Adoption of Electronic Health Records in the Portuguese healthcare system in the presence of privacy concerns

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Abstract

Title: Adoption of Electronic Health Records in the Portuguese healthcare system in the presence of privacy concerns

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Electronic Health Records promise to solve many of the current healthcare challenges since they have the potential to improve performance and quality of healthcare. However, for an EHR be fully employed by all the stakeholders, it is necessary to overcome some of the existent barriers to its adoption. With the EHRs available online, the risk of patient privacy violations as well as cyber-attacks increases the patients' concerns for their information privacy.

Therefore, this study deepens about Portuguese patients' concern around information privacy, factors influencing these concerns and how the decision to adopt EHRs can be influenced in patients with privacy concerns.

A cross-sectional online survey showed that Portuguese citizens have concerns for information privacy and those vary across gender and education. Moreover, when presented with positive message framings, individuals are more willing to adopt EHRs and the majority of the respondents believe that this system will improve the overall quality of the Portuguese healthcare system.

Resumo

Title: Adopção dos Registos de Saúde Electrónicos no sistema de saúde Português tendo em consideração preocupações relativas à perda de privacidade

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Os Registos de Saúde Electrónicos (RSE) prometem solucionar muitos dos desafios que os sistemas de saúde hoje enfrentam, uma vez que têm o potencial de melhorar a qualidade dos serviços e o desempenho dos sistemas de saúde. No entanto, para que os RSE sejam utilizados na sua plenitude, é necessário superar alguns obstáculos existentes à sua adopção. Com a disponibilização dos RSE *online*, a perda de privacidade do paciente, bem como *cyber*-ataques, levam os indivíduos a preocuparem-se com o modo como os seus dados pessoais são guardados e partilhados.

Deste modo, esta tese procura perceber se os portugueses estão preocupados com a perda de privacidade dos seus dados médicos aquando da adopção dos RSE, que factores influenciam a estas preocupações e como é que a decisão de adoptar RSE pode ser influenciada em pacientes com preocupações pela perda de privacidade.

Através de um questionário *online* conduzido a cidadãos portugueses, foi possível perceber que a maioria dos indivíduos está preocupada com a perda de privacidade dos seus dados médicos e tal varia com o sexo e a educação. Para além disso, os portugueses estão mais dispostos a adoptar os RSE quando apresentados com mensagens positivas e a maioria considera que os RSE irá melhorar a qualidade do sistema de saúde português.

Preface – Acknowledgements

This work was the result of a collective effort from everyone that intervened to guarantee its completion and success.

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Finally, I would like to dedicate this dissertation to my family as a gesture of gratitude for the love and support provided throughout these years. Thank you for providing me with the best opportunities to succeed in life.

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List of Abbreviations

CHP	Centro Hospitalar do Porto
ELM	Elaboration Likelihood Model
EMR	Electronic Medical Record
EHR	Electronic Health Record
GDP	Gross Domestic Product
HGSA	Hospital Geral de Santo António
HIV	Human Immunodeficiency virus
KP	Kaiser Permanente
NHS	National Health Service
OECD	Organisation for Economic Co-operation and Development
OOP	Out-of-pocket payments
PHI	Private Health Insurance Model
PHR	Personal Health Record
RCU2	Portuguese Single Clinical Summary
RSE	Registo de Saúde Electrónico
SHI	Social Insurance Model
VHI	Private Voluntary Health Insurance

1. Introduction

“Change is the new normal” in the healthcare sector (Deloitte, 2016) with the healthcare industry under significant pressure to manage resources, decrease costs and improve quality of care (IBM, 2013). In addition, the increasing rates of older population, chronic diseases and technology are changing the way healthcare is delivered in the society (IBM, 2013). In Portugal, the healthcare system faces the same challenges, aggravated by the recent debt crisis and consequent austerity measures (Sakellarides, et al., 2009)

Nevertheless, Electronic Health Records (EHR) may provide ways to solve some of these challenges. Defined as a “longitudinal electronic record of patient health information generated by at least one health care professional in any care delivery setting” (HIMSS, 2015), EHRs have the potential to collect, categorize and share information about patients and clinical groups (WHO, 2015). This system has also the potential of identifying older people’s needs, devise their care over time, track responses to treatment of chronic diseases and access health outcomes (WHO, 2015).

At an “individual-level”, EHRs are able to monitor disease conditions that affect patients (Caligtan & Dykes, 2010). On the other hand, at an “aggregate population-level”, EHRs can bring benefits for research since it helps understand and manage illnesses and develop personalized medicine by physicians (Association of the British Pharmaceutical Industry, 2013).

However, despite the potential benefits of EHRs, there is an increasing concern that patient privacy issues may slow down its diffusion (Angst & Agarwal, 2009). When patient’s fear about data security, the consequence is usually resistance to share important and sensitive information (Blumenthal & McGraw, 2015) and that can undermine the potential uses of EHRs. However, even patients with privacy concerns can be persuaded to adopt EHRs through proper message framing (Angst & Agarwal, 2009).

Therefore, this dissertation aims to understand the following Research Questions:

1. Do Portuguese patients have concerns for information privacy in the adoption of EHRs in the Portuguese healthcare system?
2. Are concerns for information privacy differing across gender, level of education and age?

3. Is argument framing and health status influencing the decision of patients regarding the adoption EHRs?

Based on these Research Questions, 7 Hypotheses were designed and analyzed taking into account primary data obtained from a survey conducted to the Portuguese population:

H1 –Portuguese citizens have concerns for information privacy in the adoption of EHRs.

H2- Individuals are more favourable towards the adoption of EHRs when presented with positively framed messages vs. neutrally ones.

H3 – Under positive message framing, individuals with high concerns for information privacy are less favourable towards the adoption of EHRs than those with low concerns.

H4 –Under positive message framing, individuals with chronic diseases are more favourable towards the adoption of EHRs than the healthy ones.

H5 – Individuals with higher education level have less privacy concerns towards the adoption of EHRs than the ones in a lower level.

H6 - Women have more privacy concerns towards the adoption of EHRs than men.

H7 - Older individuals have more privacy concerns towards the adoption of EHRs than younger ones.

In this way, this dissertation is relevant at an academic and organizational level.

First of all, EHRs are a recent topic and therefore it is important to understand what the opinion of the citizens is concerning the future implementation of this system. Opinion-poll data has shown that privacy concerns negatively influence the use of EHRs in such a way that national efforts to adopt these systems might become ineffective (Angst & Agarwal, 2009). In this way, this thesis contributes to understand how EHRs are perceived by the Portuguese population and their likelihood of adopting these systems in the near future.

Secondly, understanding patients' concerns for privacy is extremely important for healthcare providers. This insight will allow them to act upon the true constraints, define solutions to protect personal information and develop new laws to protect personal data of Portuguese citizens.

This thesis is composed by six chapters. Chapter 2 focuses on a review of relevant literature such as healthcare systems and their challenges; electronic health records ‘definition, benefits and current initiatives; EHRs in Portugal; and privacy and security issues in implementing electronic health records. Chapter 3 presents the Research Questions, the Hypothesis to test and the methodology used to collect data. Chapter 4 describes the statistical outcome of the analysis and Chapter 5 discusses, from a critical point of view, the results and provides recommendations. Finally, Chapter 6 is composed by the conclusion, limitations and further research topics.

2. Literature Review

2.1 Healthcare Systems Overview

2.1.1 Healthcare Systems

According to WHO (2000), healthcare systems are defined as “all activities performed by organizations and institutions whose primary purpose is to promote, restore and maintain health”. Nowadays, the healthcare industry is considered one of the “world’s largest and rapidly growing industries”, corresponding to more than 10% of the GDP of most developed countries (WHO Regional Office for Europe, 2013).

The design of the healthcare systems is different across nations. Among several classifications, the 3-model typology developed by OECD is the most popularly used *(*Lee *et al*., 2008). It distinguishes 3 main categories based on the “level of coverage”, “healthcare delivery” and “finance source” (OECD, 1987). The first model, the “National Health Service” (NHS), is characterized by universal health coverage, control over the healthcare delivery, public ownership and funded primarily through taxes (Burau & Blank, 2006). United Kingdom and New Zealand are the most common examples of countries that have adopted this model, even though, in different degrees, they have moved away from the initial model (Burau & Blank, 2006). Regarding the “Social Insurance Model” (SHI), the delivery of healthcare is through public and private providers and it is financed by employer and employee contributions (Burau & Blank, 2006). Germany and Japan are paradigmatic examples of this model. Finally, in the “Private Health Insurance model” (PHI), the delivery of healthcare is mainly private and the funding is supported by individual or employer contributions (Burau & Blank, 2006). This model can be found in the United States and until recently, in Australia, even though there are many other systems containing some elements of this model (Burau & Blank, 2006).

Around the world, the way these systems are financed and delivered have a profound effect in the quality and value of the lives of billions of people they serve (WHO, 2000). In most developed countries, governments have a central role in healthcare, with the goal of improving equity and efficiency. However, in undeveloped countries, where health systems are poorly structured, most of the population has still no access to basic and effective care (WHO, 2000).

2.1.2 Challenges in the Healthcare systems

The healthcare industry is under enormous pressure to manage resources, decrease costs and at the same time improve quality of care (IBM, 2013). Additionally, the increasing rates of older populations, chronic diseases and technology are changing the way healthcare is delivered in the society (IBM, 2013)

2.1.2.1 Aging of populations and chronic diseases

The aging of populations and the spread of chronic diseases constitute the main drivers of demand for healthcare services around the world (Deloitte, 2014). For the first time, most people can expect to live beyond their 60s which has profound consequences for healthcare (WHO, 2015). According to Rowlands (2005), the aging of populations will add extra pressure on costs as well as drive demand for new medicines and technologies with the goal of improving services for older people. Nowadays, the older population is growing at a rate of 1.9 percent which is higher than the one of the total population - 1.2 percent (United Nations, 2000).

Additionally, most of the illnesses from older people are a result of chronic diseases (WHO, 2015). These diseases can be attributable to many factors, ranging from an increase of "sedentary lifestyles, diet changes and rising obesity levels" (Deloitte, 2014). In 2005, 63% of all deaths were caused by chronic diseases, making this type of illness the primary cause of mortality worldwide (Deloitte, 2014). If nothing is done to decrease the risk of chronic diseases, approximately US$84 billion around the world will be lost (Abegunde *et al.,*2007).

All in all, healthcare policies and regulations need to be identified and changed (WHO, 2015). Therefore, new medicines need to be brought to market at a faster rate and national health indicators need to be adapted to include specific measurements for older people (WHO, 2015).

2.1.2.2 Technology

Around the world, healthcare providers are recognizing the need for change in the healthcare industry (Deloitte, 2014). The implementation of new technologies such as "electronic health records" (EHRs), "telemedicine" and "mobile health", are changing the way doctors, patients, and other stakeholders interact. Even though these technologies promise to improve the healthcare sector, barriers to their adoption remain (Deloitte, 2014). Some of the possible consequences of healthcare's digitalization are "risks of data breaches", "malware infections", and “unauthorized access of people” (Deloitte, 2013). In this way, organizations should stay alert for the possible problems that may arise when there is lack of appropriate security and privacy controls (Deloitte, 2014).

2.1.3 Portuguese Healthcare system

Portugal is one the countries in the OECD with the highest amount of healthcare spending, corresponding to approximately 10% of the GDP (Barros *et al.,*2011). The Portuguese healthcare system is categorized by three models: the “Universal National Health Service”, “Special Public and Private Insurance Schemes”, and “Private Voluntary Health Insurance “(VHI) (Barros *et al.,*2011).

The financing of the healthcare is mainly through taxation (Jakubowski & Busse, 1998) even though 30% of the total spending is private and in the form of “out-of-pocket (OOP) payments” (Barros *et al.,*2011).

Despite the overall improvement in living standards, at the end of 2010, the Portuguese healthcare system was facing several challenges such as an increase in expenditure, aging of the population and increase of technology in the medical practice (Barros *et al.,*2011).

In Portugal, fertility rates have decreased in the past decades, falling, on average, from 2,83 in 1970 to 1,36 in the early 2000s (OECD, 2014). On the other hand, the number of people aged above 65 years have dramatically increased between 1995 and 2012, with an average annual growth close to 2% which makes Portugal in line with other OECD countries in terms of aging of the population trend (OECD, 2014).

Regarding chronic diseases, Portugal presents high rates of mortality caused by cancer when compared with other OECD countries (OECD, 2014) and it is also one of the European countries with the highest levels of HIV infections (20.4 per 100 000 population in 2006) (Barros *et al.,*2011).

In what concerns healthcare spending, the ratio of health expenses to GDP decreased from 6.7 in 2000 to 6.2 in 2012 (OECD, 2014) and it was mainly driven by the negative growth of public spending due to the 2008 financial and economic crisis (OECD, 2014).

