Chapter

E-Health Applications for Smart and Pervasive Healthcare in Greece. What Can We Expect?

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Abstract

e-Health leads to the reshaping of the traditional ways of providing services by health professionals, aiming both at the rationalization of the expenses and the satisfaction of the patients-users of health services. Nevertheless, the key elements which prejudge its success are the measurable results, the guarantee of a broad consensus, as well as the leadership's commitment to implement it. In Greece, it is implemented within the European action eEurope 2005-eGovernment and the eEurope-i2010 programme. The application of e-Health in Greece is a national priority, for a number of reasons, such as the thousands of islands in the Greek archipelago which make the traditional form of medical care practically impossible. However, the economic crisis that broke out in Greece in 2009, as well as the arrival of waves of refugees in the country raised new issues in the development of the e-Health sector. This chapter analyses the institutional framework of e-Health in Greece. It also outlines the various technological, legal and organizational challenges that arise in the process of implementing e-Health in the pivots of effectiveness, efficiency, quality and equal accessibility. Finally, it develops a strategy for the future of e-Health in the Greek National Health System.

Keywords: e-Health, information and communication technologies, health services, telemedicine, accessibility

1. Introduction

The technological advances which occur at a rapid pace in the sectors of biomedicine, information technology and telecommunications, have already transformed fundamentally the entire spectrum of production and distribution of health services. The open e-government promotion leads in its turn, to the reshaping of the health sector, which is being called upon to respond to the contemporary challenges including the restriction of the expenses incurred, the effectiveness and simultaneous increase of the health services users' satisfaction [1, 2].

The Greek National Health System, especially after the prolonged period of economic crisis which it has experienced since 2009, faces up against accumulated problems in the citizen's relations with the services (responsiveness, quality and accessibility in the provided health services), having to solve a difficult equation. It's being required to balance and find the golden mean between the healthcare cost, which is constantly rising, since the destitute and uninsured citizens are multiplying, the population of Greece is aging, chronic and degenerative conditions are

striking more and more people, while at the same time the refugees who arrive in the country amount to tens of thousands. On the other hand, the available system resources, both material and human, are constantly decreasing [3, 4]. Thus, inevitably, the need arises for healthcare in Greece to readjust to the new circumstances and utilize the digital technology so that hospital institutions will be decongested and healthcare expenditure limited [5, 6].

This paper will define the content of e-Health in accordance with the decisions of the World Health Organization and other international legal entities. It will then focus on how Greece implemented the specific decisions of international organizations. It will describe in detail the forms of e-Health adopted by the Greek National Health System, it will assess the benefits and the problems that have emerged from their implementation. Finally, it will discuss some of the challenges that Greece faces in the coming years in the context of the implementation of e-Health and highlight the role that the COVID-19 pandemic may play in accelerating them.

2. The concept of e-health

The term "e-Health" describes the utilization of modern technologies of Information Technology and telecommunications across the board of provided services by health professionals [7, 8]. In the framework of e-Health there are included programmes, systems and services which exceed the simple applications based on the Internet and are addressed both to health professionals and patients-users of health services, such as organized networks of health information, an electronic health record, an electronic health card, e-prescription, telemedicine, tele-counseling, tele-monitoring, personal portable communication systems, mobile phones and health portals. According to the World Health Organization [9] and the European Commission [10], e-Health refers to a wide range of products, systems and tools, which build their operation around the advanced information and communication technologies (ICT), aiming not only at the better management of health, but also the applied lifestyle on the whole. These online applications are addressed both to health professionals and patients-users and adopt a philosophy of a holistic approach, as they handle the prevention, diagnosis, treatment and later monitoring [11].

e-Health essentially comprises an emerging field in the intercept point of the scientific fields of medical informatics, public health and operational research. Its utilization focuses on the immediate, valid, qualitative and safe provision of health or healthcare services via the Internet and other available communication technologies. The desired effect is the transference of expertise and ensuring the smooth and unencumbered information flow, concerning not only healthcare, but also public health or preventive medicine [12].

