

## Fostering digital literacy in the elderly as a means to secure their health needs and human rights in the reality of the twenty-first century

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**Summary** The rights to life and health are basic human rights but, as life spans increase and societies age, these rights become increasingly difficult to secure. The number of people needing care, nursing, and medical treatment increases – and their expectations of quality of life rise – faster than the available financial assets and workforce. The article aims at defining the influence of digital literacy of patients and digital-based medical services availability on perspectives of fulfilling health-related needs specific for ageing societies. A variety of information and communication technologies (ICT) solutions can deliver at least temporary relief to countries suffering from these problems, assuming that the potential beneficiaries are able and willing to use such methods. It is thus worthwhile to foster digital literacy, especially among middle-aged and older people. ICT-based solutions include a variety of more or less technologically advanced, sophisticated, and easy-to-use services, many of which have been in operation and common use for decades, and are thus ripe for medical application. Such technologies can create a highly complex system of interconnected electronic tools and information systems operating on sensitive medical data that must remain confidential. These systems aim to increase patients' medical safety and maximize their quality of life, but they also pose serious threats to their privacy. Confidential data are protected by legal regulations, including the recently introduced European General Data Protection Regulation (GDPR), but primary care physicians should not be discouraged by this from implementing ICT-based solutions into their practices, as they may significantly lessen their everyday workload.

**Key words:** biomedical technology, primary health care, aging, data anonymization.

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### The human right to health

Article 25 of the 1948 Universal Declaration of Human Rights states that every person has the right to a standard of living adequate for health and well-being, including food, clothing, housing, medical care, and necessary social services, and the right to security in the event of sickness, disability, old age, or lack of livelihood in circumstances beyond his or her control. Motherhood and childhood are entitled to special care and assistance [1]. The 1950 European Convention on Human Rights does not directly refer to health, but article 2 enforces protection of the human right to life [2]; however, the European Court of Human Rights has pointed out in several rulings that this article can be violated by a systemic or structure-based lack of access to health care of reasonable quality to individuals [3]. The European Union's Charter of Fundamental Rights, which was published in 2000 and came into force in 2009, provides safeguards for both the right to life (article 2) and guarantees for health, encompassing the right to access preventive health care and the right to benefit from medical treatment under the conditions established by national laws and practices (article 35), as well as the right to work under conditions that respect the health, safety, and dignity of both adult workers (article 31)

and younger working people (article 32) [4]. The article aims at defining the influence of digital literacy of patients and digital-based medical services availability on perspectives of fulfilling health-related needs specific for ageing societies.

### Health needs in aging societies

According to the Constitution of World Health Organization (WHO) "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" while "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition" [5]. Unmet health needs are often matched with patients' strong desire for their fulfillment, especially in dependent old patients [6]. The number of older community-dwelling individuals is on the rise in developed countries, and an increasing number of these are housebound because of functional impairments that preventing them from leaving their homes; some are partly housebound and are capable of leaving home only with assistance. In the United States in 2011, it has been estimated that 5.6% of the elderly population fall into this category [7], which corresponds to 3.6 million people



who need home-based care, as they suffer from multiple co-existing illnesses of both medical and psychiatric nature more often than the general elderly population. These conditions typically include metabolic, cardiovascular, cerebrovascular, and musculoskeletal diseases, cognitive impairment, dementia, and depression [8]. This group has special needs resulting from its sociodemographic characteristics, living environment barriers, and coexisting chronic diseases, which translates into an increased use of health care and social services [9], and a greater burden on informal caregivers [10]. The generally accepted solution to this is to develop various forms of home respite services to alleviate the load and stress on informal caregivers [11], although the objective evidence for the positive effects of such services is considered limited and weak by some studies [12]. Informal caregivers generally appreciate any form of support and respite care, especially that which provides them with some time off, but they also seek communication with other informal caregivers and information from professional caregivers. However, the scope of the desired support varies widely, and depends on the individual caregiver and care recipient, on the specifics of the caregiving situation, and on the formal or institutional environment [13]. The need to increase the quantity, quality, and flexibility of support and respite services is stressed by informal caregivers [14]. The true extent of the demand for support and respite services is hidden, as many informal caregivers do not readily ask for these, despite the fact that they objectively need them [15].