2.2 Electronic Health Records and Potential

2.2.1 Electronic Health Records

An electronic health record (EHR) is defined as “a longitudinal electronic record of patient health information generated by at least one health care professional in any care delivery setting" (HIMSS, 2015). The primary stakeholders of EHRs are patients, providers and purveyors. Starting with patients, they are considered the direct beneficiaries of healthcare and providers are described as hospitals and healthcare professionals such as physicians, nurses and diagnostic technicians (Caligtan & Dykes, 2010). Finally, purveyors are custodians or keepers of healthcare. In countries with centralized healthcare systems such as England, the government is the purveyor. However, in fragmented healthcare systems such as United States, independent organizations work as custodians of EHR data (Caligtan & Dykes, 2010).

EHR systems may include several elements to monitor patients' health records, such as patient's basic information, physicians´ remarks, medicines, past medical records and laboratory and radiology reports (Raghupathi & Kesh, 2007). It also integrates "Electronic Medical Records" (EMRs) and "Personal Health Records" (PHR) and authorizes the share of information about a certain individual between any authorized provider (Ambinder, 1991).

Moreover, EHRs can be distinguished between individual and aggregate. An "individual EHR" contains health related data about a specific patient (Caligtan & Dykes, 2010). With this software, the patient is able to access any healthcare entity and provide authorization to one or more providers to have access to his/her complete health record (Ambinder, 1991) and monitor disease conditions that affect him/her (Caligtan & Dykes, 2010). In what concerns "aggregate-level EHR", or "population-level", one can describe it as a collection of many individual EHRs (Caligtan & Dykes, 2010). These aggregate EHRs are composed by all patients from a "hospital, a group of hospitals, a geographical region, or a nation" (Caligtan & Dykes, 2010).

Until now, EHRs have consisted in narrative and unstructured text (Häyrinen, Saranto, & Nykänen, 2008), however, the development of these systems is crucial in order to accomplish success and guarantee a high degree of safety and efficiency in the healthcare systems (Pereira, 2012).

2.2.2 Benefits of the Electronic Health Records

The EHRs are increasingly being implemented and deployed in the healthcare organizations (Tang, 2003) because the social and economic benefits of these systems outweigh their costs with software, hardware, training and maintenance (Hamilton, 2013). The benefits of EHRs can be categorized in 3 main dimensions: "clinical outcomes", "organizational outcomes" and "societal outcomes" (Menachemi & Collum, 2011). With respect to "clinical outcomes", one can include the decrease of medical errors and improvements in the quality of healthcare (Menachemi & Collum, 2011). Concerning "organizational outcomes", it is characterized by increases on operational and financial performance, and satisfaction by physicians and patients when using EHRs (Menachemi & Collum, 2011). Lastly, “societal outcomes” consist of improvements in the population health (individual or aggregate) and permission from public health organizations to conduct better researches (Menachemi & Collum, 2011).

Taking into account the societal outcomes at an individual level, EHRs provide many benefits to individuals with long term diseases since they are the ones with the most need to monitor their health and treatments (Pagliari, et.al., 2007).

Moreover, EHRs provide benefits to physicians since it enhances their communication and decision-making process (Ambinder, 1991). This system also facilitates the integration of patient health records which allow physicians to provide better and proper treatments and see patients at a reduced pace (Ambinder, 1991).

Finally, at the aggregate population-level, the data from EHRs can be used to analyze and detect health patterns and trends (Sherer, Meyerhoefer, & Peng, 2016) as well as develop new medicines and therapies for chronic diseases (Caligtan & Dykes, 2010).

2.2.3 National EHRs initiatives

Introducing an EHR increases the operational performance of healthcare facilities since it offers a patient-centred, modern way of providing care (Chen *et al.,*2009). Across the world, many countries are currently implementing EHRs in their healthcare systems in order to decrease costs and enhance the quality of care.

Starting with the United Kingdom, the NHS’s National Programme for IT is currently analyzing ways of implementing the NHS Care Records Service, with the goal of providing a national EHR for all citizens (Dorda, *et al.,*2005). Moreover, “The Spine”, defined as a summary for each patient’s medical history, will be stored in a central database that will build the basis for the EHR (Dorda, *et al.,*2005).

In the United States, the government has defined a plan to provide all citizens with EHRs (Dorda, *et al.,*2005). In 2009, the HITECH Act was introduced with the goal of creating incentives and penalties associated with the adoption of EHRs (Sherer et al., 2016). Since its introduction, the percentage of healthcare facilities with EHRs has increased from 72% in 2011 to 85% in 2012 (ONC, 2013).

“Kaiser Permanente” (KP), a successful example of an organisation that adopted EHRs, is the largest U.S. non-profit healthcare delivery organization (Chen *et al.*, 2009). This institution implemented “KP HealthConnect” that includes an EHR across all care facilities. Since its implementation, the ambulatory care has become more efficient and patient satisfaction has increased (Chen *et al.*, 2009).

Finally, in Australia, the government is planning to finance $128 million in the next four years in order to implement a national health information system, "HeathConnect" (Dorda, *et al.,*2005). The aim of this project is to gather, store and share EHRs through a secure network and within severe privacy safeguards (Rowlands, 2005).

Despite these initiatives, there is still a lot of work to be done in every country in order to overcome the main barriers involved in the adoption of these systems. Fears about security and privacy, time concerns and lack of interoperability (Sherer et al., 2016) have to be taken into account if the countries want to be successful (Sherer et al., 2016).

2.2.4 EHRs in Portugal

2.2.4.1 Overview

Even though Portugal have participated in several projects related with the introduction of EHRs in Europe, only very recently eHealth and EHRs became a priority in the area of public health policies in Portugal (Millieu Ltd & Time.Lex, 2014).

Nowadays, there is still no exact definition of an EHR in the Portuguese legislation and no legal provision defining what the content of an EHR should be (Millieu Ltd & Time.Lex, 2014). In this way, the definition of health record contained in Articles 5(2) and (3) of the Personal Genetics and Health Information Law has been used as a proxy for the definition of the EHR (Millieu Ltd & Time.Lex, 2014).

The most important entities involved in the development of EHRs in Portugal are the "Ministry of Health"; the "Shared Services of the Ministry of Health"; and the "National Commission for Data Protection" (Millieu Ltd & Time.Lex, 2014).

The current Government has set the goal to implement a single EHR in the National Health Plan 2012-2016 (Direcção Geral de Saúde, 2016). According to this document, the single EHR should allow citizens to gather information from various care providers (Direcção Geral de Saúde, 2016) and motivate health professionals to maintain and update properly their records (Millieu Ltd & Time.Lex, 2014).

At the European level, the Portuguese government is involved in the epSOS-Smart Open Services for European Patients where the main goal is to connect the EHRs beyond borders. However, this plan is still lacking legal basis for its implementation (Millieu Ltd & Time.Lex, 2014).

2.2.4.2 Examples of current EHRs implemented in Portugal

In order for the implementation of a single, national EHR to be successful, it is necessary to look at some successful, but still defragmented EHRs already available in Portugal. In this way, projects such as the ones in "Centro Hospitalar do Porto" (CHP), "Hospital Geral de Santo António" (HGSA) and the "National Platform for Health Data" should be used as a starting point to address the problems and also the strengths in the implementation of a single, national EHR.

Starting with CHP, Pereira et al. (2013) found that the current EHR is software of great significance, good usability and high availability. However, some problems were also identified such as the lack of a system documentation and the existence of old computers (Pereira, et al., 2013). This analysis demonstrated that some opportunities could be explored by CHP, such as the increasing development of digital files that would help the hospital to become paperless. Moreover, threats such as the lack of security have to be taken into consideration. In this way, CHP must guarantee the security and confidentiality of information, avoid potential cyber attacks (Pereira et al., 2013) and have a disaster recovery plan in place.

Taking into account the EHR implemented in the HGSA, it is possible to define the main goals that every EHR must have. Among many, EHRs should provide a secure way to record data and support actions related to clinical practice and patient treatment (Neves et al., 2008). With the implementation of the EHR, the hospital could increase the reliability of information registered in the clinical process; reduce the number and gravity of errors, omissions and ambiguities; improve security of storage information and save time (Neves et al., 2008).

Finally, the National Platform for Health Data allows the registration and sharing of clinical information between user, health professionals and other entities that provide healthcare services (Millieu Ltd & Time.Lex, 2014). This platform is composed by four portals being the most important the "Portal do Professional" and the "Portal do Utente". Launched in 2012, "Portal do Utente" maximized the information available to the user by making his/her medical history visible and store data, ranging from scheduling of appointments to request for chronic medication prescription (Ministério da Saúde, 2009). On the other hand, the "Portal do Profissional" provides access to three different types of information including RCU2, the Portuguese Single Clinical Summary (Ministério da Saúde, 2009). RCU2 compiles the most relevant data from other electronic health records and provides it to health professionals for the provision of health services (Millieu Ltd & Time.Lex, 2014).

With this platform, the government of Portugal can take steps towards the development of a single, national EHR (Millieu Ltd & Time.Lex, 2014).

2.3 Privacy and Security issues in implementing Electronic Health Records

2.3.1 Privacy and Security

The use of electronic health records has been challenged on privacy grounds (Hamilton, 2013) related with the amount of information about an individual that should be available to various organizations such as the government and private institutions (Angst & Agarwal, 2009).

Although EHRs have improved the security of hospitals and clinics, the number of lawsuits concerning EHRs have duplicated between 2013 and 2014 (Allen, 2015) and many reports related with loss or theft of medical data have showed up in recent years (Fernández-Alemán *et al.,*2013).

Moreover, several threats can affect the security of the EHRs. First of all, with the increasing use of cloud computing and the increasing number of users accessing these systems from different healthcare facilities, the healthcare sector is becoming exposed to cyber-attacks (Deloitte, 2016) such as "hackers, viruses, and worms" (Barrows C. Randolph, Jr, 1996). Furthermore, threats can also arise from "insurance companies, managed care organizations and employers" (Barrows C. Randolph, Jr, 1996). These institutions have large economic resources, as well as strong motivations to profit from what they find about patients (Barrows C. Randolph, Jr, 1996). In this way, illegal activities, such as hacking and breaking a cryptographic key, could be used to access unauthorized data from patients and gather data that could be used to deny basic healthcare services to certain citizens (Barrows C. Randolph, Jr, 1996).

Hence, understanding the types of potential threats is the first step to increase measures of data protection in EHRs.

Finally, medical information is considered by many individuals as the most private of all types of personal information (Fernández-Alemán et al., 2013) and therefore, it is necessary to ensure "CIA" – "confidentiality, integrity and availability" - (Haas, *et al.,*2011) if the privacy all citizens is to be secured and preserved.

2.3.2 Privacy and Security of EHRs in Portugal

According to Bacelar-silva, *et al.,*(2011), Portugal does not have a systematic approach on how to implement electronic health records with regards to privacy and security. First of all, there are no specific laws regarding protection of data from EHRs in Portugal, and therefore, the "Portuguese Data Protection Law", dating from 1998, is applicable (Millieu Ltd & Time.Lex, 2014). Secondly, there is also no specific license or authorisation to host and process information from EHRs and in this way, the analysis must be reported to the "National Commission for Data Protection" (Millieu Ltd & Time.Lex, 2014).

Since 2012, the "National Commission" has authorized the implementation of the "National Platform for Health Data" and the creation of the "RCU2" (Millieu Ltd & Time.Lex, 2014) since it is in accordance with the "Data Protection Law" that authorizes the analysis of medical data for preventive medicine's purposes as well as diagnosis and management of health-care services (Millieu Ltd & Time.Lex, 2014). Moreover, under the "Data Protection Law", the patient has to authorise the sharing of data from his "RCU2" but this authorization is, by default, accessible to health professionals unless the patient expresses his opposition through the options available in the "Patient's Portal" (Millieu Ltd & Time.Lex, 2014).

Finally, in what concerns the secondary uses of EHRs, there are also no specific constitutional rules. In this way, from a legal point of view, there is still a lot to be done regarding the way the EHRs should be implemented in Portugal. Rules and regulations must be clearly defined in order to avoid breaches.

2.3.3 Patient's concerns for Information Privacy

To the degree individuals have privacy concerns, their opinion related to the usage of EHRs becomes more negative (Chellappa & Sin, 2005). Concerns for information privacy have been defined by Smith, *et al. (*1996) as "the extent to which an individual is concerned about organizational practices related to the collection and use of his/her personal information". These concerns can be summarized in four categories such as "Collection", "Unauthorized Secondary Use", "Improper Access" and "Errors" (Smith, et al., 1996). Together, these four categories reflect the overall privacy concerns of the individuals (Stewart & Segars, 2002).

In the sphere of healthcare, patients provide information about their past medical records and expect in return an improvement of their health. However, this situation is affected by the fact that, with the EHRs, information is stored via Internet and security threats are increasing. When patients fear about data security, the result is usually resistance in sharing important sensitive information (Blumenthal & McGraw, 2015) and this situation can undermine all the benefits of EHRs. With regards to EHRs, the concerns range from job security to ability to get an insurance (Alpert, 2003).