At a global level, e-Health implementation is governed by the e-Health Resolution adopted by the 58th World Health Assembly in 2005 and aimed at better understanding [13] as well as its e-Health standardization and interoperability of World Health Organization [14], which stresses the need for standardization and interoperability of electronic applications, convergence of standards and their evaluation using common indicators, for comparable results. Furthermore, in 2012, the World Health Organization, in collaboration with the International Telecommunication Union (ITU), provided in the form of a manual the necessary guidelines to facilitate states in developing their national e-Health planning. This WHO-ITU National e-Health Strategy Toolkit [15] is a comprehensive operation plan and monitoring of e-Health applications and can be implemented by all countries wishing to develop or upgrade their national policy for e-Health, regardless of the level they are in today.

In Greece, its implementation was placed in the Greek framework of open government e-GIF (Electronic Government Interoperability Framework) and information online management, that was integrated in the Digital Agenda 2006–2013 (for the adjustment of services to the demands of the modern era), which was later readjusted in the framework of National Digital Strategy from 2016 to 2021 [16]. The Greek framework of open government specifies in essence the commands of the European action eEurope 2005-eGovernment and the programme eEurope-i2010, which divide the online provision of services in four axes: e-Government, e-Health, e-Learning and e-Business [17]. Towards the further propulsion of e-Health, the National Council of e-Health Management (NCHM) was established in 2015, which is headquartered in the Greek Ministry of Health.

3. Forms of e-health in Greece

e-Health does not only provide technological and procedural solutions to the needs of healthcare, but also reliable supportive applications, which are called upon to serve man, as the object and recipient of the health services provided. The tools that are employed in the context of e-Health promoting, are more effective, more user-friendly and more widely accepted both by the health professionals and the patients themselves. In e-Health applications there are included the electronic patient record, the electronic health card, e-prescription, development of telemonitoring and teleconsultation systems, as well as e-referral and electronic refund of medical expenses [18].

3.1 Electronic patient record

More specifically, the Electronic Patient Record or alternatively the Electronic Health Record comprises an individual electronic catalog, in which the medical data concerning the patient is registered and kept, so that its transference to any hospital institution or authorized doctor can be possible, aiming at a better diagnosis and limitation of medical mistakes [19, 20]. The same philosophy is served by using the electronic health card, so that an overview of its owner's health condition arises.

The electronic record includes data regarding the patient's medical history, such as their admission or readmission dates, their treatment duration, the results of laboratory and paraclinical tests conducted, the administered medicines and other treatment actions, information for the cost of the provided services, prior services offered as well as reports of acute cases, so as to constitute the patient's diagnosis basis and treatment approach, and at the same time the basis of epidemiological studies. In addition, it provides information of administrative, financial and statistical nature which is related to the respective hospital unit and the patient's demographic data (full name, VAT number, competent insurance institution, blood type), as well as quality control data [21].

The Electronic Health Record comprises an updated version of the Electronic Patient Record, as it aims at the continuous observation of its owner's health and not exclusively during their treatment period. In contrast with handwritten records, it ensures the preservation of the registered data (health data, laboratory results, medical instructions, imaging records, bio-signal records), and their endurance through time, it allows their holistic management while providing interconnection capacity via applications of data transmission. This way, it facilitates the provision of medical consultation remotely, simultaneously enabling the electronic prescription. It also contributes to the timely and correct illness diagnosis, the right observation of patients, the elimination of multiple registrations, the operational cost reduction (e.g. avoidance of pointless examinations, facilitation of payment,

distribution of resources connected to the diagnosis and treatment), and at the same time it creates a constantly developing "electronic library" which is also compatible with research purposes [22–24].

Since the data which is included in the patient's medical record, fall within the most sensitive personal information (main illness, history of present illness, allergies and medicines, medical history, family history, social history, occupational history, sexual history, addiction to use of drug, smoke and other substances), every aspect of their safety, confidentiality and protection must be ensured substantially [25, 26]. In the last few years, the Citizen Health Record has been promoted in Europe, which corresponds more thoroughly to the contemporary vision of the globalized citizen, as far his expectations from the health services are concerned. It is an improved version which fully covers the digital recording and preservation of the contents of the electronic medical record and simultaneously deals successfully with the problems that arise from its electronic nature [27].

