e-health - Potentialities and challenges for health professionals and patients: Integrative Literature Review

Cláudia Sofia Orvalho Mendes Amaro dos Santos[1], Dina do Carmo Paulo Drogas[2], Sílvia de Fátima Garraio Botelheiro[3], Maria Otília Brites Zangão[4]

[1]Hospital Espírito Santo de Évora, EPE - Serviço de Bloco Operatório Évora, Portugal
[2]Hospital Espírito Santo de Évora, EPE - Serviço de Oftalmologia Évora, Portugal
[3]ARS Alentejo - ACES Alentejo Central - USF Matriz Évora, Portugal
[4]Comprehensive Health Research Centre (CHRC), Universidade de Évora, Escola Superior de Enfermagem São João de Deus. Évora, Portugal.

Correspondence

Cláudia Sofia Orvalho Mendes Amaro dos Santos

Hospital Espírito Santo de Évora, EPE - Serviço de Bloco Operatório Évora, Portugal

Abstract

Introduction: E-health is based on information and communication technologies in health and has been implemented and developed all over the world. **Objective**: to identify the scientific and available evidence on the use of the e-health policy, evaluating the potential and the challenges that it poses to health professionals and patients. **Method:** Integrative literature review, through research in PubMed, b-on and CINAHL databases. We considered for inclusion in the study, randomized controlled trials, controlled clinical trials and observational studies, written in English and Portuguese, published within the last 10 years and available in full text. **Results:** 356 studies were found, 8 studies were included in this review in which health professionals and patients recognize the importance and benefits of e-health, in various aspects. The self-management of heart disease has great potential in e-health, being one of the most studied areas in this context. The Covid-19 pandemic has further demonstrated the benefits of e-health. **Conclusions**: It was identified that the potential of e-health is evident in various contexts, whether in terms of diagnosis, disease monitoring and consultation environment. There is still a way to go in promoting self-care in patients with acute and/or chronic illness through the long-term e-health strategy, recognizing its benefits in maintaining the disease by the user.

Introduction

Health services face the challenges posed by an increasingly ageing population [1], which leads to an increase in the prevalence of chronic diseases, with consequent decrease in the independence and quality of life of a greater number of people and loss of productivity. This will naturally affect the country's economy and the health system [2].

To deal with this reality, most health authorities are planning national or regional reforms, supported by a large research community and medical technology experts, to develop new ways of providing health services and involving the patient [2].

The patient increasingly has a profile of health service consumer who seeks to be always well informed, considering health options and offers, and adopting a more active role in the management of his health and disease [1]. In this field, information, and communication technologies will play a decisive role [2]. The application of information, and communication technologies to the full range of functions and services involved in the health sector is called e-health [3].

E-health's main tools are health information networks, electronic health records, telemedicine services, health portals and personal monitoring devices. When used wisely, they assist health professionals and patients in the prevention, diagnosis, and treatment of the disease, as well as in monitoring health and lifestyles [2]. According to evidence, e-health makes it possible to improve health care and reduce socio-economic impacts on health care. In this sense, it can be affirmed that its use in the health sector translates into numerous benefits [4].

In view of the evidence, the objective of this work is to identify the scientific and available evidence on the use of e-health policy, evaluating the potentialities and challenges it poses to health professionals and patients. Thus, it is intended that through the analysis of the different articles one can identify the main benefits of e-health and how it can be adapted to daily practice, based on patient-centered care.

Background

E-health or digital health is based on the use of information, and communication technologies in health and has been implemented and developed around the world. According to the World Health Organization (WHO), e-health is the use of information, and communication technologies in the health sector in a safe and economically viable way for health support [5].

In 2005, WHO created the Global Observatory for e-health to study its evolution and the impact of use on health. This, although it served as a guiding guide, there were topics not addressed, namely, the established goals and issues related to the various governments and other bodies inherent to each country, to promote a more appropriate and individualized support [6].

It is noted that the implementation of information, and communication technologies in the health sector is an active part of the WHO agenda on a global scale, with a view to universalization and uniformity between the various countries. These opinions and guidelines are a fundamental pillar for the successful implementation of e-health [7].

