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Knowledge and atittudes of healthcare professionals and their willingness to communicate about e-Health to patients: A cross-sectional study of Centro Hospitalar Universitário do Porto.

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Master in Health Services Management

Supervisor:
MD, Phd,MLaw, Professor Henrique Martins, Associated Professor, ISCTE Business School, Human Resources and Organizational Behaviour Department, ISCTE-IUL

November, 2022

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“We delight in the beauty of the butterfly, but rarely admit the changes it has gone through to achive that beauty”

Maya Angelou

Acknowledgments

First of all, I would like to thank my teachers and mentors, Professor Henrique Martins, for the availability to clarify any doubts and for helping in the completion of this research. To the Centro Hospitalar Universitário do Porto and to Dra. Rita Veloso, for giving me the opportunity to explore two of my great passions, digital health and Hospital Organisations.

For all the empathy, knowledge sharing, sympathy and availability, thank you!

To my family, specially my parents, who provided me with the financial means to complete my master's degree and for always motivating me to do better and achieve my goals.

To all my friends who always helped me at any time of the day and always contributed to my personal and academic progression.

And last but not least, to thank André, Carolina, Beatriz, Francisca and João who have remained my constant support by making me feel that I could overcome any obstacle and calming me down in moments of greater tension.

ABSTRACT

In many countries, the implementation and dissemination of e-Health for healthcare systems are important aspects of projects and strategies, as they contribute to significantly improving the access to such a system. The aim of the study is to analyze nurses' and doctors' attitudes and knowledge on e-Health solutions as well as their willingness to communicate about e-Health to their patients.

The 2030 Agenda for Sustainable Development highlights that the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies. The relevance of the present study is to provide more data about the roles of doctors and nurses on promoting this action through digital health and also to characterise which factors can influence their action.

The present study is a exploratory- descriptive case study with a quantitative aproach and a cross-sectional design. A questionnaire was applied to 131 doctors and nurses that have clinical activity on the External Consultation Service of Centro Hospitalar Universitário do Porto. Based on the results, opportunity shows to be the key factor that drives doctors' and nurses' e-Health competence (according to the Spearman's ρ coefficient). Data shows that 87,00% of the participants feel that is part of their role to promote digital literacy, however it was gauged that doctors and nurses feel that they don't have enough time (32,10%) to be an actor on the promotion and induction of patient's in the digital world. Since healthcare is a very personal and an unique experience for each person, for future research it would be ideal to obtain data through a mixed method approach by introducing interviews in order to have the most accurate information possible.

Keywords: Digital Health, e-Health, Patient Enpowerment, Doctors and Nurses, Capability, Motivation, Opportunity, e-Health skills, e-Health Knowledge

JEL Classification System:
I12: Health Behaviour
M10: Business Administration- General

RESUMO

Em muitos países, a implementação e divulgação da e-Saúde para os sistemas de saúde são aspetos importantes dos projetos e estratégias, uma vez que contribuem para melhorar significativamente o acesso a esse sistema. O objetivo do estudo é analisar as atitudes e conhecimentos de enfermeiros e médicos sobre soluções de e-Saúde, bem como a sua vontade de comunicar sobre e-Saúde aos seus pacientes.

A Agenda para o Desenvolvimento Sustentável de 2030 salienta que a disseminação da tecnologia da informação e das comunicações e a interconectividade global tem um grande potencial para acelerar o progresso humano, para colmatar a divisão digital e para desenvolver sociedades do conhecimento. A relevância do presente estudo é proporcionar mais dados sobre os papéis dos médicos e enfermeiros na promoção desta ação através da saúde digital e também caracterizar quais os fatores que podem influenciar a sua ação.

O presente estudo é um estudo de caso exploratório - descritivo, com uma abordagem quantitativa e uma conceção transversal. Foi aplicado um questionário a 131 médicos e enfermeiros que têm atividade clínica no Serviço de Consulta Externa do Centro Hospitalar Universitário do Porto. Com base nos resultados, a oportunidade demonstra ser o fator chave que impulsiona a competência de médicos e enfermeiros em e-Saúde (de acordo com o coeficiente de Spearman's ρ). Os dados demostram que 87,00% dos participantes sentem que faz parte do seu papel de promover a literacia digital, no entanto, foi aferido que médicos e enfermeiros sentem que não têm tempo suficiente (32,10%) para serem atores na promoção e indução de doentes no mundo digital. Dado que os cuidados de saúde são uma experiência muito pessoal e única para cada pessoa, para a investigação futura seria ideal obter dados através de uma abordagem de método misto, introduzindo entrevistas de modo a ter a informação mais precisa possível.

Palavras-Chave: Saúde Digital, e-Saúde, Empoderamento dos Utentes, Médicos e Enfermeiros, Capacidade, Motivação, Oportunidade, Competências em e-Saúde, Conhecimentos em e-Saúde

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GLOSSARY OF ACRONYMS

CHUP- Centro Hospitalar Universitário do Porto

DESI- Digital Economy and Society Index

EC- External Consultation

Ehap- eHealth Action Plan

EU-DSM- European Union - Digital Single Market

EU- European Union

GDP- Gross Domestic Product

HIMSS- Healthcare Information and Management Systems Society

HLS-EU- European Health Literacy Survey

ICTs- Information and Communication Technologies

ILS-PT- Inquérito à literacia em Saúde em Portugal

IoT- The Internet of Things

RRP- The Recovery and Resilience Plan

SILS- Single-Item Health Literacy Screener

SNS- Serviço Nacional de Saúde

SPSS- Statistical Packages for the Social Sciences

WHO- World Health Organisation

INTRODUCTION

As the world becomes more and more digitalised, a certain level of digital skills are needed to manage with both private life and at work. In 2019, a third of adults in the European Union (EU) in employment or looking for work – i.e. more than 75 million people – did not have at least basic digital skills or had not used the internet at all during the previous three months (European Commission, 2019; European Court of Auditors, 2021). Nevertheless, if we consider the portuguese population in that same year, there were 48% of the population without basic digital skills; meaning that the 1.8 million portuguese who have never used the internet are not able to create na email, communicate online, use public or private digital services and are actually excluded from interacting in a digital context (European Commission, 2019; European Court of Auditors, 2021).These basic digital skills are even more critical in the context of health and in particular when the most info-excluded population is exactly the one that needs more care due to their age (Heponiemi, Kaihlanen, Kouvonen, Leemann, Taipale & Gluschkoff, 2022).

The healthcare context that we current live in acknowledges the need to overcome the pandemic and economic crisis by not only responding to the short-term conjuncture, but also to take advantage of the dynamics to undertake a true structural transformation that implies a change in the profile of our economy and society (Magalhães, 2022).

The 2030 Agenda for Sustainable Development highlights that the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies. The World Health Organisation (WHO), states that digital health should be an integral part of health priorities and benefit people in a way that is ethical, safe, secure, reliable, equitable and sustainable. It should be developed with principles of transparency, accessibility, scalability, replicability, interoperability, privacy, security and confidentiality (World Health Organisation, 2021). Thus, the "digital determinants of health", such as literacy in information and communication technologies and access to equipment, broadband and the internet, become more important as digital health becomes more prevalent. Hence, the global strategy underscores the need to ground digital foundations within national strategies and emphasizes the need to work with different sectors and stakeholders at all levels (World Health Organisation, 2021).

The strategy proposed by The Recovery and Resilience Plan (RRP) 2021 of the Portuguese Government is aligned with the 2030 Agenda of Sustainable Development. The RRP recognizes that digital means are a way that can make a significant reduction on resources waste and also can promote more sustainable behaviours, where the main goal is to include every single citizen in this process and to make them more active in their health. Therefore, the digital transition aims to address the obstacles that are averting the digital transition in the Serviço Nacional de Saúde (SNS), including the lack of appropriate hardware and software available to health professionals, to strengthen the standardisation of information systems in the SNS and to improve user experience and access to data (Planning Ministry of Portugal, 2021).

Digital health is one of the areas of healthcare that directly impacts the way we deliver care. In a very recent consensus on the definition of Digital Health, the Healthcare Information and Management Systems Society (HIMSS) defines Digital Health as a concept that: "(…) *connects and empowers people and populations to manage health and wellness, augmented by accessible and supportive provider teams working within flexible, integrated, interoperable and digitally-enabled care environments that strategically leverage digital tools, technologies and services to transform care delivery*"(HIMSS Analytics, 2019; Snowdon, 2020).

In Portugal, 3.9 million portuguese reported having at least one chronic disease (INSA, 2019.), but only 6% of the portuguese with chronic diseases uses an internet service for disease monitoring (Magalhães, 2022). Additionally, it is known that between the years of 2017 to 2020, 70%- 80% of the health budget was spent on treating chronic diseases, representing more than 115 billion euros per year in the European Union (CHRODIS,2020). About 97% of this budget is dedicated to treatment, chronic disease management and healthcare administration, leaving only 3% dedicated to health promotion and disease prevention(CHRODIS,2020). However, the most concerning fact is that about 20% of the health expenditure is waste OECD, (2017) , therefore the is an opportunity here to reallocate this waste to a potential efficiency gain through digital health but also requires the increase in training and digital literacy on healthcare professionals and patient's families and/or caregivers (OECD,2017).Awareness of digital health to patients may be influenced by the way health professionals (particularly doctors and nurses) address e-Health in front of them and talk about such tools (Bartosiewicz, Burzyńska & Januszewicz, 2021). In turn, doctors' and nurses' willingness to engage patients with digital tools may be related to their experience and e-Health skills (Bartosiewicz, Burzyńska & Januszewicz, 2021).

To research if such relations exist and considering that there is lack of studies regarding the characterisation of the current e-Health panorama of these healthcare professionals; the main aim of this study is to assess the knowledge and attitudes of doctors and nurses from a typical SNS hospital in Portugal in the external consultation (EC) service of Centro Hospital Universitário do Porto towards e-Health Solutions, as well as their willingness to communicate about e-Health to their patients **(figure 1)**. As complementary research questions, we seeked to answer:

Q1: " What are the determinants that can influence the attitude of these professionals towards e-Health Solutions?";

Q2: " How can doctors and nurses be agents of change for the patients in the digital world?".