In Greece, the creation of a National Medical Record is being promoted, in order that all the necessary information regarding a citizen's health condition (hospital treatments, medical opinions, imaging and laboratory examinations, prescriptions, etc.) will accompany them from now on [28]. The efficiency of this modern digital tool will be bidirectional. On the one hand, it will guide and facilitate the citizen in their contact with the National Health System (e.g. through the application myHealth, the appointment making will be conducted digitally, as well as the system navigation). Nonetheless, at the same time it will comprise a "portal" of access to their data for the treating doctors, so that they have the full medical history available, thus abolishing the printed records. The first step has been taken with the activation of the Individual Electronic Health Record. In the next stage, there is the provision of its further reinforcement and its gradual disengagement from the Family Doctor through legislative interventions [29]. As the General Secretary of the Ministry of Health stated, in the electronic record there will be included the patient's biochemistry and blood tests, as well as the main clinical documents of the hospitals that concern them [30].

The formation process of the Electronic Patient Record is advancing at a satisfactory pace. It is noteworthy that the non-profit Public Company under the name "Electronic Government of Social Insurance" (IDIKA P.C.), which undertook the implementation of the project, was awarded an international distinction at the awards ceremony of the World Information Technology and Services Association "WITSA Global ICT Excellence Awards 2019" that took place in the context of the World Congress on Information Technology, on October 8th, 2019 in Erevan, Armenia. The project of the Electronic Health Record (EHR) was distinguished as Merit Winner in the category "Innovative eHealth Solutions" [31].

It should also be pointed out that the pandemic of COVID-19 gave a new impetus to the formation process of the electronic record in Greece. In particular, in April 2020, there was enforced by the Greek Ministry of Health and the Ministry of Digital Government the Electronic COVID-19 Patients Register. In this way, the contact of patients suffering from COVID-19 with their treating doctors was simplified, especially in the sectors of tele-consultation and both intangible and remote prescription. What is more, it should be highlighted that based on the Greek and European Law, the patients' personal data are protected, as health services have at their disposal merely the information which is helpful for the handling of the pandemic [32].

3.2 Electronic prescription

Furthermore, the adoption and application of electronic programmes in the field of pharmaceutical policy, such as the medicine list and the electronic prescription,

contributes crucially to the rational management of the provided pharmaceutical services, ensuring the appropriate and more economical care with a simultaneous minimization of expenses [33]. The uniform electronic medicine list includes the approved available pharmaceutical preparations, their cost and the amount of their provided for compensation.

Despite the fact that this specific list mainly comprises a clinical tool, facilitating the doctors' e-prescription substantially, it also assists by its central management, the significant restriction of pharmaceutical expenditure, in combination with the promoted policy of generic medicine selection (i.e. the copies of pharmaceutical preparations), instead of the original ones which are more expensive due to the patent they possess [34, 35]. Additionally, both the electronic entries of the prescriptions on the part of the doctors with the help of personalized passwords and the obligatory prescription based on the active substance and not the commercial name of the preparation, allows the wider administration of the more economical generic medicines and the electronic monitoring of medical prescription behavior in real time [36, 37].

During the COVID-19 pandemic, it became clear that the utilization of digital technologies is the only safe way in order for the patients to gain access to the health system. Thus, in the summer of 2020, the intangible electronic medicine prescription was established by law in Greece (L. 4704/2020). Both the intangible prescription and the intangible referral are transferred now exclusively using electronic means to the Primary Healthcare System. The patients log in there and state that they wish to receive their medicine prescription electronically, either through a message (SMS) on their mobile phone or via an email to their email address. In the fulfillment of the intangible electronic prescription, the printed form of the doctor's medicine prescription is not submitted to the chemist. The chemist retrieves the intangible electronic prescription by entering in the Electronic Prescription System the prescription barcode or the patient's Social Security Registration Number (SSRN) [38].

3.3 National Network of telemedicine (NNTM)

The potential that new technologies offer is expanded in the field of telemedicine, tele-monitoring and teleconsultation, as well. The utilization of telemedicine and telecare, which means the remote support or provision of health services by specialized and suitably trained health professionals to that purpose, goes a long way towards dealing in a timely manner with situations that could turn out to be a health hazard. Therefore, it is about technical knowledge transfer instead of patient transfer. Its major significance lies in the fact that it provides the possibility of remote support for patient management at the regional health facilities by general medicine practitioners.

