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INNOVATION THROUGH ICT IN CARE HOMES

IN-ICT-CARE

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Introduction

This policy recommendation output provides an analysis of the way that information and communication technology (ICT) applies to the care home sector in Turkey which has the potential to improve the efficiency and effectiveness of care provision. When we refer to the care home sector in this report, we refer to both residential care homes and nursing homes.
This output has been undertaken at a time when reports and studies describe health and care provision to be approaching the ‘aging storm’ in Turkey and covid-19 issue occurred in the World.

The last two decades have seen an explosion in the development and availability of new information and communication technologies (ICTs) across Turkish social care. Supporters argue that ICT can help solve the urgent problems facing the sector: reducing the cost of care by enabling people to live in their own homes for longer; providing remote services and tools for self-care and management of chronic health conditions, and thus reducing the need for domiciliary care visits; enabling closer integration of health and social care; and providing more personalised and preventive care services through the use of data, algorithms and AI to keep users healthier for longer.

As the Turkish Commission stated in their 2014 report ‘Assistive Technology: Independence and Wellbeing’, these new technologies offer “the high possibility for public policy to meet more people’s desire to remain independent for longer, while at the same time saving money overall”. Sixteen years later, following a decade of austerity, with sustained reductions in social care funding, worsening workforce shortages, and a lack of political leadership on social care from central government, the promise of technologies that might deliver cost savings while improving services remains highly alluring. The COVID-19 pandemic crisis, which has disproportionately affected social care, has further highlighted the potential benefits of technologies to maintain or even improve services while reducing direct person-to-person contact.

1. The current situation of the elderly care in Turkey

Considering the rapidly rising ratio of the elderly in Turkey, which was 5.7 in 2005 and is expected to be 17.6 by 2050 in total population, proper evaluation of the possible consequences should be completed immediately before the issue turns into an alarming situation. Put clearly, as the number of the older people grows rapidly in Turkey, care needs will expand hugely in the near future.

Therefore, the governments in Turkey need to be totally ready to face this challenge institutionally and provide decent lives for the elderly.

Many countries redesign their policies in the scope of value-added targets, like active aging, successful ageing etc. The elderly are aimed to become persons who are self-sufficient and useful both for themselves and their social environment, instead of being passive beneficiaries of formal supports. Turkey, however, still seems away from conducting systematic measures, except for a few ineffective strategy papers and regulations despite of the rapidly increasing elderly population. Existing services and institutions are insufficient to meet the care needs of the elderly and provide them decent lives. Accordingly, Turkey still relies on cultural and traditional protection nets to a great extent in this field. Changing socioeconomic conditions, however, threaten these traditional protection nets. Consequently, in the lack of effective formal measures, the elderly are expected to adapt themselves to changing conditions and redefine their roles in families and society. Therefore, governments need to enhance the quality of existing services in order to improve the health and living conditions of the elderly.

Ageing of the populations emerged as one of the most noteworthy developments of the 21st century in many countries. People started to live longer, basically as a result of the decrease in birth rates and improvements in health care. This is not simply a demographic shift and may mean a number of new burdens for society. Therefore, a combined and integrated policy packet which is supposedly strengthened by the perspectives of social security, health, environment, education, business opportunities, socio-cultural activities and family life is definitely required.

In developed countries, where the ageing of the population is a more longstanding problem, studies and assessments focus mainly on two issues. The first group of studies approaches the issue from society perspective and includes the socioeconomic effects of ageing. Other studies, on the other hand, focus basically on the quality of life of the elderly population by analysing their social, economic and cultural needs while trying to ensure that elderly people participate completely in social life without being excluded. It is possible to infer from most of these studies that influential results are obtained in the struggle against the ageing problem in these countries.

However, ageing is not only the problem of the developed world; in fact, it is a more crucial problem for developing countries owing to the fact that these countries have not completed their economic and social welfare developments yet. Therefore, formulation of the required policies and

inclusion of the elderly into society may be more challenging in developing economies than the developed ones.

2. Ageing as a global issue

Age distribution of the world has been altering rapidly by the dramatic increase in the elderly population since the second half of the 20th century. The number of the elderly above 60 years old, in this sense, is estimated to reach 1.2 billion in 2025, 1.3 billion in 2040 and 2 billion in 2050 across the world. Besides, at the end of the first half of the 2000s, the number of the fourth aged people who are above 85 years old will be 6 times higher than the number of the third aged people who are 65 years old (TYDYUEP, 2013: 4).

Major developments, such as slowdowns in birth rates, longer life expectancies, improvements in nourishment opportunities, health care services, and innovations in medical technologies etc. paved the way for the worldwide increase in the elderly population. Life expectancy at birth in Europe, for instance, increased 20 years between 1900 and 1950 and is forecasted to add another 10 more years by 2050 (SPO, 2007: 6). World Health Organization data indicate that the share of the older people in Europe is expected to reach 25 percent in 2050 (WHO, 2016). This is why Europe is widely known for being the “oldest” continent in the world (Kinsella and Phillips, 2005 :7).

Besides being an inevitable physiological process, ageing has also significant outcomes regarding health, socioeconomic and cultural structure as well. Successful evaluation of the transformations in the demographic structure is, therefore, crucial to determining the possible adverse effects of ageing. Many countries, to this end, design numerous policies and projects with the purpose of coping with this phenomenon with the least damage or even turning it into an opportunity in addition to the improving the quality of life and health of the elderly population.

In this sense, ways of realizing the goals of active aging, successful aging or fourth age arrangements have always been a matter of contention. The concept of active ageing was introduced by the World Health Organization in the late 1990s. This concept simply means a healthy ageing and a satisfactory level of wellbeing without ignoring the goal of ensuring active participation in all parts of daily life (Kinsella and Phillips, 2005: 36). Solidarity among family members from all generations and within society is another crucial issue which all countries including Turkey should empower in this process.

The level of solidarity is determined basically by the culture and traditions of a society, not the policies implemented and enforced by governments. Put differently, essentially the socio-cultural factors determine the way of getting old for every individual. Even if the ageing process seems only the concern of the individual, social customs and cultural values conclude the position of the elderly in a society. This is the main reason why the process of ageing is not just a physical and individual, but also a social and cultural process as well.

The concept of successful ageing, on the other hand, has a variety of dimensions including health, a high level of wellness, social and psychological satisfaction. Therefore, physical, mental and cognitive health, social competence, functionality, self-reliance, and enjoyment of life altogether address successful ageing. As a combined concept including individual characteristics and social capabilities at the same time, successful ageing of an individual is determined by the public social services including psycho-social, economic and physiological support (SPO, 2007: 1).

Fourth age is a rather new concept in the field of ageing. It concerns a more limited span of the population and thereby, a more limited number of countries. There are various studies to define the concept. As the common features in all definitions, fourth age, which is sometimes referred to either as the disability zone or the oldest old, addresses generally the 85 and older age group (Johnson and Barer, 1997; National Institute on Aging, 2003). Fourth age is characterized by illness, frailty, ever increasing dependence and non-self-sufficiency as well as the imminence of death (Lamdin and Fugate, 1997: 30–31). Baltes and Smith (2002: 2) also confirm the biocultural incompleteness, vulnerability, and unpredictability as the essential indicators of the fourth age. They claim that nearly all people who are in their mid-80s exhibit these symptoms of the fourth age. Considering the symptoms, fourth age may start at an earlier age and people in their 70s or even their 60s may be living their fourth age time (Williamson and Asla, 2009: 77). However, it seems early for Turkey to talk about fourth age considering the present age distribution of the population. Turkey is still in the third age period and experiences the problems which are mainly related to it, not the fourth age.

3. Recent demographic trends in Turkey

Turkey has more or less the same demographic characteristics of the elderly as in other developing countries, with some unique sides (Cankurtaran and Eker, 2007: 67) Turkey, as a country having around 77 million people in total, has approximately 6 million people of aged 65 and over, which equals to 7.5 percent of the total population. Distribution of 65 and over years of age changes upon rural to urban areas, which is 4.86 and 2.65 percent, respectively (TYDYUEP, 2013: 8). This

difference may be attributed to the employment-oriented internal migration flows among the young population.

From a historical perspective, on the other hand, a fluctuation in the share of the elderly population in Turkey is evident. To this end, first a decrease from 3.9 to 3.3 between 1935 and 1950 was measured, but afterwards, a steady and regular increase period started. A big leap happened in the share of the elderly population in the 1990s. In short, from 1935 to today, the share of the elderly population in total population has doubled in Turkey (TurkStat, 2016a) Put precisely, it is possible to call the general population structure of Turkey “aged” since 2009.

Depending upon the calculations and estimations, both number and rate of the elderly in Turkey are expected to increase continuously during the 21st century. Considering Table.1 as a whole, both a declining trend in 0-14 age group and an increasing trend in the elderly population can be seen at the same time. To this end, 0-14 and 15-19 age groups are estimated to be fixed and the 25-54 age group will start to decrease rapidly in Turkey as of 2025 (SPO, 2007: 49) In other words, a relatively more outstanding increase in the elderly population than other age groups stands out based on the evaluation of the statistical data measured since 1935. The proportion of citizens aged 65 and over, in this regard, is now 7.7 percent and is expected to increase to 10.2 percent by 2023, 20.8 percent by 2050 and 27.7 percent by 2075. These percentages indicate a clear increase from 3.8 million in 2000 to 8.6 million in 2023 and around 19.5 million by 2050 (TurkStat, 2016b; State Planning Organization, 2007: 7).

Table 1. *Proportion of Age Groups within the Overall Population*

Year	0-14(%)	15-64(%)	65+ years(%)
1935	41.4	54.7	3.9
1940	42.1	54.3	3.6
1945	39.5	57.1	3.4
1950	38.3	58.4	3.3
1955	39.3	57.3	3.4
1960	41.2	55.2	3.6
1965	41.9	54.1	4.0
1970	41.8	53.8	4.4
1975	40.6	54.8	4.6
1980	39.1	56.1	4.8
1985	37.6	58.2	4.2
1990	35.0	60.7	4.3
2000	29.8	64.5	6.7
2007	26.5	66.6	6.9
2008	26.3	66.8	6.9
2009	26.0	67.0	7.0
2010	25.6	67.2	7.2
2011	25.3	67.4	7.3
2012	24.9	67.6	7.5
2013	24.6	67.7	7.7
2023	21.2	68.6	10.2
2050	15.7	63.5	20.8
2075	14.6	57.7	27.7

Source: TurkStat, Censuses and Projections.

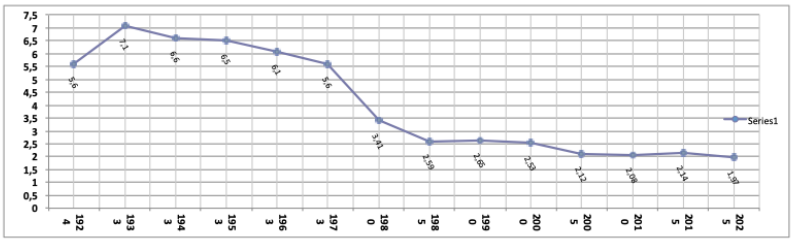
Considering the calculations and forecasts above, Turkey is one of the most rapidly ageing countries in the world. This is why Turkey should immediately stimulate studies and debates over a healthy, functional and effective ageing period and caring issues. Otherwise, governments will be blindsided by the socioeconomic, psychological, cultural and physiological problems related to the ageing process.

More importantly, as a part of the demographic transition period that Turkey has been through, total fertility rate is expected to drop to the replacement level in the near future. A continuous declining trend in fertility rate, in fact, has been the case in Turkey since 1950s due to giving up the pronatalist policies which was started by the proclamation of the Republic. Consequently, the fertility rate, which was over 6 percent in 1950s, declined approximately to 2.2 percent presently. The speed of the decline increased in the 1970s notably and since then, a reduction of 61 percent in total has been the case in Turkey (TYDYUEP, 2013: 7).

4. Elderly Care in Turkey

The right balance between familial solidarity and the public support in Turkey has been a centre of concern among researchers for a long time. As it is not easy, however, to design a universal standard for this balance, the best thing to do would be to decide the correct combination between these two care mechanisms in accordance with the need level of the elderly. Therefore, revealing existing state and needs of the elderly as well as their socioeconomic, cultural and demographic characteristics is crucial to plan the required caring services and include them socially.

Graph 1. *Total Fertility Rate*



Source: TurkStat, Basic Fertility Indicators.

Unlike many high-income countries, where the old age is commonly considered to begin with the 65 years of age, 60 is defined as the beginning of old age in Turkey (SHCEK, 2006). This discrimination is important as being the threshold for admission to the residential long-term care facilities. However, according to the "An Investigation of Turkish Family Structure: Proofs, Recommendations (AITFS)" report by the Ministry of Family and Social Policy, 66 percent of the elderly live either alone or just with their spouses. Considering only 20 thousand older people out of 6 million reside in a residential care facility as of 2012, the insufficiency of the number of care facilities to meet the institutional care needs of the elderly is beyond dispute (AITFS, 2014: 103-109).

Even if traditional kinship solidarity bonds have been strong in Turkey for centuries, it is not possible to classify Turkey neither individualistic nor communitarian solely based on several reasons. "Interdependence Model" of human development is claimed to be the correct classification for Turkish case. Communitarian and individualistic tendencies take place in this model with a special synthesis and balance. In such a society, that's showing both individualistic and communitarian features at the same time, families have a central place in meeting the needs of the

elderly and the level of the elderly who doesn't receive any support from their families would be really low. A relatively disadvantageous side of this situation is that families might act reluctantly to search for and accept institutional assistance set for the elderly (İmamoğlu, 1987).

In the lack of an effective formal care insurance model in Turkey, the issue of elderly care is still a problem required to be solved within the family and deeply depends on the goodwill of the family members. The main role in the elderly care is expected to belong to the spouse first and since the women live longer than men generally, elderly whose spouses pass away are mostly women (Cankurtaran and Eker, 2007: 67). But as the wife gets older as well in time, adult children take over this responsibility. These adult children act as the essential source of support and means of communication for the elderly.

However, family type matters significantly while providing social assistance for the elderly in general. Put differently, there is a direct relationship between having whether traditional or modern family typedesign and implementation of social assistance for the elderly (Taşçı, 2012: 137). As described in many studies and observed broadly, elderly people in rural areas still enjoy a traditional lifestyle by living in large families on the contrary to the elderly living in big cities. Put statistically, while every 2 families out of 10 in rural areas have the large family composition, this percentage is just 1 out of 10 in urban areas. As a result, elderly share per family in Turkey increased 20 percent between 2008 and 2011 (AITFS, 2014: 31-45).

Owing to the traditional and distinctively strong bonds among family members in Turkish society, a substantial part of the elderly population still lives in the same apartment, building, or neighbourhood with their children under their close supervision and concern. A survey carried out by the State Planning Organization indicates that 7 out of every 10 elderly individuals live in the same house, building, street or neighbourhood with their children (SPO, 2007: 11). This, in turn, makes it possible to support the elderly both socially and economically and works as an informal mechanism to complement the social protection duty of the state. Besides, it may create such an advantageous socially and economically situation both for the elderly and their children.

In fact, as a long-standing tradition since the times of ancient Turks, the elderly is treated respectfully and their needs are met fully in consequence of being the most experienced and the wisest in the family regardless being female or male (Altan, 2006: 270). There is also a non-written division of labour based on gender among the elderly. The old male, in this sense, is the decision maker and the old female is the main authority in domestic family issues within the large family

model in the urban areas where more than one generation lives altogether (Demirbilek, 2005: 217-218).

The privileged position of the elderly continued and, in fact, consolidated by the acceptance of Islam. “Fitre” (alms) and “Zakat” (tithe) are the key means to assist the elderly which strengthen this tradition more in time. Moreover, there are numerous verses in the Koran as well as the “hadith” commanding and advising to look after and support the elderly in any case. In short, thanks to this combination of cultural and religious practices, elderly people have always been respected and assisted in all periods of Turkish history.