Finally, there are several examples of promising and innovative technologies that failed to diffuse because of the resistance from key stakeholders to adopt them (Angst & Agarwal, 2009). To the degree that the potential of EHRs is underscored by privacy concerns is a matter of concern.

2.3.3.1 Factors influencing information privacy concerns

According to Angst & Agarwal (2009), persuasion can change attitudes of individuals towards the use of specific technologies. Moreover, Angst & Agarwal, (2009) consider that persuasion can happen before individuals use a specific technology if the quality of the arguments is good enough to convince people to adopt them.

One way to study persuasion is through the ELM model, which describes the change and formation of attitudes and suggests that persuasion occurs via a “central” or “peripheral route” and the relative success is driven by personal attributes of the individuals (Petty & Cacioppo, 1986).

Consistent with this literature, Angst & Agarwal, (2009) found that the degree to which attitudes are influenced by messages is based on the way a certain message is written – “Argument Framing” - and on the extent this information is relevant for the individual - “Issue Involvement”.

The results from Angst & Agarwal, (2009) provide empirical support that “Argument Framing”, “Issue Involvement”, and “Concern for Information Privacy” are key factors to understand individuals’ likelihood of adoption of EHRs.

This study is particularly important since it takes into account that the use EHRs by patients and clinicians is still not totally diffused and therefore, the adoption of EHRs needs to be accessed via perceptual evaluations rather than concrete behaviour (Angst & Agarwal, 2009). In other words, an individual needs to accept the idea of having his/her health information in an electronic format before allowing others to use their records (Angst & Agarwal, 2009). In this way, the study performed by Angst & Agarwal, (2009) provides useful insights to understand to which extent people are willing to adopt EHRs.

Finally, Sheehan (1999) found that men have less privacy concerns than women. Also, Kehoe et al. (1997) found that women feel a stronger need for the creation of new laws to protect their privacy online and are more likely to give wrong data on web sites in order to protect their privacy.

Moreover, Culnan, (1995) found that young and poor people are less concerned about privacy and Zukowski & Brown, (2007), found that education has an impact in the privacy concerns.

In this way, individuals with higher education are likely to be less concerned about information privacy than others (Zukowski & Brown, 2007).

To sum up, it is necessary to look at all these factors to understand the extent to which concerns for information privacy can be changed to allow the full usage of EHRs that can range from sharing health-data across healthcare facilities to the use of this information for research purposes.

3. Methodology

3.1 Research Focus

The adoption of EHRs has the ability to improve efficiency, quality and reduce costs in the healthcare systems (Beard et al., 2012). However, opinion-poll data has shown that attitudes towards the adoption EHRs are negatively affected by privacy concerns. This factor can be so strong that national efforts to adopt these systems might become ineffective (Angst & Agarwal, 2009).

In this way, and based on the Literature Review, this dissertation will focus on the following Research Questions:

RQ1: Do Portuguese patients have concerns for information privacy in the adoption of EHRs in the Portuguese healthcare systems?

RQ2: Are concerns for information privacy differing across gender, level of education and age?

RQ3: Is argument framing and health status influencing the decision of patients regarding the adoption EHRs?

3.2 Hypothesis

Based on the Research Questions, the following Hypotheses were developed:

H1 – Portuguese citizens have concerns for information privacy in the adoption of EHRs.

When patients fear about data security, the result is usually resistance in sharing important information (Blumenthal & McGraw, 2015).

According to Smith, *et al. (*1996), concerns for information privacy are summarized in four dimensions. The first dimension is related with “Collection” and reflects the growing impression from the individuals that organizations are becoming more intrusive in gathering personal information (Smith, *et al.* 1996). The second dimension is "Unauthorized Secondary Use" and refers to the use of data collected for one purpose, and used for another without explicit consent from the patient (Smith, *et al.* 1996). The third dimension is "Improper Access" and refers to security breaches that lead to an exposure of personal data to unauthorized people (Smith, *et al.* 1996). Finally, the "Errors" dimension is characterized by people's concerns regarding databases that contain imprecise personal information, either by accident or design (Smith, *et al.* 1996). Together, these four dimensions reflect overall privacy concerns by individuals (Stewart & Segars, 2002).

Moreover, with the spread of EHRs, most of the health data will be stored via Internet increasing the concerns of individuals regarding privacy (Dinev & Hart, 2006). The reason for that is because EHRs introduce higher uncertainty about who has access to the data and how this data is used (Dinev & Hart, 2006).

All things considered, understanding the main privacy concerns of patients is the first step to understand what can be improved in order to allow the full implementation of EHRs.

H2 – Individuals are more favourable towards the adoption of EHRs when presented with positively framed messages vs. neutrally ones.

According to Angst & Agarwal (2009), argument framing is an important persuader on how individuals can change their attitudes towards the adoption of EHRs.

Taking into account the ELM Model, Angst & Agarwal (2009) state that individuals tend to be more persuaded to adopt EHRs when presented with positive framed messages than with neutral ones (Angst & Agarwal, 2009). The main reason is related with the fact that positively framed messages contain credible content and emphasize beneficial outcomes as opposed to neutral framed messages (Angst & Agarwal, 2009).

H3 – Under positive message framing, individuals with high concerns for information privacy are less favourable towards the adoption of EHRs than those with low concerns.

According to Angst & Agarwal (2009), concerns for information privacy have a negative relationship with the likelihood of adopting EHRs.

One of the reasons is associated with the fact that the definition of privacy is subject to analysis in "economic terms", (Klopfer & Rubenstein, 1977). In this way, when individuals have higher concerns for information privacy, the costs of disclosing such information are higher than the benefits. Therefore, the higher the privacy concerns, the lower the likelihood of adopting EHRs (Angst & Agarwal, 2009).

H4 – Under positive message framing, individuals with chronic diseases are more favourable towards the adoption of EHRs than the healthy ones.

Individual's health condition determines the extent to which a message is seen as personally important or significant (Petty & Cacioppo, 1979). Moreover, individuals accept certain levels of influence depending on the amount of personal involvement with the topic in question (Angst & Agarwal, 2009).

In this way, healthy individuals are less influenced by messages related with EHRs because the outcome does not impact them that much (Angst & Agarwal, 2009). On the other hand, the likelihood of adoption of EHRs by unhealthier individuals is positive because these systems might lead to an improvement in the individuals' health (Angst & Agarwal, 2009).

H5 – Individuals with higher education level have less privacy concerns towards the adoption of EHRs than the ones in a lower level.

H6 – Women have more privacy concerns towards the adoption of EHRs than men.

H7 – Older individuals have more privacy concerns towards the adoption of EHRs than younger ones.

Sheehan (1999) found that men have less privacy concerns than women about the collection of information by organizations. Moreover, Culnan, (1995) found that young and poor people are less concerned about privacy and, according to Zukowski & Brown, (2007), education has an impact on privacy concerns as individuals with higher education are likely to be less concerned about information privacy than the ones in a lower level.

3.3 Type of Methodology

In order to answer the research questions, primary and secondary data was collected. In this way, a Literature Review was developed in order to broaden the knowledge about healthcare systems and their challenges; electronic health records' definition, benefits and current initiatives; EHRs in Portugal; and privacy and security issues in implementing electronic health records. Afterwards, a questionnaire was distributed to the Portuguese population where primary data was collected. The aim of this survey was to understand individuals' perceptions about EHRs and their likelihood of adopting of these systems taking into account concerns for information privacy.

3.4 Survey Context

A cross-sectional online survey of patients' perceptions of adopting EHRs in the presence of privacy concerns was conducted during 29th March-15th April to the Portuguese population. The goal of this survey was to understand three main points. First of all, this survey intended to know if Portuguese patients have concerns around information privacy in the adoption of EHRs in the Portuguese healthcare system. Secondly, this survey analyzed if concerns for information privacy differ across gender, level of education and age. Finally, this survey was also designed to understand if argument framing and health status influence the decision of adopting EHRs. This survey had an estimated completion time of 8 minutes being all multiple choice questions.

3.5 Survey Development

The literature review on "Adoption of Electronic Health Records in the presence of privacy concerns" developed by Angst & Agarwal (2009) helped identifying the key issues of the survey. This paper included a questionnaire where questions related to the "likelihood of adoption of EHRs in the presence of privacy concerns" were developed. In this way, I adapted the questionnaire and used it for the portuguese population. Additionally, other questions were developed taking into account the literature review presented in this dissertation (to consult the survey, Appendix 1).

This survey starts by asking questions regarding health status and use of healthcare facilities in the past year. During these set of questions, it is asked to the individuals if they suffer any chronic disease.

Moreover, in order to ensure that individuals understand what an Electronic Health Record is, the survey presents a definition of the system according to HIMSS, as "a longitudinal electronic record, accessible in real time and containing information regarding the health status of an individual. This system is generated by at least one health care professional in any care delivery setting". Another description from "Ministério da Saúde" (2009) was also included, stating that "the citizen may also access, update and insert information in the EHR that he/ she considers relevant for his/her clinical follow-up."

Afterwards, a set of questions were examined to understand if the individuals have concerns for information privacy related to the healthcare system. According to Smith, *et al. (*1996), concerns for information privacy can be summarized in four dimensions that together reflect the overall information privacy concerns (Stewart & Segars, 2002). In this way, three questions were asked for each dimension in order to understand if individuals are concerned with their information privacy.

Additionally, a series of questions were asked to understand the willingness of the individuals to adopt the EHRs. Since one of the main goals of this survey was to understand how the likelihood of adopting EHRs can be influenced when individuals are approached with positive or neutral message framings, five sentences were presented to the individuals. The first three sentences were written by reliable sources, whereas the other two were written by unreliable sources. According to Angst & Agarwal (2009), for a message to be considered positively framed, it must contain credible content from a reliable source and emphasize beneficial outcomes for the recipient as opposed to neutral framed messages. In this way, after understanding if the individuals perceived the first three questions as positive and the last two questions as neutral, two other questions were asked. The first question was related with the sentences 1 to 3 and the other related with the questions 4 and 5. In both questions, it was asked to the individuals whether they would be willing to adopt EHRs in the near future taking into account the sentences presented. Afterwards, the answers were compared in order to see if individuals are more willing to adopt EHRs when presented with positive framed messages than with neutral framed messages.

Finally, the last set of questions intended to understand if the individuals perceived EHRs as a system that can bring benefits for the Portuguese healthcare system.

To ensure that the questionnaire was understandable, a pre-test was performed to a small group of three individuals before launching it.

3.6 Survey Distribution and Analysis

The survey presented in this dissertation is not randomised as its distribution was done online through my individual and professional network. During the time the survey was available online, it was possible to collect 255 answers, however, only 228 were considered for analysis since some respondents did not complete the questionnaire.

Taking into account the "Cronbach's Alpha" to measure the internal consistency of all items of the survey (Cronbach, 1951), one can see that the value given was 0.721 and therefore the data obtained in the survey is consistent. Moreover, a KMO test was performed in order to measure how suited the data was for factor analysis (Cerny, B. A. & Kaiser, 1977). Since the value given was 0.781, one can conclude that the sample is adequate for analysis (Appendix 7).

Regarding the analysis of the sample, a set of descriptive statistics were performed. These statistics were interpreted in terms of demographics, health status, interaction with healthcare providers, concerns for information privacy, authorization to access EHRs, willingness to use EHRs and potential benefits of EHRs. The goal of this analysis was to have a general overview of the data collected during the survey in order to make conclusions about it. Moreover, the design of the graphs presented in this dissertation was prepared on Excel 2007.

Secondly, a set of T-Tests were performed in order to test the hypotheses formulated in this thesis. In order to answer RQ1, H1 was formulated and a one-sample T-Test was performed. For this hypothesis, four sets of questions were analysed and were related to the Collection of Data, Errors, Unauthorized Access and Secondary Uses of Data (Appendix 5). As referred previously, according to Smith et al., (1996) it is important to take all these questions into account in order to analyse if individuals have concerns for information privacy. Each set of questions was rated from 1- Strongly Disagree to 7 - Strongly Agree, and a total average of these questions was done for each individual. With this total average, a one-sample T-Test was performed and it was considered that if the rating would be higher than 4, then Portuguese citizens would have concerns for information privacy.

Regarding RQ2, H5, H6 and H7 hypotheses were developed and Independent T-Tests were performed. The goal of this research question was to find out if factors such as gender, education and age affect concerns for information for privacy.