In Greece, a mainly insular country which is divided in seven health regions, there has been materialized a National Network of Telemedicine since 2016, headquartered in the country's 2nd Regional Health Authority to which the large port of Piraeus and the Aegean islands belong. The same year, NNTM won the award of Business I.T. Excellence Gold (BITE) for its output, which is awarded in cases where technological innovation coincides with business excellence. The Network of Telemedicine is based on the Public Data Network of OTE "INTERCONNECTION" and it includes 43 telemedicine units. Those are based on 12 regional and central hospitals, as well as 30 centers of the Aegean islands, including the border islands of Astypalaia, Icaria, Kalymnos, Ios, Kasos, Kastellorizo. Lastly, there is a telemedicine unit in the center of operations of the Greek Ministry of Health [39].

The National Telemedicine Center is bound to be expanded to 22 additional islands of the Northern and South Aegean, covering the healthcare needs of 52

islands on the whole, with 71 telemedicine units and 90 patient monitoring systems at home [40]. This way, there is provided an equal access of the island regions patients to the services of the National Health System. At the same time, the pointless transfers and evacuations by air are limited, simultaneously relieving the hospitals Out-patient Clinics.

Every telemedicine unit consists of a specially configured chamber, a camera, a screen and appropriate medical instruments that broadcast the indications of examinations live at hospitals of Athens and Piraeus. In this effort towards not only the provision of specialized health services, but also the guidance and education of the regional health professional in the Aegean islands which are isolated from the major urban centers, 270 health professionals participate, among whom 67 doctors-consultants from 27 different specialties (Psychiatry, Child-Psychiatry, Pediatrics, Surgery, Pediatric Surgery, Breast Surgery, Orthopedics, Pathology, Bio-pathology, Pathologic Oncology, Cardiology, Dermatology, Medical Imaging, Dentistry, Pulmonology, Obstetrics-Gynecology, Chest Surgery, Plastic Surgery, Nuclear Medicine, Ophthalmology, Rheumatology, Gastroenterology, Endocrinology, Nephrology, Urology, Critical Care Specialist, Emergency Unit Specialist) [39]. The examinations categories which are mainly requested are child-psychiatric, endocrinologic, diabeteologic, psychiatric and oncologic [40]. In a country such as Greece, which has over 90 islands, the telemedicine network is estimated to serve the needs of more than 320,000 permanent residents and a fairly large number of visitors each year [41].

According to the information available, there were held more than 4,500 appointments of specialized health services provision in regular and emergency incidents in Aegean islands of the Greek-Turkish border through the NNTM. At the same time, actions of prevention and promotion of oral hygiene were conducted to children aged 6–12 in Chios (Pyrgi, Kalamoti), in Oinousses and Icaria's Fournoi, as well as an action of prevention aimed at children and adolescents of the border island of Ios about mental health issues. Furthermore, continuous education of the health professionals who staff the insular health units is carried out, the main bodies being the University General Hospital "Atticon" and the General Nikaia Hospital "Agios Panteleemon". It is interesting that over 300 educational seminars have been materialized to date. Alongside, in the education context of the general population, junior high and high school students of Lesbos island (Antissa) were educated on Basic Life Support (BLS) and the use of an automatic external defibrillator.

Moreover, the telemedicine network is used for administrative support, with frequent video-conferences (approximately 70,000 teleconferences were carried out up to November 2020) for the further familiarization with the use of the system and primarily for the change of philosophy of the employees in the sector of health and the adoption of the operation of NNTM on everyday practice. What is especially important is the free-of-charge provision of tele-interpreting for the facilitation of hospital institutions and Health Centers in the handling of incidents where there is no common communication language between the patient and the health professionals. As far as the future goals of NNTM are concerned, they include the integration of emergency incidents in the hospital shifts, in order to achieve a 24-hour coverage of the Aegean islands, at least concerning cardiologic and pediatric incidents.