Similar results, revealing how strong this informal social protection mechanism is in Turkey, are possible to gather from other studies. National Plan of Action on Ageing, for instance, states that 56 percent of elderly women attribute the primal responsibility of meeting the care needs to their children, while this is just 27 percent for elderly men. The rate for the elderly who think they have the responsibility to take care of themselves is calculated 43 percent in the same action plan. The ratio for this again changes upon gender and equals 27 percent for women and 66 percent for men (SPO, 2007: 12).

Even if these ratios still reveal the strong familial caring bonds in Turkey, starting with the period of the Republic, internal and external changes in social and family life, such as increasing industrialization and rapid urbanization, put some pressure on familial solidarity. This is especially a big problem in large cities where the social life flows much quicker. Social institutions, behaviour, and values, including the status and the functions of the elderly, are transformed by the given changes significantly in the end. As a result, demand for formal care services to replace the insufficient informal caring services has increasingly expanded.

Demographic shifts are among the other key factors affecting social relations and the level of formal services. Individuals have started to live longer, for instance, essentially as a result of the advancements in medicine and level of wellbeing. The increase in the number of divorces and single parenthood, turning from large family into immediate family, and growth in the number of women labour force all together weakened the former strong positions of the elderly in the family and challenged the informal support mechanisms (Akgeyik, 2006: 59; Bayoğlu, 2011:

125). Besides, migration by children from rural areas to urban areas, changing culture and increasingly conflicting values between young and old generations, and social and economic deprivation challenged the former strong positions of the elderly in families (Saka and Varol, 2007:

20). However, there are various studies indicating that the elderly still prefer internal care instead of the institutional one even if internal care and support for the elderly by family members declined significantly as a result of these developments (Karahan and Güven, 2002).

A counter-discourse about the internal roles of the elderly within the family has appeared recently due to certain socioeconomic developments. Wish for staying longer in education among the young population, increase in the young unemployment rate, migration, deterioration of income distribution, decline in the relative income levels, modern style of consumption, and general increase in housing and life expenses etc. led the elderly to undertake different roles than the traditional ones. Tracks of those new roles are possible to follow from Household Income and Employment Surveys. The elderly in families increasingly provide income and stipend support for their adult children and grandchildren instead of accepting assistance from them. Elders take new roles such as meeting completely or partly the wedding and setting up a home costs of their adult children, doing the housework, cooking, caring the grandchildren while the mother is at work, supporting education costs of their grandchildren or simply keeping silent without any complaints when their children don't spend enough time with them etc. (Dülger, 2012: 36). In short, elderly in Turkey adapted themselves to the new social and familial conditions and found new ways to continue being effective in family affairs.

In conclusion, despite the above-mentioned transformations and 87.7 percent immediate family rate compared to only 12.3 percent traditional large family type (AITFS, 2014: 29) in Turkey, large family and kinship relationships still keep their presence functionally. In this sense, even if the family members live in different residences, mutual assistance and support among them are still kept. As a result, protection of the elderly both financially and physically by the family is still the common case in Turkey compared to the Western world (SPO, 2007: 103; Cankurtaran and Eker, 2007: 66). Moreover, the elderly still try to keep the traditional large family structure, too. In fact, a big part of the elderly population prefers to keep silent even if they face negligence and abuse because of the social pressures, such as being stigmatized. Besides, there is always the risk of being taken from their homes and left to a nursing home. In Turkey, it is still considered a source of disgrace for an old person to reside in a nursing home if his/her children are still alive.

5. Formal Care

Social protection of the elderly is not confined only to the informal solidarity bonds in Turkey even if it still seems the primal one. Last two decades in Turkey witnessed a dramatic increase in government caring institutions due to the rapid increase in the number of the elderly. However, the administrative structure, as well as the classification of care institutions, is significantly different in Turkey. Elderly or nursing homes and elderly care and rehabilitation services, in this sense, are the major institutional care services run by either the central or local government authorities. The legal structure of elderly care dates back to the early republican period. The first law on elderly care, in this regard, was enacted in 1930, and some revisions and new additions were implemented to the law in 1963, 1982, and 1997.

In Turkey, as in many countries, the primary element of formal protection system for the elderly is social security service, which is stated as an essential right in 1982 Constitution. In order to be entitled to this service, the elderly must have worked for a specified duration and contributed to the pension system regularly. The social security system provides both a monthly income and healthcare support to the elderly with their dependents during both the working and retirement period.

The elderly who are 65 and older and not included by any kind of formal insurance based on registered work in the labour market are provided an aging salary and “help to aged” benefits by the government. As a rights-based social protection mechanism without considering any pre-contribution, this support started in 1976 through the Law on Encouraging Social Help and Solidarity and targeted the poorest sections of the population. As a solid example of a social state, this law seems appropriate to expand the social protection coverage and make the elderly independent from the labour market which is not dynamic enough to create sufficient jobs for everyone. However, there are some problems in practice. Bureaucratic formalities, for instance, hinder many elderly to reach these salaries and other support mechanisms. Even if they become entitled to get the salary, this time, the amount of the pension is extremely insufficient to provide a decent retirement life for the elderly. Considering the estimations on the rapid increase in the elderly population in the near future, this system should be reformed and de-bureaucratized in order to provide a comfortable life for the elderly in conformity with the claims of being a social state (Cankurtaran and Eker, 2007: 68).

Looking at the protection coverage of the elderly in Turkey, the National Plan of Action on Ageing offers valuable information relating to the wellbeing of the elderly. This action plan focuses basically on improving the quality of life and general status of health of the elderly through the policies and programs designed directly for them. According to this plan, 56 percent of the elderly population is entitled to some kind of income in Turkey by varying significantly by gender. 75 percent of elderly men, in this regard, are entitled to some kind of income, but the percentage for the elderly women is almost the half of the men and just 38 percent. As for the source of income, the pension is the primal income of 46 per cent of elderly men. Other sources are aging salary and rental/interest income. The share of the active working elderly is just 6 percent. The percentages for the elderly women, on the other hand, are quite disappointing. Only 6 percent of elderly women have their own pensions. The percentage of women who get an indirect pension as the dependants of their entitled husbands is 16 percent. 10 percent of elderly women are entitled to old-age pension and only 1 percent still work (SPO, 2007: 12; AITFS, 2014: 99) Clearly, all statistics for women are quite behind of those for men.

As in other aspects of Turkish social security legislation, the conditions designed for the elderly are also very complicated, too. Three different laws- Law on Pension Fund for Civil Servants, Law on Social Insurance Institution, and Law on Tradesmen and Craftsmen and Other Freelance Workers- entitled the elderly for a very long time before the social security reform was started in 2006. Even if these laws and institutions were abolished and just one institution for all was established by the reform, the discrimination among the elderly still continues in practice under the regulations of 4A, 4B, and 4C retirement status.

The imbalance between beneficiaries and active contributors, therefore, appears as another major problem about the social security system in Turkey. Although the average life expectancy increases from year to year due to mainly the advancements in healthcare services and relative level of well-being, the number of active workforce contributing to the system regularly does not expand with the same speed in spite of the long period of demographic window of opportunity. To this end, today, the ratio of active contributors and passive beneficiaries in social security system in Turkey is just 1.90 which is very low to enable the system covering itself (SGK, 2016) Considering this ratio is almost 4 or 5 active insured individuals for one retired person in many developed countries, the severity of the problem can be seen clearly.

In Turkey, social care services for the elderly are basically provided by the General Directorate for Social Services and Child Protection Agency. This directorate was founded in 1983 and operates residential care homes, home-care services, day-care centres and rehabilitation services nationwide. There are two principal types of support: financial support and provision of social services. Therefore, the systemized social services aimed to eliminate not only economic and social destitutions but also physical and psychological ones, too. The central objective of the directorate was defined as having various social security and assistance services operating in conformity with each other, coordinating caring, housing, and rehabilitating services altogether for the needy elderly, children and disabled individuals who are subjects of socioeconomic deprivation. The ultimate purpose was improving the quality of life of these groups altogether by passing beyond only the eliminating these problems (Karagel, 2011: 62; Saka and Varol, 2007: 20). Following the foundation of the directorate, the first senior centre was founded in 1966 in Turkey relevant to the establishment objectives of the directorate.

Local administrations are also significant actors in the provision of social care and protection to the needy elderly. Municipalities, in this regard, are the primal providers and they are obliged by law to establish boarding houses, alms-houses or rest homes for needy and helpless people, including the elderly, since 1930. Moreover, as seen in the Table.2, numerous private care institutions operated by various NGOs, minorities, and real persons provide social care for the elderly, too (Karagel, 2011: 62; TYDYUEP, 2013: 12).

There are, of course, some preconditions for the admission to these care homes. For instance, publicly funded care homes stipulate being socially and/or economically destitute through a means-testing and a social analysis report rather than poor health. In fact, being healthy is the first criterion in order to get admission. Put clearly, an individual must be healthy enough to undertake activities of daily life independently, have no serious disability or illness requiring continuous medical care, and no drug or alcohol addiction problems (Saka and Varol, 2007: 20).

6. ICT and E-government practices in Turkey

The most important competitive tool in the information society is the acquisition of information and sharing among the institutions. The most important contribution of the information society to public administration reforms is the e-government, which provides advantages in terms of time and labour costs. E-government practices strengthen communication between citizens and administrative institutions. E-government is accelerating mutual communication between public institutions and

increases communication possibilities. It makes public administrators accountable directly to the public. It prevents administrative corruption. It increases citizen participation in administrative processes and political practices in a democratic manner. The ehealth, which refers to the e-government's practices in the health sector, ensures that the services provided to all stakeholders are delivered quickly and easily in the field of health. Turkey is still in its first phase in e-health applications. Since the announcement of the health transformation program in 2003, many e-health projects have been developed and put into practice.

E-government is one of the administrative reform instruments aimed at increasing citizen satisfaction in public services. With egovernment applications bureaucratic procedures can be done easily and cheaper. One of the most important indicators of the information society is the increase in the use of information and communication technologies. With e-government policies, any public service can be offered to the citizen in an electronic form. Health services are public services that citizens use mostly as a semi-public service. The effective presentation of health services is a requirement of becoming a social state in the constitutional framework. In this regard, e-health applications are being spread so that public institutions can exchange information among themselves and between institutions; make it easier for health personnel and citizens to access information about the health sector, and process and store national health data records for citizens. E-health applications aim to provide modern and quality health services based on knowledge and information systems.

The Ministry of Health has undertaken a number of projects to provide transforming the information society and has acted as an active political leader in e-health applications.The widespread use of e-health applications by citizens, apart from the policies of the Ministry of Health at the central level, will increase the chances of success of these projects.

7. E-Health practices in Turkey

E-health is the use of all the functions of information and communication technologies to improve the health of citizens and patients and to increase access to health care services (T.C. Sağlık Bakanlığı, , 24.12.2016). E-health applications bring many benefits to health care delivery. For example; health care costs are falling. Efficiency is provided in health service delivery and resource distribution. Communication between health personnel is increasing. Citizens who have difficulty accessing health services, such as living in rural areas or difficulties in transportation, may benefit from health services. Health personnel and citizens can access the information more easily. Thanks

to new technologies, the relationshipbased approach has become more effective. The relationship-centered approach refers to a more sensitive approach to the needs of patients in accordance with doctors and patients' perspectives. It includes sharing treatment-related situations with patients and their relatives (Williams, et al., 2000: 80).

In addition, today's patients have a more active role in the decisionmaking process to educate themselves about medical issues related to their illness before they come to see their doctors (Diaz, et al. 2002: 180). In this respect, e-health provides the improvement of the quality of the health services by taking the role of internet and similar technologies in the acquisition, transfer and development of the data related to the service. It requires the use of information and communication technologies for the development of local and general health services (Sivil Dayanışma Platformu, sdplatform.com, 22.12.2016). Thus, health services can be provided in the highest quality and fastest manner to big masses. E-health applications are a health presentation system based on knowledge and information systems. The system cares about human life. It seeks new methods in the treatment of diseases. It creates goals for the future. It provides quality ser vice with stakeholders (IT Advisor, itadvisor.com.tr, 22.12.2016).www.e-saglik.gov.tr

The basic aims of e-health projects are (T.C. Sağlık Bakanlığı, , 24.12.2016): Establishment of data analysis support and decision support systems, acceleration of data flow among e-health stakeholders, to increase resource efficiency and productivity, to coordinate e-health initiative processes, to support scientific studies, adoption of e-health concept at national level. www.e.saglik.gov.tr

There are five different stages of transition to the e-health system (Tan, 2005):

Level 1: At this stage patient records are still kept on paper in the patient services system. Some of the patient informations were transferred to the computer. Some of the procedures (such as patient registration, appointment, results, etc.) required by health services can be automated.

Level 2: Patient records are digitalized and placed in the document monitoring system. The patient's information is scanned and transferred to the system as an optical image. However, the transfer of information to the system does not provide the opportunity to update and analyse user information to system’s users.

Level 3: At this level, medical records serve as a decision-making support tool to user physicians. The records can alert service users.

Level 4: Electronic medical records keep only patient informations. Electronic patient service, as well as patient information records, include informations concerning all patient services and from other public institutions where the patient is connected. It is possible to see the information in the hospital where the patient applied in the past, which treatments were applied, and what kind of results the treatments gave.

Level 5: At this level, information is obtained from a wider audience. The information that will give rise to general conclusions is detected. For example; informations about the eating habits of the individuals, the frequency of using cigarettes and alcohol are collected and reports are made according to the results. At this level, records are kept as welfare services records (Wager and et al., 2009).

In May 2003, Turkey Health Information System Action Plan was prepared. The e-health studies in the Ministry of Health began in 2004 and were completed in January 2005. The necessary workings for e-health infrastructure in Turkey were made on 09.10.2016. In addition, since the year 2014, the Ministry of Health has set up health data warehouses covering across the country and plans to use the informatics applications through obtained the data from the center and the provinces over the Health Special Network (SB.net). In 2015, the Ministry of Health decided to transition to web-based architecture with applications such as Hospital Information Management Systems and Family Medicine Information Systems with the circular no. 2013/14 "Information and Communication Technologies". Established in 1996 and reorganized in 2011, the General Directorate of Health Information Systems has been brought to a contemporary structure.

Through the technological and administrative changes, the General Directorate of Health Information Systems developed new and effective strategies to implement the e-health transformation program (T.C. Sağlık Bakanlığı, 2013). Within the context of the Health Transformation Program and the scope of strategic management, the Ministry of Health has prepared the first strategic plan covering 2010-2014 years. Accordingly, the ministry is required to establish mobile health stations that will increase access to health services, to train educated health professionals in the EU standard to improve e-health management, and to support health information systems with facilities, equipment and technology.

In this section, the e-health projects conducted by the Ministry of Health are mentioned.

Telemedicine

Tele-medicine is the provision of communication technology and the use of information in health care services to the individuals who are away from health service providers. Thus, health workers exchange views with each other. They can share data. They use information systems and communication technologies to conduct health-related researches (Demirel, 2013: 73; Wallace, 1998: 777; Blackwell et al., 1997: 583). The beginnings of tele-medicine applications extend back to the 1960s. First, in 1964, a 180-kilometer closed-circuit television system was established between the Nebraska Institute of Psychiatry in Omaha and the State Mental Hospital in Norfolk. In our country, tele-medicine was first used in health services in the field of radiology and pathology. The project covers the state, education and research hospitals in various parts of Turkey (Işık and Güler, 2010: 2).

The aims of the Tele-Medicine project are (T.C. Sağlık Bakanlığı, www.e-saglik.gov.tr, 24.12.2016):

1- All images and informations about the patient are collected in the electronic area for digital and paperless hospital establishment.

2- To provide quality and certainity in patient evaluation, to reduce costs.

3- Knowledge and experience sharing among physicians.

4- Consultation in complex cases.

Family Medicine Information System

The Family Physician Information System communicates with the Ministry of Health Central Database via the internet and can send the data from the local base to the center. The system allows the communication between the physician and the Ministry of Health and the Provincial Public Health Directorate. With the Family Physician Information System, family physicians can record the health service offered by them in an electronic form. The data sets requested by the Ministry of Health from these recorded data are transmitted directly to the Ministry in the electronic environment (Ministry of Health, 2005: 6). First, this program started to be implemented in Düzce.