The other side of the coin is that attitudes are changing towards aging processes, old-age lifestyles, and the behaviors presented by comparably healthy retired people of both sexes, even in the oldest age groups – including the changing demand for medical services [16]. The desire to stay healthy, even towards the end of life, without giving up on plans, is consistent with increasing life expectancies [17]. As both the chance of reaching old age and health in old age are largely predetermined by genetic predispositions and modifiable factors, such as environment and lifestyle, with proper public health policy, the onset of age-related physical and intellectual deterioration can be significantly delayed and managed – a feat which will in the coming decades seriously involve the activities of primary care physicians [18]. Japan presents a good example of the changes expected to arrive in Europe with increased average lifespan and declining birth rates. Population aging in Japan has reached an extent unknown in any other society: by 2013, 25% of the population were 65 years or older, and 12% were 75 years or older; Japanese society continues to age and by 2060, these percentages are expected to reach 40% and 27%, respectively [19].

## Digital literacy

Electronic medical services are being more widely introduced in developed countries. Interaction with information systems can be difficult for many older people, many of whom lack digital literacy, which is defined as possessing the general competences that allow interaction with information systems. On the other hand, medical literacy refers to a background level of basic medical knowledge allowing the use of medical resources in a meaningful and effective way. Such resources now include not only printed materials but increasingly websites, e-mails, electronic messages, computer files in different formats on different media or online, electronic medical records (EMR), and other remote databases [20]. A person's level of digital literacy is inversely linked with their level of anxiety around tools and services based on information technologies [21]. There is a direct link between the frequency of contact with information and communication technology (ICT) and positive attitudes towards ICT, including decreasing anxiety, though this has been clearly demonstrated only in men [22]. Elderly people's attitudes towards ICT also seem to be modifiable, although they are com-

monly believed to have more negative attitudes toward ICT than younger people: they feel on average less comfort, efficacy, and control over ICT tools and services, but their attitudes toward technology improve with experience, as in others [23], even after two weeks of training [24]. However, this does not change the general observation that, on average with increasing age of ICT users, response time becomes longer, the number of errors rises, and the subjective perception of fatigue and of the difficulty of the tasks increases [25]. Other user-independent phenomena, such as the unexpected crashes and slowdowns which are common with ICT tools and services, often cause significant additional burden to elderly users [26]. It was confirmed that also in Poland, on average, the older the person the less likely he or she is to search the Internet for medical knowledge [27].

As health literacy and digital literacy are increasing closely linked in modern societies, a lack of digital literacy should be considered an important factor discriminating against access to medical services in the modern world; interestingly, this can work both ways, as elderly people with low health literacy are generally less likely to use and benefit from electronic medical resources [20]. To make decisions concerning health, people now need increasing amounts of information and, as access to health information is provided largely through various ICT systems, especially internet-based services, they thus require skills such as the ability to search, evaluate, and employ information acquired online [28]. Medical education is increasingly provided in the form of multimedia, which has been demonstrated to be more effective not only than no education at all, but also than the standard clinical care education provided by health professionals, as medical personnel members tend to be overloaded with work and often lack the time for the prolonged interaction with patients needed for proper education [29].

## Digital-based medical services

With the aging of society, medical services are supposed to be adjusted and the paradigm of health care provision is expected to change from hospital-centered medical care oriented towards healing to community-rooted medical care aiming at both healing and support [19]. Providing care to an increasingly large dependent aged population increases the societal burden, calling for new solutions to avoid structural and systemic collapse as a result of increased lifespans [30]. Modern technologies can be used to a wide variety of ends, including the delivery of education and shaping behavioral skills, and these ends can be achieved by enhancing communication between patients and health professionals; maximizing patients' motivation, individual self-management, efficacy, organization, and adherence in intervention-demanded activities, especially by using reminders and providing feedback on progress; facilitating the management and self-monitoring of health condition and disease by the patient; providing the patient with education on the condition or disease, its prevention, monitoring, and treatment; supporting adherence to medical procedures, particularly by using reminders; providing the patient with the opportunity to communicate with other patients with similar conditions, especially via electronic discussion boards or peer-to-peer networks; supporting the process of proper informed decision making for both patients and their caregivers; and collecting or capturing data originating from both the patients and their caregivers [31].