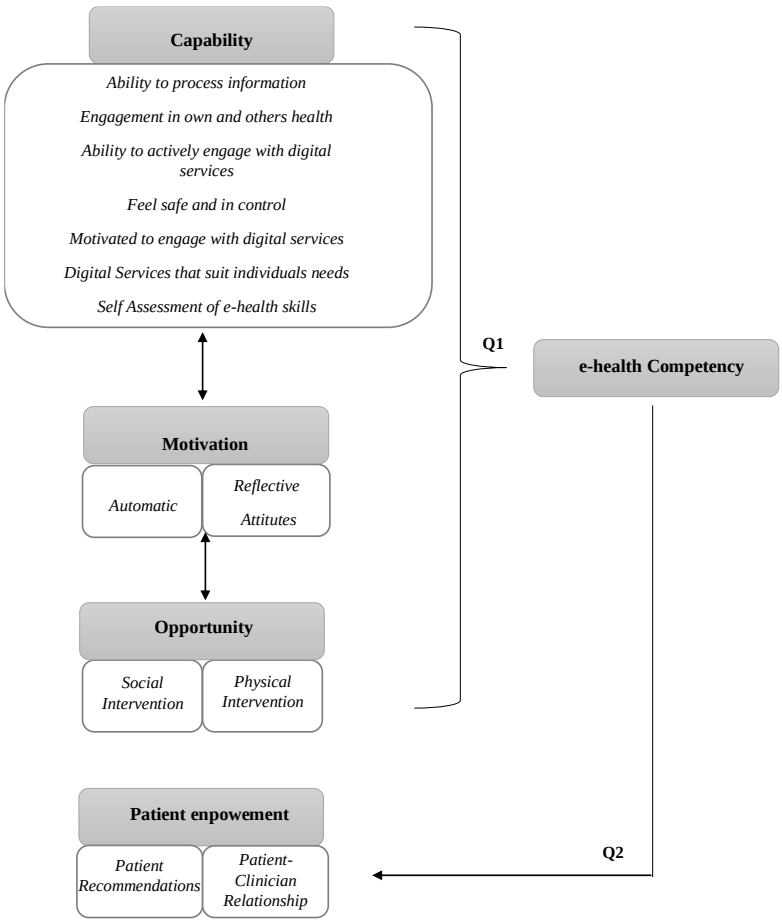

Figure 1: Model for the conceptualisation and operationalisation of doctors' and nurses' attitudes and knowledge towards e-Health solutions (Source: The author)

I. THEORETICAL BACKGROUND ON DIGITAL HEALTH

When everything is digital, healthcare cannot be an exception. The 4th Industrial Revolution, also known as the digital revolution, differs from previous ones by combining two factors that were previously incompatible: scale and personalisation. The health sector is one of the sectors that is most exposed to technological evolution, so it is revolutionizing the way healthcare is provided, from the interaction between patient and caregivers to governments and stakeholders (Melo & Araújo, 2020).

In fact, for the first time in history, it is now possible to offer a technology-based health service virtually, which responds to the specificity of each individual by bringing support to lead to faster interventions through the use of one or more devices/wearables, and sharing their biodata digitally with a degree of efficiency and effectiveness never achieved before (Magalhães, 2022; Melo & Araújo,2020).

However, digitalizing health has to be much more than buying computers or investing in softwares, i.e., digital transformation in health presupposes the modernization of health units, the ingenuity and vision to create new models of health care delivery, the integration of data and care throughout the whole cycle. Therefore, there is the need to increase the level of technological intensity in all segments of the health value chain; it will undoubtedly be an investment with return, which implies above all a paradigm shift on the part of professionals, organisations and the funding model itself (Magalhães, 2022).

Consedering that healthcare is connected to almost every aspect of society and the economy and the major mission is to keep populations healthy, using the knowledge, tools and skills of highly trained clinicians to advance patient care ; a question undoubtedly arises (Kleij, Kasteleyn, Meijer, Bonten, Houwink, Teichert, van Luenen, Vedanthan, Evers, Car, Pinnock, & Chavannes, 2019) :What will happen to those clinicians when society and technology change?

According to Pordata statistical website, the proportion of the population in Portugal that did not have access to healthcare for financial reasons, due to waiting lists or distance, rose from 1.1% in 2008 to 1.7% in 2019. This indicator leads us to reflect that, despite the increase in healthcare professionals in the SNS (+12% in 2019, in hospitals) in the last decade, they are not sufficient for the growing need for healthcare (Magalhães, 2022). As a consequence of these trends and changes, clinicians experience increasing pressures and challenges. In order to ensure that they deliver the care required, clinicians must learn new skills and adapt their thinking and approaches (Herzof, 2022).

When considering e-Health, the increasing use of e-Health in the organisation, production, and delivery of healthcare is changing the work culture in healthcare sector (European Commission, 2019). Although healthcare professionals regularly use e-Health in their work, studies show that their e-Health competency is not developed to the optimal level (Barakat, Woolrych, Sixsmith, Kearns & Kort, 2013; Clark, Baker & Baker, 2009; Kinnunen, Heponiemi, Rajalahti, Ahonen, Korhonen & Hyppönen, 2019). In Portugal, the edition of the Digital Economy and Society Index - DESI 2021, states that the biggest challenge in the digitalisation process is still the human capital (European Commission, 2019).

It is crucial to understand that the nature of healthcare systems is changing, and the need for innovative ways of delivering high quality healthcare requires highly skilled professionals. Access to digital health programmes that enable healthcare professionals to lead the digital transformation in their institutions is therefore essential, including through the acquisition of skills and identify new digital health opportunities that provides new ways of working.

1. 1 Digital transformation in the Healthcare Sector

According to Belliger & Krieger (2018), "*healthcare is no longer primarily something that takes place in the intimacy and confines of the doctor-patient relationship. Instead, health care is distributed throughout a complex network of both human and nonhuman actors such as databases, hospital information systems (…)*" (Belliger & Krieger, 2018).

Two of the drivers for digital transformation in healthcare are, on the one hand, the increase in average life expectancy, with the consequent need for access to healthcare, and on the other, the growing need for adequacy in the training of healthcare professionals, in addition to the need to improve the efficiency of the institutions themselves; according to Herzof, (2022) 70% of clinicians agreed the widespread use of digital health technologies will enable the positive transformation of healthcare, and 63% expect most consultations to be remote in 10 years (Herzhof, 2022).

Digital transformation allows population all over the world to have access to better healthcare but, at the same time, the costs associated are escalating, putting healthcare providers and patients in a sensitive situation (Health Parliament Portugal,2021).

In its agenda for the creation of the European Union - Digital Single Market (EU-DSM), the European Commission identifies health as one of the main sectors to benefit from the digital shift, considering the potential benefits that digital services have to offer to citizens and workers in this area. showing that digital health could save €99 billion in healthcare costs for EU Gross Domestic Product (GDP) and enable 11.2 million people with chronic diseases and 6.9 million people at risk of developing chronic diseases to extend their working lives and improve productivity - which would add €93 billion to EU GDP (Magalhães, 2022).

By the end of 2020, more than 80% of the Portuguese population already had access to high-capacity fixed networks and to mobile networks, through the use of smartphones that, in addition to the capabilities related to telecommunications, such as receiving electronic prescriptions and remote consultations, have high computing capabilities, to collect UltraHD images, to detect falls and location, and to collect several biomedical data, such as heart rate, one of the relevant indicators in the context of circulatory system diseases, which is still the main cause of death in Portugal (Magalhães, 2022).. In addition to the data that can be gathered by smartphones, it is also possible to incorporate data from other sensors and transfer them to health systems, meaning that we can monitor citizens in their homes and "on the go" on a regular or permanent basis. This is a huge opportunity for those with chronic diseases that carry a high risk of developing complications to have a more supportive healthcare system (Essén, Stern, Haase, Car, Greaves, Paparova, Vandeput, Wehrens & Bates, 2022; Gopal, Suter-Crazzolara, Toldo & Eberhardt, 2019; Magalhães, 2022).

Thus, real-time data evaluation enables the anticipation of emergency situations, resulting in a decrease in incident-related mortality rates, and data storage and ongoing analysis also enables a better assessment of patients' needs and the efficacy of the therapies and medications that are prescribed to them (Gopal et al., 2019; Magalhães, 2022). Additionally, research has demonstrated that the stated practise is strongly connected with lower rates of hospitalisation and re-admission when compared to standard treatment **(**Koehler, Koehler, Deckwart, Prescher, Wegscheider, Kirwan, Winkler, Vettorazzi, Bruch, Oeff, Zugck, Doerr, Naegele, Störk, Butter, Sechtem, Angermann, Gola, Prondzinsky & Stangl, 2018; Mann, Chen, Chunara, Testa & Nov, 2020; McBain, Shipley & Newman, 2015).

Therefore, we must transition from a provider-centric health system where patients are passive recipients of care to a health ecosystem that empowers people, leveraging digital infrastructure and technology to support and enable greater participation in managing their health and promoting well-being, supported by healthcare teams as partners, i.e., a truly holistic participatory approach.

It's crucial to build a set of organisational and talent management abilities. The idea of ambidextrous organisations in health entails balancing the capacity to optimise existing processes while researching and verifying fresh, cutting-edge methods of care delivery. These organisations require more autonomy, agility, and the flexibility to adjust to the needs and expectations of professionals and patients while fostering talent management, attracting, retaining, and acquiring new skills.

1.2 E-Health Capability

Healthcare organisations' workplace cultures are shifting as e-Health is used more frequently to organise, produce, and provide healthcare (European Commission,2019). However, how can we actually comprehend the e-Health flow of information?

The e-Health Tree **(figure 2)** has roots, a trunk, branches, and fruits, just like a "real" tree, and in fact, according to Belliger & Krieger (2018) it can be the perfect metaphor to explain and understand the digital flow of the healthcare system (Belliger & Krieger, 2018). The Internet of Things (IoT) serves as an example of how the roots represents connectivity, or the potential to connect "everything to everything." Modern society is founded on "digital information and communication technology," which can transform closed systems into "open and flexible networks" with access to a wide variety of free information. The trunk comprises emerging new technologies as well as new standards and values, such as "transparency and authenticity" from all parties involved, including small businesses and individuals. This combination exemplifies the real shift in social norms and technology advancement.