Core Resource Management System

The implementation of the Core Resource Management System began in 1997. The systems were established to record, monitor and plan all the resources of the country's health system. Buildings, tools and equipment, medical devices and materials, financial resources; buildings, facilities, services and human resources belonging to the private sector are recorded in the public health facilities with the system. With the Core Resource Management System, the Ministry of Health is able to follow up and plan the situation of all public personnel. It is a system used to manage, monitor and support resource planning of the Ministry of Health. The system consists of five modules: The Human Resources Management System module enables the monitoring of personnel movements, payroll and accrual procedures to be carried out in the Ministry of Health. With the basic health module, statistical follow-up of diseases and diseases that can be encountered in health institutions are recorded as data and evaluated as statistical data.

With the investment tracking system; The Ministry of Health's investments are being followed. The system includes information such as code, substitution and land registry informations, fire controls and earthquake analysis of all the buildings connected to the Ministry. The material resources management system records all the materials needed. The system is looking for the answer to the questions of which material is used, which institution and organization, and how much it is used. The management system of private health institutions monitors the establishment and personnel movements of private health institutions. It provides all kinds of information and document flows by including these institutions in the health private network (T.C. Sağlık Bakanlığı, , 24.12.2016).

E-Prescription

It is the regulation, correction, observation and transfer to the person or pharmacist of the pharmaceutical prescriptions using information and communication technologies. Under the e-prescription, the physicians transfer the prescription electronically to the pharmacists or persons in electronic environment (eHealth Initiative, 2010). It is possible to store the prescription electronically without the necessity of transferring the prescriptions to the paper environment. E-prescription minimizes human-induced mistakes. It constantly updates and improves the health system. It provides fast and repeatable service. It provides follow-up to the patient and controls unnecessary drug uses (T.C. Sağlık Bakanlığı, , 22.12.2016). Considering that 1.5 million

prescription papers are used daily in Turkey, it is understood that the system provides a great saving even in terms of paper savings (Demirel, 2013: 88).www.saglik.gov.tr

Drug Monitoring System

Drug monitoring system is the adaptation of the follow-up and monitoring system that is applied all over the world to the pharmaceutical sector. Thanks to the electronic product code, it is a system to follow the drugs during the procurement and distribution. The most important purpose of the system is to ensure patient safety. Inputs and outputs are reported and stored in a database with the system since the production or import of drugs. Receiving a report on medicines is important both for ensuring drug safety and for detecting drug deceitfulness (T.C. Sağlık Bakanlığı, itsportal.saglik.gov.tr, 24.12.2016).

Medula (General Health Insurance)

It is aimed to record all the personnels and the health expenditures as the informatics arm of general health insurance. The general health insurance collects billing information electronically between health institutions. It is an integrated system designed to realize service payments (T.C. Çalışma ve Sosyal Güvenlik Bakanlığı, www.sgk.gov.tr, 24.12.2016).

With the Medula System, the disabilities of health services are prevented. The quality of the provided health services has increased. The health services are now available in a faster format. All information used in the health service is recorded in an electronic database with the Medula System. With the system, applications for monetary receivables of individuals and institutions have been resolved in a timely manner (SGK, 2013: 40).

Central Hospital Appointment System

The central hospital appointment system has made it easier for all citizens in the country to access health services within the scope of the health transformation program. It is a project developed for public hospitals to provide services more effective and efficient manner. With the project, it has been facilitated to apply health services from anywhere and all kinds of information communication tools. Citizens also can choose physicians according to their wishes. The project was first implemented in pilot regions of Erzurum and Kayseri in 2010. In 2011, this service was spread throughout the country (www.mhrs182.net, 24.12.2016).

Health-NET

Citizens with e-health portal called Health.NET can learn their own family physician and communicate with him. They also make appointments via the central hospital appointment system. They can see their health records. Health care personnels can also keep up-to-date informations and regulations about their area. They can report data through applications on the portal. They can access health reports and detailed statistics (Kırıcı, 2008). In this respect, Health.NET helps to identify problems and priorities and take measures in the health sector. The sector contributes to the planning of resources, workings and investments, and the assessment of the quality of health services. It collects and processes the data necessary for scientific researches and studies (T.C. Sağlık Bakanlığı, www.e-saglik.gov.tr, 24.12.2016). Health-NET has brought quality and standard to health services. With Health-NET, only the data collected in statistical and printed form have been collected to cover all the health information from the birth to the death of the patient. Electronic health records of citizens have been shared among different health institutions (Yıldız, Ertuna and Uçar, 2009: 108).

Decision Support System

The decision support system ensures that data in the decision-making process are collected, stored, analyzed and easily accessed. The data obtained are used in the planning of health services, in determining the strategies and in making critical management decisions. The Ministry of Health aims through the system to report the data in applications such as e-health, core resource management system to every level user over decision support system-geographical information system platform. In this regard, the decision support system aims to support to the users in decision making process. Thus, the system helps to solve semi-structural and non-structural problems (Demirel, 2013: 71).

One-Order Accounting System

It has been determined that financial and fiscal statements of healthcare providers are different in accounting, business and the Ministry of Health. In this respect, it is necessary to tabulate the financial and fiscal tables in the accountings in a uniform and appropriate standard. For this, it is aimed to process the accounting records and informations with standard software in oneorder accounting system (T.C. Sağlık Bakanlığı, , 24.12.2016).www.tdms.saglik.gov.tr

Ministry of Health Communication Center

Ministry of Health Communication Center has been active in 1.1.2004. The aim of the center is to make interactive management effective with the participation of ministry personnels and citizens. The center contributes to the resolution of problems arising from lack of communication between the public and the administrators. It serves citizens for seven days and 24 hours by phone number 184. Each Provincial Director of Health and the assistants of the director were appointed as the Ministry of Health communication center authority (T.C. Sağlık Bakanlığı, sabim.saglik.gov.tr, 24.12.2016).

Electronic Transfer System

With the implementation of the central hospital appointment system, it became possible for patients to make appointments to a different hospital over the Health.NET infrastructure. In this context, the information of patients who have made an appointment from a different hospital with electronic transfer system is sent in an electronic environment and transfer of the patient is carried out (T.C. Sağlık Bakanlığı, , 24.12.2016).www.e-saglik.gov.tr

National Health Data Dictionary

It is a dictionary work that is referenced by the hospital information systems used by the health institutions in Turkey. The dictionary contains hierarchical inter-term relations that are of different data sets. The data dictionary simply provides for the collection, analysis and evaluation of data from health institutions in accordance with established standards. The first version of the National Health Data Dictionary was created in 2007 by the Ministry of Health Data Processing Department (T.C. Sağlık Bakanlığı, , 24.12.2016).www.e-saglik.gov.tr/TR7141/usvs.html

E-Pulse

It is a personal health record system where all health information is managed and can be accessed from one location to the medical background. Detailed information on all examinations and treatments can be obtained with e-pulse. The examinations are evaluated in terms of service quality. You can comment on the health services you received. All laboratory test results and radiological views are recorded on e-pulse. In the e-pulse application, all data is encrypted and stored. The

project has been in operation since 1 March 2015. The system has been used by all family physicians and other health care providers through a common channel. The project provides access to all health informations and documents from everywhere in the most economical way (T.C. Sağlık Bakanlığı, enabiz.gov.tr/Yardim.html/#url13, 24.12.2016).

The Pension Fund and SSK E-Health Applications

With the supervision project of the pension fund's health expenditures, while pharmacies act on prescription process, they connect to the computer center of the pension fund and perform the data entry from their computers. Thus, it is evident whether the person has the right to benefit from the health service, whether the medicines entered into the system will be paid, or how much will be paid. In addition, patient participation payments and the amount that the pension fund will pay to the pharmacy are reflected on the pharmacy's computer. The tests and treatments made by the health centers are evaluated according to the coding system and the budget implementation order prices and they are taken into computer records on a person basis. Under the Social Insurance Institution (SSK), the infrastructure of the central and provincial insurance units has been renovated and a e-insurance project has been passed down for follow-up of the institution's revenues and expenditures. With the e-insurance project, all the employer informations, accrual and collection accounts in the province can be monitored from the center in Ankara. The affiliated institutions of the Ministry of Health require provision for the SSK members who apply to them. During the provisioning process, it is checked whether the SSK member has the right to receive health services or not. It is called "entitlement" for an SSK insured or a pensioner to qualify for health care. The rights acquisition control web service does this procedure. (Güleş ve Özata, 2005: 159-163).

Although Turkey is in the first stage of transition to the e-health system; Turkey has achieved an important milestone in the last decade, along with a health transformation program. The Ministry of Health, which has carried out many successful projects in the field of e-health, has increased the effects of technological development on health sector by supporting its health policies with information technologies. It has become possible to exchange views between health personnel with tele-medicine. The family medicine information system allows family physicians to record patient informations and, if necessary, transfer these informations to the Ministry of Health.

The core resource management system allows the Ministry of Health to manage, monitor and plan for its own resources. Eprescription practices have reduced red tape and unnecessary bureaucratic processes. The drug monitoring system records the inputs and outputs of drugs. It secures drug

safety. The Medula system is provided to store informations from health services in an electronic database.

The central hospital appointment system made it easier for citizens to apply for health services. The Health.NET portal provides quality control of health services and standardization of services offered. The decision support system adopted a user-focused approach and made the decision-making process easier.

The one-order accounting system ensures that accounting entries are recorded in a standardized order, avoiding the fragmentation in financial records in the health field. The electronic transfer system has carried out the transfer of patients from one hospital to another without the need for bureaucratic procedures. The national health data dictionary is an essential resource for hospital information systems. The e-pulse project allows patients to receive detailed information about their examinations and treatments. The pension fund and SSK's e-health applications control health spendings and automatically identify those who qualify for health care. As you can see; The Ministry of Health has demonstrated the importance of information technology in health policies by introducing multi-directional projects in e-transformation process. The widespread use of e-health applications by citizens consciously will further enhance the impacts and successes of information technologies on the health policies.

8. ICT infrastructures of Turkey in health care

The Health Transformation Program [1] of the Ministry of Health, Turkey, was published in 2013. One of the main components of this program is achieving e-health, with the following objectives:

- Ensuring standardization of data used in healthcare
- Creating the Electronic Health Record for citizens
- Data analysis support for managers (Decision Support System)
- Speeding up the flow of information among stakeholders
- Saving resources and increasing efficiency in the healthcare system.

Following the Health Transformation Program, several healthcare ICT infrastructures have been developed in Turkey. In this intellectual output, we have described some of them including Sağlık-Net, together with its two major components, namely, the National Health Information System (NHIS) [2] and the Family Medicine Information System (FMIS) [3]. The other infrastructures include the Centralized Hospital Appointment System (CHAS) [4], the Basic Health Statistics Module (BHSM), the Core Resources Management System (CRMS) and the e-prescription system of the Social Security Institution. Figure 1 shows the overall architecture of the Sağlık-Net. In addition to the major components, it also contains the National Health Data Dictionary (NHDD) [5], the Health Coding Reference Server (HCRS) [6] and the Decision Support Systems. The Sağlık-Net is also integrated with the national e-prescription infrastructure maintained by the Social Security Institution. The Turkish e-identity pilot project has successfully been concluded and distribution of e-identity cards to Turkish citizens started by January 2014.

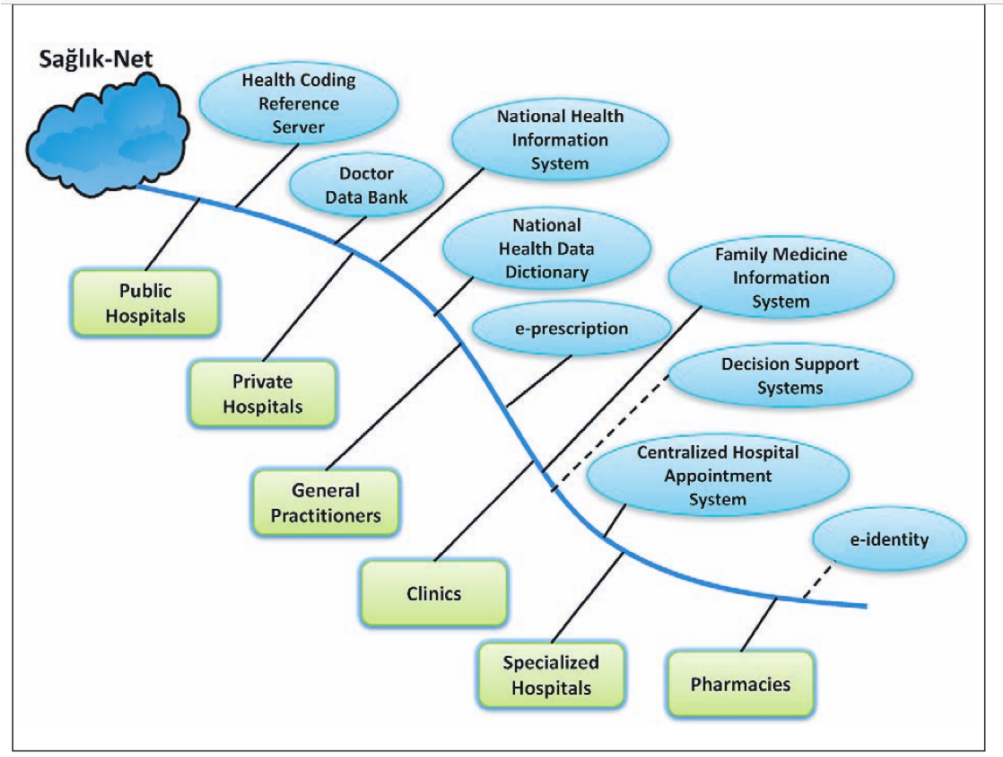


Fig. 1 Sağlık-Net

The following sections are organized as follows: Section 2 briefly summarizes the Health Coding Reference Server and Section 3 describes the National Health Data Dictionary. Section 4 presents NHIS which has already been described in detail in [2] and briefly explained here for the sake of completeness by also stressing the updates in the version released in 2012. Section 5 describes the

Family Medicine Information System. Section 6 presents the Centralized Hospital Appointment System. Basic Health Statistics Module is summarized in Section 7 and Core Resources Management System in Section 8. Section 9 presents the e-prescription infrastructure. The international collaboration projects of Turkey which are integrated to Sağlık-Net are given in Section 10. Finally, Section 11 concludes the article.

2. The Health Coding Reference Server

The Health Coding Reference Server encapsulates all the international and national coding systems used in Turkey within a publicly accessible server.

Some of the coding systems available from Health Coding Reference Server are international such as ICD-10 [7] or Anatomical Therapeutic Chemical Classification System [8] and most are locally defined for certain sets of information such as Clinics, Patient Discharge Type, Pregnancy Result, or Baby Monitoring Calendar. Currently, there are 329 coding systems maintained in the server.

3. The National Health Data Dictionary

The National Health Data Dictionary [5] contains the commonly used healthcare data elements such as “Address”, “Name”, “Main Diagnosis”, “Vaccination”, and “Treatment Method”. The format of these data elements is defined according to the rules and guidelines given in ISO/IEC 11179-4 Standard [9]. The first version of the dictionary that was active from 2008 to mid 2012 had 261 data elements, while the current version, which is an update of the first version based on feedback from the users and decision makers, has 464 data elements.

The “Aggregate Core Components”, which are called Minimum Health Data Sets (MHDSs), are formed using these data elements [2]. The Minimum Health Data Sets define the data that emerge at the time of presenting a specific healthcare service, e.g. infant monitoring data set or pregnant monitoring data set. There were 46 Minimum Health Data Sets in the first version of the National Health Data Dictionary, and now there are 65 of them.

The data elements within the Minimum Health Data Sets are mostly coded using coding systems that are available from the Health Coding Reference Server.

