secretary
- Madeira Regional Health Secretary



Prev Done