Addittionally, the e-Health branches also bear fruit that can be translated as "new forms of communication and involvement," such as health apps, big data and predictive analytics, personalised treatment, new modes of communication between physicians and patients, among others. These are the outcomes of modern ideals and technology, as well as the flow of information and knowledge in the healthcare industry.

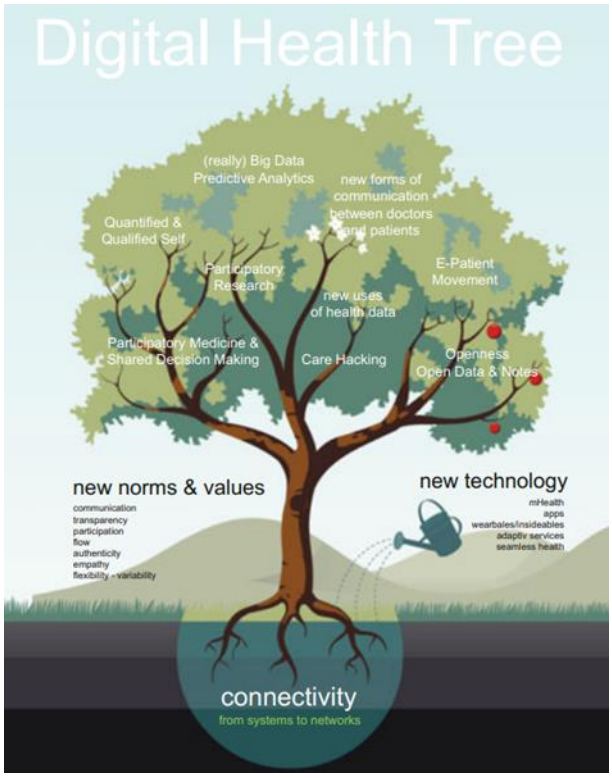

Figure 2: The e-Health Tree.
(Source: Belliger, A., & Krieger, D. J., 2018)

Thus, how can e-Health be defined? The conceptualization of e-Health, for instance, as provided by Shaw (2017), distinguishes three functions of e-Health: 'inform, monitor and track', covering the use of e-Health technologies to observe and study health parameters; 'interaction,' covering the use of e-Health to facilitate communication between all healthcare participants; 'data utilisation,' referring the collection, management, and use of health and medical data sources to inform medical decisionmaking and intervention development. Therefore, e-Health comprises communication technology that enables the interchange of information between primary and secondary care through big data and goes beyond mobile apps that can track a patient's behaviour or symptoms (Kleij et al.,2019). As such, e-Health the use of Information and Communication Technologies (ICTs) in support of health, i.e., it enhances health surveillance, health system management, health decision making, standardised sharing of health information.

In order to increase the effectiveness and efficiency of healthcare administration and delivery, it promotes equity in healthcare delivery (Olok, Yagos & Ovuga, 2015; Perera, 2012).

The growth of potential in medicine is made possible through digitization. Every aspect of medicine is influenced by the digital transition, from patient care to medical research (Foadi & Varghese, 2022). Physicians require a wide range of knowledge and skills concerning digital systems and tools in order to actively engage in the ongoing process of digital transformation and avoid playing a passive role (Foadi et al., 2022). To provide high-quality treatment, one must possess sufficient e-Health knowledge, skills, and related social and communication abilities, as well as the willingness and favourable attitudes toward e-Health (Keshta & Odeh, 2021; Olok et al.,2015).

The need for digital skills for health professionals is acknowledged at EU level, and several initiatives take it into account, such as: The Commission's eHealth Action Plan 2012-2020 (eHAP) (European Commission, 2019) that provides a roadmap to empower patients and health workers, and includes actions to promote skills and digital literacy; the CAMEI-project (Li, Bamidis, Konstantinidis, Traver, Car & Zary, 2019), which aims to increase IT skills in the curricula of healthcare workers by developing and renewing educational materials and programs of the healthcare workforce in the EU and the Unitesd States of America; and the Joint Action Health Workforce Planning and Forecasting (Joint Action on Health Workforce Planning and Forecasting. 2016) coordinated by Belgium and funded by the third EU Health Programme, brings together expertise from across Europe in an analysis of the health sector designed to define the skills needed in education and training policies (Fadi, Lenglet, Steen, Giedrojc, Filipe, Flordindi, Gohlar, Lim, Mao, Pastore, Schmidt & Vandame, 2016). But the majority of todays physicians has not received sufficient training on digital competencies (Fadi et al., 2016).

Different surveys and studies identified gaps in healthcare professional's knowledge. A survey among more than 200 healthcare professionals being conducted by the Digital Skills for Health Professionals Committee of the European Health Parliament revealed that 54% of the healthcare professionals reported to have received insufficient training, and therefore, skills in digital health (Fadi et al., 2016).

This fact is also supported by Clark (2009) , which was able to find that only 13.8% of nurses were able to comprehend and use telemedicine, and that only 25.9% of nurses assessed their knowledge of the concept of e-Health as good; a study by Kinnunen (2019)that was able to identify that nurses had very low e-Health competencies, particularly in the patient-related e-Health services, such as working in the digital healthcare environment and encouraging the patient to take advantage of the potential of electronic self-assessment and self-care, also stated the lack of e-Health competencies (Clark et al., 2009; Kinnunen et al., 2019).

A lack of digital competence can lead to medical errors and can weaken the willingness to use and implement new digital tools (Foadi et al.,2022).

1. 2.1 Capability Assessment

The concept of competence includes knowledge, abilities, performance, attitudes, and values, and it can be complicated and occasionally ambiguous (Jarva, Oikarinen, Andersson, Tuomikoski, Kääriäinen, Meriläinen. & Mikkonen, 2022). A holistic framework of professional competence was previously presented by Cheetham and Chivers (1998) and included five sets of competences: cognitive (including informal tacit knowledge, knowledge and understanding); functional (including skills and know-how); personal (behavioural competences); ethical (including appropriate personal and professional values); and meta-competences (including learning, reflection and the ability to cope with uncertainty) (Cheetham & Chivers, 1998). However, due to the digital transformation that has been evolving in the last years, there is not a professional competence without the digital concept. Thefore, in order to explore and determine the e-Health capability, several assesment questionnaires, such as the Digital Health Scale (Cassidy, 2021), the Single-Item Health Literacy Screener (SILS), (Morris et al., 2006), the ILS-PT (Espanha, 2016) and other scientific articles were considerable as eligible (Cassidy 2021; Espanha, Ávila & Mendes, 2016; Morris, MacLean, Chew & Littenberg, 2006). Therefore for the purpose of the thesis, we will define e-Health capability can be as:

i. Ability to process information

In order to make decisions about their healthcare, disease prevention, and strategies to promote healthy living, people need to be able to access, interpret, evaluate, and apply health information (Cassidy, 2021; Espanha et al., 2016; European Commision, 2017; Foadi et al., 2022; Morris et al., 2006).

This is known as health literacy. Four distinct ways of dealing with pertinent health information were identified, closely following the methodology used in the European Health Literacy Survey (HLS-EU): - The ability to access information; - The understanding of information; - The ability to interpret and evaluate information; - Its application or use in various contexts (Espanha et al., 2016; Norgaard, Furstrand, Klokker, Karnoe, Batterham, Kayser & Osborne, 2015).

ii. Engagement in own and others health

This domain included the basic knowledge about one's own and others health conditions (symptoms or needs), how to approach the healthcare system, as well as the approach to health in terms of will and responsibility. All of these imply that the person has an interest in learning about and managing their health (Cassidy, 2021; Espanha et al., 2016; European Commision, 2017; Foadi et al., 2022; Morris et al., 2006; Norgaard et al., 2015).

iii. Ability to actively engage with digital services

This conceptualization includes not only the fundamental knowledge and abilities related to using digital services, such as knowing how to use search engines, but also a crucial component on how to process information and data in the context of digital media, including the skills required to use these technologies in a healthcare setting (Cassidy, 2021; Foadi et al., 2022; Morris et al., 2006; Norgaard et al., 2015).

iv. Feel safe and in control

Healthcare data security is a significant issue that raises worries when utilising any digital tool, from feeling secure and trusting the system's source of information to having control over your own data and knowing what and how it will be used (Cassidy, 2021; Foadi et al., 2022; Norgaard et al., 2015).

v. Motivated to engage with digital services

This concept was gauged through data about the motivations for using e-Health, with a focus on the advantages associated with use, but also encompassing attitudes like curiosity, bravery, enjoyment, and a sense of closeness and comfort as driving forces for using digital services (Cassidy, 2021; Foadi et al., 2022; Norgaard et al., 2015).

vi. Digital Services that suit individuals needs

The interaction between the individual and the system includes key-factors such as: the user interface; understandbility of the data collected and its meaning; the benefits that the service can bring to the user and the ability to bring a better management and support of the individuals' health (Cassidy, 2021; Norgaard et al., 2015).

vii. Self assessment of e-Health skills

Digital health skills of healthcare professionals is a crucial component of efficient and effective transformation of health care. The future doctors and nurses should become more knowledgeable about the potential of e-Health solutions, be conscious of their own limitations, and exercise caution when relying too heavily on technology.

The healthcare professionals need to comprehend the terms and definitions used in the context of e-Health while also learning new communication techniques with patients and other medical personnel. They should be aware of their patients' level of digital literacy and recognise that they can play a part in empowering patients to use digital technologies to better manage their own health. Additionally, these healthcare professionals should understand that how they use digital health technologies will determine how effectively medicine is transformed by technology (Comité Permanent Des Médecins Européens, 2020).

1. 2.2 Motivation

Depending on its nature, motivation can be either automatic or reflective. According to literature, automatic motivation, as it's name suggests, refers to processes including emotional reactions, desires (wants and needs), impulses, inhibitions, drive states, and reflex responses rather than thought-through, purposeful processes. Antagonistically, reflective motivation includes processes involving plans (self-conscious intentions) and evaluations (beliefs about what is good and bad) (McDonagh, Saunders, Cassell, Curtis, Bastaki, Hartney & Rait, 2018; Michie, Stralen & West, 2011).