4. National Health Information System (NHIS)

The National Health Information System of Turkey (NHIS) [2] is a nation-wide infrastructure for collecting and to some extent sharing patients' Electronic Health Records (EHRs). The current implementation of NHIS supports the transfer of episodic EHRs from secondary and tertiary healthcare provider information systems to NHIS servers at the Ministry of Health. Yet, only the general practitioners (GPs) can access the EHRs of their own patients, through their Family Medicine Information System (FMIS) client applications.

In the first version of the NHIS, which became operational in January 2009, NHIS and FMIS were two separate systems with their own databases and Web services on the server side, which created problems in linking the EHR data between primary care and secondary/tertiary care. This problem is solved in August 2012 with the 2.0 release of the NHIS, which is an improved, standards compliant and technically more capable redevelopment of the first release, based on the experiences gained from its first version. In the new release, the data collected through the previous NHIS and FMIS systems are merged and preserved. With NHIS 2.0, all the client side applications of primary, secondary and tertiary care providers interact with the unique national system.

The episodic EHRs collected through the NHIS, also called the Transmission Data Sets, are aggregated from the Minimum Health Data Sets. In the previous version of NHIS implementation, there were 41 Transmission Data Sets; each dedicated to a Minimum Health Data Set such as "15-49 Age Female Observation", "Mouth and Teeth Examination", "Vaccine Notification", "Infant Nutrition" and "Diabetes". In the current release of NHIS, there are only seven broader Transmission Data Sets, namely "Citizen Registration", "Examination", "Patient Demographics", "Test Results", "Inpatient", "HIV" and "Death Notification", which are capable of collecting all 65 Minimum Health Data Sets in various combinations.

The Transmission Data Sets are mapped to HL7 CDA Release 2 to create the "Transmission Schemas" as described in [2]. In brief, the Minimum Health Data Sets are mapped to CDA sections, and the data elements of the MHDSs are mapped to CDA entry classes and their attributes. A "Transmission Schema" instance constitutes the payload of an NHIS EHR exchange message and HL7 v3 Web Services Profile [10] is used at the transport layer.

It should be noted that the data required by the NHIS is automatically generated by the healthcare provider information systems and are sent by invoking NHIS Web Services; hence the process is transparent to the health professionals who create the content of the EHR documents. The health professionals continue using the healthcare provider information systems as before; the vendors of these systems have developed wrapper applications that populate the NHIS conformant messages from the data collected from their own systems and send them by invoking the NHIS Web Services.

NHIS is open to extensions: When a need for a new EHR document arises, the existing Minimum Health Data Sets are re-used if possible; if not, the new Minimum Health Data Sets are constructed by using the ex-isting data elements and the National Health Data Dictionary is expanded by defining new Data Elements when necessary. These updates are then reflected to the operational electronic services. So far, one major and a number of minor updates have taken place.

5. Family Medicine Information System (FMIS)

In comparison to many other countries, Turkey was late in migrating to the family medicine practice. Previously, primary healthcare was delivered either through health posts distributed all over the country or by hospitals which are conventionally responsible for the secondary and tertiary healthcare services. However, with the introduction of Health Transformation Program in 2003, there has been considerable progress in realizing family medicine in Turkey.

5.1 Implementation of FMIS

The Family Medicine Information System is a national system for exchanging primary care records among general practitioners and the Ministry of Health. The content of healthcare data under the GPs responsibility is also defined through the Minimum Health Data Sets, which are available in the National Health Data Dictionary.

The FMIS has a client-server based architecture. The centralized part is hosted by the Ministry of Health in Ankara and the desktop client applications are used by the GPs in their own offices. The client applications can both store into and retrieve data from the Ministry servers. Communication is based on Web Services exposed on the Ministry side. Prior to August 2012, FMIS had its dedicated central database and proprietary Web Services for communicating with the FMIS client applications. With NHIS 2.0, these client applications use the HL7 compliant Web Services of the

harmonized NHIS, which are also used by secondary and tertiary healthcare providers as explained in the previous section.

Until a year ago, the Ministry of Health used to distribute a simple FMIS client ap-plication to GPs for free. Even then, many GPs opted for using more capable and user friendly FMIS client applications by 3rd party vendors.

The client applications that are used by the GPs can work both in online and offline modes. They can either record patient observations locally and synchronize with the MoH Web Services immediately, or synchronize the local data later. The second approach is especially useful when GPs visit their patients in the rural areas together with their laptops. As mentioned earlier, it is also possible to retrieve data from the MoH central servers. For example, when a citizen moves to a new city or district, the new GP assigned to him is able to retrieve all his previous records into his FMIS client application through the Web Services.

The Minimum Health Data Sets that are defined in the family medicine domain and exchanged via Web Services are (some apply to secondary and tertiary care domain as well):

• Infant Observation

• Child Observation

• Vaccine Tracking

• 15-49 Age Woman Observation

• Pregnancy Observation

• Puerperal Observation

• Death Notification

• Generic Patient Examination

• Consultation Notification

The architecture diagram of FMIS is presented in Figure 2.

5.2 Performance Evaluation of the GPs through FMIS

FMIS is also used to evaluate the performance of the GPs, which affect their salaries. The GPs have a baseline salary which can increase or decrease depending on their performance scores calculated by the FMIS. When they complete all the expected patient observations, their salaries increase. In the opposite case, their salaries may decrease below their baseline salaries.

The performance criteria for GPs are composed of five measures that are calculated each month:
1. Vaccine success rate: Division of the number of vaccines applied by the number of vaccines that should have been applied. The latter is calculated based on the vaccine calendar for babies who are registered to the GP. The central system keeps an instance of this vaccine calendar for each infant per GP and the success rate of a GP is calculated automatically according to the expected number versus the realized number of vaccines.

2. Infant observation success rate: Division of the number of infant observations made, by the number of infant observations that should have been made. This is similar to the vaccine success rate; this time there is an infant observation calendar which necessitates seven distinct observations until the baby is ten months old.

3. Pregnancy observation success rate: Division of the number of pregnancy observations realized by the number of pregnancy observations that should have been made. There is a pregnancy observation calendar which divides the complete pregnancy process into four periods, and in each of these periods at least one pregnancy observation has to be made by the responsible GP.

4. Referral rate: This is calculated based on the number of referrals that the GP made, the total number of patients registered to the GP and the average number of patient visits to a healthcare provider in Turkey. With this calculation, the GPs are encouraged to refer their patients to secondary healthcare services when it is necessary.

5. The number of citizens in need of mobile service: The GPs have to visit their patients who are physically impaired or living in hard to reach rural areas. These visits are within the scope of mobile services and this extra work generates extra income for the GPs.

Each GP is responsible from about 3500 citizens. When a GP is officially on leave, all of his patients are assigned to a proxy GP so that neither his patients nor he face a medically or financially disadvantaged situation. Apart from that, citizens are free to change their GPs at any time, as long as the geographic constraints are satisfied.

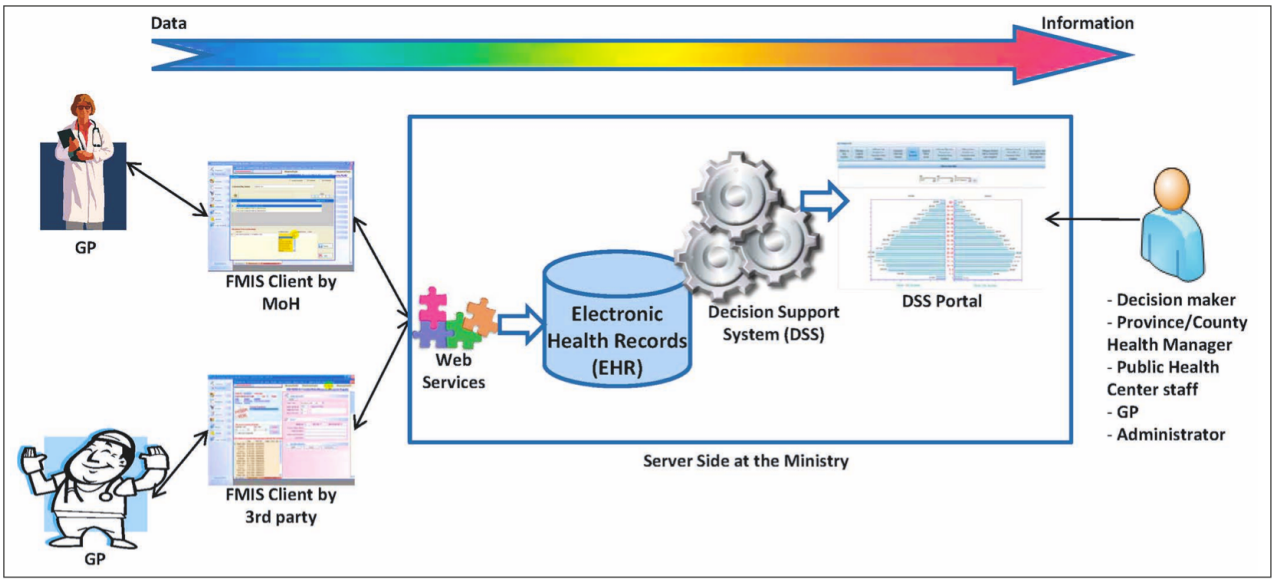


Fig. 2 FMIS Architecture

5.3 Decision Support System of FMIS

The Decision Support System (DSS) of FMIS provides an overall view of the primary care patient records at various levels, e.g. in the country as a whole, or statistics per province/county or per GP. Furthermore, the patient records can be grouped according to the topics while displaying statistical data. For example, with a single click, it is possible to list all women who are in the final month of their pregnancy, and then dig into their individual records, find the responsible GP, etc.

DSS is based on Oracle Business Intelligence (BI) solutions [11] and provides customized interfaces for several roles that are accessible through Web:

• The policy makers (i.e. decision makers) including the Minister of Health: They are able to see all primary care data in Turkey.

• Administrators: They can see all data and handle administrative tasks of the Web portal. They can also create new interfaces/queries.

• Province/County Health Managers: They can see all data in the province/county in which they are responsible.

• Public Health Center staff: There is a Public Health Center for each 100,000

population. The staffs of these centers have the same capabilities as the Province/County Health Managers. • General Practitioners: The GPs are able to see all data that belong to the patients registered to them.

6. Centralized Hospital Appointment System (CHAS)

Centralized Hospital Appointment System (CHAS) enables the citizens to make appointments in any public secondary and tertiary healthcare provider by calling the CHAS Call Center phone number “182” or online through the CHAS Web Portal [12] and mobile applications in all major mobile operating systems (i.e. Android, iOS, Windows Phone, Blackberry). The citizens are assisted by online operators during phone calls. All the healthcare professionals working in public healthcare providers share their calendars of at least 15 days with the Ministry through CHAS Web Services to enable citizens to make appointments according to these calendars. CHAS, which was introduced in 2009 in a few provinces, became operational in the whole country by 2011.

7. Basic Health Statistics Module (BHSM)

Basic Health Statistics Module (BHSM) is used to collect information about the health status, health risks and indicators across the country to direct the resources and programs of Central and Provincial Directorates of the Ministry of Health. There are about 70 Basic Health Statistics Forms and some of them are reported to the World Health Organization (WHO) as well. However, most of these forms are filled out manually.

An analysis by the Ministry of Health revealed the fact that some of the data in the forms are already available from the Family Medicine Information System, such as Infant/Child Follow-up or Pregnancy Follow-up. Therefore, currently the work is in progress to improve the FMIS Decision Support System to obtain these reports automatically to replace the manual BHSM reports.

For the automation of the other forms, there are plans for the automatic generation of these reports from the National Health Information System to the extent possible.

8. Core Resources Management System (CRMS)

Core Resources Management System (CRMS) is a system developed to monitor the staff, institutions, equipment of the Ministry of Health and it consists of the following components:

• Human Resources Management System (HRMS)

• Equipment Resources Management System (ERMS)

• Investment Tracing System (ITS)

• Private Health Organizations Management System (HOMS)

8.1 Human Resources Management System (HRMS)

HRMS is used for monitoring the staff information and activities including payroll and accrual processing. It covers the following applications: Appointment Information System, Register Information System, Staff Information System, Promotion Information System, Salary and Accrual Information System, Family Medicine Billing, Specialization/Degree Registration (Doctor Data Bank - DDB), In-service Training, Discipline Information System, Legal Regulatory Information System, HRMS Practice Management, Personnel Departments, Contracted Staff actions, 112 Emergency Medical Service Reports, National Medical Rescue Team Staff Tracking, Mobilization Automation.

This system has reached the goals of acceleration of the information flow between Ministry of Health Headquarters and 81 Provincial Directorates of Health, helping to quickly determine the needs by monitoring the sources, getting statistics and reports intended for planning, achieving the coordination and standardization between Ministry of Health Headquarters and Provincial Health Directorates.

8.2 Equipment Resources Management System (ERMS)

ERMS enables monitoring the equipment in stock of the all institutions under the Ministry of Health, determining the overstock equipment and following up responsibilities. It is composed of an Inventory Information System, an Equipment Check-in System, a Storage Information System, a Fixed Asset Information System, a Transportation Vehicle Information System, a Medical Device Information System, a Repairing and Maintenance Information System, and the Company Information System.

Using ERMS, it is possible to determine the overstock items in hospitals. Hospitals can query ERMS for their needs to prevent unnecessary purchases. Moreover, the system can be queried for the prices of items to compare the prices of the same or similar purchases.

The hospital information systems can also transfer data to ERMS. This communication is achieved through Web Services.

8.3 Investment Tracing System (ITS)

ITS is used for planning the financial resources of the Ministry of Health according to the needs, distributing the resources between the ministry units, and monitoring them. It contains the following modules: the Investment Information System and the Real-Estate Information System.

Through the Investment Information System, investment proposals, the level of construction, building repairs, construction revision processes can be monitored. With the help of the Investment Information System, it is possible to monitor the progress of a construction until it is completed.

Real-Estate Information System contains information about the buildings the Ministry owns or rents; its name, city, address, age, the result of its earthquake-resistance test, physical properties of the building, its rent, and ownership information.

8.4 Private Health Organizations Management System (HOMS)

Private Health Organizations Management System (HOMS) makes it possible to monitor the hardware of private health organizations, their licenses, their staff and service capacity. HOMS is integrated with the other CRMS components. For example, the registration of the doctors of a private hospital

has to be done via HOMS and validation is realized automatically via CRMS.

9. E-prescription System

The Social Security Institution has developed a Web-based e-prescription infrastructure as a part of their Medula system, which was originally developed to automate the reimbursement of the medical expenses of the citizens covered by social security. After a few years of regional piloting, the e-prescription system became operational in the whole country by July 2012.

The e-prescription system is linked with Sağlık-Net and seamlessly integrated with the healthcare provider information systems through Medula Web Services, so that the health professionals continue prescribing medications via their regular interfaces. Health professionals provide medication details together with the ICD-10 codes of patient's diagnoses in an e-prescription. Each e-prescription is assigned a unique identifier by the e-prescription system. The health professionals can also view patients' ongoing medications and the amount not yet consumed. The same facilities are offered to health professionals also through a Web-based application served by the Social Security Institution [13].

Patients apply to pharmacies for dispensation with their citizen IDs and unique e-prescription identifiers provided by the health professional. Using the Medula Pharmacy Software, the pharmacies are able to query, view and dispense the e-prescriptions. The system also keeps track of all the medications provided to the patient so far, prevents unnecessary dispensation, and offers replacements whenever a specific product is not available. Finally, the system is used by the Social Security Institution for the reimbursement of pharmacies.

10. International Collaboration

Ministry of Health, Turkey has been in collaboration with a number of European countries through its involvement in projects supported by the European Commission.

10.1 ICT-PSP epSOS: Smart Open Services for European Patients

The aim of the epSOS Project [14] is to provide a European level cross-border interoperability platform for sharing healthcare data. Through this platform, the exchange of electronic patient

summary and prescription documents among the European countries is realized. epSOS is supported by the European Commission and the health ministries of the European countries, and its consortium is composed of 48 partners from 23 European countries.