3.4 Patient tele-monitoring

An advancement of telemedicine is the provision of health services at home, which supports tele-monitoring and tele-management of patients in their own premises. The health professionals, who provide care remotely, can diagnose X-rays, receive a medical history from patients, assess laboratory findings and suggest

courses of treatment. Electronic recording devices are used, which send the data to the treating doctor, and then he/she on his/her part, having all the necessary documentation, consults the patient-user comprehensively. The system under discussion addresses mostly patients with heart disease, pulmonary disease, hypertension and diabetes, who require long-term monitoring. Nevertheless, there is also the possibility to utilize it in the monitoring of patients having different treatment needs, such as post-operative or psychiatric patients [42].

Greece has also demonstrated significant progress in the sector of patient telemonitoring in the last few years. More specifically, the following programmes are being carried out:

3.4.1 Telecare programme renewing health

The programme was applied for the first time at 2014 in the area of Thessaly, in Central Greece, granting monitoring remote services to patients with chronic conditions, in particular to patients with type 2 diabetes, cardiovascular disease and obstructive pulmonary disease. It is noteworthy that in the cases of the patients suffering from diabetes and cardiovascular failure, there were noted positive clinical results as far as intervention via tele-monitoring is concerned. However, at the same time various problems arose, such as the slow pace of adoption of technological innovations in healthcare, the complexity of the institutional framework, the lack of compensation models, as well as the lack of interoperability in telemedicine infrastructure. The Greek Ministry of Health is making an effort to resolve all those problems [43].

3.4.2 SmartCare programme

It's a European programme in which the Greek Municipalities of Palaio Faliro, Alimos and Agios Dimitrios participated. The project was related with the development and incorporation of technologies in the existing care structures for the independent living of patients and the elderly at home (home platforms). The programme provided various services, such as observation of the patients' physiological, environmental and behavioral parameters, self-care functions, management of the patients' medication, prevention of falls and accidents and practice of the patients' cognitive functions [43].

3.4.3 United4Health programme

In the programme United for Health, there were overall 33 participants from all Europe as well as international organizations from the sector of electronic health. Greece took part through the 5th Regional Health Authority of Thessaly and Continental Greece, as well as via the "Cities NET S.A." (Larissa, Ioannina, Volos, Lamia, Kozani, Katerini, Veria, Karditsa, Trikala and Grevena) after being granted permission from the competent Ministries. The programme had a duration of 3 years and a total budget of 10,151,56 Euros for all Europe, while it was cofounded by the European Committee. In the context of the programme, there were selected patients suffering from chronic diseases (such as diabetes mellitus for the case of the pilot in Greece) by the treating doctors with the criteria of the need for intensive home monitoring and adjustment of medication [44]. There were utilized some conclusions from the Renewing Health Telecare Programme in Central Greece and there were organized telecare services of an out-patient clinic in actual conditions. The study conclusions demonstrated that the clinical efficacy of telecare for diabetes mellitus patients is feasible, depending on the service per National Health System, though [43].

3.5 Video-communication stations for the deaf and hearing-impaired

The National Institution for Deaf People of Greece, since March of 2019, began to develop a new form of service for people with hearing/impaired hearing problems with the aid of technology (Relay Service). The referred to service is of a 24-hour cycle. People with hearing/impaired hearing problems can make use of the electronic appliance on their mobile phone or on an electronic computer of any kind and contact a special interpreter via video call. By using the programme, the improvement of communication and service of the deaf and hearing-impaired is achieved, as the transmission of information to health professionals is facilitated. By extension, the users are able to receive equally quality health services at the levels of prevention, diagnosis, treatment, hospital treatment, rehabilitation and support in administrative services.

In the framework of social support for the disabled, the specific initiative was adopted by the Ministry of Health in Greece, anticipating inequality decrease and equal access to social communication commodities for all citizens. With a document from the Administration of Primary Healthcare of the Greek Ministry of Health (Γ1γ/ΓΦ.20.ΣΤ/ΓΠ. 66393/26.10.2020), it was requested by all structures and services of healthcare provision, both of the public (Hospitals, Health Centers, Centers of Mental Health and other supervised bodies of the Ministry of Health) and the private sector (private clinics, private practices, dental practices, group practices, laboratories, units of daily treatment) to accept and utilize the recommended authorized way of communication through the programme of Relay Service in order to accommodate the deaf and hearing-impaired, as well as for the provision of services in which their physical presence is not required [45].