Therefore, this research concentrates on acquiring empirical information about the relationship between motivation and usage. If significant associations are found to persist, efforts must be made to promote positive attitudes toward digital health. It must also be determined whether giving people the chance to use health technology in situations where they are supported is a worthwhile strategy for boosting attitudes and encouraging adoption of digital health. As a result, this present investigation includes the viewpoints of healthcare professionals.

i. Automatic Motivation

Individual's motivation has been highlighted as another factor with the potential to slow down or prevent the introduction of digital health (Cassidy, 2021; European Commision, 2017; Norgaard et al., 2015).

According to Mcleod (2018), the strength with which an attitude is held is often a good predictor of behavior. The stronger the attitude the more likely it should affect behavior . The following factors contribute to attitude strength: importance and personal relevance (how significant the attitude is for the individual and how it relates to self-interest, social identification, and value); high individual self-interest (i.e., it is held by a group the individual is a member of or would like to be a member of, and is related to a person's values) Mcleod (2018). As a result, a person's behaviour will be strongly influenced by their attitude, which will also affect their motivation and topic knowledge.

On the other hand, a study conducted by Keshta & Odeh (2021) assessed that an intervention based on the COM-B model could enhance healthcare professionals' e-Health knowledge and skills but may overlook the efforts to address their negative attitudes towards digitalization (Keshta & Odeh, 2021; Michie et al., 2011). This finding suggests that an intervention that successfully enhances capability may not have enough of an impact on enhancing motivation, which is equally important for competent e-Health. The motivation of physicians and nurses with regard to this issue must be evaluated in light of their perspectives about the application of digital technology in healthcare, in order to address this factor.

It is also noticed that there is, however, often significant frustration around digital. Healthcare professionals frequently express concern that expenditures in technology don't always translate into benefits, according to Magalhães (2022) and Iyanna (2022) (Iyanna, Kaur, Ractham, Talwar & Najmul, 2022; Magalhães, 2022). This fact is reinforced by Keshta & Odeh (2021), which gauged that after providing the necessary training and knowledge on e-Health tools, there wasn't observed any significant difference in automatic motivation (Keshta & Odeh, 2021). However, contradicting evidence was shown on a study conducted on 849 nurses, in which when asked if they felt motivated to handle e-Health solutions related to their professional work, nurses declared that they would "rather yes" (43.5%) and "yes" (28.3%) (Bartosiewicz, Burzyńska & Januszewicz, 2021).

The positive effect on the handle of e-Health solutions in clinical practice was also shown on doctors (Glock, Nymberg, Bolmsjö, Holm, Calling, Wolff & Pikkemaat, 2021; Wilt, Versluis, Goedhart, Talboom-Kamp & van Delft, 2020).

In order to investigate the automatic motivation, it is necessary to assess the motivation of doctors and nurses towards the adoption of e-Health in their clinical practises in light of their perspectives

ii. Reflective Atittudes

Having sufficient time for digital tools in work was emphasized in the literature that was analysed. Healthcare professionals experienced that use of digital tools increased their daily workload and increased processes and bureaucratic tasks (Carlqvist, Hagerman, Fellesson, Ekstedt & Hellström, 2021; Magalhães, 2022). In contrast, evidence shows that some healthcare professionals feel that the adoption of digital tools in their daily workload don't require additional time and that they prefer to use this tools in clinical practice; suggesting that if there is a benefical relationship in the use of digital tools and workload, they would use e-Health tools more often (Zaman, Hossain, Ahammed & Ahmed, 2017).

1. 2.3 Opportunity

According to the study conducted by Virtanen (2021), if an intervention is successful in igniting participants' desire for professional growth in e-Health, it may result in longer-term advantages. Techniques for achieving this emphasise the significance of the social environment, specifically the empathy, participatory approach, encouragement, adequate e-Health equipment and e-Health support and training demonstrated by skilled coworkers (Virtanen, Kaihlanen, Laukka, Gluschkoff & Heponiemi, 2021).

Hence, if doctors and nurses have the opportunity to learn how to use data and technology confidently, they can foster self-belief in their abilities and therefore motivation to use new approaches.

1. 2.4 Patient Enpowerment

Substantial proliferation of e-Health has enabled a move in patient-centred care from the traditional in-person care model to real-time, dynamic, and technology supported on-demand care. However, in general, the uptake of these innovations is low.

Studies show that e-Health is helpful in providing patient empowerment through e.g. providing high quality and timely information, enabling self-monitoring and shared decision making, but dropout rates are high and guidance for optimal implementation is lacking (Penedo, Oswald, Kronenfeld, Garcia, Cella & Yanez, 2018).

Therefore, it is important to explore and determine what recommendations are being taken during the doctor/ nurse contact with patients, ir order to increase the use of digital tools. The study conducted by Bartosiewicz (2021) on nurses gauged that nurses most often recommend obtaining laboratory test results and arranging medical appointments via the Internet in their daily work (Bartosiewicz, Burzyńska & Januszewicz, 2021). They would advise using a mobile application that served as a knowledge base on health-related subjects, an application that served as a medicine reminder, and an application that allowed for video consultations with a doctor, nurse, or midwife. A fifth of the nurses questioned did not encourage the use of mobile applications that facilitate test analysis, and one-fourth of respondents did not think that video consultations should be offered to patients.

Reaching a more holistic and systematic understanding of the patient empowerment process through the healthcare professional's recommendations may help in tailoring e-Health interventions to be tuned to patient needs and priorities.

Doctors and nurses need several competences to integrate digitalization in their daily work, which include motivating and guiding patients in the use of digital health and e-Health tools. Healthcare professional's capibility in digitalization has been previously described as consisting of sufficient skills in using digital technology to provide highquality ethical patient care, social and communication skills to use digital technology in health prevention, diagnoses and treatment, willingness and motivation to apply digital technology in a professional context, and collegial and organizational support to enhance positive experiences in digitalization. However, the previous literature suggests that there are other dimensions that need to be taking into consideration when looking at this process, such as the opportunity and motivation. Healthcare Organisations should give more emphasis on exposing doctors and nurses to various digital health possibilities to increase familiarity, interest and user experience, which are suggested to perceived the increase of digital health competence, knowledge and attitudes.

II. METHODOLOGY

2.1 Research Design

The present study is a exploratory- descriptive case study with a quantitative aproach and a cross-sectional design, in which the researcher is going to explore and analyse the attitudes of doctors and nurses towards e-health solutions in Centro Hospitalar Universitário do Porto. Since the study uses questionnaires as a primary data collection tool in survey research, it will provide data and information with deductive characteristics, i.e. it will be possible to assess if the variables under study relate to each other, whether or not they affect different populational groups and its characteristics (Leavy, 2017; Mills, Eurepos & Wiebe, 2010).

Therefore, and as a result of following a cross-sectional design or social survey design, the researcher will be able to collect a body of quantitative data in conection with two or more variables, which are then examined to detect patterns of association (Bryman & Bell, 2016; Leavy, 2017; Mills, Eurepos & Wiebe, 2010). Thus, the present study aims to evaluate the knowledge and attitudes of doctors and nurses towards e-health solutions as well as their willingness to communicate about e-Health to their patients, by exploring the following hypothesis:

- **Ha:** If a doctor /nurse has e-Health capabilities, they will be more motivated in using e-Health tools and therefore use more often e-Health tools in their clinical practice;
- **Hb:** If a doctor/nurse has the opportunity to improve their e-Health capabilities, they will have better e-Health skills and therefore use more often e-Health tools in their clinical practice;
- **Hc:** If a doctor/nurse has the motivation to use e-Health tools in their clinical practice, they will increase their e-Health capabilities and therefore use more often e-Health tools in their clinical practice;
- **Hd:** If a doctor/nurse has e-Health competence, they will be more willing to communicate about e-Health to their patients.

2.2 Description of Centro Hospitalar Universitário do Porto

The present case study was carried out at the Centro Hospitalar Universitário do Porto. This Hospital Centre is composed of four Hospital units:

- Hospital Geral de Santo António;
- Centro Materno-Infantil do Norte Dr. Albino Aroso;
- Centro de Genética Médica Doutor Jacinto Magalhães;
- Centro Integrado de Cirurgia de Ambulatório;

The Centro Hospitalar Universitário do Porto (CHUP) is integrated in the Portuguese National Health System network, thus being part of the Admnistração Regional de Saúde do Norte. CHUP is a differentiated hospital centre that has the capacity to respond to about 3 000 000 inhabitants, having in its area of influence all the parishes of the city of Porto, with the exception of Bonfim, Paranhos and Campanhã, and the municipality of Gondomar. CHUP is also a reference to the population of the districts of Bragança and Vila Real, the municipalities of Amarante, Baião and Marco de Canaveses of the district of Porto and the south municipalities of Douro belonging to the northern part of the districts of Aveiro and Viseu (Centro Hospitalar Universitário do Porto,2021).

With 848 inpatient beds, CHUP is the third-largest reference facility on a national scale. Additionally, the Ministry of Health has designated CHUP as a National Reference Center in 16 areas of Priority Intervention: refractory epilepsy; familial amyloidosis; liver transplantation; pancreas transplantation; hereditary diseases of metabolism; adult oncology (treatment of testicular cancer, sarcomas of the bone and soft tissues, rectal cancer, hepatobiliary pancreatic cancer, kidney transplantation); pediatric renal transplantation; esophageal cancer; cystic fibrosis; congenital coagulopathies; interventional neuroradiology for cerebrovascular illness and cochlear implants (Centro Hospitalar Universitário do Porto,2021). When considering the human capital, CHUP in the year of 2021 had 4755 workers, of which 1574 were nurses (33,10%) and were 1267 doctors (26,64%).

Since 2019, the age distribution of patients seen in the CE has not changed noticeably: those over 65 years old account for one-fourth of the total, which is consistent with the ageing index of the local population in CHUP's reference region.

However, if the range of ages from 15 to 65 is taken into consideration, it will represent 58% of the overall mobility in this medical service.