Turkey's contributions to the epSOS Project can be summarized as follows: First, Turkey provided an open source implementation of the epSOS cross-border interoperability platform. This implementation triggered an open source community with the involvement of a number of epSOS beneficiaries for further development [15]. Further contributions include participation to specification and design of some European level services such as semantic interoperability; exposing of the clinical data that are collected in Turkey's National Health Information System to Europe through standards-based epSOS interfaces; and processing of patient data that are coming from European countries. Turkey also leads the validation activities in which the conformance of country implementations to epSOS specifications and interoperability among the implementations are tested continuously.

10.2 FP7-ICT EMPOWER: Support of Patient Empowerment by an Intelligent Self-management Pathway for Patients

The EMPOWER Project [16] develops a modular and standards-based Patient Empowerment Framework, which facilitates the self-management of diabetes patients based on Personal Health Records (PHRs) and Self-Management Pathways through context-aware, personalized services. The services include:

• Services for the specification and execution of actions to change behavior according to diabetes-specific healthcare needs. Patients can develop personalized action

plans, which include recommendations from the treating physicians and patients' preferences. • Services for monitoring of vital, physical, mental parameters as well as physical and lifestyle activities based on health standards.

EMPOWER semantically integrates multiple information sources (EHR/PHR, diabetes guidelines, mobile devices/applications for patterns of daily living) using a shared and standards-based knowledge model. The Self-Management Pathways facilitate the specification of recommendations by the health professionals and these recommendations allow specifying individual goals for the patients.

The pilot applications are being realized in Germany and in Turkey to demonstrate that the patient-centric approach of EMPOWER can improve disease management by personalized self-management services helping diabetes patients to cope better with their diseases. For this purpose, through its standards-based interfaces, the National Health Information System is already integrated with the EMPOWER Patient Empowerment Framework within the scope of Turkish pilot.

10.3 ICT-PSP PALANTE: PAtient Leading and mANaging their healThcare through Ehealth

The PALANTE Project [17] aims to empower patients to lead and manage their healthcare by informing the patients about their health problems with the help of a Personal Health Record (PHR) system. It also supports managing chronic diseases, and helps to reduce costs with the help of tele-medicine.

There are seven pilot applications in six different countries. The Turkish pilot focuses on patients suffering from severe arthritis. The Virtual Arthritis Clinic Service of the pilot is a Web based patient-doctor shared arthritis disease management system, which is already integrated with both the National Health Information System and the local hospital information systems of hospitals in two different pilot regions.

The end-users (both health professionals and patients) provided by the Turkish Ministry of Health are involved in the pilot from the beginning of the project, in order to guide the requirement analysis and design phases.

We have summarized some of the major healthcare IT infrastructures which are realized as a part of the Health Transformation Program of Turkey [1] that began in 2003.

One of the main healthcare IT infrastructures, the NHIS, became operational in January 2009, which was then updated in August 2012 based on the experiences and lessons learned during the operation of the first release. In its first release, NHIS and FMIS were two different infrastructures and attempts to merge them failed several times because; i) these two similar but disconnected systems had different data and connection interfaces for collecting the same medical data, and ii) they were being used heavily, which made it difficult to interrupt one for a period of time for the merging operation. The second release of NHIS implemented a single EHR system to serve for all

primary, secondary and tertiary care integrating (former) NHIS and FMIS data. Another handicap of the first release of NHIS was that the transmission schemas were HL7 v3 Web Services compliant and reused HL7 CDA R2 schema; however they were not totally CDA compliant due to renaming of attributes as previously explained in detail in [18]. Although this was done to facilitate the interpretation of the Web Service schemas by the developers; in the long run, it caused maintainability problems for both the Ministry and the vendors: Updates to schemas, even the minor ones, were difficult to achieve. In the second release of NHIS, with its full compliance to the generic CDA schema, it is possible to add new data elements or Minimum Health Data Sets to the existing Web Services with minimum effort.

By November 2013, 98% of the public hospitals and 80% of the private and university hospitals were connected to NHIS sending the EHRs of their patients on a daily basis. The average number of EHR docu-ments that are sent by the healthcare provider information systems and successfully persisted in the NHIS can reach to 4.6 million a day. As of November 2013, there were more than 2 billion EHR documents in the NHIS. The number of connected healthcare providers is 3,573, and this number is still increasing while the remaining healthcare providers are completing their integration to the NHIS. Since August 2012, all the GPs are also connected to the NHIS; hence the total number of connected nodes is 24,918. So far, electronic healthcare records of 78.9 million people have been created in the NHIS.

Although NHIS is a successful system, currently, only the general practitioners can access the EHRs of their patients. To make EHRs accessible to the authorized health professionals in the secondary and the tertiary healthcare systems as well as the patients themselves, a legal framework and a proper patient consent mechanism are necessary. The work is going on in this direction and a pilot application is planned.

Another contribution of the Health Transformation Program of Turkey was introducing family medicine to Turkey. Family medicine plays an important role in the healthcare system by preventing inappropriate referrals that may cause loss of time for individuals and service providers, irregularities and unnecessary health expenditures. Currently family medicine is available in all 81 provinces of Turkey supported by FMIS. As of November 2013, there were 21,345 GPs on duty in Turkey and all were connected to the FMIS.

Centralized Hospital Appointment System enables the citizens to make appointments in any public secondary and tertiary healthcare provider together with Mouth and Teeth Health Centers by calling

the CHAS Call Center or online through the CHAS Web Portal and mobile applications. 111 million appointments have been made via CHAS so far. As an example to the daily usage, in the second week of November 2013 the average number of appointments a day was 281 thousand and the maximum number of appointments a day was 331 thousand.

Basic Health Statistics Module is a system to collect information through forms about the health status, health risks and indicators across the country to direct the resources and programs of Central and Provincial Directorates of the Ministry of Health. However, most of these forms are filled out manually. Therefore, currently the work is in progress for the automatic generation of these reports from the NHIS to the extent possible.

The Core Resources Management System provides tracing of manpower, equipment and management of financial resources between Central Organization of Ministry of Health and agencies within 81 Provincial Health Directorates.

The e-prescription system together with Medula, the underlying medical reimbursement system of the Social Security Institution, is another successful healthcare IT infrastructure in Turkey. The system processed and reimbursed 171 million prescriptions with a total value of 7.4 billion Turkish Liras (~ 3.7 billion $) within the first six months of 2013 [19]. The e-prescription system has retired the paper based prescriptions in Turkey by seamlessly integrating with the existing information systems of the health professionals and pharmacists. It contributes to the general budget to a great extent by preventing fraudulent or unnecessary dispensations.

Finally, the Turkish authorities believe in the mutual benefits of experience sharing and open collaboration, and execute this vision through their involvement in a number of international collaborative projects. Best practices in other countries are taken into account while initiating or improving a national project.

E-health concepts of the EU

Research shows that since the early 2000s, number of international organizations have started to focus on e-health. This topic was discussed at the World Summit on the Information Society of UN in December 2003 and at the 58 th session of the World Health Assembly in May 2005 and e-health resolution was adopted. Since then, the ICT has played a significant role in protecting health, providing healthcare and improving the health system in the world. WHO has launched a number of

initiatives in the field of eHealth. For example, the WHO Global Health Observing Initiative aimed at "introducing the guidelines and strategic information on effective practices, policies and standards in the e-health to the Member States" was launched in 2005 [2].

In November 2005, the World Summit on Information Society in Tunisia, attended by 175 countries, discussed the some significant issues as the expansion of access to healthcare and telemedicine services, the integration of the network of specialists particularly for the improvement of health and well-being and the global co-operation in emergency situations [2].

In general, protection of the health of mothers and children in healthcare is one of the most important issues. In 2010, the UN Secretary General initiated the Global Strategy for the Protection of Women's and Children's Health. The Initiative aims to reduce the deaths of women and children. The strategy specifies supporting the national health policies, providing of the comprehensive services for prevention and treatment of women and children, taking measures to save lives, increasing the number of specialized staff to strengthen the healthcare systems, providing the innovative approaches to financing, financing the improvement of the monitoring and evaluation to ensure responsibility of all participating parties, and the significance of strengthening the policy and improving the services. Based on the WHO's Global E-Health Observing Initiative, 64 out of 75 countries with the highest maternal and child mortality have attended the development of the document. More than 300 e-health professionals in Mother and Child Health Protection have contributed to the development of this document [7].

E-health is a key component of the European Commission's E-Europe action plan. In 2006, the plans for defining the standards of joint use of health data for EU member states were identified. In 2008, the EU began to execute the plans for the introduction of health information networks and online services such as tele-consultation, e-recipe, e-mailing, tele-monitoring and remote diagnostics [4, 5].

In May 2011, the European Commission adopted E-Health Action Plan for 2012-2020. The main objectives of this plan are to expand the capabilities of the patients and healthcare providers, to coordinate the facilities and technologies, to invest in research in medicine, and to develop mobile healthcare [8].

This action plan is based on a number of innovative initiatives, such as epSOS (European Patients Smart Open Services). The main goal of this project, involving 23 European countries, is to achieve

the trans-boundary links among the European electronic health record systems. This project, which was completed in 2013, has already given its contribution. Due to epSOS, the tourists, residents, or students will be able to securely access the high-quality health data beyond the country. E-health has enabled the nine leading regions to unite their efforts in the field of chronic diseases. Patients with diabetes and heart disease can care about their health recovery without leaving home [8, 9].

The Health-e-Child network, which is another example of the collaboration platform, provides the joint use of basic clinical information about heart and inflammatory diseases, and brain tumors in children by all European doctors and their early diagnosis [8].

The European Commission also finances the projects aimed at the study of deadly diseases. Or example, HAMAM project covers the early detection and precise diagnosis of breast cancer, euHeart – the diagnosis and treatment cardiovascular disease, and PASSPORT – the liver surgery [8].

There are many examples of ICT application in the health sector nowadays. Thus, the national programs on the informatization of healthcare are implemented in several European countries, the United States and Canada. The implementations in e-health field in Europe seem more attractive.

E-Health policy of EU countries

In the EU countries, a certain "e-health" program is being implemented [2, 10, 11]. The program aims at providing the processing of health information about the patient with the application of ICT, and providing the insurance regardless of the location of the patient. The program includes some projects on the use of electronic health records, personalization of health services, development of ICT infrastructure in the healthcare system, building the regional centers for health data, organization of electronic health data exchange, creation of single registries, reference books, and tele-health. The EU allocated 317 million euro to the implementation of the e-health program (excluding national EU programs) [2, 11].

To increase the efficiency and profitability of healthcare, the reliability and confidentiality of health data exchange is required to be ensured without the dissemination of personal information of the patients. Therefore, healthcare providers often use electronic health records [12].

In many cases, the relationships between the patients and the healthcare system begin from small health institutions. The advantages of using electronic health records arise in these circumstances. 59% of the European Union member states have an electronic health insurance system, while 69% of these countries (31 countries) have adopted the legislative acts regulating the use of these records. These records are the key elements of the national e-health strategies. Electron health records provide access to complete and relevant information when providing first aid. However, the need for large expenditures for ICT and the lack of experience of healthcare professionals hinder the application of such systems [10,12]. At present, 66% of member states use to teach students the medical and sanitation behavior, and 71% use electronic trainings for preparing healthcare professionals. Holding electronic trainings within the framework of national health strategies can increase the knowledge and skills of healthcare professionals [10].

In many European countries, combined electronic health records are the central element of the e-health concept. The main purpose of merging the electronic health records and electronic disease records is to ensure the data safety and confidentiality, and to achieve the consent of the patient for data access. However, the complexity of modern security architecture and its integration with the health information technology systems requires a large amount of funds [9].

The availability of the legal framework is a key factor for the successful application of e-health. The legal framework for the protection of the privacy of electronic health data promotes the efficient use of e-health and enhances the patient's confidence in medical services. 80% of the member states have the national legislation in this field [10].

The scale of e-health in Europe is constantly expanding. The national services have been established on the basis of many programs in this area. 70% of European countries have developed the national e-health policies or strategies. The strategies in the field of e-health, including ethical principles, funding and education strategies, ensure its sustainable development. 62% of Member States have the national policies or strategies for tele-health, and 49% have state budget-funded mobile healthcare programs [10].

Analytical health data and Big Data have great potential in healthcare. Many health-related reports and newssheets show that Big Data can be used for the provision of public health, the identification and realization of the proper treatment methods for patients, the support of clinical development, and the management of the safety of healthcare system [13]. At present, only 13% of European

countries have national policies or strategies that govern the use of Big Data in the health sector, while the use of Big Data in 9% of countries is regulated by private companies [1, 10].

Recently, Big Data analytics has been widely used to better detect diseases and to conduct research in healthcare field. For example, the researchers dealing with the "human immunodeficiency virus" in the EU used IBM's Big Data tool set for the clinical genome analysis. Within the framework of EuResist project aimed at the treatment optimization, IBM's Big Data tool set has played a key role in understanding the clinical data of different countries by the researchers studying the "human immunodeficiency virus" during their treatment based on the empirical data [13].

A brief review of e-health practices of some European countries:

The Electronic Health Record Association, which incorporates basic Austrian hospitals and clinics, local healthcare associations and regional healthcare networks, has developed a new improved concept of electronic health records technology [12]. This approach enables the health care professionals and system designers to focus on the business as it provides the safety and privacy of electronic health records. This approach allows users to access the regional healthcare network and also facilitates the involvement of new actors in healthcare [11, 14].

Due to the transition to e-health in Austria, the cost of existing healthcare is predicted to be reduced by up to 30%. In particular, the use of e-prescription technology will save about 200 million Euro per year. It can also reduce the cost of treatment methods, additional procedures and misdiagnosis of medicines, saving about 500 million Euro annually. Moreover, detection and prevention of insurance frauds can save up to one billion Euro a year [11].

In 2002, the National Program for the Development of Information Technology was developed to improve the quality of all services, including the services for patients in Spain. A total of 11.4 billion euros of funding was allocated to the implementation of the program. The main objectives of the program were to provide the national standards for the quality of data and their sharing, to provide the most appropriate systems for their application and to ensure the access of each patient to personal health records.

The Spanish National Health Service provides public health for all citizens (approximately 58 million people). In Spain, approximately 189.84 billion euros is spent on health. However, in this

country, the National Health Service still remains the main healthcare provider, with most of the population paying for health care at the expense of personal health insurance [13].

The Spanish Parliament has issued a briefing on the necessity for the use of data (health and treatment records of the patients, status of the national healthcare system, diagnosis and treatment data), the digitization of health records, the management of public health and conducting scientific research [15].

Spain is currently implementing NHS Connecting for Health program. $ 25 billion has been allocated to the implementation of this program. These programs are implemented in all countries of the Organization for Economic Co-operation and Development (OECD) [11].

In 2014, more than 30 million euro was allocated to the regional health information system, which was built in the administrative territory of South Denmark. The tendency of the Danish government to establish a single electronic infrastructure of existing administrative territories (since 2007) is also referred to the informatization of healthcare. Within the framework of the project implementation, it is planned to coordinate all health information systems. According to the program, each resident of the South Denmark region can get the necessary assistance from the regional health institution. At the same time, the hospitals will be capable to exchange information about the patients, regardless of their location. In addition, the Danish government has implemented a program that uses Big Data analytics to improve the quality and coverage of the care provided for the patients with chronic illness, including diabetes and heart disease [11, 15].

In Sweden, a national center has been set up for the informatization of healthcare. This center is practically making decisions for different regions of the country uniting the various regional organizations and government structures. Additionally, special organizations for project management, including e-prescription have been established within the national e-health strategy of Sweden. In general, about 2-3% of the country's expenditure is spent on the use of information technologies. In the near future, this figure is predicted to increase to 7-8% [4, 15].

The Swedish government has a high rate for the use of Big Data analytics. The reporting systems of the healthcare sector of the country are gathering the data streams from lab results, first aids and health centers. Additionally, the high quality of applied research enables large data collection to be jointly used by the industry actors in collaboration with the research institutes and academic circles. For example, the studies are carried out to ensure the efficient and effective decisions are made for

medical and pharmaceutical research in the area of healthcare analytics. These studies include the development of methods and tools that support the study of the effects of drugs and the decision-making process through the data analysis [15].