Modern technologies allow for the delivery of medical interventions in many ways, particularly using older mobile phones; software-enhanced and internet-enabled smartphones; other internet accessing devices such as personal computers (PC), portable computers, and tablets [31]. Some technologies seem to be more easily introducible than others: for example, mobile phones have been in wide use for over two decades, and their Short Message Service (SMS) and Multimedia Message Service (MMS) facilities do not require high levels of digital literacy; they

are thus generally well-accepted by patients as a means of communications with both medical professionals and healthcare institutions. Those services are cheaper than the alternatives, such as postal reminders and phone calls [32], and more convenient for medical staff, as they allow a significant level of automation of the process of both sending and receiving messages, thus proving effective both for health promotion and prevention [33] and in the management of long-term health-related conditions and illnesses, such as obesity, diabetes, hypertension, and asthma. SMS and MMS have proved to be more efficient than e-mail prompts in ensuring patient compliance, for example in the regular use of prescribed drugs, sending results of tests, or attending scheduled visits [34].

Smartphones present some difficulties for older people with vision impairments and psychomotor limitations, as they require more accurate pointing with the fingers and their small size can be difficult to operate. However, they are still very promising tools, as they are internet-connected and software-enabled, which makes them flexible and allows them to be used as a single means for communication, education, reminders, and feedback, leading to better control of chronic diseases and resulting in better health outcomes [35]. Smartphones and other wireless internet-enabled wearable electronic tools, such as smartwatches and specialized trackers are equipped with Global Positioning System (GPS) receivers, allowing their location to be tracked; this can serve as a feasible assistive technology for caregivers of patients with mental disturbances, including the elderly suffering from dementia [36]. At present, the distinction between larger smartphones and smaller tablets is becoming blurred, it can be expected that the uses of tablets will also prove to be numerous, not only as they can serve as a means of connection to medical information sources and medical professionals, but also because they can help overcome old-age physiological limitations, such as improving the reading performance of low-vision patients. Unlike classic tools, the positive effects improve significantly with the users' growing experience with them [37]. Previously employed technical solutions to the low-vision problem have included handheld or static magnifying lenses, systems based on closed-circuit television (CCTV), and head-mounted video magnifiers (low-vision enhancement system, LVES), but as these operated on the basis of the object's view, rather than on the viewed object itself, they had numerous limitations, including a restricted range of magnification [38]. These limitations are absent in the case of electronically generated images on tablets.

There are many portable, wearable, and even implantable medical hardware and software solutions, with varying ranges of ease of use, which have been developed to fulfill one or more functions such as reminding; remote supervision; monitoring; alarming; emergency contact; storing, aggregating, and sharing medical data locally or in the cloud; tracking and emergency

location; medical advice and consulting; automated diagnosis support; remote diagnosis; intervention guidance and remote treatment; and documenting [39].

## Medical data security

The recently introduced European General Data Protection Regulation (GDPR) [40] requires that providers of care and medical services implement strict data privacy protection and patient consent procedures; that they use means of control for collecting, accessing, and sharing data; and that they ensure broad acceptance of the privacy and security culture by all staff of medical facilities. At the same time, securing elderly patients' health needs increasingly relies on a multidimensional approach that combines multiple services, engaging more medical, care, support, and technical staff from different facilities, and employing more data-dependent technical devices and information systems; all this demands the rapid acquisition, exchange, integration, and sharing of the medical data of larger numbers of patients, which means it becomes a complex, demanding task to adequately preserve patients' privacy and autonomy [41].

Although many modern medical technological solutions foster elderly patients' independence and self-reliance, there is always a trade-off in the case of privacy and security. If modern technology-supported care is to extend to cover an increasing number of older people, it needs to continue to seek the optimal point of dynamic balance [42]. It needs to be stressed that the actually achieved level of medical data security depends not only on the built-in safeguards of the ICT systems but also on the medical personnel and their steady efforts while operating those systems [43].

## Guidelines for primary care physicians

Both the assets and resources of health care systems are limited in an aging society. In order to utilize them optimally in primary care practice, it is useful to actively seek new medical ICT solutions and incorporate them into existing systems in medical facilities. It is also crucial to advise middle-aged and elderly patients, as well as their caretakers, of existing ICT-based opportunities, to direct and encourage them to gain experience in using ICT services as early as possible in their lives, so as to foster and sustain positive attitudes towards such services. It is important to start with technologies that are well accepted by patients, and then proceed to more advanced ones. In introducing any new ICT solution, the primary care physician needs to follow the applicable legal regulations on medical data security and information confidentiality, and especially the newly introduced GDPR.

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