In 2021 compared to 2020, there were 64,035 more medical consultations, a 9.8% rise (n=718 979 consultations). To account for this change, first (n=175 272 consultations) and subsequent consultations (n=543 707 consultations) both increased by 17.8% (+26,535 consultations) and 7.4% (+37,500 consultations), respectively. Moreover, a remarkable initiative was taken by the CHUP to provide telemedicine consultations, which accounted for 1.5% of the first consultations conducted in the same year. Despite being hampered by the COVID-19 pandemic, activity in 2021 nonetheless outpaced that of 2019 by 17,733 extra medical consultations (Centro Hospitalar Universitário do Porto,2021).

In July 2021, the Centro Hospitalar Universitário do Porto presented the "CHUPorto" application to its users as part of the introduction of new digital tools that support the user. As far as adherence to this application is concerned, 50 000 useres were registered in October of the present year.

The single sign-on application enables the patient to:

a) Review the details of your interactions with CHUPorto in the past;
b) Look at their personal agenda to see if there are any appointments or tests;
c) Request the rescheduling or cancellation of their scheduled appointment and/or test;
d) Receive notifications about upcoming appointments;
e) Request attendance records for the user and/or the accompanying person;
f) View unpaid fees;
g) View details on the appointment and/or examination venue.
h) Provide informative details about CHUPorto.

2.3 Target Population and Sampling Technique

The target population of the present study are the doctors and nurses that provide assistance in the External Consultation Service of Centro Hospitalar Universitário do Porto. Regarding the sampling technique, a non-probablistic by convenience sampling design was selected (Bryman & Bell, 2016; Stratton, 2022; Taherdoost, 2020).

2.4 Data Collection

i. Questionnaire development

Appropriate authorisations were requested to conduct the study in the external consultation of the CHUP. The documentation was sent to the Ethics Committee for Health along with the study protocol, data protection form, and questionnaire to be given to the participants after receiving the favourable opinion of the Director of the external consultation, Doctor Castro Poças, with knowledge of the investigator's Supervisor, Dra. Rita Veloso, a member of the Board of Directors of the CHUP. Following this procedure, a formal affirmative judgement was given.

The literature found supported the elaboration of the questionnaire. The questions were elaborated first in English and later in portuguese, the main language of the respondents. The questionnaire was developed in May 2022 and distributed in October 2022 via online intramail with the colaboration of the CHUP.

Eligible participants in the present study included nurses (n=1639) and doctors (n=1340) who practised medical activity at the external consultation service of CHUP.

The central model created for this questionnaire can be shown as a matrix of eleven cells (subdimensions) that places the three factors—Capability, Motivation, and Opportunity—that may affect knowledge and attitudes towards e-health. Patient empowerment and the socio-demographics, which will be analysed through their characterization, are two variables that are independently examined from the ones already discussed.

The questionnaire was divided into five sections, has shows on **table 1:**

a) **Capability-** It aims on acquiring empirical information about the knowledge, abilities, performance, attitudes, and values in e-Health. For the purpose of this thesis, "*capability*" will be classied as: "*positive capability*" that supports decisive action; "*negative capability*" that supports reflective inaction, that is, the ability to resist dispersing into defensive routines when leading at the limits of one's knowledge, resources and trust (Sievers & International Society for the Psychoanalytic Study of Organizations. 2009; Simpson, French. & Harvey, 2002).
b) **Motivation-** Focus on acquiring information about the relationship between motivation and usage. For the purpose of this thesis, "*motivation"* will be classied as: *"positive motivation"* if autonomous motivation exists; "*negative motivation*" if controlled motivation and especially amotivation exists (Deutsch, Smith, Kordts-Freudinger & Reichardt, 2015; Gillet, Vallerand, Lafrenière & Bureau, 2013). If significant associations are found to persist, efforts must be made to promote positive attitudes toward digital health (Deutch et al., 2015; Gillet et al., 2013).

c) **Opportunity -** The ideal physical and social setting that promotes behaviour is referred to as an opportunity. This section evaluates the two components mentioned before and how they relate to the primary variable being investigated.

d) **Patient Enpowerment-** The use of e-health solutions in daily work is examined in this section, along with the recommendations made to patients in this regard.

e) **Socio- Demographics-** In the final section, socio-demographics were used in order to described and divided into various groups.a exploratory- descriptive case study with a quantitative aproach and a cross-sectional design, in which the researcher is going to explore and analyse the attitudes of doctors and nurses towards e-health solutions in Centro Hospitalar Universitário do Porto.

Table 1- Questionnaire of the present study.

Broad Topic	Specific Topic	Author (Year)		Questions
Capability	Ability to process information	Cassidy, 2021; Espanha et al., 2016; European Commission, 2017; Foadi et al.,2022; Morris et al., 2006; Norgaard et al.,2015	**Please mark your level of agreement with each of the following statements, on a scale of 1 meaning strongly disagree and 5 meaning strongly agree.**	**Q1.** It is difficult for me to find information on the internet about healthy behaviours, such as a balanced diet and exercise.
	Engagement in own and others health			**Q2.** I can use the internet to solve and research for medical informations that are related to my health and/or that of my family members.
	Ability to actively engage with digital services	Cassidy, 2021; European Commission, 2017; Foadi et al.,2022; Norgaard et al.,2015		**Q3.** I can make medical appointments via computer or by the Hospital's mobile application.
				Q4. I prefer to receive medical prescriptions by message (SMS) or email.
	Feel safe and in control			**Q5.** I am concerned that digital technologies will jeopardise the privacy of my health data.
	Motivated to engage with digital services	Cassidy, 2021; Foadi et al.,2022; Norgaard et al.,2015		**Q6.** I don't like using digital health technologies.
				Q7. Medical appointments by phone or video call are as good as face-to-face appointments.
				Q8. I feel that digital health technologies allow me to be more proactive and autonomous in my health, and that they enable me to have a better management and control of my diseases.
	Digital Services that suit individuals needs	Cassidy, 2021; Norgaard et al.,2015		**Q9.** I use wearable devices and apps to monitor my health, such as a smartwatch.
	Self Assessment of e-health skills	CPME, 2020		**Q10.** How would you rate your digital skills?
Motivation	Automatic	Cassidy, 2021; European Commission, 2017; Norgaard et al.,2015 Virtanen et al., 2021		**Q11.** The use of digital technologies has improved healthcare.
		Bartosiewicz et al., 2021; Magalhães,T. 2021; Virtanen et al., 2021		**Q12.** I am frustrated with the adoption of e-Health tools in my daily clinical practice.
	Reflective Attitudes	Virtanen et al., 2021		**Q13.** If I have the possibility, I prefer to use e-Health tools in my clinical practice.
		Carlqvist et al., 2021; Virtanen et al., 2021; Zaman et al., 2017		**Q14.** Using e-Health tools allows me to have more time to perform other tasks.
		Magalhães,T. 2021.		**Q15**. The use of digital means in my clinical practice only contributes to the increase of processes and bureaucratic tasks.

Table 1- Questionnaire of the present study (continuation).

Broad Topic	Specific Topic	Author (Year)		Questions
Opportunity	Social Intervention	Virtanen et al., 2021	**Please mark your level of agreement with each of the following statements, on a scale of 1 meaning strongly disagree and 5 meaning strongly agree.**	**Q16**. If there was a participatory approach between me and my Organisation, I would be willing to use e-Health tools more often in my clinical practice.
	Physical Intervention			**Q17.** If my Organisation provided better equipment, I would use e-Health tools more often.
				Q18. If my Organisation provided training and support in the adoption of e-Health tools, I would use these more frequently.
Patient enpowerment	Patient Recommendations	Bartosiewicz et al., 2021	**Please select whether you currently recommend, will recommend in the future or would not recommend the following e-Health solutions.**	**Q19**. Remote monitoring of basic physiological and biochemical parameters (heart pressure, body temperature and glucose level).
				Q20. Receiving laboratory test results via internet.
				Q21. Arranging medical appoitments via the Internet or by using the Hospital's mobile application.
				Q22. Using a mobile application that is a knowledge base on health-related topics.
				Q23. Using a mobile application that reminds to take the medication.
				Q24. Using video-consultation to support the clinical process.
	Patient-Clinician Relationship		**Please select how often you have carried out each of the following actions in the last three days of your work.**	**Q25.** Do you feel that it is part of your role to promote digital literacy and the use of e-Health tools with your patients?
				Q26. What is the percentage of your appointment time that you allocate to answering digital questions from your patients?
				Q27. If you had more time during your clinical practice, would you encourage your patient to use digital means?
				Q28. In the three days of your job, how often did you assist your patient in booking an appointment via the Hospital app.
				Q29. In the last three days of your job, how often did you assist your patient in using a prescription via SMS.
				Q30. In the last three days of your job, how often did you assist your patient in requesting a video-consultation.
				Q31. In the last three days of your job, how often did you assist your patient into use wereable devices.
Socio-Demographics	N/A*	Arriaga et al., 2022; Espanha et al., 2016	**Please select your response.**	**Q32**. What is your age?
				Q33.What is your gender?
				Q34. What is your academic degree?
				Q35. What is your professional classification?

*N/A= Not Applicable

ii. Statistical analysis and technological instruments

By using the Qualtrics platform, the responses were gathered. Before the questionnaire was filled out, it was given information on the study's goals, the required steps, and the voluntary nature of completion. It was also protected the confidentiality and anonymity of all the data gathered through this process. The Statistical Packages for the Social Sciences (SPSS) (version 28) programme was then used to analyse the data. The evaluation of independence/association, differences and correlation between variables was carried out (after verification of applicability conditions) using the normality tests (Kolmogorov-Smirnov), Kruskal- Wallis test and Spearman's correlation coefficient.

III. DATA ANALYSIS AND RESULTS

A total of 200 answers were obtained, of which, after verification the existence of incomplete forms, 131 answers were considered as the sample.

3.1 Socio-demographic description

In the present study, 63.40% of the participants were nurses and 36.60% were doctors,of which 84.40% of nurses were women while 70.80% of doctors were men.

Regarding academic qualifications, 66.40% of the participants had a Bachelor's degree, followed by 28.20% that had a Master's degree and only 5.30% had a PhD. The sample's mean age was 43 years old, with 87.00% of the participants between the ages of 20 years old and 64 years old, of which the remaining total being above 65 years old. Additionnaly, the youngest participant was 23 years old, while the oldest was 69 years old, according to **table 2**.

Table 2: Respondents' socio-demographic description.