According to WHO, on the implementation of e-health in Europe in 2016, 30 Member States claimed to have a national strategy for the implementation of e-health; 31 Member States reported the existence of specific funding for the implementation of e-health; 40 Member States had educational institutions with training capacity around information, and communication technologies in health; 27 Member States had electronic health records, of which only 18 had legislation regulating their use. It should also be noted that, according to the same data, 22 Member States mentioned financing problems as the main barrier to the implementation of e-health [8].

Among the various levels of functioning of health systems, e-health has been responding from organizational restructuring of services to access to care users, proving to be an important element to combat sustainability problems, often existing in public/private health systems [9].

In Portugal, the implementation of digital health has been a fundamental strategy for the reform of the health system and has even been recommended as an economic-political instrument under the Economic and Financial Assistance Program agreed between the Portuguese Government and the European Union [10]. The rapid development of information, and communication technologies is a great opportunity to reduce costs in the various health sectors and improve efficiency, however, these advances entail some challenges, notably related to privacy and security policies [7].

E-health has a considerable scope, within the various digital solutions, which have as primary objectives to improve the health and quality of life of health professionals and patients. There are also some areas with a lot of potential in e-health, namely the areas of interaction with patients. Within these opportunities stands out m-health, mobile health applications, as a digital health aspect supported by mobile devices, wireless, such as mobile phones and monitoring devices for patients [11]. More recently, the importance of telemedicine as an e-health tool has been perceived. Telemedicine, in particular teleconsultation and telemonitoring, concerns the provision of health care services, using information, and communication technologies [5], allowing many patients to perform their routine and follow-up consultations, in the comfort of their own home [12]. In this way, it is possible to exchange useful clinical information for the diagnosis, prevention, and treatment of diseases.

The use of e-health improves the health of people and the community, improving access to and quality of health care provided. It is a broad and multidisciplinary concept for several areas related to health, such as nursing, dentistry, psychology, physiotherapy, and speech therapy, among others. The use of telemedicine translates into an improvement in the quality of health care presentation; efficiency and effectiveness gains; risk reduction; and improvement in the quality of diagnosis [13]. Health services, whether public or private, should include telemedicine strategies in their organization as organizational axes since this potential has increasingly sustainability worldwide [9].

The main areas where e-health can be used, with potential for success are [14]:

- Diagnosis - sending the results of the tests from the diagnostic equipment to the computer of the health professional (technician and/or nurse and/or doctor), with tools for the adequacy of the care to be provided to the patient.
- Monitoring – with devices capable of measuring different parameters at any location and at any time, such as hemodynamic evaluation, such as heart rate, blood pressure, blood glucose level, oxygen saturation, etc. Some of these devices are also capable of if any value is outside the normal parameters generate an alert, both to the patient and to the health professional.
- Consultation - to carry out a remote consultation, through digital devices, such as the computer, tablet, or mobile phone, without the need to move the patient.
- Promote healthy lifestyles.
- Improve access to health services and different specialties.
- Improve/increase efficiency in clinical decision making and prescription of medication and/or exams, through better communication between health professionals.
- Promote patient-centered and lower-cost health care.
- Improve the management of chronically ill patients, both in long-term healthcare institutions and at home.
- Decrease waiting lists.
- Optimize resources and productivity gains.
- Improve accessibility to healthcare and specialists for patients living in more remote areas.

The benefits in the use of e-health and m-health are centered on the functioning of health services, providing improvements in the functioning of health units, both in terms of quality in patient care, as well as reducing the costs of the health system and assisting in the performance of health professionals.

Method

Protocol

The protocol used as the basis of this literature review was the PRISMA-P checklist, which served as support for the definition of all items relevant to its elaboration [15]. The main question of this research followed the PIO strategy and was as follows:

What are the potentialities and challenges (O) that the use of e-health policy (I) poses to health professionals and patients (P)?