The first video-communication station for the deaf and hearing-impaired in Greece operated in July 2020 at the "Laikon" General Hospital of Attica. According to the national plan, 30 stations of video-communication for the deaf and hearing-impaired are expected to operate for a trial period of one (1) year both in hospitals and other public services and bodies of common interest in Greece, for instance Local Authorities, Regions, Airports and the Underground [46].

The example of the "Laikon" General Hospital of Attica was followed, in October 2020, by the 4th Macedonia and Thrace Regional Health Authority, which announced the operation initiation of three (3) video-communication stations for the deaf and hearing-impaired at the AHEPA University General Hospital, the Alexandroupoli University General Hospital and at the 25th Martiou Health Center in Thessaloniki [47].

3.6 Mobile health (m-health)

One of the subdivisions of e-Health is the exploitation of mobile phones, mobile Health (m-Health). The cellular phone is proved to be the handiest tool nowadays, as it has evolved into a personal object that the majority of the population uses and does not part with. It can be recruited in the context of e-Health in a variety of ways: notification of the patient about the taking of their medication through automatized messages, their scheduled appointments or reminders to pregnant women either about different stages of pregnancy or advice when they cope with an unusual condition [48–50].

In Greece, mobile Health was used extensively during the COVID-19 pandemic. In this context, a special hotline of psychosocial support operated in Greece (10306) by the National Public Health Organization. The hotline service was offered under the supervision of the Medical School of the National and Kapodistrian Athens University [51].

4. The contribution of e-health to smart and pervasive healthcare. Challenges for Greece in formulating a national strategy for the future of e-health

e-Health certainly does not constitute the "magic solution" for the existing health system's various problems in infrastructure, staffing, organization and resources. However, it can significantly enable the successful dealing with its chief function issues, optimizing the provided services of Primary Healthcare. In particular, e-Health ensures fast, valid, reliable and directly accessible medical information for everyone, which covers not only topics of general interest, but also specific issues that cope with specific needs. By the exploitation of the possibilities it grants, the prompt and correct diagnosis of diseases becomes feasible, as well as the regular monitoring of patients and the remote provision of medical consultation, with an emphasis on preventive medicine. It also facilitates both the medical care of people who reside in isolated areas and individualized medical healthcare in combination with patients' safety [52].

The applications of e-Health contribute to the correct diagnosis, with the assistance of non-invasive systems that base their function on imaging. Thus, the sector of Primary Healthcare provision is re-determined and expanded, regionally and temporally, as well as with regard to the speediness, utilization easiness, availability, operability, possibilities of control and cost reduction, the degree of participation and awareness, combined with the improvement of service of the patients-users [53].

By utilizing e-Health extensively, the exchange of data is facilitated, while at the same time, standardized forms of communication are now created between health professionals. Primarily, however, a new status is given to the interaction and mutual cooperation of the doctor with the patient, which must, nonetheless, be governed by honesty, trustworthiness and confidentiality [54].

e-Health is a key component that the European Union also emphasizes in the setting of Europe 2020 targets [10]. As of 2011, the European Commission's Implementing Decision of 22 December laying down the rules for the establishment, management and operation of the network of national authorities responsible for e-Health (Decision 2011/890/EU) entered into force. The following year, the European Commission, through the Directorate-General for Health of the European Union, adopted common rules of procedure for the implementation of the e-Health network in European countries, aiming at interoperability and uniform evaluation [12]. Concerning the Member States of the European Union, according to a press release issued by the European Commission on the extent of e-Health in Europe, the use of e-Health systems has been generalized in most European countries. The pioneers are: Denmark, the Netherlands, Great Britain, Estonia, Sweden, Finland and Germany. More specifically, the countries that perform best in the implementation of e-Health in hospitals are Denmark (66%), Estonia (63%) and closely followed by Sweden and Finland (62%). In the digitization of medical files the best performance has been made by the Netherlands (83.2%), followed by Denmark (80.6%) and Great Britain (80.5%), while Estonia stands out (100%) in e-prescription followed by Croatia (99%) and Sweden (97%) [55].

In 2015, the top ten European States in e-Health applications between doctors and patients were as follows: Denmark, Finland, Spain, the Netherlands, Sweden, Estonia, Croatia, Portugal, Germany and France. The e-Health applications evaluated included physicians' ability to diagnose and prescribe electronically, the ability of health professionals to exchange data, make appointments with patients, and communicate with care providers, medical surveillance, patients' electronic information about their health and the ability to obtain valid information via the Internet [56].