Finally, for RQ3, three hypotheses were developed. For H2, two questions were asked in order to validate this hypothesis. These questions were related to the willingness of the individuals to adopt EHRs, taking into account positive and neutral message framings (Appendix 6). Each set of questions was rated from 1 - Strongly Agree to 5 - Strongly Disagree and a Paired Sample T-Test was performed. Regarding H3 and H4, a Mann-Whitney U Test was performed as data was not normally distributed. In order to ensure that the output of the tests was correct, the data was also adjusted. In this way, data related with concerns for information privacy was initially aggregated from 1 to 7 (Strongly Disagree to Strongly Agree) and the adjustment was made to have the values from 1 – Not Concerned, 2 – Concerned. Moreover, the data related with the willingness to adopt EHRs under positive message framing was initially aggregated from 1 – Totally Agree to 5 – Totally Disagree and the adjustment was made to have the values from 1 – Totally Disagree to 5 - Totally Agree in order to make the analysis more comprehensible.

A confidence interval of 95% was performed for all tests and the null hypotheses were excluded when the p-value was lower than 0.05. Moreover, means and standard deviations were also calculated.

4. Results

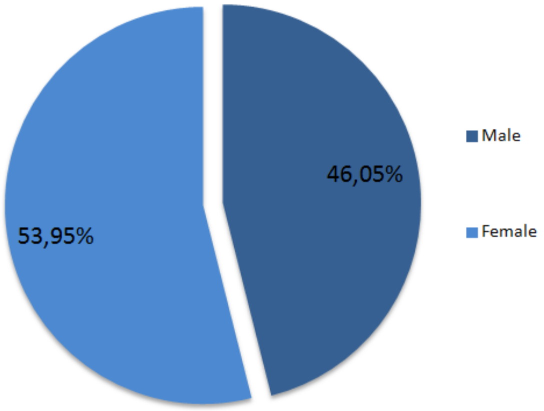
This chapter is divided in two subchapters: first, a descriptive statistical analysis is performed in order to characterize the overall sample. After this analysis, the Hypotheses formulated in this dissertation are tested.

4.1 Descriptive Statistics

4.1.1 Demographics

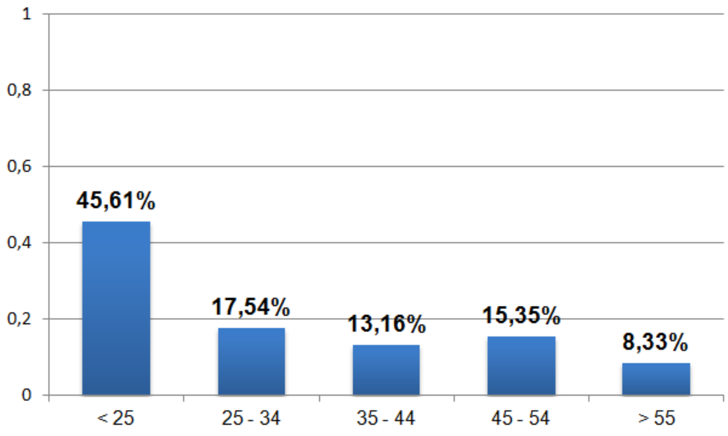
Demographic variables such as age, residence, gender, income and education were analysed in this sample (Appendix 2). Starting with gender, one can see that the survey was not balanced as 53.95 % of the respondents were female and 46.05 % were male.

Figure 1 – Gender distribution



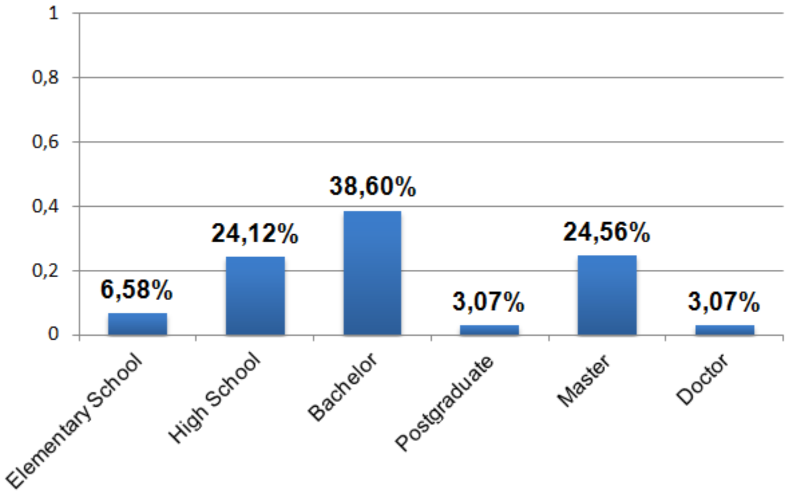
In what concerns age, it is possible to see that the majority of the answers were from respondents aged below 25 years old mainly because this survey was distributed through my personal and professional network where the majority of the people are young.

Figure 2 – Age distribution



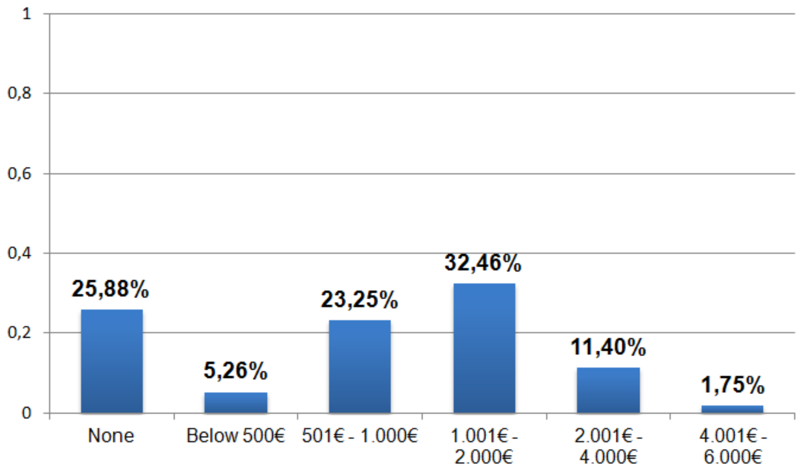
In terms of education, 69.3% of the respondents had superior education and 30.70% had high school or elementary school as their most recent study. By looking at these results, one can see that the survey does not represent the Portuguese population as in 2014, only 25% of the active population had a higher level of education (INE, 2014)

Figure 3 – Education



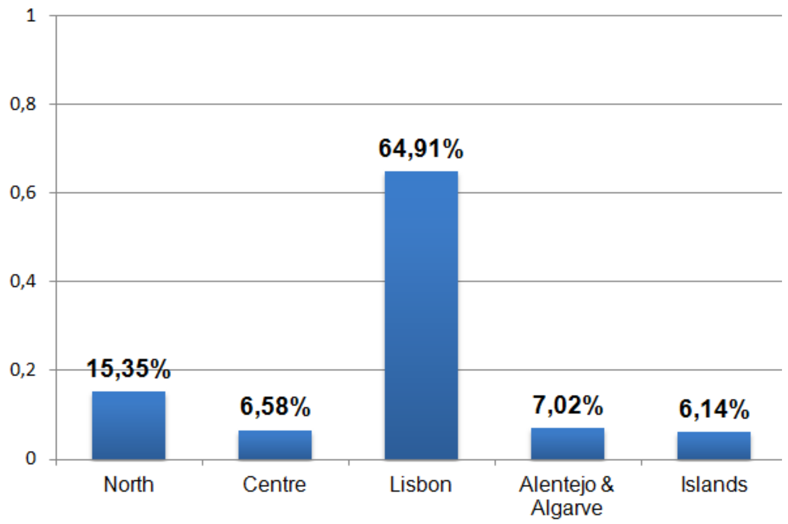
Regarding income, one can see that 32.5% have a salary between 1001€ and 2000€, 25.9 % do not have any salary and 23.2% have a salary between 501€ e 1000€.

Figure 4 – Income



At last, in what concerns Residence, there is significant discrepancy between respondents from Lisbon (64.9%) and from the rest of the country.

Figure 5 – Residence



4.1.2 Health Status and interaction with health care providers

By taking into account all the collected answers, one can see that 54.39 % of the individuals perceive their health status as excellent or very good, 39.04 % perceived their health status as good, and only 1 respondent (0.44%) considered his/her health as poor. In what concerns chronic diseases, one can see that 57 out of 228 stated to have chronic diseases (Appendix 3). In what concerns the number of visits to healthcare units in 2016, the majority of the individuals did not visit an emergency room, hospital or a health centre in the last year.

However, when looking at the visits to private doctors, one can see that 59.21% of the patients visit these facilities at least once. These results might indicate that many individuals surveyed had some kind of private insurance which allow them to use private medical facilities. Finally, in what concerns visits to public specialized doctors, one can 37.28% of the respondents visited these doctors once and 20.61% of the respondents visited these doctors at least twice.

Overall, the majority of the individuals were satisfied or very satisfied with the quality of both private and public healthcare facilities (82.02%). However, 5.70 % were somehow dissatisfied or very dissatisfied with the quality of the healthcare system (Appendix 3).

Figure 6- Satisfaction with Healthcare

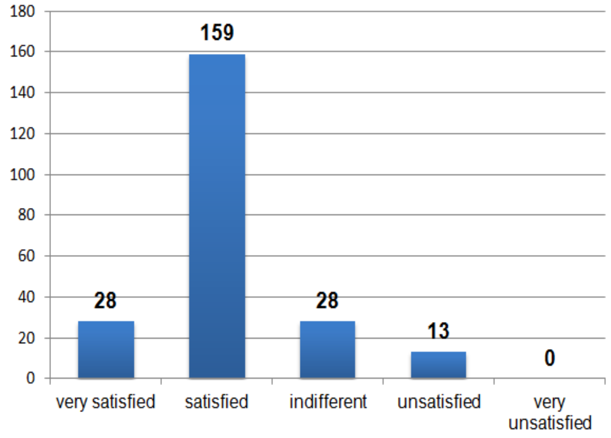
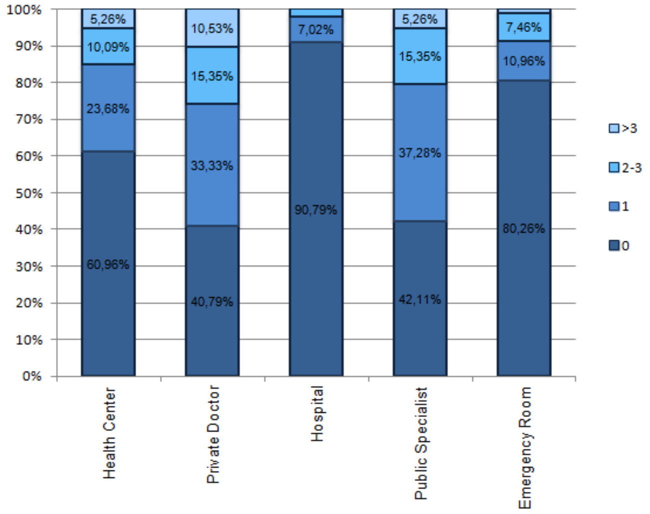


Figure 7 – Visits to Healthcare Units



4.1.3 Perception of EHRs

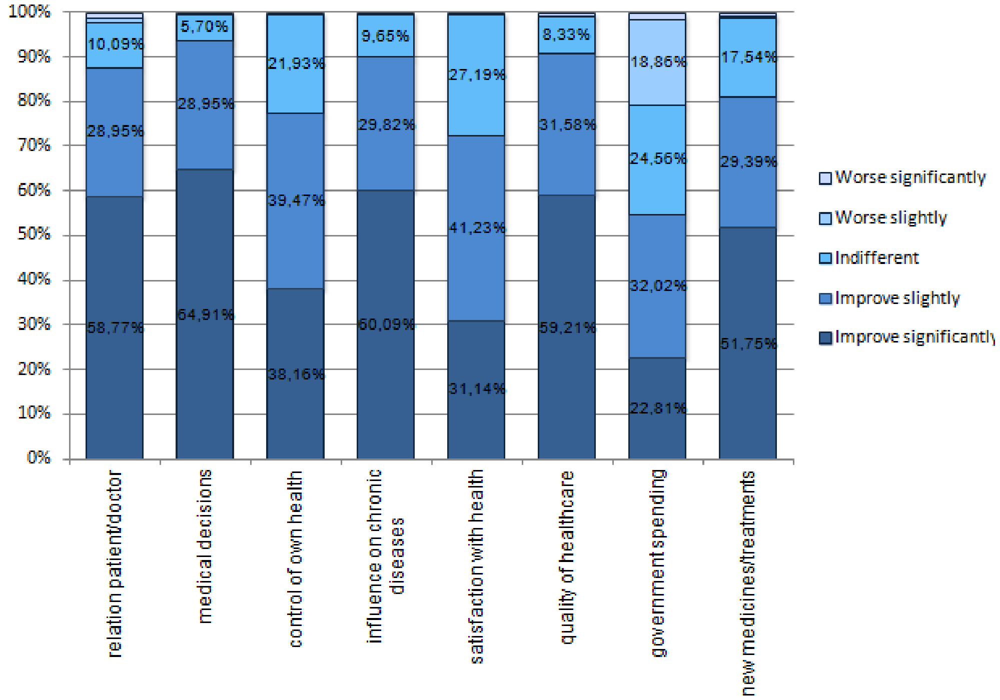
When faced with the concept of electronic health record, 75.44 % of the respondents stated not being aware of the concept in contrast with 24.56 % that already knew the concept (Appendix 4).