Eligibility criteria

In the first phase of the research, documents produced in the last

ten years were identified. In addition to the date of publication, inclusion criteria were considered: language (Portuguese and English) and type of studies (randomized controlled trials (RCT), controlled clinical studies and observational studies). In the next phase, studies evaluating e-health programs and, later, the association with new challenges for health professionals and patients, which were available in full text, were included.

Research and selection strategy of studies

The research and identification of the studies to be included in the integrative review of the literature was carried out by three reviewers, independently, during the month of February 2022 and started from the research of information in the databases PubMed, b-on and CINAHL, using the descriptors validated in DeCS (Descriptors in Health Sciences) "e-health" OR "ehealth" OR "digital health" OR "telemedicine" OR "telehealth" AND "nurse" or "nurses" or "nursing" AND "health professionals". The search terms were subdivided into phases, according to the criteria defined, as shown in table 1.

A few 356 studies were obtained, to which exclusion and inclusion criteria were applied with the analysis of the title and abstract of the articles (Figure 1). After the removal of the

***Table 1.** Study selection strategy*

| #	Search - 20/02/2022	PubMed	b-on	CINAHL
	Phase I			
1	"e-health" OR "e-health" OR "digital health" OR "telemedicine" OR "telehealth"	5474	4957	616
	Phase II			
2	"nurse" or "nurses" or "nursing"	8009	193459	78578
	Phase III			
3	"Health professionals"	15322	467768	82789
	Phase IV			
4	(#1) AND (#2) AND (#3) AND (#4)	13	23	4
Total		40		
Repeated		7		
***Total with Filters applied:** **NOT Systematic Review OR Meta-Analysis**, in the last 5 years*		33		
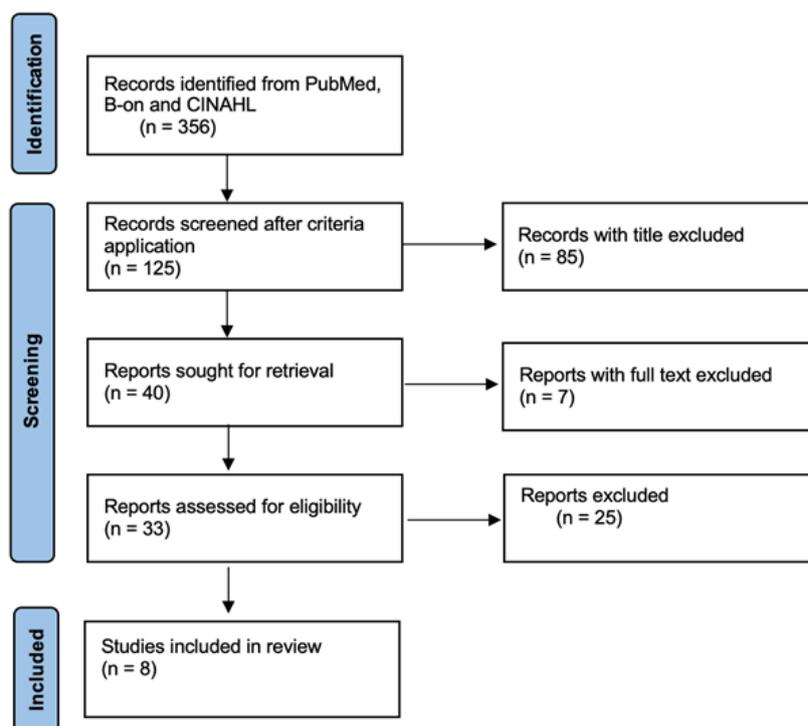
***Figure 1**. PRISMA Flowchart - Diagram of studies selection process*