The healthcare system of Estonia is one of the most advanced European systems. Since 2008, Estonia has started the introduction of an electronic health system. Estonia is the first state to adopt the national healthcare systems. In 2009, Estonia used a health data exchange mechanism to download all health records to the system. The use of e-health in this country is governed by the "Law on the Estonian Health Information System" and the "State Legislation on the Exchange of Health Information" [16]. Since 2010, the country has been using an e-prescription. More than 98% of all prescriptions in Estonia are now electronic. Additionally, the hospitals have already started to issue the digital certificates on births and automated health insurance. Moreover, health records of 1.35 million people (98% of the population) have been included in the system. The electronic card system is an element of the largest e-Estonia system providing electronic government services such as electronic taxation, electronic school, single electronic state register of legal entities and electronic election system [15, 16].

The Health Data Center has been established in Estonia, which interacts with various mobile applications and practically collects information based on the ID card of each resident. The database covers the entire country and records all the data about the illness of the citizens “from birth to death”. The data from the mobile devices like pulsmeter and pedometer is also possible to be voluntarily included into this database [11].

ID card ensures secure access to all health data of the local patients through public portals eesti.ee or digilugu.ee. All e-health services provided to the citizens of Estonia are integrated into the e-service system. This system also incorporates 4 services, which are electronic health records, electronic registration office of clinics, X-ray images, and prescription services. Digital eprescriptions easily eliminate the need for paper recipes. This service is used in all pharmacies of Estonia [12].

Policy Recommendations

It is evident that Turkey is passing through a new era demographically. The average life duration, in this regard, is increasing owing to the advancements in nutrition and health conditions or in the level of wellbeing generally as well as the decline in fertility rates. As a result, the share of the elderly in total population is increasing more rapidly compared to other age groups. This rapid

increase in the elderly population is highly possible to yield serious problems relating to care issues and their life standards in the next decades.

However, traditional familial solidarity is still considered the central agency in the provision of social care and protection for the elderly in Turkey, instead of conducting sufficient systematic and institutional solutions by the state. In this family-centred system, especially the spouse or daughter of the elderly has the main responsibility of caring because of the paternal authority and traditional culture which is still effective to some extent in Turkish society. Although this family-centred care mechanism is not as powerful as before due to numerous internal and external factors, such as migration from rural to urban areas, increasing levels of education and workforce participation by the women and girls in families, rapid urbanization, deterioration in income levels and changing family structures etc., the institutional efforts in Turkey still seem insufficient to fill in this gap of family in the elderly care.

As a result of these significant social and cultural transformations mentioned above, the elderly do not have their former strong positions in power relations in families anymore. Old age and life experience do not provide as much prestige as before and caring the elderly is not a voluntary act anymore in families. In this sense, more rehabilitation or nursing homes for the elderly are definitely required. The existing care centres, in fact, are in need of revision and improvement in terms of capacity and quality as well as the number of the staff. Projects and programs enabling social, cultural, economic and political inclusion of the elderly should also be redesigned and encouraged.

Besides, as stated in the 10th Development Plan, a well-functioning national home care system must be encouraged and supported particularly in places where caring institutions are difficult to build and/or run due to various reasons. In addition designing simple procedures to benefit from these services, provision of a decent and comfortable life standard must be the guiding principle in the design of all these services.

Despite having a rapidly ageing population, Turkey still seems very slow in taking the necessary measures against the socioeconomic problems relating with ageing. Traditional family-based solutions can be effective to some extent and there is definitely a need for a more systematic, institutional, and nationwide solution. As being applied heavily in recent times, in this regard, local solutions may be useful and rational only if they provide the required uniformity and quality in

social services nationwide. Otherwise, clientelist and populist impacts may emerge instead of the rights-based solutions in care issues.

Recommendations about the digitisation of the health and care services;

While various kinds of projects involving novel syntheses of data, the use of telecare and internet of things infrastructure to communicate directly with people in their own homes in a highly personalised way may improve health outcomes and reduce the use of more labour-intensive care services and the overall cost of care, they also raise important questions about the role of care services in the lives of citizens. To what extent should care services generate new data about citizens by aggregating manifold forms of data across departments – with or without individual citizens' consent, and potentially without transparency where this process is outsourced to technology companies with strong commercial interests – with the intention of investigating, analysing and intervening in their lives and lifestyles?

The characterisation of the Turkey's systems of health care as "under developed" has been a common motif over the past decade, reinforced by continuing real term cuts to care service budgets. In particular, Turkey's system has become ever more precarious, with many care home companies either in administration or close to collapse, a precarious workforce with a high attrition rate working for minimal pay, and some older individuals having to sell almost all of their assets to fund their own care. The impact of COVID-19 is likely to exacerbate these problems, as care home occupancy rates fell, as did the use of domiciliary care. In the absence of top-down political leadership in proposing solutions to issues around social care funding, delivery, and workforce, technology is fast becoming the most important de facto strategy among care homes for the future of adult social care. Depending on technology for the future of care comes with both opportunities and risks.

The digital transformation underway across social and health care, as well as the wider economy, create compelling opportunities to collect and share data to drive improved outcomes for older people. At the same time, many policy documents and grey literature reports identify issues of cost, lack of evidence for benefits, lack of interoperability between new and legacy systems across health and social care, and complex issues of data governance, including privacy and data security, as barriers to wider adoption of new ICT technologies (e.g. Derya Öz et al,2018). On the side both of care homes and users with direct payments or personal budgets who may be eligible to purchase

assistive devices, there is a lack of awareness of the technologies available and what they can do; the marketplace itself is already highly fragmented and becoming even more so.

This fragmentation is a reflection of the lack of national-level funding and strategy to push new technologies on the same scale as the widespread implementation of telecare in the early 2000s. Implementation of much new ICT for social care has been left to care homes, which have limited technical capacity, capability and resources to assess these technologies and make commissioning decisions, thereby creating bottlenecks that can impede their use. Trials of relatively expensive new technologies such as robots or virtual reality have been small-scale and inconclusive with regard to benefits and cost savings. The danger of a care home-based approach to sophisticated new technologies is that this will contribute to unequal distribution: care homes have varying levels of expertise in specialised areas such as data science or data management, as well as skills in procuring innovation funding or bringing together public-private consortia such as partnerships with some private companies. There is a fundamental mismatch between care homes' responsibilities for delivering social care in discrete local silos, and the growing imperative to plan and implement interoperable, highly complex systems across Turkey to gather, analyse and action big data sets in real time. A national strategy for technology in social care may have the potential to be more successful in trialling and scaling up technologies that are found to be effective.

Partly in response to these issues, we have seen a growing trend among councils towards making use of existing everyday "generic" consumer technologies such as Amazon Echo, iPads, Facebook, Skype, Whatsapp and so on. These technologies are cheap, powerful, familiar to many people, and often designed with a degree of accessibility in mind. They also avoid the stigma and user rejection traditionally associated with telecare devices such as "beige" pendant alarms (Allen, 2018). Yet despite the ubiquitous rhetoric of "co-production" in social care discourse, it is unclear whether such an approach involves true participatory co-production on the part of end users or other stakeholders, since they are dealing with the finished commercialised product and may have limited influence over the corporate development process of a relevant app or, for example, "Alexa Skill". Making widespread use of consumer products would in fact seem to run directly counter to the ethos and practice of co-production. It may also be politically and ethically problematic to use taxpayer money to effectively commission social care services from technology corporations such as Amazon, a company widely criticised for paying only %2 sales revenue in 2018 (Hammond, T et al, 2020).

Applying new consumer ICT products also carries another risk, exemplified by the case of Jibo, a social robot introduced in 2017 and less than two years later, in care homes across the US, Jibo abruptly announced to its owners that its servers were about to be shut down. The majority of staff at the company were laid off, and the company, which had raised $73m in venture capital funding since a successful crowdsourcing round in 2014, sold its intellectual property and collected data to SQN Venture Partners. This event demonstrates the fragility of new ICT service providing products reliant for their continuing day-to-day functioning on the ongoing support or solvency of their manufacturer. Two of the benefits of traditional telecare have been its technical reliability and long contract periods, despite the relatively slow incremental technical improvements that have largely characterised the industry to date. Yet the use of generic products yokes long-term social care services to the relatively short-term lifecycles of consumer technologies. For example, the robot Pepper, despite having been introduced in Turkey only recently, and promoted as the latest in robotic technology, may prove to be short-lived based on the evidence that 85% of businesses using Pepper in Japan, where it has been available since 2015, failed to renew their leases when they started to expire in 2018.

The increasing use of everyday consumer electronic devices not specifically designed for care is already displacing more expensive, specialist care technology. During this transition to more accessible generic products and digital technologies, the widespread introduction of a range of digital products risks leading to a highly fragmented, unstable and precarious care technology landscape.

It is further important to note that the digital turn towards websites, apps, and networked devices that depend on a broadband internet connection is likely to exacerbate a digital divide in the application of ICT, with around half of older adults not using the internet (Özgür G et al., 2019). Rural-urban differences in the quality of broadband, and 4G and 5G supply could also lead to inequality in the uptake of increasingly internet-based care services. While new technologies are being championed for older adults, as we have seen, they may be the members of society least willing or able to use them. As services increasingly shift online, vulnerability to internet outages, network slowdowns, and internet or Wi-Fi equipment failure is also likely to increase.

A further policy recommendation that we though would be the central policy focus on and investment in older people who are still able to live independently. Most technologies mentioned in policy documents attempt to extend for as long as possible the period of time before older people start to require institutional care. This group of older adults represents the main target of ICT

products and innovations, particularly teletechnologies, virtual assistants, monitoring devices, companion robots and so on. This has the twin benefits of catering to a widespread desire among older people to be able to stay in their own home, and helping to reduce costs by reducing the number of older people moving into expensive residential care or hospital. However, concentrating resources on this single group of users runs the risk of creating a new technological divide based on a form of digital ableism between those who are able to live independently and have most available technological resources and funding expended on their behalf to enable them to stay independent, and those who require more intensive residential care. This may constitute a cliff edge of spending on technologies pre-institutionalisation, with little spent on those who are no longer able to live independently. There is also the risk that people will be treated as independent simply because they have technology in their home, or that independence will be conflated with wellbeing, because this suits a cost-cutting agenda. ICT for independent living, particularly in the form of increasing remotely or digitally delivered services, may essentially institutionalise some older people in their own homes, and lead to a reduction in human to human contact in daily life (Aydın K. Et al, 2014).

The technology that has been developed in the care sector both influences and is influenced by the care landscape and situation of care policy and funding in Turkey. The reduction in funding of social care is reflected in the primary focus on technologies to cut costs by supporting independent living, by applying cheap generic consumer electronics to care, and by developing apps and devices to encourage unpaid carers to provide more labour in the form of care, managing care, and indeed managing care technologies. The move towards more domiciliary care has been facilitated by the move towards independent living and the introduction of more telecare infrastructure, as well as by national policies enabling greater flexibilisation of the labour market at large, which in turn has enabled the emergence of digital platforms for care workers.

Last but not least, it is important to view new technologies not simply as discrete widgets in a box to be parachuted into an existing care context, but rather as part of the broader assemblage of care: both reflective of changes to the care system and contributing to changes to the system as a whole, often in unexpected ways. In order to find effective and sustainable solutions to the crisis in social care in Turkey, new technology alone is not the answer: we need a holistic approach that does not just focus on individual devices but looks across the whole care home system.

SPAIN

The Spanish government has recently published a number of policies to accelerate the development of new, more efficient models of ICT use in health care and social care. The policies of most relevance to the care home sector are the NHS's 'Five Year Forward View', the creation of the National Information Board and Technology Enabled Care Services, and the Care Act 2014.

What is the five year forward plan

In October, Spain published its 'Five Year Forward View'. This guidance document described the seven new models of care that NHS of Spain believes will need to become mainstream within the next five years to ensure that future demands for public healthcare in the Spain can be met. One of these models is 'Enhanced care in care homes - offering older people better, joined up health, care and rehabilitation services', which is described as:"The NHS will work in partnership with care home providers and local authority social services departments to develop new shared models of care and support, including medical reviews, medication reviews and rehabilitation services. These will draw on models that have been shown to improve quality of life, to reduce hospital bed use and to yield significant cost savings." In January 2015 the NHS invited care providers to become 'vanguard' sites for three of the seven new models of care, including 'Enhanced care in care homes'. Since April 2015, NHS Spain's New Care Models team has designed and delivered bespoke support packages to each of the 6 chosen vanguard care homes to implement their new models, including the Andulusian Care Home project, which aims to align GP practices and community nursing teams with care homes by co-commissioning all community-bed and home-based care, introducing a capitation-based payment system based on need, and developing outcome-based contracts. Airedale and Partners, will equip care homes with telemedicine services, providing their residents with a single point of access to all aspects of specialist health and care advice. It is hoped that the learning made by these vanguards will be used to develop new standards and inspire the nation's 17,500 other care homes. In a separate initiative, in January 2016 the NHS announced the winning 'test-bed' sites comprising partnerships of NHS and care providers and innovative businesses tasked with deploying and evaluating new technologies and services that enable better integration of health and social care, and digital health innovations that improve patient outcomes, experience and cost-effectiveness. Several of the 7 winning test beds address the healthy ageing agenda and the opportunity for TECS, such as Barcelona and Valencia Innovation Alliance test bed. The National Information Board (NIB) The purpose of the NIB is 'to put data and technology safely to work for patients, service users, citizens and the caring professionals who serve them, to help

ensure that health and care in this country is improving and sustainable'. In the NIB Policy Paper 'Personalised health and care 2020: a framework of action' published in November 2014, there are 7 proposals which aim to deliver change, including for citizens to be able to access their digitised care records, placing Spain as a leading digital health economy and supporting care professionals to make best use of data and technology. Technology Enabled Care Services NHS and Spain's Technology Enabled Care Services (TECS) project has been developed by NHS commissioners to help maximise the value of TECS for patients, carers, commissioners and the whole health economy. It is a collection of practical tools and resources that help to raise awareness of how the wide range of TECS can support commissioning intentions and benefit patients, commissioners, families, health and social care professionals and provider managers. It also addresses the demand from commissioners for information on how to commission, procure, implement and evaluate these types of solutions effectively.

The Care Act 2014 The Care Act places greater responsibility on local authorities for care, providing them with greater power to influence their local services.

The CQC inspects every care home at least once every two years, with homes that perform poorly being inspected up to every 6 months. TECS have the potential to maintain if not boost a care home's rating, by directly supporting the delivery of the care they deliver, and by generating the robust evidence of the five key questions assessed by CQC inspectors ('Key Lines of Enquiry' - KLOEs)

The five KLOEs:
1. Safe? Are residents protected from abuse and avoidable harm?
2. Effective? Are residents supported to live the life that they choose and experience the best health and quality of life outcomes?
3. Caring? Are staff kind, compassionate and respectful?
4. Responsive? Are services well organised?
5. Well-led?

Does management inspire high-quality and person-centred care and promote an open and fair culture? There is pressure from CQC to push care homes towards improvement – this means that those with sufficient resources have a strong incentive to improve their status from Good to Outstanding, affording them the opportunity to charge more for their services. In order for a key question to be rated as Outstanding, a care home must demonstrate imaginative and innovative

facilities, services and systems that adhere to best practices and demonstrate creative thinking, i.e. they go above and beyond expectations. The other requirements for achieving an Outstanding rating that could directly benefit from technology are:

• systems for continually driving improvements, e.g. automatic scheduling of meetings between staff and management in response to complaints and incidents,

• opportunities for enabling autonomous care are actively sought, e.g. falls detectors and GPS alarms,

• staff are considered excellent, e.g. staff empowered by electronic care records, communication technologies and loneworker security technologies.

