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E-Health in Europe: Current situation and challenges ahead

Introduction

Currently, there are various challenges facing healthcare systems in the European Union (EU). The rise of life expectancy and the decline in birthrates have led to a demographic transition over the last decades. For example, the average life expectancy in the EU, which was 77.7 years in 2002, increased to 80.6 years in 2012 [1]. Alongside these demographic changes, additional factors complicate the current situation, such as the increase of chronic diseases which is frequently seen in multi-morbidity conditions [2]. These developments, along with other socio-economic factors, have a considerable impact on the sustainability of the healthcare system.

Information and communication technology (ICT) in healthcare plays a key role in expanding access to diagnostic services, improving their quality, increasing coordination between providers, improving patient management, and helping to overcome physical distances between patients and health professionals [3]. The concept of an Electronic Health Record (EHR) was set out in order to close the gap between institution-specific patient data and a comprehensive, longitudinal collection of the patient's health data. In this context, the patient is regarded as a partner who actively participates in his/her treatment [4].

Many EU Member States (MSs) have invested substantially in the development of ICT in healthcare. e-Health and m-Health are gaining wider acceptance and are being deployed more and more across the EU. They are also becoming increasingly important in the delivery of top-quality care to European citizens, yet e-health and m-health still face barriers. For example, the suggestion to allow patients access to online medical records was recommended a long time ago, as a key action contained in the Digital Agenda for Europe [5]; yet it is still not realised in many EU MSs [6]. A report by the World Health Organisation from 2016 indicates that 53% of the MSs do not have legislation which supports patient access to their own electronic health data [7].

Drivers such as the proliferation of the Internet are changing the attitude of patients towards their health and their role in healthcare. This change is reflected by the concept of patient empowerment, which can be defined as

a 'process in which patients understand their role, are given the knowledge and skills by their healthcare provider to perform a task in an environment that recognises community and cultural differences and encourages patient participation in their healthcare' [8].

Such issues, including those mentioned above, were discussed recently in a European Parliament debate on e-Health in Europe, organised by the Science and Technology Options Assessment (STOA) Panel in Brussels [9]. The STOA Panel is the European Parliament's in-house source of analysis of public policy issues related to science and technology [10].

Key trends of e-Health in the EU

There are major differences in e-Health deployment at a national, regional and local level in the EU. In 2013, the European Council urged for the reduction of the digital gap amongst MSs [11]. Access is a major barrier for effective e-Health use. Overall, people living in the richer MSs tend to have more ubiquitous Internet access. More than three quarters (78%) of Europeans (aged 16-74) in the EU-28 use the Internet. At least 9 out of every 10 individuals in Denmark, Luxembourg, the Netherlands, Sweden, Finland and the UK use the Internet. In comparison, less than two thirds of citizens use the Internet in Portugal, Greece, Italy, Bulgaria and Romania [12]. On average, 57% of Europeans used mobile devices to access the Internet on the move in 2015. This figure, however, does not take into account the large differences between EU MSs and associated countries, such as the widespread availability in Norway (83%) and the UK (79%) compared to the limited access in Bulgaria (38%) and Italy (26%) [13]. In addition, across all EU MSs, mobile diffusion has not yet made an evident difference to disadvantaged groups, who primarily use mobile phones for basic functions (e.g. making calls, texting, and gaming) rather than for more elaborate searches [14].

Inequalities are also evident in the health sector, for example in the use of ICT by general practitioners and hospitals. While in some countries it is quite common for general practitioners to have their own website, this is still

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uncommon in most EU MSs [14,15]. Differences are also evident at policy level, where a few countries (e.g. some Nordic / Baltic States and Scotland) have clear e-Health strategies in place linking up national, regional and local stakeholders, whereas in the majority of EU MSs, e-Health implementation is still focused on the introduction of EHR. Not all EU MSs grant patients full access to their EHR, and even where this is done citizens are not always aware that this opportunity is available to them.

The first EU e-Health Action Plan was adopted in 2004 [16]. Since then, the European Commission (EC) has developed several policy initiatives aimed at fostering the implementation of e-Health throughout the EU [17]. The adoption in 2011 of the Directive on the Application of Patients' Rights in Cross-Border Healthcare, establishing the e-Health network, marked a further step towards formal cooperation on e-Health, through interoperability and the implementation of e-Health systems [18]. The new 'EC e-Health Action Plan' describes the actions which will need to be implemented, regarding e-Health in Europe in the coming years, in order to address and remove well-known existing barriers. It focuses on the interoperability of e-Health services (semantic, legal and organisational) and e-Health deployment and uptake (funding, awareness, evidence, digital health literacy, etc.). Finally, it also addresses the need to strengthen international cooperation among EU MSs and to increase e-Health research and innovation [19].