***Table 2.** Main results*

Title	Study	Objective	Results	Study quality
1. Effectiveness of the European Society of Cardiology/Heart Failure Association website 'heartfailurematters.org' and an e-health adjusted care pathway in patients with stable heart failure: results of the 'e-Vita HF' randomized controlled trial [16]	RCT	Assess the effect on self-care of patients with stable heart failure promoted by the website of the European Society of Cardiology/ Association of Heart Failure 'heartfailurematters.org' and by the telemedicine-e-Vita HF-adjusted care route compared to classic healthcare.	Both the self-care promoted by the heartfailurematters.org website and the self-care promoted by e-Vita HF motivated patients with short-term chronic heart failure, but not in the long term.	GOOD
2. The Effects of Telemonitoring on Patient Compliance With Self-Management Recommendations and Outcomes of the Innovative Telemonitoring Enhanced Care Program for Chronic Heart Failure: Randomized Controlled Trial [17]	RCT	Assess participants' support for an innovative weight telemonitoring program in patients with chronic heart failure on a self-care regimen.	Telemonitoring is a promising method to support and motivate patients with chronic heart failure in weight control.	GOOD
3. Matching depression management to severity prognosis in primary care: results of the Target-D randomised controlled trial [23]	RCT	Investigate whether a person-centered e-health platform (Target-D), adequate to the prognosis of the severity of the symptoms of depression of each participant, can improve depressive symptoms in relation to the usual care.	A person-centered e-health platform improves depressive symptoms by 3 months compared to usual care.	GOOD
4. The impact of a patient web communication intervention on reaching treatment suggested guidelines for chronic diseases: A randomized controlled trial [18]	RCT	Examine the impact of an intervention through PACE-inspired web communication (Prepare, Ask, Check, Express) alone or combined with a workshop on how to achieve treatment goals for patients suffering from chronic diseases compared to usual care.	Communication by the patient through a website promotes the achievement of treatment goals for hypertensive, diabetic and dyslipidemia patients.	GOOD
5. Exploring Implementation of m-health Monitoring in Postpartum Women with Hypertension [21]	Observational	Identify and examine the potential factors that influenced the use of m-health technology and the adhering to monitoring symptoms related to preeclampsia in puerperium.	Mobile health technology can be beneficial during pregnancy and in the postpartum period for women with preeclampsia to manage blood pressure and warning signs of worsening of the disease.	GOOD
6. A Web-Based Telemanagement System for Improving Disease Activity and Quality of Life in Patients With Complex Inflammatory Bowel Disease: Pilot Randomized Controlled Trial [22]	Pilot study	Assess the impact of remote telemonitoring using a Web system (TECCU) in patients with complex inflammatory bowel disease compared to phone call nursing care and classic face-to-face care.	Remote telemonitoring using a Web system - TECCU - is a safe strategy to improve health outcomes in patients with inflammatory bowel disease.	GOOD
7. Mobile health applications enhance weight loss efficacy following bariatric surgery [19]	RCT	Assess the impact of m-health technology on weight loss in patients undergoing bariatric surgery.	M-health applications are a useful supplement for improving and maintaining weight loss after bariatric surgery.	GOOD
8. Nursing Management in e-Health and the articulation of the principles of Primary Health Care and Supplementary Health: Experience Report during the beginning of the Covid-19 Pandemic [20]	Observational	Describe the experience of Nurses in remote care during the beginning of the Covid-19 Pandemic in Brazil, reflecting on the interconnection of Health Systems through e-health.	O atendimento por telemedicina é parte fundamental para este tipo de acompanhamento.	GOOD

excluded studies, there were 40 possibly relevant studies, 13 from PubMed, 23 from b-on and 4 from CINAHL. Of the 40 possibly relevant studies, 7 were excluded because they were repeated, leaving a total of 33 studies, and the full text was analyzed. This analysis led to the exclusion of 25 articles. In this sense, the final sample consists of 8 studies.

Data extraction

To systematize the research process, was eloborated Table 2, which aims to summarize the information extracted from each of the studies included in this literature review, which consisted of: Title, Type of study; Objective; Main results/conclusions obtained.

Quality of studies

The evaluation of the quality of the studies included in the literature review was performed by two of the authors of this study, using the "Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies" and the "Quality Assessment of Controlled Intervention Studies", in the various existing dimensions, obtained from the website of "The NIH Quality Assessment". This form of evaluation defines the classification of studies through the risk of bias and the general recommendations indicate that an individual evaluation of each study should be made, categorizing it as "good", "reasonable" or "poor" [15]. For all studies evaluated, the general classification of "good" was attributed, with considerable quality level.