There is, of course, a significant proportion of care homes that must improve otherwise they risk losing their registration, making it illegal for them to continue operations. These care homes stand to benefit the most from adopting technology. This is because key questions are often rated as Requires Improvement because of inconsistencies in services standards, or because formal evidence of Good care (such as low medication error rates) is unavailable. Technology has obvious potential to remedy these problems; inconsistencies can be greatly reduced through automated alerting and reminders of best practice and electronic recording can build up a body of evidence that meets regulatory standards. Despite these positive attributes to the uptake of technology, consideration must always be made that any technologies used to deliver Safe, Effective and Responsive care do not undermine Caring care, i.e. care homes must not become so heavily reliant on technologies that they end up providing task-led rather than caring care. From our surveying of care home owners, it is clear that confidence needs to be raised that the CQC truly supports the use of technology to enhance care.

CQC Inspectors will look favourably upon those providers who can demonstrate robust mechanisms and systems that strive for best practice in their Provider Information Returns. Examples of these mechanisms and systems are:

• mechanisms to ensure continual review of safeguarding, accidents, pressure ulcers etc.

• systems for ensuring that guidance on medicines management (storage, timely administration, quality assurance, disposal etc.) is strictly followed and regularly reviewed

• mechanisms for regular care plan reviewing and auditing, proactively engaging with other health specialists when required and facilitating effective information transfer

• mechanisms to ensure care plans are adhered to e.g. regular turning of bedbound residents, regular checking of wounds, scheduling of appointments etc.

• mechanisms to ensure that resident distress and discomfort is minimised, and that their preferences (history, interests and aspirations) are accommodated as fully as reasonably possible
• systems to protect premises, residents, visitors and staff
• systems to ensure residents receive a balanced diet in accordance with their preferences, nutritional advice, swallowing assessment and food and fluid charts, and eat food served at the correct temperature and at appropriately spaced times
• mechanisms to assist staff to account for their decisions, behaviours and actions e.g. to seek consent for using restraint and reporting these events
• mechanisms for sharing and escalating event reports, including submitting mandatory statutory notifications to the CQC and local authorities
• formal methods for capturing and transparently responding to resident, family and staff feedback, complaints and whistle-blowing
• systems for assessing staffing levels (good mix of skills, competencies, qualifications and knowledge) and initiating any necessary change (i.e. intelligent workflow management using staff activity records)
• mechanisms to support safe recruitment and effective staff supervision and discipline
• processes that ensure staff continually receive excellent support, training, education on latest research and guidance and professional development
• systems for ensuring premises and equipment are clean, hygienic and safe
• mechanisms that ensure regular action plan setting and delivery by management.

COSTS AND BENEFITS

Money is the fundamental issue behind many of the barriers to the adoption of TECS, including initial purchasing and set-up costs, and lack of funds to train staff and then allow them to adjust to new ways of working. Care home managers must therefore be reassured of the favourable cost-benefits of a new technology before they will consider purchasing it. The benefits that TECS should bring care homes have one thing in common: they should enable its longer term sustainability. There are three ways in which this can happen:
• Improving resource efficiencies, e.g. - Improve staff workflow, e.g. no avoidable duplicative tasks and minimisation of time spent moving between residents, equipment and consumables. - Allow for optimal staff allocation, e.g. staff location and activity tracking and client needs and risk stratifications. - Allow for optimal allocation of overheads and consumables, e.g. building energy management and supply of medications. - Reduce staff workload by reducing incidences of falls and health exacerbations and improving outcomes.

• Improving rates of referrals, e.g. - Improve reputation by excelling in CQC and local authority inspections, e.g. improve compliance of care standards and generate supportive evidence, and reduce incidence of falls and health exacerbations. - Improve reputation by improving client experience, e.g. support client socialising, cater for client independence with managed risk, allow friends and family to access care records, and reduce incidence of falls and health exacerbations. - Improve marketing through higher quality advertising and stronger recommendations and testimonials.
• Reducing their insurance bill, e.g. - Robust systems in place to reduce number of client, staff and visitor incidents. - More effective response processes that reduce the negative consequences of these incidents when they do occur, e.g. more accessible and effective communication channels. - Staff training. - Mechanisms that improve staff compliance of care standards and other regulatory procedures, e.g. regular equipment testing. As already mentioned, few care homes have adopted more than basic technology, i.e. management computers and broadband connectivity. Fewer of these still have evaluated these adoptions, including their cost-benefits.

WHAT IS THE SOLUTION

• Care home providers see particular value in enhancing a care home's capacity to support wellness and leisure, as this is a key differentiating factor between care homes today. External relations were also deemed very important, as CQC ratings and word-of-mouth recommendations are by far the key determinants for a care home to win private business.

• The specific technologies that seemed to excite care providers most were: - Falls detection (and, ideally, falls prevention) - Early warning systems to detect infections - Remote and continual monitoring of and assistance with hydration and nutrition - Electronic tools to speed up medication management and reduce the risk of errors - Electronic tools to promote and enable client independence without compromising on safety - Electronic marketing and advertising tools (to attract both clients and staff), such as websites and social networking All of the care providers seemed to agree, however, that the ideal solution is a single platform into which all stakeholders, sensors and individual devices can feed and access data (with appropriate permissions), and which records and manages everything in a single environment.

• The cost-benefit analysis is absolutely critical: for a technology to be attractive to care providers, it must create an efficiency gain. The key insight made from the analysis of the commissioner responses is that commissioners are most interested for care homes to adopt technologies that: - free

up staff time to provide more human-centric care - improve resident wellbeing, such as social integration, sleep, hydration and nutrition. In summary, Spain's needs analysis has revealed that, once care home owners are made aware of the potential of technologies to assist with the key challenges that keep them awake at night and threaten the sustainability of their businesses, they have significant appetite for them.

BOX 6 - MEDICATION MANAGEMENT Medication management presents care homes with a number of logistical, staffing and quality of care issues. Its mismanagement can have very severe consequences for an "offending" staff member or anyone who contributed to or should have prevented the mismanagement. It is for these reasons that medication management merits all care home managers' serious attention. There are a myriad ways in which technology can already assist with each step of the medication management cycle, including:

• intelligent stock management with automatic requests for repeats being sent to pharmacy websites and alerting when a medicine is reaching its expiration date

• electronic devices with Medication Administrations Records (MAR) software for nurses to timestamp when they deliver a medicine to a resident and record a missed or erroneous administration

• automatic reminder alarms to next time of administration

• electronic tools for doctors to communicate with care home nurses about the medicines they have prescribed to residents

• electronic tools for helping nurses to calculate medication dosages

• electronic devices for keeping medicines safe and secure, e.g. electronic pill dispensers and intelligent medicine cabinets.

BOX 7 - FALLS Although falls are not a daily occurrence in a care home, they do happen relatively frequently, with about a third of all people aged over 65 falling each year and rates in female care home residents estimated as high as 50.8 hip fractures per 1000 person. The consequences of a fall can be disastrous for the fallen resident, with only half of those with hip fracture ever regaining their former level of function and one in five dying within three months. Falls are estimated to be the primary cause of ten deaths in the Spain 65 and over population every day. Equally, care homes must not only respond to, manage and supervise the immediate medical response to a fall, which could easily absorb the full time of a staff member on shift, but also provide much more intensive care in the long term. Immediately available technologies assist with fall detection and response. These solutions range from pendants worn around the neck, to

wristwatch-type devices, to devices clipped to clothes or worn as a belt. They generally use accelerometers to detect impacts, which in turn activate communication channels between the person who has fallen and a call operator, to assess the most suitable response (in-house care staff, the emergency services, or friends and family). The Meath Epilepsy charity is a care organisation that offers residential and day services to those with Epilepsy and associated disabilities. The Charity has installed very sensitive microphones in their residential bedrooms to alert staff to seizures and falls. They are now keen to add a remote element to this system so that they can detect seizures and falls in various other environments. They wish to extend this system by adding other functional sensors to measure, for instance, oxygen levels and heart rate - key indicators that a seizure is imminent. Continuing the thinking about how other technologies could complement today's standard falls detectors to help reduce the incidence and consequences of falls in care homes, there ought to be a role for technologies that help to mitigate or reduce the risk factors of falls, such as physiological monitoring for early detection of urinary tract infections, and technologies to prevent poor hydration and nutrition. Technology may even one day have a role to play in directly preventing falls or their consequences, for example continually updated falls-risk analysis (on continual gait analysis and physiological measurements), and intelligent triggering of cushioning devices around hips.

BOX 8 - DEMENTIA Dementia is common amongst care home residents and, intuitively, technology should be able to help monitor and manage people with this challenging condition. However, most of the relevant assistive technologies have been employed to enable people with dementia to manage in their own homes by providing additional safeguarding and security; these are not always essential in care home settings. In a review conducted by University of Malaga in 2020, the authors recorded that 71% of technologies were used by people with dementia in their own home and 27% in residential care settings. The majority of technologies were for home-based monitoring and surveillance. Many residential care homes use technology to offer mental stimulation opportunities for people with dementia, such as reminiscence therapy and specialist sensory rooms. A 2015 study by University of Madrid demonstrated the positive effects of care-home activity coordinators' working with iPads alongside clients with dementia. The technology was used mainly to enhance existing activities such as showing films, playing songs and games, but handheld PCs were also used to enable video communication with family members. There were also significant benefits for care home staff who were more engaged with clients and became more familiar with technology.

SPAIN's VISION FOR THE FUTURE

Our observations are that care budgets will continue to be restricted in the immediate future and priorities will continually have to be re-assessed; the private payer will become more important to the sustainability of the care home; and the use of technology, particularly to maintain social inclusion and family connections for residents, will contribute to differentiating between care homes. Despite the immense financial obstacles facing local authorities that try to stimulate innovation in their local social care services, the Care Act 2014 has bestowed greater powers on them to shape these services. It is within their control, for example, to demand higher or new standards of care that could be most easily achieved using a specific technology, in order for a care home to receive state-funded business from them. This incentivised approach to raising standards may seem punitive, but local authorities are mandated to act in the best interests of its citizens and to work closely with care providers, as they are ultimately responsible for ensuring that adequate care arrangements are made for any local care home resident displaced by the failure of a care home. It is these complementary interests of local authorities, local citizens and care providers that should motivate local authorities to assume an important role in the development of new technologies for the care home sector. This might also open up the possibility for local authorities to subsidise new products and services, making it available to care homes that otherwise would not be able to bear the initial shortterm costs of purchase and set-up in order to reap the longer term benefits. Suppliers could also contribute by offering rental packages as opposed to capital purchase. TECS do not only have the potential to bring benefits to care providers, their residents and commissioners, but also to regulators.

By having continual access to up-to-date care home records, and needing only to see evidence that quality-assured mechanisms and systems are in place, CQC and local authority inspection routines could be much more efficient. What is more, by making sources of inspection evidence more robust, local authorities will become more confident in CQC ratings and therefore more likely to base their commissioning decisions on these ratings alone, rather than carrying out their own inspections. This in turn could create savings that are put to better use, e.g. to support care homes to improve, or to widen public access to financial support. It is suggested, therefore, that the CQC be more encouraging of the use of technology in care homes.

A more consistent message from regulators and commissioners about the use of technology by care homes will become all the more important as care homes provide step-down virtual-ward care in response to the NHS's 'Five Year Forward View' aim for a shift in investment from expensive

reactive acute care to more cost-effective preventative primary and community services. Virtual care stands to gain more from technology than traditional forms of care, as systems that allow risk to be assessed and managed remotely have the potential to hugely optimise staff workloads. It would do this by reducing unnecessary face-to-face check-ups and freeing up professionals' time for those who need it most. For care homes that choose to deliver virtual-ward care in addition to standard residential care, technology provides a means for it to enjoy the financial rewards of hosting patients who would otherwise be blocking considerably more expensive NHS beds, at minimal extra cost to the staffing budget line. Our discussions with care home owners have revealed that care home owners are generally aware of this opportunity, which will benefit their bottom line as much as the NHS's, and yet they are very frustrated that progress towards achieving it is so slow, because the acute sector does not seem to acknowledge their capacity to deliver this potentially revolutionary service.

In particular, approaches were illustrated taking into consideration the different actors (human and non human actors - Latour 2015), and considering documents "as a means of tracing the evolution of government policy and the involvement of political actors" (Prior, 2013). This form of analysis

Policy objectives	Variables	Findings of the practice evidence
Independent living of older adults and carers	**Independent living of older adults:** • falls at home and hospitalisations due to falls. • observation to reaction to the robot prompt. • walking and balance ability. • walking speed • functional status • health status indicators. • blood glucose level control • infection rate. • global cognitive status. • executive functions. • attention. • processing speed. • clinical conditions (health conditions) • independence. • quality of life. • clinical effectiveness of the service (health benefits). • users' perceptions of the impact of telecare. **Independent living of carers**: • anxiety. • experience with caring. • quality of life. • stress of caring/burden. • social support. • health. • change in pressure on informal carers.	The older adults were more independent because they: • were less reliant on informal carers for daily activities. • had fewer falls at home and fewer hospitalizations as a result of falls. • were less affected by depression. • were more active when alone. • had better walking ability, balance and speed. • their physical and cognitive status was better maintained • had better cognitive functions • stayed in their homes • felt safer at home. Informal carers were also more independent in their tasks and responsibility, they felt: • better quality of life. • better health. • more safety • more free and with peace of mind. • less stressed.
Productivity of carers		Carers were more productive because the technology-based services: • saved time and money • facilitated timely medical responses in emergency conditions. • reduced the length of patients ' visits • provided more information on care more time for more needed, • improved carers' satisfaction with the job. • allowed new ways of working • helped them to have more respect towards the independence and dignity of older people. • helped them have fewer worries. • helped them retain their jobs. • supported them to improve their relationship with the older adults.

recognises the potential of such documents being key actors (Latour, 2015) in the unfolding process of ehealth policy development. In fact, in this study we did not list and comment documents and acts according to the chronological order they were produced and delivered. We tried to identify the Governmental and organizational bodies that worked on it, and where possible, we investigated the relationships existing between one document and the others produced before it and also how it may affect the further ones. We highlighted the key themes in each document and we tried to understand the role of ICT achieving goals that these policy acts aim to address.

Based on this analysis we found that all the documents express different relationships and systems of hierarchy, that we tried to highlight. Their circulation and dissemination may shape patterns of everyday activities, may influence policy definition process and its implementation. Furthermore, we tried to identify different approaches to the development of ehealth policy by considering the different bodies in charge of editing and publishing the policy acts, plans and strategy, the stakeholders involved in the definition and development process (such as policy makers, clinical professionals and external consultants). Our analysis shows that the different levels of governments have different starting points, resources and goals. Government may play a key role in defining policies or have a more pragmatic approach led by strong communication between clinical professionals and policy makers. The policy development process is strictly related to the context and to the people who work within the organization. We need to move toward an approach that combines local consultation with professionals and agreed standards and goals at local, regional, national and supranational level for the exchange of information at different levels. The policy development process has to combine elements of all of the above approaches in a comprehensive way, taking 2 main points into consideration: (i) the need for cooperation between professionals and policy makers and (ii) the continuous interaction with contingent circumstances that make up the situation for the development of policies in terms of former policies and actions delivered and in terms of the needs of the public.

AUSTRIA

Policy Review and Recommendations

Executive Summary

The nursing and care sector has not been given much attention in policy debates and proposals on e-health in Austria. While general legal frameworks in the domain of data protection and regulation of medical devices have been formulated, questions of liability, responsibility, adequate training and data ownership remain. Austrian patients and doctors are skeptical of telemedicine, despite the successfully rollout of pilot projects by local governments. Advances in telemedicine and telecare need to be accompanied by legal clarifications, information campaigns and trainings for patients and healthcare professionals. Any advances in telenursing also need to take into consideration that long-term care in Austria is predominantly provided in informal settings.

Introduction

Austria, like many countries in Europe, is faced with the socio-economic challenges of an ageing population. Currently, 19 percent of the Austrian population are aged 65 years and older (Statistik Austria, 2021). The percentage is projected to increase to 27.6 in 2050 (Statistik Austria, 2020a). This demographic trend sparks policy debates on rising costs in healthcare and care of older people.

Telemedicine and telecare are debated as technological solutions to this societal issue. The Austrian federal government responded by creating working groups on telemedicine and telemonitoring. Local governments fund pilot projects in specific areas of e-health.