4.1.3.1 Potential benefits of EHRs

In order to understand if individuals perceive EHRs as a tool that could bring benefits to the Portuguese healthcare system, an evaluation of their opinion regarding the potential benefits of EHRs was performed (Appendix 4). Overall, 87.72 % of the respondents believe that EHRs would improve the relationship between doctor and patient; 93.86 % believe that it would improve the quality of the decisions from the doctor; 90.79 % consider that it would improve the overall quality of the healthcare; 72.37 % believe that it would improve the overall satisfaction of the individuals' health, 77.63 % consider that it would improve the feeling of control for their own health; 89.91 % of the respondents consider that it would improve the health of individuals with chronic diseases; and finally, 75.14 % of the respondents believe that the adoption of EHRs would also improve the development of new medicines and treatments. The lowest result was in government spending as only 53.83 % of the respondents believe that EHRs would improve this area of healthcare.

Overall, the majority of the respondents perceive EHRs as a tool that will improve the overall Portuguese healthcare system.

Figure 8 – Benefits of EHRs

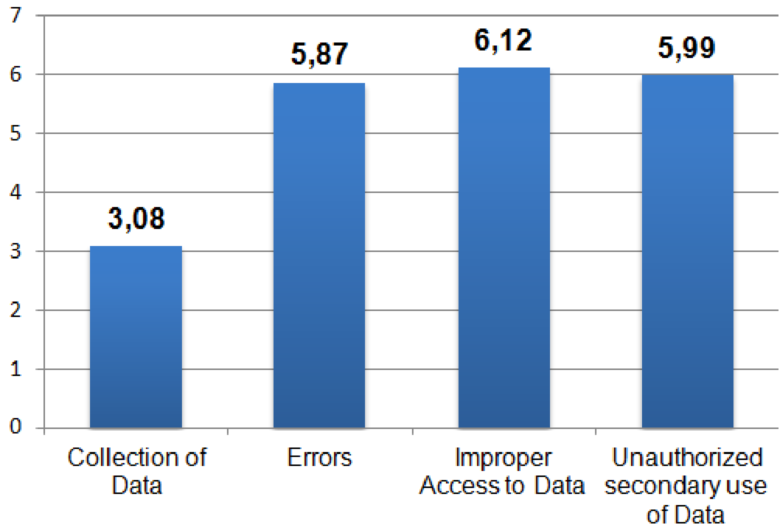


4.1.4 Concerns for Information Privacy

Overall, the respondents do not have concerns regarding the "collection" of data by healthcare entities as the total average of the three questions asked was 3.62. Regarding the "Errors" dimension, the majority of the individuals agree that more should be done by the healthcare entities in order to avoid mistakes in the data collected since the total average of these questions was 5.89. In what concerns the "Improper Access to Data" dimension, one can see that the majority of the respondents are very concerned with this topic as the mean of all the answers was around 6.13. In fact, for all the three questions asked about this dimension, more than 90% of the individuals stated that they are very concerned with the unauthorized access of their medical data by other individuals (Appendix 5). Finally, in what concerns the

"Unauthorized Secondary Use of Data" dimension, one can see that the scores are very high for the three questions asked. Once again, more than 90% of the individuals stated to be very concerned with this dimension and the average of all the questions was 5.97.

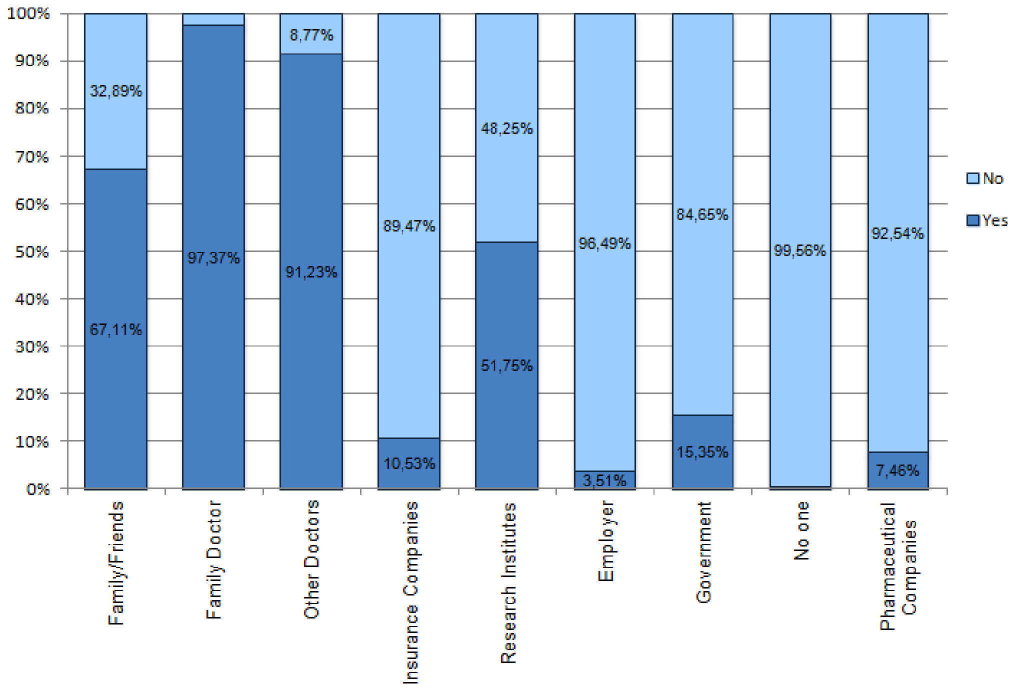
Figure 9 – Privacy Concerns



4.1.4.1 Authorization to access EHRs

When asking the respondents to whom they would give access to their EHRs, the majority of the individuals would mainly give access to their families and friends, family doctor and other healthcare facilities where they usually go. Surprisingly, 51.75% of the respondents would also give access to research clinics, but only 10.53% of the respondents would give access to insurance companies, 7.46 % to pharmaceutical companies, 3.51% to the employer, 15.35% to the government agencies and only 1 respondent would not give any permission.

Figure 10 – Authorization to Access EHRs



4.1.5 Positive vs. Neutral message framing

4.1.5.1 Reliable vs. non-reliable sources

In order to analyse if a specific message is framed positively or neutrally, 5 sentences were provided to the individuals and it was asked whether they consider the author of the sentences as a reliable or non-reliable source. For the first three sentences, the average of the answers were respectively, 1.14, 1.12 and 1.17, which means that on average, these sources were considered reliable. Regarding sentences 4 and 5, both of them were considered non-reliable with an average of, respectively, 1.91 and 1.93. In this way, it is possible to conclude that sentences 1 to 3 were considered positive messages whereas the sentences 4 and 5 were considered neutral.

4.1.5.2 Positive vs. Neutral message framing

By comparing the answers provided in these two set of questions, one can see that individuals were more willing to adopt EHRs when presented with positive framed messages than with neutral framed messages. In this way, 57.02% of the respondents totally agreed with the adoption of EHRs when presented with positive framed messages. In contrast, when presented with neutral messages, the likelihood of adoption of EHRs was lower with only 11.84% totally agreeing with the adoption of this system and 40.79% being indifferent to its adoption.

Figure 11 – Positive Message Framing

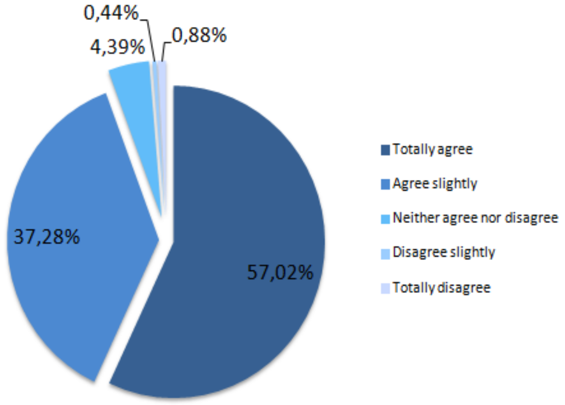
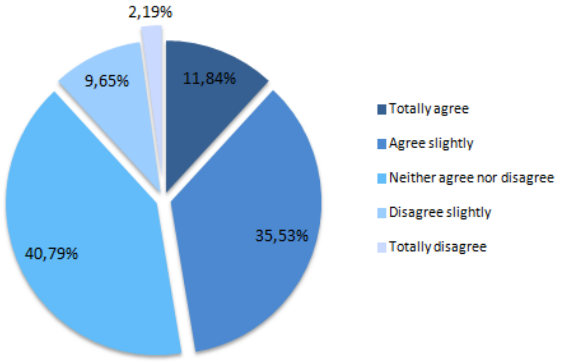


Figure 12 – Neutral Message Framing



4.2 Hypothesis Testing

As shown in the following table, six out of the seven hypotheses developed were considered valid.

Table 1 – Hypothesis Testing Results

H1	Portuguese citizens have concerns for information privacy in the adoption of EHRs.	**Valid**
H2	Individuals are more favourable towards the adoption of EHRs when presented with positively framed messages vs. neutrally ones.	**Valid**
H3	Under positive message framing, individuals with high concerns for information privacy are less favourable towards the adoption of EHRs than those with low concerns.	**Valid**
H4	Under positive message framing, individuals with chronic diseases are more favourable towards the adoption of EHRs than the healthy ones.	**Valid**
H5	Individuals with higher education level have less privacy concerns towards the adoption of EHRs than the ones in a lower level.	**Valid**
H6	Women have more privacy concerns towards the adoption of EHRs than men.	**Valid**
H7	Older individuals have more privacy concerns towards the adoption of EHRs than younger ones.	**Not Valid**

H1 - Portuguese citizens have concerns for information privacy in the adoption of EHRs.

H0: Portuguese citizens do not have concerns for information privacy in the adoption of EHRs

H1: Portuguese citizens do have concerns for information privacy in the adoption of EHRs

After computing the One Sample T-Test, where the total average was compared with a value of 4, the p-value was 0.000. Therefore, one can reject the null hypothesis and conclude that the Portuguese citizens do have concerns for information privacy.

H2- Individuals are more favourable towards the adoption of EHRs when presented with positively framed messages vs. neutrally ones.

H0: Positive and neutral messages are the same in persuading the individuals towards the adoption of EHR

H1: Positive and neutral messages are different in persuading the individuals towards the adoption of EHR

After computing a Paired-Sample T-Test, the p-value was 0.000. Therefore, one can reject the null hypothesis and conclude that positive and neutral messages are different in persuading individuals towards the adoption of EHRs.

H3 – Under positive message framing, individuals with high concerns for information privacy are less favourable towards the adoption of EHRs than those with low concerns.

H0: Concern for information privacy does not affect the likelihood of adopting EHRs

H1: Concern for information privacy does affect the likelihood of adopting EHRs

After computing a Mann-Whitney U Test, the mean rank for individuals with low concerns for information privacy was 156,00 and for individuals with high concerns for information privacy was 113,27. Since the p-value= 0.013, the null hypothesis of equal mean ranks is rejected and one can conclude that people with low concerns for information privacy are more willing to adopt EHRs under positive message framing than individuals with high concerns for information privacy.

H4 –Under positive message framing, individuals with chronic diseases are more favourable towards the adoption of EHRs than the healthy ones.

H0: Health status does not affect the likelihood of adopting EHRs

H1: Health status does affect the likelihood of adopting EHRs

After computing a Mann-Whitney U Test, the mean rank for individuals with chronic diseases was 129,81 and for healthy individuals was 110,67. Since the p-value= 0.030, the null hypothesis of equal mean ranks is rejected and one can conclude that individuals with chronic diseases are more willing to adopt EHRs under positive message framing than the healthy ones.

H5 – Individuals with higher education level have less privacy concerns towards the adoption of EHRs than the ones in a lower level.

H0: Education does not affect the likelihood of adopting EHRs

H1: Education does affect the likelihood of adopting EHRs

After computing an Independent Sample T-Test, the p-value was 0.000. Therefore, one can reject the null hypothesis and conclude that individuals with higher education have less privacy concerns towards the adoption of EHRs than the ones in a lower level.

H6 - Women have more privacy concerns towards the adoption of EHRs than men.

H0: Gender does not affect the likelihood of adopting EHRs

H1: Gender does affect the likelihood of adopting EHRs

After computing an Independent Sample T-Test, the p-value was 0.000. Therefore, one can reject the null hypothesis and conclude that women have more privacy concerns towards the adoption of EHRs than men.

H7 - Older individuals have more privacy concerns towards the adoption of EHRs than younger ones.

H0: Age does not affect the likelihood of adopting EHRs

H1: Age does affect the likelihood of adopting EHRs

After computing an Independent Sample T-Test, the p-value was 0.312. Therefore, the null hypothesis is not rejected as there is no significant difference between the averages of older and younger individuals. In this way, one can conclude that age does not affect the likelihood of adoption of EHRs.