Results

The final sample of this integrative literature review consists of eight studies, as previously mentioned. The selected studies are mostly experimental studies, five RCT, two observational studies and one pilot study. The objectives of all studies within the design adopted considered the identification of potential factors that influenced the use of e-health technology and how they can improve the delivery of health care.

Heart disease, in particular chronic heart failure, was the pathology evaluated in two of the experimental studies [16, 17] and hypertension in 1 of the also experimental studies [18]. The diseases and comorbidities of metabolic syndrome, and other chronic diseases were also considered in one of the experimental studies and in this sequence also 1 of the studies had as population, individuals undergoing bariatric surgery [19]. Observational studies focused on Covid-19 disease [20] and follow-up during pregnancy and puerperium [21]. The pilot study evaluated patients with irritable bowel syndrome [22] and the most recent experimental study of 2021, allowed to make an approach to e-health in mental health [23].

The main tools of e-health used in the studies under analysis were telemedicine, m-health, and the Web platform. In the three studies that used telemedicine, the benefits were always greater than the usual care. In follow-up of patients with cardiac pathology [16] the benefits were the same as the web platform, however, in the follow-up of patients with mental disorders [23], the web platform was superior to telemedicine follow-up, with reasons of constant follow-up feeling indicated by the patients.

M-health has been studied in three studies with good responses in all, namely in patients with heart disease [17], patients with other chronic diseases [18] and in the surgical treatment of obesity [19] with always superior and very motivating results for patients. In terms of telemonitoring and monitoring by web platforms, the results were evaluated in 4 studies, with different chronic pathologies [16-18, 23] and positive results in all.

The entire process of integrative review was independently verified by three authors and an experienced investigator, with consensus on the results obtained.

Discussion

The main objective of this study was to identify the scientific and available evidence on the use of e-health policy, evaluating the potentialities and challenges to health professionals and patients. We wanted to verify the scientific publications of clinical trials and observational studies, available on the subject, thus responding to the question and research: What are the potentialities and challenges that the use of e-health policy place to health professionals and patients?

We have been able to see that, in the long run, e-health has immense potential for all actors in the health/disease process. The most used e-health tools were web platforms in 4 studies [16, 18, 22, 23], m-health in 3 studies [17, 19, 21] and telemedicine in 1 study [20]. In addition, 2 studies compared web page-based solutions with telemedicine-based solutions [16, 23].

In the evaluation of heart disease, we found that the fact that patients have access to an m-health application [17] allows not only greater follow-up accuracy, in parameters related to weight and warning signs, but also better health outcomes. In a similar population, the study by Wagenaar et al., compared two types of approach (web platform and telemedicine), verifying that during follow-up, health outcomes, namely, the criteria for managing the disease by patients were much better when compared to the usual care. In this study, it was also possible to verify that one year after the end of the follow-up, the results decreased, without long-term positive effects [16].

Still following heart disease and based, the results of the study by Glaser et al., focused on diseases related to metabolic syndrome and chronic diseases, it was concluded that patients in the group on a web platform had 1.42 times more opportunity to achieve the goals, compared to participants in the usual care regimen, while in the group combined with the workshop there were no statistically significant differences [18].

At the level of primary health care, despite the scarcity of resources, professionals can offer treatment for both acute diseases and chronic diseases (diabetes and hypertension), without reducing the quality of health care provided. By the results of the studies, it is possible to observe that the monitoring by web platforms and telemedicine has excellent results, which allows us to infer that this follow-up as a complement to the nursing consultation of diabetic patients and hypertensive patients or as a follow-up after hospitalizations for cardiac pathology, would be an added value, with significant improvements in the care provided to patients [16, 17]. We know that the development of web platforms will not be the easiest and most accessible means, but we find that telemedicine is within reach of any health unit with equally proven results. Given these results, it would in fact be a good methodology to adopt in our primary health care units.