In Greece, e-Health has experienced a rapid development in the last two decades. As contradictory as it may sound, the economic crisis following 2019 became an opportunity for the country to proceed to extensive changes in the National Health System. That was necessary since health expenditure had to be significantly reduced. In this context, e-Health applications were deemed very effective so that the country could secure resources for the repayment of foreign loans. According to the European Union data, per capita expenditure in the health sector in Greece in 2009 amounted to 2,287 Euros. That amount decreased to 1,650 Euros in 2015 [57], a sum which is 45% lower than the European Union average [58].

An additional pressure to the National Health System was given by the thousands of refugees who arrived in the country in the last few years. According to the data, only in the year of 2015, Greece in collaboration with NPO, provided medical care to approximately 870,000 refugees. The available data shows that, from the e-Health sectors, e-prescription has proved to be an essential factor towards expenditure restriction. It is estimated that in the time period 2009–2014, 3 billion Euros were saved thanks to intangible prescription [59].

The last pandemic of COVID-19 is expected to contribute even more towards the reinforcement of e-Health. In various countries, there have already been made and are currently functioning applications of tracking of contacts for cell phones. The said applications are installed voluntarily and, by using the Bluetooth technology, warn the users who were very close to a person affected by the virus for a period of time. In this way, it is possible to control the expansion of the infection more easily. Nonetheless, it is vital that the privacy and personal information of the users be protected, with the commitment from the national authorities that they will not make use of them and that they will deactivate the respective applications as soon as the pandemic has been overcome [60].

However, the way towards the direction of a smart and pervasive healthcare is still long both for Greece and the rest of the world. The only thing certain is that it is a one-way street. In our era, the era of the Fourth Industrial Revolution, e-Health is expected to experience an exponential growth in the years to come.

Unfortunately, in the case of Greece there are still no reliable financial data on the cost of implementing e-Health programmes and the benefits of their implementation. This is a significant lag in relation to the European reality, which is undoubtedly an obstacle on the further promotion of e-Health in Greece. The only reliable data that has been able to be found are based on research by the Association of Greek Industries which include as good practice the application of the National Network of Telemedicine in the remote Greek islands as well as the case of a public hospital, which is included in smart hospitals, i.e. those hospitals that have largely implemented the digitization of their services [61].

5. Conclusions

e-Health can yield significant benefits to the society as a whole, contributing conspicuously to the accessibility and quality of the provided health services to the citizens who are in need of them. Furthermore, it helps towards the development of a National Health System with an anthropocentric orientation, founded on the viability of the health field, with the spreading of correct practices and the optimal exploitation of the available resources, both material and human. Moreover, e-Health is bound to increase the effectiveness and efficiency of the services provided by health professionals, thus contributing to the rationalization and reduction of expenditure.

The promotion of e-Health renders possible the provision of better care to more patients, releasing the institutional resources (of Hospitals, Clinics, Health Centers,

Regional Surgeries) and limiting healthcare expenses. The new technologies provide various possibilities, readjusting the provided healthcare forms, depending on the individualized needs and expectations of every patient. Geographical distances are nullified and the provision range of health services is expanded, granting equal access even to residents of removed from the urban centers areas. This way, the citizens' feeling of their equal participation to the public commodities is consolidated, particularly to those who live in remote and isolated areas.

There are certainly several issues which must be resolved so as for e-Health to be reinforced. It is essential that all bodies concerned, and especially Leadership, realize the value and the advantages which derive from its utilization. It is also necessary that e-Health applications be more user-friendly. Above all, though, there must be ensured the confidentiality of the transmitted information and the patients' personal data. Only in this way will everybody understand that e-Health can really contribute towards the direction of a smart and pervasive healthcare.

In the case of Greece, it is necessary to have measurable results that prove in practice the benefits of implementing smart and pervasive healthcare. In addition, the Greek National Health System needs to adopt good practices, which are already successfully applied in other European countries, such as Denmark, Estonia and Finland.

Conflict of interest

The author declares no conflict of interest.

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