5. Discussion and Recommendations

5.1 Discussion

Taking into account the results obtained in the questionnaire, one can see that more than half of the participants were not aware of the concept of Electronic Health Records. The results are in accordance with the Literature Review as this concept is relatively new and only few healthcare facilities are now introducing this software. Moreover, when asked about the potential benefits that EHRs might bring to the Portuguese healthcare system, the majority of the surveyed believe that EHRs will improve the overall quality of the healthcare system. According to Menachemi & Collum, (2011), the benefits of EHRs can be aggregated into "Clinical", "Organizational" and "Societal Outcomes". With respect to "Clinical Outcomes", the majority of the respondents believe that EHRs will improve the quality of the healthcare and the relationship between physician and patient. Concerning "Organizational Outcomes", the majority of the participants believe that EHRs will increase the financial performance of the healthcare system, as well as improve the satisfaction regarding individual's health and control of their own health. Lastly, for the "Societal Outcomes" the majority of the individuals surveyed consider that EHRs will promote the health of individuals with chronic diseases as well as the development of new medicines and treatments.

Regarding the first research question, one can see that individuals have concerns for information privacy. According to Stewart & Segars, (2002), concerns for information privacy can be categorized in 4 dimensions - "Collection", "Errors", "Improper Access", "Unauthorized Secondary Use". Starting with the first dimension, "Collection" of data, the majority of the respondents were not concerned with this topic. In fact, the total average of the three questions asked concerning this topic was 3.62 which indicate that the Portuguese citizens do not believe that the healthcare organisations are becoming more intrusive in gathering personal information. Regarding the second dimension, "Errors", the majority of the individuals is concerned about the fact that databases may contain imprecise personal information about individuals, either by accident or design. In this case, the total average of the three questions asked concerning this topic was 5.89. Concerning the third and fourth dimension, "Improper Access" and "Unauthorized Secondary Use", the majority of the respondents are very concerned with these two dimensions as the mean of all the answers was respectively, 6.13 and 5.97.

By taking all these dimensions into account, a One–Sample T-test was performed and it showed that Portuguese individuals' surveyed have concerns for information privacy. As stated by Angst & Agarwal, (2009), there are several examples of promising technologies that failed to diffuse due to the resistance from key stakeholders to adopt them. In this way, to the degree that the potential of EHRs is underscored by privacy concerns is a matter of concern.

Lastly, in terms of authorization, individuals tend to give authorization to access their EHRs to family and friends, family doctors and other healthcare facilities where the patient usually goes. Surprisingly, 51.75% of the respondents would be willing to give access to research clinics to use their EHRs. However, very few participants would give access to their EHRs to insurance companies, pharmaceutical companies and government agencies.

With respect to the second research question, one can see that concerns for information privacy differ across gender and education but not across age. In this way, the results obtained from the questionnaire regarding gender and education are in accordance with the literature review presented in this dissertation. However, in what concerns age, the results were not valid and one possible reason might be related with the lack of responses of people aged above 45 years old which might have affected the results of the Independent T-Test.

Finally, regarding third research question, one can see that argument framing and health status influence the decision of adopting EHRs. Starting with argument framing and taking into account the Paired-Sample T-Test, one can see that the respondents are more willing to adopt EHRs when presented with positive framed messages than with neutral framed messages. This situation is also in accordance with Angst & Agarwal, (2009) that consider that persuasion can happen before individuals use a specific technology if the quality of the arguments is good enough to convince people to adopt them. Moreover, taking into account the willingness to adopt EHR between individuals with high and low concerns, one can see that the respondents with low concerns for information privacy are more willing to adopt EHRs under positive message framing than the ones with high privacy concerns. This situation is also in accordance with Angst & Agarwal, (2009) that found that concerns for information privacy have a negative relationship with likelihood of adopting EHRs.

Finally, in what concerns health status, the results obtained from the survey are in accordance with the literature review since individuals with chronic diseases are more willing to adopt EHRs than the healthy ones.

5.2 Recommendations

In order to address privacy and security concerns in the implementation of EHRs, one should take into account some of the following points.

Security Architecture Systems for EHRs

Although security concerns surrounding EHR environments are justified, solutions for this problem can be found with currently available technologies.

First of all, one should look at other industries in order to understand what has been done in terms of technologies to protect consumer's privacy. For instance, in the banking sector, especially in online user interfaces, one can see that measures to protect consumer's data have been already implemented (Beard, et al., 2012).

Moreover, in order to guarantee the confidentiality of the EHRs, all medical data located and stored externally must be encrypted (Haas, et al., 2011). In this way, each piece of data must be tagged with a specific ID in order to avoid the association of different data from a patient without the respective identification code (Haas, et al., 2011).

Finally, "audit trail" is useful to identify common and suspicious accesses of the electronic health records (Fernández-Alemán, et al., 2013). Thus, EHRs' history shall be recorded in a chronological way in order to allow the data to be easily reconstructed. It should also contain information about access and changes that occurred in the data (van der Linden, et al., 2009).

Current EHRs initiatives

For the implementation of EHRs to be successful, it is suggested to look at some successful, but still defragmented, projects of EHRs available around the world. By doing that, it is possible to define the strength as well as guarantee the 3 main security goals – "Confidentiality", "Integrity" and "Availability", that are essential for EHR systems (Haas et al., 2011). Once EHR's systems present some strength, it is possible to identify the best practices, define areas that have to be improved and create different scenarios to develop a single, national EHR (Pereira, et al., 2013). With that, many opportunities can be exploited and threats avoided (Pereira, et al., 2013).

New Laws and Policies

As mentioned in Chapter 2.2 of the Literature Review, there is still no exact definition of an EHR in the Portuguese legislation and no legal provisions defining exactly what the content of an EHR should be (Millieu Ltd & Time.Lex, 2014).

In this way, it is necessary for the Government to create new laws and policies. These laws should take into account the multiplicity of institutional policies (Bates, et al., 2014) and define what needs to be protected, which organizations will have access to these secured items and the degree of affordability of these protections (Barrows C. Randolph, Jr, 1996). Moreover, under the current "Data Protection Law", the medical data from an individual is by default, accessible to all healthcare professionals in the "Patient's Portal" in Portugal (Millieu Ltd & Time.Lex, 2014). By looking at the survey performed in this dissertation, one can see that Portuguese citizens have concerns for information privacy and individuals authorize different entities to access their EHRs. In this way, with the implementation of EHRs in Portugal, the authorization to access EHRs must be performed by the citizens and not being authorized by default.

Educational Programs

Public education regarding the potential value of EHRs will persuade individuals to use the system in a more secure and appropriate way. In this way, national education programs demonstrating the benefits of EHRs can significantly improve the public acceptance of EHRs (Angst & Agarwal, 2009). However, one-size-fits-all programs should not be performed since concerns for information privacy vary across gender and education and therefore different programs should tackle different problems and benefits in order to increase the uptake of this technology (Angst & Agarwal, 2009).

Moreover, as demonstrated by the cross-sectional survey, most of the individuals consider that the implementation of EHRs will increase the quality of the services provided. However, it is necessary to guarantee that the health professionals know how to use the EHRs. Therefore, all staff must be trained to use new electronic systems in order for them to acquire new technical skills and change their working patterns (Colligan et al, 2015). Also, educational programs should be designed to healthcare professionals in order to address issues related to privacy and security (Patel, et al., 2000)

EHR's Design and Development

In order for the healthcare system's architectures to become more person-centred rather than organisational-centred (Blobel, 2007), both patients and healthcare professionals shall paticipate in the creation, improvement and execution of the EHRs (Pagliari et al., 2007). By doing so, it is possible to guarantee that EHRs meet users' requirements and are simple to use (Pagliari et al., 2007).

Government Incentives

The Government should also consider ways to make it easier for healthcare facilities to implement electronic health records and achieve the minimum criteria for privacy and security (Jha, et al., 2010). One possible approach is to increase technical and personnel assistance to providers. Another approach is related to incentives that can be offered to these institutions in order for them to adopt the EHRs as soon as possible (Jha, et al., 2010).

6. Conclusions

6.1 Conclusion Overview

Electronic health records may provide ways to solve some of the current challenges faced by the healthcare industry. This software has the potential to collect, categorize and share information about patients and clinical groups (WHO, 2015) as well as improve the decision-making by physicians (Ambinder, 1991) and develop new medicines and treatments for a rapidly aging population suffering from chronic diseases (Caligtan & Dykes, 2010).

By looking at Portugal, one can see that the definition of EHR is still unknown for more than half of the people surveyed. Actually, even in the Portuguese legislation, there is still no exact definition of what an EHR should be and what it should contain (Millieu Ltd & Time.Lex, 2014). However, when asked about the potential benefits that EHRs might bring, the majority of the participants consider that EHRs will promote the overall quality of the healthcare system.

Moreover, when analysing concerns for information privacy, it is possible to conclude that Portuguese citizens are concerned about possible misuses of private information by healthcare organizations. Actually, the most of the individuals surveyed stated that they are very concerned with unauthorized access to their personal information as well as with the secondary uses of their data and errors. In order to solve this problem, better security systems as well as clear rules and regulations must be developed by the government and the healthcare entities.

Additionally, when asked about to whom they would give access to their EHRs, the majority of the respondents would give access to entities or individuals directly related to them. Surprisingly, only one individual surveyed would not give access to anyone. In this way, one can conclude that even though individuals have privacy concerns, when given the opportunity to decide to whom they would give access to their EHRs, the majority of the respondents would allow healthcare facilities and research clinics to access their data. In this way, the government as well as healthcare entities should guarantee that information should be made available to others only upon his/her authorization. This fact will not undermine the potential uses of EHRs since the majority of the respondents are willing to give access to EHRs to different institutions, although at different degrees.

In this study it was also found that concerns for information privacy differ across gender and education, which implies that these factors might work as barriers for the adoption of EHRs.

Finally, in what concerns argument framing and health status as influencers in the adoption of EHRs, one can see that people are more willing to adopt EHRs when presented with positive message framings than with neutral message framings. These results are very important since it shows that even with a limited amount of information regarding EHRs, it is possible to persuade individuals to adopt EHRs when showing them with positive, strong text- messages (Angst & Agarwal, 2009). This finding indicates that educational programs, where the advantages of EHRs are demonstrated, have the potential to increase the acceptance of these systems (Angst & Agarwal, 2009). However, one should take into account that these educational programs shall be created according to the differences in education and gender of the population.

Regarding health status, the survey results demonstrate that people with chronic diseases are more eager to adopt EHRs. One possible reason is related with the fact that individuals with chronic diseases perceive EHRs as a tool that might lead to an improvement in their health (Angst & Agarwal, 2009).

In a nutshell, Electronic Health Records are seen by Portuguese citizens as a system that increases the overall quality of healthcare. However, when designing a centralised EHR in Portugal, where sensitive data is easily accessible to a wider audience (Fernández-Alemán et al., 2013), it is important to consider the citizens' privacy concerns and build a system that considers all security measures that avoid unauthorized access and secondary uses of EHRs without consent.

6.2 Limitations

This thesis faced some constraints. First of all, there was a shortage of articles related with the electronic health records in Portugal which limited to some extent the Literature review in this matter.

Secondly, by looking at the survey developed it was possible to see that the knowledge on Electronic Health Records among Portuguese citizens is limited. In this way, it was assumed that the definition given in the survey was enough for them to answer questions regarding this matter.

Thirdly, although the thesis aims to understand the likelihood of adoption of EHRs by the Portuguese population in the presence of privacy concerns, the sample collected is not representative of the Portuguese population. First of all, the sample collected for the survey was not big enough when compared with the total Portuguese population. Second of all, most of the answers in the survey were from Lisbon and Porto and therefore not all regions of Portugal are represented. Finally, in terms of education, most of the individuals that answered the survey had some kind of superior education (69.3%), which does not match with the Portuguese reality. The reason for these limitations was mainly related with time constraints and with the fact that the survey was not randomized.

Finally, as the survey was conducted electronically, all the respondents were technology friendly, which might have created some bias in the answers.

6.3 Future Research

Regarding the electronic health records, there are still many areas to be explored in order to guarantee a successful implementation in Portugal.

First of all, it would be interesting to repeat this study to a larger population to see how privacy concerns affect the adoption of EHRs either in Portugal or in any other European country. Moreover, it is also important to test how negative framed arguments affect the decision of adopting EHRs instead of solely positive and neutral framed messages.

Moreover, according to (Milberg et al, 1995), privacy concerns may vary across different cultures and regulatory structures. For example, consumers from collectivist cultures tend to have less privacy concerns than those from individualistic countries. The reason for that is related with the fact that “collectivist countries” tend to trust more in government entities and thus are more eager to disclose information (Miltgen & Peyrat-guillard, 2014). Regarding regulatory structures, some countries have comprehensive laws defining privacy whereas others do not have it. These regulations have an impact in the development of EHRs as it makes it difficult for software developers to devise systems and make it possible for individuals to access their medical data beyond national borders (Miltgen & Peyrat-guillard, 2014).