	Doctors	Nurses		
	N	**N**	**N**	**% Total**
Total	48	83	131	**100%**
Gender				
Female	31	76	107	**81,70%**
Male	17	7	24	**18,30%**
Other	0	0	0	**0,00%**
Age Group				
≤19	0	0	0	**0,00%**
20-64	37	77	114	**87,00%**
≥65	11	6	17	**13,00%**
Academic Degree				
Bachelor	29	58	87	**66,40%**
Master	12	25	37	**28,20%**
PhD	7	0	7	**5,30%**

3.2 Capability

In order to explore and analyse the data obtained through the implemented questionnaire, the normality of the variables under study was verified:

H0: The distribution of capacity is equal to the normal distribution;

H1: The distribution of capacity is not equal to the normal distribution.

Considering the sample size of the present study (n=131), the normality of the sample was assessed by using the Kolmogorov-Smirnov test. The data point to the rejection of H0 (sig < 0.05), p < 0.01, thus there is evidence to state that the variable, "*Capability*", may not come from a normal population. In order to continue the investigation, two additional variables—"*Positive Capability"* and "*Negative Capability*"—were created and used to group all linked variables in accordance with the components' natures and examine them as dimensions. The data shows the rejection of H0 (sig < 0.05), indicating that there is evidence to claim that the distribution of the variables, "*capability*" (positive and negative), does not correspond to a normal distribution, as shown in **Table 3:**

Table 3: Summary of Hypothesis Testing (Positive Capability and Negative Capability).

Hypothesis testing: Capability			
H0	Test (a)	Sig	Decision
The distribution of the positive capability is equal to the normal distribution.	Kolmogorov-Smirnov test	0,02	Rejection of H0
The distribution of the negative capability is equal to the normal distribution.		<0,01	

a. Lilliefors Significance Correlation
Significance level of 0.05

The Kruskal-Wallis test of independence was conducted to determine whether the dimensions under research were independent from the professional classification, as indicated in **table 4**:

Table 4: Summary of hypothesis test (Positive Capability and Negative Capability: Kruskal-Wallis Test of independent samples).

Hypothesis testing: Capability			
H0	Test	Sig	Decision
The distribution of the positive capability is independent of the professional category.	Independent- Samples Kruskal-Wallis test	0,445	Non-Rejection of H0
The distribution of the neagtive capability is independent of the professional category.		0,636	

Significance level of 0.05

It was verified that, the data points to the non-rejection of Ho, H(1) = 0.582, p= 0.445 and H(1) = 0.225, p= 0.636, thus, there is no evidence to state that the professional classification influences the positive and negative "*capability*", respectively.

Considering the varibale "*Negative Capability* ",59,50% of respondents strongly disagree on the difficulty to find information on the internet about healthy behaviours, such as a balanced diet and exercise **(Q1)**. If we consider safety and feel in control **(Q5)**, 40,50% of the participants agree that digital technologies will jeopardise the privacy of their health data. Additionaly, 55,00% of the present sample stated that they strongly disagree with not liking to use digital health technologies **(Q6)**, as shows in **table 5**.

Table 5: Respondents' Negative Capability description.

	Please mark your level of agreement with each of the following statements, on a scale of 1 meaning strongly disagree and 5 meaning strongly agree.				
Questions:	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
Q1. It is difficult for me to find information on the internet about healthy behaviours, such as a balanced diet and exercise.	**59,50%**	**29,80%**	**5,30%**	**4,60%**	**0,80%**
Q5. I am concerned that digital technologies will jeopardise the privacy of my health data.	**11,50%**	**16,80%**	**14,50%**	**40,50%**	**16,70%**
Q6. I don't like using digital health technologies.	**55,00%**	**32,80%**	**4,60%**	**6,10%**	**1,50%**

If "*Positive Capability*" is consider, 42,70% agree that they can use the internet to solve and research for medical informations that are related to their health and/or that of their family members **(Q2)**. When considering the capability of making medical appointments via computer or by the Hospital's mobile application **(Q3)**, 33,60% strongly agree that they are capable of.

It was gauged that 74,80% of the participants prefer to receive medical prescriptions by message (SMS) or email **(Q4)**.

Regarding telemedicine, 36,60% of the respondents disagree that medical appointments by phone or video call are as good as face-to-face appointments **(Q7)**. This tendency of disagreement follows the use of apps and wearable devices to monitor health, of which 36,60% of the participants strongly disagree that they use these tools to monitor health **(Q9)**.

It was gauged that 74,80% of the participants strongly agree that digital health technologies allow them to be more proactive and autonomous in their health, and that it enable them to have a better management and control of their diseases **(Q8)**, according to **table 6**.

Table 6: Respondents' Positive Capability description.

	Please mark your level of agreement with each of the following statements, on a scale of 1 meaning strongly disagree and 5 meaning strongly agree.				
Questions:	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
Q2. I can use the internet to solve and research for medical informations that are related to my health and/or that of my family members.	**3,10%**	**9,90%**	**6,10%**	**42,70%**	**38,20%**
Q3. I can make medical appointments via computer or by the Hospital's mobile application.	**13,00%**	**7,60%**	**13,70%**	**32,10%**	**33,60%**
Q4. I prefer to receive medical prescriptions by message (SMS) or email.	**0,80%**	**3,10%**	**5,30%**	**16,00%**	**74,80%**
Q7. Medical appointments by phone or video call are as good as face-to-face appointments.	**27,50%**	**36,60%**	**13,70%**	**19,10%**	**3,10%**
Q8. I feel that digital health technologies allow me to be more proactive and autonomous in my health, and that they enable me to have a better management and control of my diseases.	**0,80%**	**3,10%**	**5,30%**	**16,00%**	**74,80%**
Q9. I use wearable apps and devices to monitor my health, such as a smartwatch.	**36,60%**	**14,50%**	**8,40%**	**21,40%**	**19,10%**

Lastly, 36,20% of doctors and 63,80% of nurses consider their digital skills as good **(Q10)**.

3.3 Motivation

The normality of the sample was assessed by using the Kolmogorov-Smirnov test. The data point to the rejection of H0 (sig < 0.05), p < 0.01, thus there is evidence to state that the variable, "*motivation*", may not come from a normal population. In order to continue the investigation, two additional variables—"*Positive Motivation*" and "*Negative Motivation*"—were created. The data shows the rejection of H0 (sig = 0.05), indicating that there is evidence to support that the distribution of the variables, "*motivation*" (positive and negative), does not correspond to the normal distribution, as shown in **Table 7**:

Table 7: Summary of Hypothesis Testing (Positive Motivation and Negative Motivation).

Hypothesis testing: Motivation			
H0	Test (a)	Sig	Decision
The distribution of the positive motivation is equal to the normal distribution.	Kolmogorov-Smirnov test	<0,01	Rejection of H0
The distribution of the negative motivation is equal to the normal distribution.		<0,01	

a. Lilliefors Significance Correlation
Significance level of 0.05

The Kruskal-Wallis test of independence was conducted to determine whether the dimensions under research were independent from the professional classification, as indicated in **table 8:**

Table 8: Summary of hypothesis test (Positive Motivation and Negative Motivation: Kruskal-Wallis Test of independent samples).

Hypothesis testing: Motivation			
H0	Test	Sig	Decision
The distribution of the positive motivation is independent of the professional category.	Independent- Samples Kruskal-Wallis test	0,87	Non-Rejection of H0
The distribution of the negative motivation is not independent of the professional category.		0,87	

Significance level of 0.05

It was verified that, the data point to the non-rejection of Ho, H(1) = 0,027, p= 0,870 and H(1) = 0,027, p= 0,870, thus, there is no evidence to state that the professional classification influences the positive and negative motivation, respectively.

"*Positive Motivation*" shows that 51,10% of the participants agree that the use of digital technologies has improved healthcare **(Q11).** It was gauged that 44,30% of the healthcare professionals also agree that they would use e-Health tools in their clinical practice if they had the possibility **(Q13)**. The tendency of agreement was also shown in question 14, where 32,10% agreed that using e-Health tools allows them to have more time to perform other tasks, as shows on **table 9:**

Table 9: Respondents' Positive Motivation description.

	Please mark your level of agreement with each of the following statements, on a scale of 1 meaning strongly disagree and 5 meaning strongly agree.				
Questions:	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
Q11. The use of digital technologies has improved healthcare.	**0,00%**	**10,70%**	**11,50%**	**51,10%**	**26,70%**
Q13. If I have the possibility, I prefer to use e-Health tools in my clinical practice.	**3,10%**	**10,60%**	**23,70%**	**44.30%**	**18,30%**
Q14. Using e-Health tools allows me to have more time to perform other tasks.	**12,20%**	**29,00%**	**22,10%**	**32,10%**	**4,60%**

"*Negative Motivation*" shows that 33,60% of the participants disagree that they are frustrated with the adoption of e-Health tools in their my daily clinical practice **(Q12)**. There wasn't a consensus on **question 15**, regarding the feeling that using digital means in clinical practice only contributes to the increase of processes and bureaucratic tasks, as shows on **table 10**:

Table 10: Respondents' Negative Motivation description.

	Please mark your level of agreement with each of the following statements, on a scale of 1 meaning strongly disagree and 5 meaning strongly agree.				
Questions:	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
Q12. I am frustrated with the adoption of e-Health tools in my daily clinical practice.	**28,20%**	**33,60%**	**23,70%**	**13,00%**	**1,50%**
Q15. The use of digital means in my clinical practice only contributes to the increase of processes and bureaucratic tasks.	**20,60%**	**29,00%**	**18,30%**	**29,00%**	**3,10%**

3.4 Opportunity

The normality of the sample was assessed by using the Kolmogorov-Smirnov test. The data point to the rejection of H0 (sig < 0.05), p < 0.01, thus there is evidence to state that the variable, opportunity, does not come from a normal population, as shows in **Table 11:**

Table 11: Summary of Hypothesis Testing (Opportunity).

Hypothesis testing: Opportunity			
H0	Test (a)	Sig	Decision
The distribution of the opportunity is equal to the normal distribution.	Kolmogorov-Smirnov test	<0,01	Rejection of H0

a. Lilliefors Significance Correlation
Significance level of 0.05

The Kruskal-Wallis test was conducted to determine whether the dimension under research was independent from the professional classification, as indicated in **table 12:**

Table 12: Summary of hypothesis test (Opportunity: Kruskal-Wallis Test of independent samples).