In the follow-up of chronic diseases such as diabetes we verified that web communication on a platform, part of the patient, promotes the achievement of the goals of the established treatment [18]. Also, m-health proved to be important as a tool

for adhering in patients with chronic heart failure, through the monitoring of risk signals [17]. It is in this context of chronic disease that m-health can be very important, particularly in diabetes control, supporting the needs of daily routines, which are often quite rigorous and contributing to the improvement of self-management of the disease.

Within e-health, many mobile apps that incorporate blood glucose meters have been developed by device manufacturers. In addition, continuous real-time glucose monitoring by a mobile device is increasingly used as an adjunct to make decisions about diabetes treatment.

In monitoring the stages of pregnancy and puerperium [21], the use of m-health showed great importance, especially in situations of risk of preeclampsia, and can be a very useful tool to implement both at the level of primary health care and at the level of hospital care by nurses who specialize in maternal and obstetric health nursing. The monitoring by telemedicine, especially in times of pandemic Covid-19 [20] proved to be of great use, becoming a very important tool in obstetric risk situations. Covid-19 and telemedicine follow-up adopted in our country emphasized that the telemedicine solution is very useful in the treatment and follow-up of patients with this pathology, but also in the follow-up of other chronic pathologies, without signs of severity.

Mental health is an area to be explored by e-health. The person-centered web platform improves depressive symptoms by 3 months compared to the usual care. In this study, patients reported their symptoms, establishing priorities and management options compatible with prognosis, including online self-help, online psychological therapy, and nurse-oriented care [23]. Considering the home support and outpatient care provided by psychiatric services would be an option to improve the care to be considered. It is also in this context that, recently, a web platform under tele management and telephone consultations performed by nurses was evaluated in patients with irritable bowel syndrome, where despite better results in both when compared with usual care, the web platform proved to be a safer strategy to improve health outcomes in these patients [22].

In the field of bariatric surgery, being a treatment for obesity, which requires the need for long-term follow-up, the exploration of e-health options is of great importance. Also, in the study that tested m-health technology in contrast to usual care, evidencing itself as a great complement in terms of usefulness for patients and professionals in improving and maintaining weight loss after surgery [19]. Not all patients, however, lose the desired amount of weight, some regain weight, and some need another surgery. Patient interviews and discussions with patient support groups indicate that many of the patients unsuccessfully feel foreseeable in terms of follow-up. In this context, without overloading the services, monitoring by e-health system, either by telemedicine or m-health or other, would be an added value, for patients and in terms of improving the quality of the service provided to the patient.

Thanks to e-health platforms, specialized monitoring can be applied pre- and postoperatively to ensure good patient preparation and safe quality monitoring. Similarly, discharge and early return to home are essential parameters in the optimization and availability of hospital resources, with evidence of better clinical results, fewer complications, and lower hospital costs.

E-health is shown to be a developing area, promising, and as evidenced by the articles analyzed, able to assist in several areas, namely in the provision of clinical information that promotes the literacy of the patient in his own disease, allowing him to self-control his situation through the verification of symptoms, which can be achieved through websites or mobile applications.

Conclusion

E-health or digital health, in its various forms, is a very useful tool nowadays, which allows to increase the literacy of the patient, promoting their involvement in their own disease, and thus encouraging self-care. This form of involvement of the patient in his own disease, proves to be a cost-effective way of monitoring the patient, since it allows the reduction of costs in a variety of ways, namely in reducing the number of consultations, with the reduction of all expenses involved, from the consultation itself to the transport of the user.

It is also possible to conclude, albeit indirectly, that e-health can improve the sharing of information among health professionals through mobile applications or chat channels, which translates into gains in health, since the sharing of experiences can help in the decision-making of some clinical situations.

For the success of strategies that use e-health, in most situations, it is necessary the internet, digital media and their domain. Thus, it is important to consider that, although nowadays the internet is already widespread, there are several areas in Portugal where the internet does not yet exist or does not perform well, and that the predominance of an ageing population, which does not dominate digital media, does not support projects involving digital health. Thus, during the implementation of an e-health project it is important to take these aspects into account to achieve equity of opportunities for the population involved in the project.

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