Secondly, it would be interesting to understand how physicians perceive EHRs as increasing their efficiency and improving the quality of care and the degree to which providers and patients would be willing to accept recommendations from EHRs analytics. Moreover, future research should also analyse the impact of monetary incentives on the decision of adopting EHRs by healthcare organisations.

Finally, more research should be made concerning the way information can be treated and extracted from a single national EHR without having the risk of data loss. With the existence of different electronic health records across different healthcare facilities, the challenge is to understand how these systems can communicate with each other.

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Appendix 1

Survey Design

Caro participante,

Eu sou uma estudante da Católica Lisbon School of Business and Economics e estou actualmente a desenvolver uma tese de mestrado acerca dos Registos de Saúde Electrónicos. Deste modo, gostaria de o/a convidar a preencher este questionário que tem como objectivo responder às seguintes questões:

- Será que os portugueses estão preocupados com a perda de privacidade dos seus dados no momento em que os registos de saúde electrónicos são adoptados no sistema de saúde português?
- Será que as preocupações com a perda de privacidade variam de acordo com o sexo, educação e idade dos indivíduos?
- Será que a forma como o argumento é apresentado e o estado de saúde dos indivíduos influenciam a decisão de adoptar os registos de saúde electrónicos?

Todos os dados recolhidos serão anónimos e confidenciais, sendo apenas utilizados no âmbito desta tese de mestrado.

Este questionário terá a duração de aproximadamente 8 minutos.

Agradeço desde já a sua participação e gostaria de salientar que a sua opinião é fundamental para o sucesso deste estudo.

Atenciosamente,
Raquel Andrade

○ Clique aqui se aceita que os dados recolhidos neste questionário sejam tratados apenas no âmbito desta tese de mestrado de modo a poder prosseguir

Em primeiro lugar, gostaria de saber um pouco mais acerca do seu estado de saúde e a utilização dos serviços de saúde

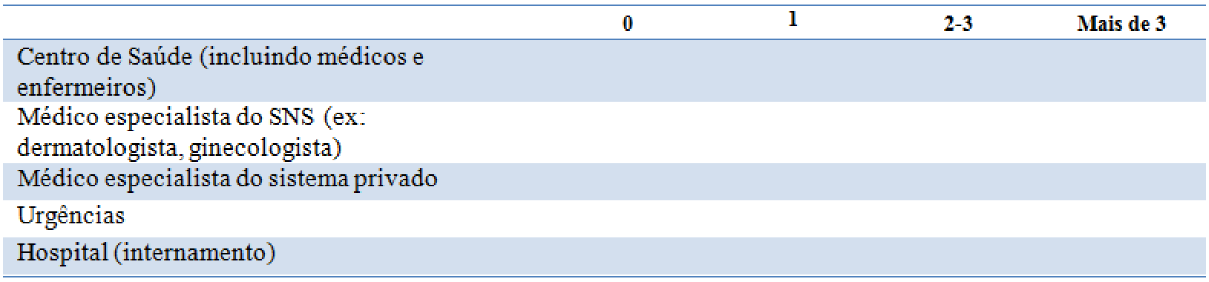
1. Em geral, como classifica o seu estado de saúde?

○ Excelente
○ Muito Bom
○ Bom
○ Satisfatório
○ Fraco

2. Sofre de alguma doença crónica?

○ Sim
○ Não

3. Durante o último ano, quantas visitas fez às seguintes unidades de saúde:



	0	**1**	**2-3**	**Mais de 3**
Centro de Saúde (incluindo médicos e enfermeiros)				
Médico especialista do SNS (ex: dermatologista, ginecologista)				
Médico especialista do sistema privado				
Urgências				
Hospital (internamento)				

4. Em geral, o quão satisfeito está com a qualidade do serviço de saúde recebido ao longo dos últimos 3 anos?

○ Muito satisfeito
○ Satisfeito
○ Indiferente
○ Insatisfeito
○ Muito Insatisfeito

As seguintes questões estão relacionadas com os Registos de Saúde Electrónicos

"Registo de Saúde Electrónico (RSE) é uma base de dados *online*, acessível em tempo real e que contém informação relativa ao estado de saúde de um indivíduo. O RSE apoia a tomada de decisão clínica através do acesso a registos de informação sobre a saúde de um paciente onde e quando se torna necessário e pode ser acessível por múltiplos utilizadores autorizados (exemplo: pacientes e profissionais de saúde)." (*Fonte: HIMSS)*

"O Cidadão poderá também aceder, actualizar e inserir informação que considere relevante para o seu acompanhamento clínico." (Fonte: Ministério da Saúde, 2009)

5. Conhecia este conceito?

- ○ Sim
- ○ Não

Tal como em todos os domínios que lidam com informação pessoal de indivíduos, as questões associadas à segurança da informação assumem uma importância fundamental. Com a introdução dos RSE, é necessário avaliar os impactos que a sua divulgação não controlada nem autorizada de dados pessoais podem ter. (Fonte: Ministério da Saúde, 2009)

De seguida vai-lhe ser apresentado uma série de questões relativas aos dados pessoais que se encontram disponíveis nos registos médicos. Esta parte deverá demorar entre 3 a 5 minutos a completar

6. As próximas questões têm como objectivo avaliar a percepção relativa à colecção de dados. Do ponto de vista pessoal, indique por favor até que ponto concorda ou discorda com as seguintes afirmações (1 = Discordo totalmente; 7 = Concordo Totalmente)

6.1. Geralmente incomoda-me quando as entidades de saúde me pedem informações pessoais.

6.2. Incomoda-me dar informações pessoais a tantas entidades de saúde.

6.3. Estou preocupado que as entidades de saúde obtenham muita informação pessoal sobre mim.

As próximas questões têm como objectivo avaliar a percepção relativa a erros de informação. Do ponto de vista pessoal, indique por favor até que ponto concorda ou discorda com as seguintes afirmações (1 = Discordo totalmente; 7 = Concordo Totalmente)

6.4. As entidades de saúde devem tomar mais medidas para se certificarem de que os dados pessoais dos pacientes que se encontram nos arquivos são precisos.

6.5. As entidades de saúde devem ter melhores procedimentos para corrigir erros que existam nos dados pessoais de cada paciente.

6.6. As entidades de saúde devem dedicar mais tempo e esforço a verificar a precisão dos dados pessoais que se encontram nas suas bases de dados.

As próximas questões têm como objectivo avaliar a percepção relativa ao acesso não autorizado a dados pessoais. Do ponto de vista pessoal, indique por favor até que ponto concorda ou discorda com as seguintes afirmações (1 = Discordo totalmente; 7 = Concordo Totalmente)

6.7. As entidades de saúde devem dedicar mais tempo e esforço para impedir o acesso não autorizado a dados pessoais dos pacientes.

6.8. As bases de dados informáticas que contêm informações pessoais devem ser protegidas contra o acesso não autorizado, independentemente do seu custo

6.9. As entidades de saúde devem tomar mais medidas para garantir que pessoas não autorizadas não possam aceder a informações pessoais guardados nos computadores

As próximas questões têm como objectivo avaliar a percepção relativa ao uso secundário da informação. Do ponto de vista pessoal, indique por favor até que ponto concorda ou discorda com as seguintes afirmações (1 = Discordo totalmente; 7 = Concordo Totalmente)

6.10. As entidades de saúde não devem usar informações pessoais para qualquer finalidade, a menos que tenham sido autorizadas pelos indivíduos a fornecerem essas informações.

6.11. As entidades de saúde não devem vender informações pessoais disponíveis nas suas bases de dados a outras entidades de saúde (exemplo: industrias farmacêuticas, clinicas de investigação, etc.).

6.12. As entidades de saúde não devem partilhar informações pessoais com outras entidades de saúde, a menos que tenham sido autorizadas pelo paciente que forneceu essas mesmas informações.

7. A quem daria autorização para aceder ao seu registo de saúde electrónico? Seleccione todas as aplicáveis

- Familiares ou amigos designados
- Médico de família
- Outros médicos ou unidades de saúde que cuidem de mim (numa clínica, urgência, ou hospital)
- Seguradora
- Clinicas de investigação
- Empresas farmacêuticas
- Empregador
- Organismos do Governo
- Não daria permissão a ninguém

8. As seguintes questões têm como objectivo avaliar a importância que as fontes de informação têm para si

Tendo em conta as seguintes afirmações, avalie os autores das frases como “fidedignos” ou “não fidedignos”

Um autor é considerado uma **fonte fidedigna** se for considerado de confiança.

Por outro lado uma fonte **não fidedigna** não é considerada de confiança.

Afirmação 1: “O conceito de registo de saúde electrónico foi criado para permitir que os pacientes e todos os profissionais de saúde tenham acesso, em tempo real, ao historial médico de cada utente. Este registo permite que o paciente seja capaz de entrar em qualquer rede de cuidados de saúde e fornecer autorização a qualquer profissional de saúde a ter acesso ao seu historial médico (Ambinder, 1991)”

8.1. O autor “Ambinder, 1991” é:

- Uma fonte fidedigna
- Uma fonte não fidedigna

Afirmação 2: “Um estudo realizado demonstrou que a percentage, de erros graves provocadas por médicos e auxiliares de saúde diminuiu 55% desde a implementação de um registo de saúde electrónico” (Brigham and Women’s Hospital).

8.2. O autor “Brigham and Women’s Hospital” é:

- Uma fonte fidedigna
- Uma fonte não fidedigna

Afirmação 3: “Os Registos de saúde electrónicos podem transformar os cuidados de saúde...se os registos de saúde de todos os pacientes fossem partilhados em redes de computadores seguras...as instituições hospitalares e os médicos teriam acesso aos registos completos de todos os pacientes e não teriam de realizar sistematicamente os mesmos exames médicos” (New York Times, May 3, 2004).

8.3. O autor “New York Times, May 3, 2004” é:

- Uma fonte fidedigna
- Uma fonte não fidedigna

8.4. Tendo em consideração as **afirmações 1 a 3**, diga em que medida concorda ou discorda com a seguinte afirmação: Depois de analisar os problemas relativos à perda de privacidade e os benefícios dos RSE mencionados nas afirmações 1 a 3, estou interessado/a em utilizar o registo de saúde electrónico para aceder à minha informação clínica.

- Concordo Totalmente
- Concordo em parte
- Não concordo nem discordo
- Discordo em parte
- Discordo Totalmente

Afirmação 4: “Os registos electrónicos de saúde são o futuro” (utilizador anonimo)

8.5. O autor “utilizador anonimo” é:

- Uma fonte fidedigna
- Uma fonte não fidedigna

Afirmação 5: "A maioria dos estudantes diz que gostaria de utilizar os registos de saúde eletrónicos para poder aceder às suas informações de saúde em qualquer momento" (yahoo weblog 2003)

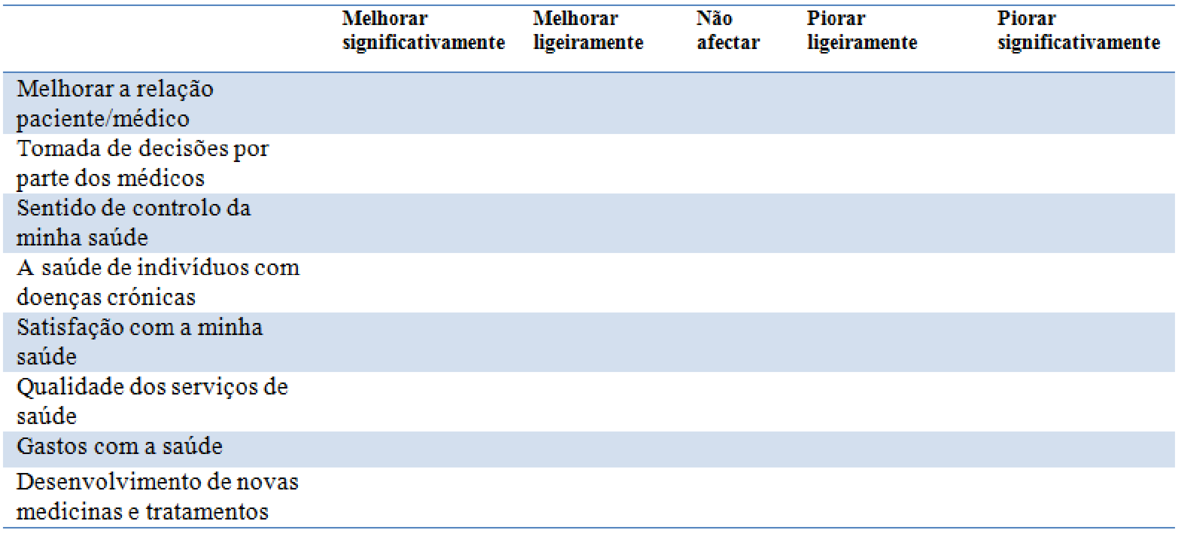
8.6. O autor "yahoo weblog 2003" é:

- Uma fonte fidedigna
- Uma fonte não fidedigna

8.7. Tendo em consideração as **afirmações 4 e 5**, diga em que medida concorda ou discorda com a seguinte afirmação: Depois de analisar os problemas relativos à perda de privacidade e os benefícios dos RSE mencionados nas afirmações 4 e 5, estou interessado/a em utilizar o registo de saúde electrónico para aceder à minha informação clínica

○ Concordo Totalmente
○ Concordo em parte
○ Não concordo nem discordo
○ Discordo em parte
○ Discordo Totalmente

9. Em que medida acredita que os registos de saúde electrónicos iriam:



	Melhorar significativamente	**Melhorar ligeiramente**	**Não afectar**	**Piorar ligeiramente**	**Piorar significativamente**
Melhorar a relação paciente/médico					
Tomada de decisões por parte dos médicos					
Sentido de controlo da minha saúde					
A saúde de indivíduos com doenças crónicas					
Satisfação com a minha saúde					
Qualidade dos serviços de saúde					
Gastos com a saúde					
Desenvolvimento de novas medicinas e tratamentos					

10. Grupo Étario:

○ <25
○ 25-34

- 35-44
- 45-54
- >55

11. Sexo:

- Masculino
- Feminino

12. Habilitações literárias (mais recente):

- Ensino Básico
- Ensino Secundário
- Licenciatura
- Pós-graduação
- Mestrado
- Doutoramento ou mais

13. Rendimento médio mensal individual (líquido):

- Inferior a 500€
- Entre 501€ e 1.000€
- Entre 1.001€ e 2.000€
- Entre 2.001€ e 4.000€
- Entre 4.001€ e 6.000€
- Superior a 6.000€
- Não tem

14. Local de Residência (Distrito): _______________

Appendix 2

Demographics of the Sample

Gender	Count	Percentage
Male	105	46.05%
Female	123	53.95%

Age	Count	Percentage
<25	104	45.61%
25-34	40	17.54%
35-44	30	13.16%
45-54	35	15.35%
>55	19	8.33%

Education	Count	Percentage
Elementary School	15	6.58%
High School Graduate	55	24.12%
Bachelor Degree	88	38.60%
Postgraduate	7	3.07%
Master Degree	56	24.56%
PhD or more	7	3.07%

Income	Count	Percentage
None	59	25.90%
Below 500€	12	5.30%
Between 501€ and 1.000€	53	23.20%
Between 1001€ and 2.000€	74	32.50%
Between 2001€ and 4.000€	26	11.40%
Between 4001€ and 6.000€	4	1.80%
Higher than 6.000€	0	0.00%

Residence		
	Count	Percentage
North	35	15.40%
Centre	15	6.60%
Lisbon	148	64.90%
Alentejo & Algarve	16	7.00%
Islands	14	6.10%

Appendix 3

Health Status and interaction with Healthcare providers

Perceived Health Status		
	Count	Percentage
Excellent	29	12.72%
Very Good	95	41.67%
Good	89	39.04%
Fair	14	6.14%
Poor	1	0.44%

Chronic diseases		
	Count	Percentage
Yes	57	25.00%
No	171	75.00%

Satisfaction with the quality of the healthcare services		
	Count	Percentage
Very Satisfied	28	12.28%
Satisfied	159	69.74%
Indifferent	28	12.28%
Dissatisfied	13	5.70%
Very Dissatisfied	0	0.00%

Visits to the Healthcare facilities in the last year (Percentage)				
	0	1	2-3	More than 3
Healthcare Centre	60.96%	23.68%	10.09%	5%
Private Doctor	40.79%	33.33%	15.35%	10.53%
Hospitals	90.79%	7.02%	2.19%	0.00%
Public Specialist	42.11%	37.28%	15.35%	5.26%
Emergency Room	80.26%	10.96%	7.46%	1.32%

Appendix 4

Perception of EHRs

Perception EHR

	Count	Percentage
Yes	56	24.56%
No	176	75.44%

Potential Benefits of EHR (Percentage)

	Improve Significantly	Slightly Improve	Not affect	Slightly Worsen	Worsen Significantly
Improve Relationship between doctor/patient	58.77%	28.95%	10.09%	0.88%	1.32%
Decisions made by doctors	64.91%	28.95%	5.70%	0.00%	0.44%
Control of my own health	38.16%	39.47%	21.93%	0.00%	0.44%
Health of individuals with chronic diseases	60.09%	29.82%	9.65%	0.00%	0.44%
Satisfaction with my health	31.14%	41.23%	27.19%	0.00%	0.44%
Quality of the healthcare services	59.21%	31.58%	8.33%	0.00%	0.88%
Government Spending on health	22.81%	32.02%	24.56%	18.86%	1.75%
Development of new medicines and treatments	51.75%	29.39%	17.54%	0.44%	0.88%

Appendix 5

Concerns for Information Privacy

Collection of Data (Percentage)

	Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree
It usually bothers me when health care entities ask me for personal information	16.67%	36.40%	17.54%	8.33%	14.04%	5.26%	1.75%
It bothers me to give personal information to so many healthcare entities	15.79%	25.00%	17.98%	8.77%	26.32%	4.39%	1.75%
I'm concerned that healthcare entities are collecting too much personal information about me	20.61%	21.05%	22.81%	11.40%	15.35%	6.14%	2.63%

Errors (Percentage)

	Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree
Health care entities should take more steps to make sure that the personal information in their files are accurate	0.88%	0.00%	0.88%	4.39%	34.21%	25.88%	33.77%
Healthcare entities should have better procedures to correct errors in personal information	0.00%	0.00%	1.75%	8.33%	25.88%	27.19%	36.84%
"Healthcare entities should devote more time and effort to verifying the accuracy of the personal information in their databases	0.00%	0.00%	2.63%	4.82%	29.82%	28.51%	34.21%

Improper Access to Data (Percentage)

	Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree
Healthcare entities should devote more time and effort to preventing unauthorized access to personal information	0.00%	0.00%	0.44%	3.95%	27.63%	20.61%	47.37%
"Computer databases that contain personal information should be protected from unauthorized access no matter how much it costs	0.00%	0.00%	0.88%	2.19%	27.19%	24.12%	45.61%
Health care entities should take more steps to make sure that unauthorized people	0.00%	0.00%	0.88%	3.07%	26.32%	21.93%	47.81%

cannot access personal information in their computers

Unauthorized Secondary Use of Data (Percentage)

	Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly Agree	Agree	Strongly Agree
Health care entities should not use personal information for any purpose unless it has been authorized by the individuals who provided the information	1.75%	0.88%	3.95%	1.75%	28.51%	17.54%	45.61%
Health care entities should never sell the personal information in their computer databases to other health care entities	0.44%	0.44%	3.51%	3.07%	21.49%	21.93%	49.12%
Health care entities should never share personal information with other health care entities unless it has been authorized by the patient who provided the information	0.88%	0.44%	3.95%	2.19%	24.56%	21.05%	46.93%

	Mean	Standard Deviation
Collection of Data	3.6284	2.14141
Errors	5.8963	0.92036
Improper Access to Data	6.1398	0,90113
Unauthorized Secondary Use of Data	5.9745	1.13743
Total Average	5.3874	0.97485

Authorization to Access EHRs (Percentage)

	Yes	No
Family or designated friends	67.11%	32.89%
Family Doctor	97.37%	2.63%
Other doctors or healthcare facilities that I usually go	91.23%	8.77%
Insurance companies	10.53%	89.47%
Research Clinics	51.75%	48.25%
Employer	3.51%	96.49%
Government agencies	15.35%	84.65%

Appendix 6

Positive vs., Neutral Message Framing

Reliability of the Sentences (Count)

	Reliable	Non-Reliable	Average
Sentence 1	196	32	1.14
Sentence 2	200	28	1.12
Sentence 3	190	38	1.17
Sentence 4	20	208	1.91
Sentence 5	15	213	1.93

Positive vs. Neutral Message Framing

	Totally Agree	**Slightly Agree**	**Neither agree nor disagree**	**Slightly Disagree**	**Totally Disagree**
Positive Message Framing	57.02%	37.28%	4.39%	0.44%	0.88%
Neutral Message Framing	11.84%	35.53%	40.79%	9.65%	2.19%

Appendix 7

Cronbach’s Alpha and KMO Test

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.721	0.740	50

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.781
Bartlett's Test of Sphericity	Approx. Chi-Square	5439,356
	df.	1225
	Sig.	0.000

Appendix 8

H1 One Sample T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std.Error Mean
Total Avg Concerns	244	5.2365	0.84947	0.05438

One-Sample Test

	Test Value = 4					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Total Avg Concerns	22,736	243	,000	1,23645	1,1293	1,3436

H2 Paired Sample T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Positive Message Framing	1,52	230	,722	,048
	Neutral Message Framing	2,55	230	,918	,061

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Positive Message Framing & Neutral Message Framing	230	,413	,000

Paired Samples Test

	Paired Differences				t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			

					Lower	Upper			
Pair 1	Positive Message Framing - Neutral Message Framing	-1,030	,903	,060	-1,148	-,913	-17,303	229	,000

H3 Mann-Whitney U Test

Statistics

Positive Message Framing

Low Concern	N	Valid	12
		Missing	3
	Mean		4,9167
	Median		5,0000
	Std. Deviation		,28868
	Skewness		-3,464
	Std. Error of Skewness		,637
	Kurtosis		12,000
	Std. Error of Kurtosis		1,232
High Concern	N	Valid	218
		Missing	22
	Mean		4,4541
	Median		5,0000
	Std. Deviation		,73127
	Skewness		-1,873
	Std. Error of Skewness		,165
	Kurtosis		5,610
	Std. Error of Kurtosis		,328

Ranks

	High_Low_Concern	N	Mean Rank	Sum of Ranks
Positive Message Framing	Low Concern	12	156,00	1872,00
	High Concern	218	113,27	24693,00
	Total	230		

Test Statistics

	Positive Message Framing
Mann-Whitney U	822,000

Wilcoxon W	24693,000
Z	-2,477
Asymp. Sig. (2-tailed)	,013
a. Grouping Variable: High_Low_Concern	

H4 Mann-Whitney U Test

Statistics

Positive Message Framing

	N	Valid	0
		Missing	8
Chronic Disease	N	Valid	58
		Missing	5
	Mean		4,5690
	Median		5,0000
	Std. Deviation		,86068
	Skewness		-2,786
	Std. Error of Skewness		,314
	Kurtosis		8,891
	Std. Error of Kurtosis		,618
No Chronic Disease	N	Valid	172
		Missing	12
	Mean		4,4477
	Median		5,0000
	Std. Deviation		,66898
	Skewness		-1,407
	Std. Error of Skewness		,185
	Kurtosis		3,708
	Std. Error of Kurtosis		,368

Ranks

	Chronic Diseases	N	Mean Rank	Sum of Ranks
Positive Message Framing	Yes	58	129,81	7529,00
	No	172	110,67	19036,00
	Total	230		

Test Statistics[a]	
	Positive Message Framing
Mann-Whitney U	4158,000
Wilcoxon W	19036,000
Z	-2,166
Asymp. Sig. (2-tailed)	,030
a. Grouping Variable: Chronic Diseases	

H5 Independent Sample T-Test

Group Statistics					
	High and low education	N	Mean	Std. Deviation	Std. Error Mean
Total Avg Concerns	Low Education	70	5,5548	,73473	,08782
	Superior Education	158	5,1319	,81797	,06507

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total Avg Concerns	Equal variances assumed	1,546	,215	3,712	226	,000	,42291	,11393	,19841	,64740
	Equal variances not assumed			3,869	146,207	,000	,42291	,10930	,20689	,63892

H6 Independent Sample T-Test

Group Statistics

	Sex:	N	Mean	Std. Deviation	Std. Error Mean
Total Avg Concerns	Masculine	105	4,7929	,74992	,07318
	Feminine	123	5,6619	,63825	,05755

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total Avg Concerns	Equal variances assumed	3,663	,057	-9,454	226	,000	-,86907	,09193	-1,05021	-,68792
	Equal variances not assumed			-9,335	205,425	,000	-,86907	,09310	-1,05262	-,68551

H7 Independent Sample T-Test

Group Statistics

	Age_Groups1	N	Mean	Std. Deviation	Std. Error Mean
Total Avg Concerns	Young	144	5,2199	,80840	,06737
	Old	84	5,3333	,82749	,09029

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means					
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference

									Lower	Upper
Total Avg Concerns	Equal variances assumed	0,07	,933	-1,013	226	,312	-,11343	,11196	-,33404	,10719
	Equal variances not assumed			-1,007	170,475	,315	-,11343	,11265	-,33579	,10894