Hypothesis testing: Opportunity			
H0	Test	Sig	Decision
The distribution of the opportunity is independent of the professional category.	Independent- Samples Kruskal-Wallis test	0,361	Non-Rejection of H0

Significance level of 0.05

It was verified that the data points to the non-rejection of Ho, H(1) = 0,836, p= 0,361, therefore there is no evidence to state that the professional classification influences the opportunity.

The variable "*Opportunity*", shows that 46,60% of respondents agree that if there was a participatory approach between them and their Organisation, they would be willing to use e-Health tools more often in their clinical practice **(Q16)**. Better equipment also shows relevance when choosing to use an e-Health tool on their clinical practice (43,50% agree) **(Q17)**. Additionaly, despite of having 32,10% of agreement that if the Organisation provided training and support in the adoption of e-Health tools, the healthcare professionals would use these more frequently **(Q18)**, data does not shows consensus in this variable, as shows on **table 13**:

Table 13: Respondents' Negative Opportunity description.

	Please mark your level of agreement with each of the following statements, on a scale of 1 meaning strongly disagree and 5 meaning strongly agree.				
Questions:	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
Q16. If there was a participatory approach between me and my Organisation, I would be willing to use e-Health tools more often in my clinical practice.	**1,50%**	**4,60%**	**19,80%**	**46,60%**	**27,50%**
Q17. If my Organisation provided better equipment, I would use e-Health tools more often.	**0,80%**	**4,60%**	**12,20%**	**43,50%**	**38,90%**
Q18. If my Organisation provided training and support in the adoption of e-Health tools, I would use these more frequently.	**12,20%**	**29,00%**	**22,10%**	**32,10%**	**4,60%**

In order to answer to the first research question (Are capability, Motivation and opportuniy related to eachother?), Spearman's test was performed in order to assess the correlation between variables, according to **table 14:**

Table 14: Spearman correlation coefficient (Correlation between variables)

	Hypothesis testing: Spearman's correlation			
Variables	Spearman's rho	sig (2-tailed)	H0	Decision
Negative Capibility - Negative Motivation	0,422**	<0,001	The negative capability of doctors and nurses to use e-Health tools is independent of the negative motivation.	Rejection of H0
Negative Capibility - Opportunity	-0,293**	<0,001	The negative capability of doctors and nurses to use e-Health tools is independent of the opportunity	Rejection of H0
Negative Motivation - Opportunity	-0,331**	<0,001	The negative motivation of doctors and nurses to use e-Health tools is independent of the opportunity	Rejection of H0
Opportunity- Positive Capability	0,461**	<0,001	The opportunity of doctors and nurses to use e-Health tools is independent of the positive capability.	Rejection of H0
Opportunity- Positive Motivation	0,479**	<0,001	The opportunity of doctors and nurses to use e-Health tools is independent of the positive motivation.	Rejection of H0
Positive Capability- Positive Motivation	0,340**	<0,001	The positive capability of doctors and nurses to use e-Health tools is independent of the positive motivation.	Rejection of H0

**.The correlation is significant at the 0.01 level (2 extremities).

Spearman's ρ coefficient varies between -1 and 1, the closer these extremes are, the greater the association between the variables. A Spearman's correlation was run to determine the relationship between "*Negative Capability*"-"*Negative Motivation*", in which there was a moderate, positive monotonic correlation between the previous described variables (ρ = 0,422, n = 131, p < .001). When correlating the "*Negative Capability*"-"*Opportunity*", there was a gauged a weak negative monotonic correlation (ρ = -0,293, n = 131, p < .001), meaning that if one of the variables increase, the other follows the inverse tendency. On the correlation between "*Negative Motivation*"-"*Opportunity*", it was shown a weak negative monotonic correlation (ρ = -0,331, n = 131, p < .001) (Schober & Schwarte, 2018).

The relationship between "*Opportunity"-"Positive Capability"* shows a moderate positive monotonic correlation (ρ = 0,461, n = 131, p < .001). The correlation between *"Opportunity"-"Positive Motivation"* shows a moderate positive monotonic correlation (ρ = 0,479, n = 131, p < .001). Lastly, *"Positive Capability" - "Positive Motivation"* shows a weak positive monotonic correlation (ρ = 0,340, n = 131, p < .001) (Schober & Schwarte, 2018).To summarise the information previously described, the adaptation of the model under study was developed as shown in **figure 3:**

Figure 3: Correlation between the variables in study according to the Spearman's ρ coefficient
(Source: The author.)

3.5 Patient Enpowerment

The Kruskal- Wallis test was conducted to determine whether "*Patient enpowerment*" was independent from professional classification, as indicated in **table 15:**

Table 15: Summary of hypothesis test (Patient Enpowerment: Kruskal-Wallis Test of independent samples).

Hypothesis testing: Patient Enpowerment			
H0	Test	Sig	Decision
The distribution of the patient enpowerment is independent of the professional category.	Independent- Samples Kruskal-Wallis test	0,212	Non-Rejection of H0

Significance level of 0.05

It was verified the non-rejection of Ho, H(1) = 1,555, p= 0,212, therefore there is no evidence to state that the professional classification influences the opportunity.

The surveyed doctors and nurses most often recommend obtaining laboratory test results (64,90% currently recommend) **(Q20)** and arranging medical appointments via the Internet or by using the Hospital's mobile application (60,30% currently recommend) **(Q21)** in their daily work. In the future, 54,20% would recommend the use of a mobile application to take medication **(Q23)** and a video consultation to support the clinical process (45,00% would recommend) **(Q24)**. Every fifth recommends the use of mobile application that is a knowledge base on health-related topics (55,70% currently recommend) **(Q22)** and 55,70% of doctors and nurses would recommend the remote monitoring of basic physiological and biochemical parameters (heart pressure, body temperature and glucose level) **(Q19)**, as shows **on table 16:**

Table 16. Types of e-health solutions recommended by doctors and nurses.

	Please select whether you currently recommend, will recommend in the future or would not recommend the following e-Health solutions		
Questions:	**I Recommend Now**	**I Would Recommend**	**I Do Not Recommend**
Q19. Remote monitoring of basic physiological and biochemical parameters (heart pressure, body temperature and glucose level).	**35,90%**	**55,70%**	**8,40%**
Q20. Receiving laboratory test results via internet.	**64,90%**	**31,30%**	**3,80%**
Q21. Arranging medical appoitments via the Internet or by using the Hospital's mobile application.	**60,30%**	**35,90%**	**3,80%**
Q22. Using a mobile application that is a knowledge base on health-related topics.	**55,70%**	**37,40%**	**6,90%**
Q23. Using a mobile application that reminds to take the medication.	**43,50%**	**54,20%**	**2,30%**
Q24. Using video-consultation to support the clinical process.	**37,40%**	**45,00%**	**17,60%**

According to the surveyed doctors and nurses, 87,00% feel that it is part of their role to promote digital literacy and to use of e-Health tools with their patients, of which only 35,90% allocate 1%-5% of their appointment time to answer patient's digital questions **(Q26)**; the negative respondents (13,00%) described that they don't have the time or the training to promote digital literacy and the use of e-Health tools, claiming that it is not part of their role description **(Q25)**, of which 32,10% claim they don't allocate any time of their appointments to answer to their patient's digital questions **(Q26)**, as it shows on **table 17**. Therefore, it was considered that if time was a mutable variable, would doctors and nurses allocate more time to encourage their partients to use digital means? Data shows that 86,30% of participants would allocate more time to encourage their patients to integrate the digital world **(Q27)**.

Table 17. Percentage of time allocated from doctors and nurses to answer to their patient's digital questions.

What is the percentage of your appointment time that you allocate to answering digital questions from your patients?		
	N	**% Total**
Total	131	100%
1%-5%	47	35,90%
6%-10%	21	16,00%
11%-15%	13	9,90%
16%-20%	8	6,10%
0%	42	32,10%

In order to explore the willingness of doctors and nurses regarding the patient empowerment through digital tools, it was gauged how often did they carried out those behaviours. The results show that most participants don't assist their patient's on digital matters **(Q28,29,30,31)**. The only positive action was registered on assisting a patient in using a prescription via SMS (22,10% "1-2 times") **(Q29)**, as shown on **table 18**.

Table 18. Frequency of actions carried out by doctors and nurses in the last three days of work.

	Please select how often you have carried out each of the following actions in the last three days of your work				
Questions:	**1-2 times**	**3-4 times**	**5-6 times**	**≥7 times**	**0 times**
Q28. Assist your patient in booking an appointment via the Hospital app.	**13,00%**	**2,30%**	**0,00%**	**0,00%**	**84,70%**
Q29. Assist your patient in using a prescription via SMS.	**22,10%**	**12,20%**	**4,60%**	**15,30%**	**45,80%**
Q30. Assist your patient in requesting a video-consultation.	**9,20%**	**1,50%**	**0,00%**	**1,50%**	**87,80%**
Q31. Assist your patient into use wereable devices.	**13,00%**	**2,30%**	**0,80%**	**6,10%**	**77,90%**

IV. DISCUSSION

The aim of the study is to assess the knowledge and attitudes of doctors and nurses towards e-Health Solutions, as well as their willingness to communicate about e-Health to their patients. The job of doctors and nurses around the world is being affected more and more by the advancement of digital technologies. This is best demonstrated by the increasing number of different electronic device and Internet usages, reliance on numerous tele-care models, robotic systems, and the increased use of artificial intelligence in healthcare (Foadi et al., 2022; Herzhof, 2022). Our results showed that the vast majority of nurses and doctors consider their digital skills as good (52,7%) and that they like using digital health thechnologies (55,00%), through being engaged with digital services by making medical appointments via computer or via the Hospital's mobile app (33,60%) or by prefering to receive medical prescriptions via SMS or email (74,80%). Nonetheless, our data shows consistency with the described literature Clark (2009), by showing that 36,60% of doctors and nurses disagree that telemedicine is as good as face-to-face appointments (Clark et al., 2009). By using digital health technologies, it allows them to be more proactive and autonomous in their health by enableing them to have a better control and management of their diseases (74,80%). However, when management and control of their diseases requires the use of wearable devices or apps, doctors and nurses show low adherence in using e-Health tools for this mean (36,60%). Participants showed that it is simple for them to comprehend online information about personal behaviours (59.90%) or to interact with other people's health-related subjects (42.70%). Having a good e-Health capability also requires to feel safe and in control when using digital health, it was showed that 40,50% of the participants feel concerned about data privacy. Similiars results were gauged in Tegegne (2022) study that identified that healthcare professionals can have a good knowledge about data protection but they still have concerns about it (Tegegne, Melaku, Shimie, Hunegnaw, Legese, Ejigu, Mengestie, Zemene, Zeleke & Chanie, 2022). The average capability of doctors and nurses in e-Health was 3.13, therefore by analysing the capability/ skills in terms of its positive and negative aspects, we were able to learn more about the factors that contribute for this dimension. Actions should be made by taking in consideration the previous described factors, to our knowledge there is a lack of studies that are able to characterise with such detail the e-Health skills of doctors and nurses beyond the classification based on a numerical scale.