Challenges for the deployment of e-Health in the EU

Despite the proliferation of ICT in the EU, healthcare systems are still facing fundamental challenges to take advantage of the full potential of e-Health solutions. Several European research, market validation and initial deployment projects have investigated the problems. These problems have been attributed to, amongst others things, the healthcare environment and also to the healthcare providers.

The Impact project was one of the first projects that systematically investigated critical success factors and published recommendations based on their findings. Amongst other things, these included the importance of multi-disciplinary teams, to realise benefits while meeting actual needs and to support the process of change [20]. Another key study, the EHR Impact study, also recommended the creation of an enabling organisational and legal framework by policymakers. It also highlighted that interoperability and engagement are central for the success of e-Health implementation [21].

Moen *et al.*, identified a number of challenges attributed to e-Health in Europe belonging to four categories: policy, technology, organisation and professionals. According to this study the most prominent challenges are: i) a missing legal framework and national strategy with sufficient funding; ii) the need to establish a sound e-Health platform (with an effort to harmonise standards, ensure interoperability, optimise integration of new and existing ICT-solutions, etc.); and iii) the need to balance the interests between the private and the public sector. Finally, iv) the study highlighted the complexity and variety of clinical practice across Europe, through the analysis of the health professional dimensions [22].

The Momentum project identified a number of requirements within four categories (context, people, plan and run). These included the need to involve stakeholders and account for actual needs, guarantee the legal security of the health records and the need to set up a proper management and business plan [23]. A more comprehensive review carried out by Hoerbst *et al.* concerning the barriers and critical success factors for clinical information systems in integrated care settings, achieved similar results [24].

During the STOA debate, additional clinical evidence was presented from the Renewing Health project [25]. This project recruited more than 7.000 patients affected by diabetes, chronic obstructive pulmonary or cardiovascular diseases. It showed that health professionals were interested in providing e-Health services. Despite this, there was a great diversity between health professionals in their judgement concerning the results of the efficiency of e-Health solutions. It also emerged that using e-Health saved less time than was expected (e.g. the patients still needed to attend the outpatient clinic at regular intervals). However, a certain amount of task shifting was seen, yet often this did not reach its full potential due to the pilot nature of the project [25].

From the United4Health project, it emerged that the resistance of healthcare providers to the use of e-Health is related to the lack of strong evidence supporting its clinical benefits. The increased time that clinicians spend on documentation due to new systems, is identified as a major barrier. Moreover, even when the clinicians are willing to get involved, they are not sufficiently supported by clear guidelines [26]. The study suggested that in order to convince the 'non-believers' a transparent reimbursement model, appropriate training, clear legal and regulatory framework and carefully redesigned ICT-supported care pathways could be implemented. The need for trialling ICT-enabled integrated care has been well identified by the European Commission, which has launched three large-scale projects to assess the impact of such a care approach [27-29].

Within the EU, healthcare systems are highly differentiated by funding levels, access to healthcare services and quality of care. As EU MSs aspire to improve their healthcare systems, the need for increased healthcare spending and ICT infrastructure/e-Health capacity in less developed countries will continue to pose a challenge. An important objective of the EU is to create a level playing field by extending access and availability of health services to all citizens. Policies to reduce health inequality include promoting cross-border healthcare [30], creating a digital single market [31] and patient empowerment [32].

The STOA workshop examined the current status and developments regarding the proliferation of e-Health in the EU from different perspectives. It appears that, as well as the technological efforts to develop innovative e-Health solutions and concepts in the last decades, substantial efforts have also been made to identify key factors for the success of such solutions. Across the different perspectives, the STOA workshop identified several barriers that hamper the wider uptake of e-Health solutions. They are: i) a lack of confidence in e-Health among patients and healthcare professionals; ii) a lack of interoperability between e-Health solutions; iii) limited evidence of the cost-effectiveness of e-Health tools and services; iv) a lack of legal clarity e.g. for mobile health applications; v) a lack

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