This research also seeked to acquire empirical information about the relationship between motivation and usage and if significant associations are found to persist, efforts must be made to promote positive attitudes toward digital health. In our study, more than half of doctors and nurses considered that the use of digital technologies has improved healthcare (51,10%), showing no frustration regarding the adoption of e-Health tools in their clinical practice (33,60%), contradicting the data gauged on the studies previously described (Iyanna et al., 2022; Keshta et al., 2021; Magalhães, 2022). We also seeked to find if they felt that using digital means contributed to the increase of processes and bureaucratic tasks, however no consensual anwser was found. Additionally, the positive motivation in the use of e-Health tools was also reinforced by the fact that one in three of the participants agree that the use of e-Health tools allows them to have more time to perform other tasks (32,10%) and that if they had the possibility to use it more often, they would (44,30%). These findings strengthen the results showed by Zaman (2017), meaning that if there is a benefical relationship in the use of digital tools and workload, doctors and nurses would use e-Health tools more often (Zaman, Hossain, Ahammed & Ahmed, 2017). Motivation as a dimension presented a mean of 3,07 but only after analysing the variables previously described we can state that there is the prevalence of positive motivation towards e-Health tools.

The obtained results concerning the doctors' and nurses' opportunity to use e-Health tools in their clinical practice showed similarities with the findings conducted by Virtanen's (2021) study (Virtanen, Kaihlanen, Laukka, Gluschkoff & Heponiemi, 2021). Social intervention is a meaningful factor, i.e., 46,60% of the participants agree that if there was a participatory approach between them and their Organisation, they would be willing to use e-Health tools more often; however there wasn't a consesual response about the increase of willingness in using e-Health tools more often if they had more training, contradicting the data provided by Virtanen (Virtanen et al., 2021). This fact means that the only physical intervention doctors and nurses find important is the better equipment, meaning that if they had the opportunity of having better e-Health tools in their clinical practice, they would use them more often (43,50%). This dimension shows a mean score of 4,09, consolidating the assumption that the opportunity is a key factor in the increase of positive motivation and positive capability and therefore of the improvement of the e-Health competence of doctors and nurses, as shows on figure 2.

The study showed that the surveyed doctors and nurses most often recommend obtaining laboratory results (64,90%) and arranging medical appoitments via the internet or by using the Hospital's mobile application in their daily work (60,30%). In the future, 54,20% of doctors and nurses would recommend the use of a mobile application to take medication and a video consultation to support the clinical process (45,00%). These findings show a major relavance when looking to the data regarding the doctors and nurses' capability, i.e., it was showed on our study that one in three participants would not prefer telemedicine support (36,6 %) and also 36,60% don't use health apps and wearable devices to monitor their health , however their position about the same topic changes prespective if the target is the patient. The investment in digitization of healthcare is likely to bring measurable benefits, for both patients and medical staff (Hussey, Adams & Shaffer, 2015; Kasper, Lager, Rumpsfeld, Kienlin, Smestad, Bråthen, Ankell, Knutsen, Kløvtveit, Gulbrandsen, Vandvik, Heen, Flottorp, Tollåli & Eiring, 2017), therefore a beneficial relationship between the use of telemedicine and health apps and wearable devices must be shown to doctors and nurses to change their personal's assumptions and also to stimulate the recommendations of this strategy with patients.

According to the surveyed doctors and nurses, 87,00% feel that is part of their role to promote digital literacy and to use e-Health tools with their patients, the negative respondents described that they don't have the time or the training to promote digital literacy and the use of e-Health tools, claiming that is not part of their job description. Additionally, 32,10% claim that they don't have any time to respond to their patient's digital questions, and if time was a mutable varibale, 86,30% would allocate more time to encourage their patients to integrate the digital world. These findings corraborate what was reported by the Herzhof (2022) study, where despite their clinical expertise, empathy, and motivation to serve others, today's clinicians feel overworked (Herzhof, 2022). Resources are being stressed due to the severe global scarcity of physicians, nurses, and midwives, leaving practitioners to contend with busy schedules, high expectations, and inconsistent support. The clinicians who took part in the Clinician of the future survey expressed how they felt trapped by cumbersome administrative procedures and overwhelmed by data. Additionally, clinicians claim that the existing healthcare system leaves them feeling underappreciated and dissatisfied. Even while they welcome change, they find it difficult to stay abreast of the most recent advancements (Herzhof, 2022).

Moreover, the lacking of time is also a consistent varible with the Herzhof (2022) survey where half (51%) of respondents to the Clinician of the future poll who were questioned about their present experience working in healthcare felt that the amount of time they are able to spend with patients is sufficient to provide them with quality treatment. Among these providers, doctors (49%) are less likely than nurses (54%), who believe the time spent with patients is adequate. Only 31% of clinicians (doctors and nurses) across Europe reported having enough time, with 30% in France, 28% in Spain, and only 15% in Germany (Herzhof, 2022).

The obtained results may differ from the average age of currently working nurses and doctor of the Centro Hospitalar Universitário do Porto. Our sample has the average of 43 years old, and it is a generation that has learned basic information technology skills only in adulthood, which makes it much more difficult to acquire e-competency (WHO, 2021). Moreover, the self-assessment of IT competence declared by the nurses does not always correspond to the actual competence in this area.

The digital transformation of the entire organisation must be highlighted, not only in terms of the acceleration of dematerialization procedures but also in terms of the accelerated growth of teleconsultations and other non-face-to-face services, which were aided by the introduction of the hospital's mobile application. It would have been intersting to know how many initial and follow-up appointments were scheduled via the hospital's application, as well as how much the hospital's productivity increased as a result of this measure, however no data regarding that matter exists.

4.1 Pratical Implications

This case study showed that opportunity is a key factor within the three dimensions that can influence the e-Health competence of doctors and nurses. Therefore, any type of effort at the organisational level of the Centro Hospitalar Universitário do Porto should be made through the improvement of these professionals' opportunities, either through physical changes or social changes. With regard to e-Health competence, we found that, although the sample showed that there is a good e-Health competence, this is not always reflected in the willingness to communicate about e-Health with their patients. This fact is due to the health professionals' demonstrated lack of time to promote this type of adoption among their users.

V. CONCLUSION

E-Health promotes equity in healthcare delivery while enhancing health surveillance, health system administration, health decision-making, and standardised exchange of health information (Magalhães, 2022; Melo & Araújo, 2020). E-Health has the potential to increase healthcare workers retention in locations with limited resources, reduce professional isolation, and improve access to healthcare (Herzhof, 2022). E-Health is a crucial component of effective healthcare administration and delivery across the globe, and it improves access to information for healthcare professionals to improve the results of health treatments (Herzhof, 2022). However, if doctors and nurses have a favourable attitude and opportunity towards e-Health and have the ability to use information and communication technology tools, it may be possible to employ e-Health tools effectively in their clinical practice.

To respond to the research questions, "*What are the determinants that can influence the attitude of these professionals towards e-Health Solutions*?"and " *How can doctors and nurses be agents of change for the patients in the digital world*?", a quantitative study was conducted involving 131 doctors and nurses allowing several conclusions to be drawn . Regarding the first research question, three dimensons were taken into consideration, "*capability*", "*opportunity*" and "*motivation*". As early described, opportunity showed to be the key factor that can influence the attitude of doctor and nurses towards e-Health.

When taking in consideration the second research question , providing patient-centric care through digital means is a crucial aspect in digital health competence. Providing patient-centric care through digital means includes the ability to acknowledge a patient's willingness to use digital health, evaluate the patient's digital capabilities, assess how to provide equal services and incorporate the patient's needs into digital health services. However, data shows that doctors and nurses feel that they don't have enough time to enpower their patient's to join the digital world.

The study did encounter several restrictions and obstacles, as was to be expected. First of all, the sample size was somewhat little when compared to the total number of practising doctors and nurses; as a result, it is challenging to forecast the genuine perceptions of them generally, which lowers the study's accuracy. Another particular aspect was that given the study's digital character, the Centro Hospitalar Universitário do Porto initially showed motivation and curiosity in participation. In this research, the timeline do adress how doctors and nurses act and think about e-Health in their clinical practise was impacted by the lengthy of the internal approval process, which was very long.

Given this and the previously described outcomes of our research, the Centro Hospitalar Universitário do Porto, as a hospital organisation, has a fantastic potential to lead the way in its professional e-Health training and approach. It can not only support internal training for its doctors and nurses but also recommend a collaboration with the Orders of the aforementioned professionals, fostering a culture of creativity and knowledge among patients.

The questionnaire was constructed using a quantitative methodology. As a result, more uniform replies were produced because the majority of the questions had predefined possibilities (like multiple choice). This is a shortcoming of the study since each respondent—doctors/ nurses—has unique requirements, unique experiences in their regular healthcare facility, and approaches the pandemic and medical care in various ways.

It could be worthwhile to include a qualitative component in comparable future research and studies. Since healthcare is a very personal and unique experience for each person, it would be ideal to obtain all the inputs through in-depth interviews in order to have the most accurate information possible; however, in order to do so, the sample would need to be smaller because it is not possible to gather as many responses from an online questionnaire (in the same period of time).

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