Compared to other countries in Europe, Austria is in the midfield regarding the digitalization of health care services. In a comparative study on digital health care systems in 17 OECD countries[1], Austria was ranked 10th (Thiel et al., 2018), mainly due to the rollout of an electronic health record (Elektronische Gesundheitsakte, ELGA) system. However, telemedicine services have mainly been adopted in the form of medical consultations via phone or email; this development has been pushed further due to the COVID-19 pandemic. Telenursing and telecare in Austrian care homes have not been implemented yet. This puts Austria in an interesting situation, where the groundwork for e-health has already been completed, but implementation of telemedicine and telemonitoring is long in the coming.

1 The study included comparative country cases of Germany, Australia, Belgium, Denmark, Estonia, France, Israel, Italy, Canada, United Kingdom, Netherlands, Austria, Poland, Portugal, Sweden, Switzerland and Spain. While Estonia (1st) Canada (2nd), Denmark (3rd), Israel (4th) and Spain (5th) ranked high in the comparative study, France (15th) Germany (16th) and Poland (17th) ranked low.

Difficulties in implementing telemedicine and telecare services for older people arise from the characteristics of the national (health-)care system in Austria. Care of older people is mainly carried out in informal settings. The Austrian care system is based on a mixed-system, which includes residential care in nursing homes, and care at private homes by care professionals and family members as informal caregivers. The majority of older adults (80 percent) are cared for by family members at home (91).

Another obstacle to national wide rollout of telemedicine and telecare is a fragmentation of competencies among ministries, and among the federal government and local/state governments. Long-term care often falls into the competency of local governments (and their respective departments for health and social affairs), while health care (financing) is regulated by the federal government (Ilinca et al., 2015, p. 6).

Furthermore, the majority of Austrian doctors and patients are skeptical of or opposed to e-health. The main concern among patients and medical professionals regard privacy issues (Haluza et al., 2016). Especially medical professionals remain critical of e-health (Haluza and Jungwirth, 2015). Among particular patient groups and physicians, the opinions are mixed. In the domain of care for diabetes patients, 58 percent of physicians and 65 percent of patients perceived that Austria is ready for telemonitoring. Prevalent concerns included data protection issues, decrease of personal communication, lack of funding and the organizational structure of the Austrian health care system (Muigg et al., 2018).

This policy review introduces the main policies and governmental initiatives in Austria that have been adopted in the domains of telemedicine, telecare and telenursing. Based on the evaluation of policies, the paper issues recommendations for a responsible, sustainable and ethical policy development in ICT-based care. It also builds on the outcomes of a study conducted by SYNYO (Bertel et al. 2018), defining a roadmap for assistive technologies for care until 2025.

Austrian policies in telemedicine and telecare

The Austrian federal government recognizes the benefits of e-health and telemedicine. The Ministry for Social Affairs (Sozialministerium, 2019) underlined the potential of telemedicine to treat chronic diseases among older people, as well as cardio-vascular issues, in a cost-effective way, in addition to the potential of creating better access to care to the population that lives in remote areas. While the federal government is dealing with telemedicine and telehealth on a theoretical and policy level, local governments are involved in the implementation of telemedicine and telecare through

the realization of pilot projects. However, the domain of telenursing and ICT-enabled care in nursing homes has been neglected in this context.

The Austrian government formed an inter-disciplinary commission on telemedicine in March 2013 (TGDK - Telegesundheitsdienste-Kommission), which issued recommendations. These recommendations were further developed by a working group in 2015, which developed a guideline for IT infrastructure for telemonitoring and data collection (Sauermann, 2018). As noted in the guideline, Austria does not have an existing IT infrastructure in place that would currently enable telemonitoring. Standardization and interoperability are core issues addressed in the guideline. As noted by Sauermann, health care providers in Austria use a variety of software to store and process data of patients. Another issue is the standardization of language to ensure semantic interoperability (op.cit. p.13). Furthermore, medical data (of implanted heart rate monitors) is sent to the product companies, rather than to health care providers (op.cit. p.18), raising questions about data ownership and data accessibility. The guideline does not specifically address the use of telemonitoring in the setting of care homes. The main discussion centers around the monitoring of patients after they release from the hospital, or the monitoring of patients with chronic diseases by health care providers.

While there is no general roll out of telemedicine services, some pilot projects have been successfully implemented, such as “Herzmobil Tirol”, “Herzmobil Steiermark” which monitor patients with heart disease (funded by the regional public health care system), or the project “Gesundheitsdialog Diabetes” which provides telemedicine service to patients with diabetes.

Telenursing is a topic that has been neglected in the discourse on e-health in Austria. This issue was raised during an event at the Austrian Ministry of Social Affairs, Health, Care and Consumer Protection, during which Dr. Hanna Mayer, Director of the Institute of Nursing Science at the University of Vienna, stressed that the policy discourse on e-health is focused on telemedicine, and not on telenursing, despite the fact that there are already research projects implemented on this topic. One of the issues, according to Mayer, is the low standard of education requirements for care professions, which goes hand in hand with the low desirability of taking up the profession (Springer Vienna, 2020) and does not reflect the required knowledge and new responsibilities of ICT-based care.

Telemonitoring is state of the art in intensive care but not in long-term care at home. The use of telenursing and robotics in other care settings is not well established (Rappold and Juraszovich, 2019, p. 73). While robotics and care robots are a field of research in which Austrian research institutes and companies are involved, robotics have not been sufficiently included in policy development or implementation (Čas et al., 2017).

Assistive Technologies in Austria

In addition to telecare and telemedicine, assistive technologies in the context of Ambient Assisted Living (AAL) aim to maintain or improve the quality of life of older people and support their independence, especially within their own homes. Intelligent assistive technologies can be used in a number of areas, in which they can provide support for senior citizens and their caring relatives; they include telehealth solutions as mentioned above, as well as home emergency call systems, navigation systems for pedestrians and wheelchairs with voice control (Bertel at al. 2018). With the *benefit* research programme (101), funded by the Federal Ministry of Digital and Economic Affairs and the Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology, the Austrian government supports the development of AAL solutions. Several test regions have been rolled out in Austria, testing the implementation of AAL solutions for longer periods of time. For example, the Viennese AAL test region WAALTe (291), which ran between December 2016 to November 2019, addressed demographic and health policy challenges and combines the ubiquitous digitalisation of everyday life with the requirements of current Viennese concepts.

Legal framework

The Austrian legal system provides regulations for key aspects of e-health which are relevant to ICT-based care, such as data protection laws, regulations of medical devices and laws stipulating the responsibilities of health care practitioners. With the general legal framework in place, the devil is within the detail, especially when it comes to regulating the responsibilities and liabilities of medical and care personnel.

Data protection is regulated by the European General Data Protection Regulation (GDPR) and the Austrian data protection act (DSG). Data stored in electronic health records (ELGA) are in line with law of GDPR. The legal aspects of ELGA were specified in the ELGA law (Elektronische Gesundheitsakte-Gesetz - GTelG 2012). Since then, the GTelG has been amended to include changes regarding the Covid19 pandemic and to further the use of the ELGA infrastructure in other aspects of health and medicine. The latest version of the health telematic act (Republik Österreich, 2020) will also serve as a foundation for the e-vaccination certification, which is currently piloted and will be implemented nationwide. In this context it has to be noted, that Austrian citizens can opt

out of the ELGA system.[2] Therefore, the participation of the whole population in the centralized system of health care data cannot be readily assumed.

Medical devices are regulated in the Austrian Medical Devices Act (Medizinproduktegesetz, MPG), which includes general requirements for quality standards of medical products, and specific legislation for in-vitro diagnostics and implanted medical devices. The Austrian legislation is based on the EU Regulation on Medical Devices (European Parliament, 2017)[3], which includes strict regulation for wearable technology.[4] Medical devices need to be registered and approved by the Austrian Federal Office for Safety in Health Care.

Regulations of health care professionals' responsibilities and liabilities are not clear regarding the administering of telehealth services. The Doctors Act (ÄrzteG 1998) (Republik Österreich, 1998) does not provide legal details on telemedicine services. In paragraph §49 of the Doctors Act it is stated that doctors need to practice medicine in a direct/unmediated manner ("unmittelbar"), a term that provoked uncertainty among practitioners and legal advisors (Raabe-Stuppnig and Söllner, 2020). While the law does not forbid telemedicine services, it states that doctors need to pay respect to due diligence. This means that doctors need to assess on a case-by-case basis whether telemedicine is appropriate to treat a patient. During Covid-19 pandemic, a preliminary regulation specified the fees that doctors in the public health care system can charge for the provision of telemedicine services, which mainly included consultations per phone or email (Treml and Schwabl, 2020).

Further uncertainties regarded the responsibilities of nurses, carers and other medical personnel. The amendment to The Health and Nursing Act (Gesundheits- und Krankenpflegegesetz, GuKG 2016), which regulates confidentiality, mandatory documentation and access to medical information, expanded on the competencies of care professionals. In Paragraph § 15(4)18 it is stated that care professionals are allowed to administer the monitoring of patients using technical medical devices, if they received relevant training (Republik Österreich, 2016), without further specifying which type of training would be deemed adequate.

2 In the period between 2009 (when ELGA was introduce) and 2018, 269.000 patients made use of the opt-out clause. (Egyed, 2018).

3 The new regulation entered into force in 2017 and is replacing existing regulation in a transition period until 2022.

4 Software used in wearable devices is classified in the IIa, IIb or III risk category, instead of risk category I, thereby requiring official certification (Koch, 2020).

Key issues in the national rollout of telemedicine and telecare

The existing policies and legal frameworks need to be further developed to address key issues and open questions regarding the implementation of telemedicine and telecare in Austria. The identified issues resonate with the findings of Nittari et al. (2020) on legal and ethical issues in telemedicine. The following section discusses key issues which need to be considered in a national rollout of telemedicine and telecare services in Austria: data security, data ownership, ethics, liability, user friendliness & user acceptance, standardization, informed consent, financing and ICT training.

Data security and trust

Austrian patients and health care professionals have concerns regarding data protection. While there is a robust legal basis in place to deal with privacy and data protection issues (based on the EU data protection laws), the wide-spread use of telehealth services would provide vulnerabilities in terms of data security. Hospitals and other health care providers have been (successfully) targeted by hackers (Seh et al., 2020) and remain vulnerable to data breaches. Given the sensitivity of medical data, the issue of data protection and security is crucial to ensure trustworthiness of new technologies.

Data ownership, data access and sustainability

Ownership of medical data remains a complex issue. While some argue that patients should be the owners of their personal medical data, health care providers (such as hospitals and medical practitioners) often remain the de-facto owners of medical data (Choi and Walker, 2019). Discussion regarding the use of medical data for research purposes and for the benefit of the general public are also ongoing. In Austria, this discussion is held regarding data stored in the ELGA system (Die Presse, 2018). Data ownership in the context of wearable technology is even more contested (Kerr et al., 2019), as manufacturers claim ownership of the data and exploitation for commercial purposes. This leads to further uncertainties regarding the reliability of data access, and again, the security of stored data. Responsibilities in the continued maintenance of devices and IT infrastructure are also unclear. From a policy perspective, these issues also have to be taken into account regarding procurement strategies.

Ethical issues and liability

An open topic remains the question of who is responsible for the accurate and ethical gathering, use and interpretation of remotely collected data. To what extent are patients responsible for the adequate use of devices? Who takes responsibility if telemedicine leads to false diagnoses or late treatment (due to malfunction of the devises, wrong interpretation of the data, among other issues)? Uncertainties regarding legal issues (such as liability in cases of malpractice) were named as one of the issues Austrian medical practitioners named in a survey (Hainzl and Juen, 2020). Therefore, a comprehensive e-health strategy needs to be based on robust ethical and legal frameworks.

User-friendliness and user acceptance

The use of emerging ICTs requires a certain level of tech-savviness and the ability to learn new skills. Older patients have different levels of IT competency. This can create issues among older people, who have less experience and sometimes feel that they are not equipped to learn the use of new technologies. Some patients feel that the effort of learning the use of new technologies is higher than the potential benefits. Other issues can be sensory difficulties, dementia, or lack of internet access (Kratky, 2020). Institutional setting of care homes can provide advantages in this respect, by providing the necessary infrastructure and assistance by care personnel. A study conducted in 2018 defined the development of assistive technologies for and with the users to increase acceptance and usefulness as one of the key goals for the future of the field (Bertel et al. 2018).

Standardization and interoperability

Clear guidelines regarding the necessary quality of wearable sensors (such as accuracy etc.), robotics and other ICT tools need to be formulated. This also regards potential European standards in telemedicine. As patients move between member states of the European Union, a standardized language would enable the smooth transfer of patient data across borders. Cooperation with other European countries would also enable states like Austria to draw on existing efforts of data standardization. As of now, there is no European wide standard regarding telemedicine, which could be implemented in Austria.

The national electronic health record (ELGA) has an standardized terminology, which has been evaluated as a success (Seerainer and Sabutsch, 2016). A comparative study on e-medication approaches in Austria, Germany and Switzerland demonstrated the divergence among national approaches. While the goals are similar, the implementation through e-heath infrastructure varies

significantly in terms of standards used, chosen architectures and available functionalities (Gall et al., 2016).

Informed consent and drop out

Patients need to give their consent to participating in e-health. In addition, there needs to be an option to drop out of telemonitoring, or to choose between personal consultations and telemonitoring. Older patients that do not master the use of new technologies need alternative treatment and monitoring options. Especially in the Austrian context, where patients and doctors are skeptical of adopting emerging ICTS, a drop out option is necessary. The personal choice in treatment options also needs to take into consideration the different costs of offline and online treatments, and whether patients can be asked to pay more if they choose the more expensive treatment.

Financing

Apart from the funding of research and pilot projects in telemedicine and ICT for care, a national strategy for the financing of telehealth is missing. At this moment, it is not yet clear to what extent the public healthcare system will cover the costs of telecare and telemonitoring. A nationwide rollout of telemedicine and telecare services needs to be supported by a national funding strategy, incentives for investment in telemedicine for health care providers and clear guidelines on who covers which costs.

ICT training of physicians and care takers

Medical doctors and care takers are not experts in the use of ICTs and in the interpretation of data generated by wearable sensors. The curriculum of medicine in Austria does not include mandatory education in e-health. Currently, elective subjects in telemedicine are taught at Austrian universities, which are often theoretical and do not provide students with the necessary practical skills. Curricula of medicine students need to be reformed to reflect trends in e-health (Rieder, 2020). The Medical University of Vienna suggested to include a module on health care informatics and ethics in the curriculum (*Task Force Lehre*, 2019, p. 26). Similar gaps concern the education of care

professionals (Ammenwerth and Kreyer, 2018). While the general curriculum in medicine and care does not include courses on telemedicine, some specialized Masters degrees in this field exist.[5]

Perspectives and Policy Recommendations

The existing policy initiatives and legal frameworks provide a good starting point for the development of telemedicine and telemonitoring in Austria. Opportunities lie in the further roll out of successful pilot projects, in intensifying efforts to include the nursing and care sector into e-health initiatives, in specifying legal guidelines further and in educating all stakeholders in the responsible use of ICT in health and care. Based on the review of current policies on telemedicine, telecare and e-health in Austria, eight policy recommendations can be issued:

- **Foster acceptance and desirability of e-health through information and communication**

The advantages of introducing telemedicine and telemonitoring need to be communicated to health care professionals, patients and the general public, to increase desirability and acceptance of the use of ICT in health care. This means to address and take seriously the fears and concerns of the involved groups.

- **Create evidence through research and pilot studies**

Finance and promote research projects that can demonstrate in which contexts the use of ICT in health and care can save costs, increase quality and accessibility of care, and involve the users – older people, informal and professional caregivers – in the design and development of technologies. Studies need to demonstrate the pros- and cons of different telemedicine and telecare technologies in hospital, care and private settings. In particular, the use of ICT in care homes needs to be advanced, which is currently understudied. Further, research is needed to understand benefits and long-term effects of assistive technologies and telemedicine.

- **Fund investment in ICT and cover telemedicine and telecare services within the public health care system.**

Widespread roll-out of telemedicine and telemonitoring needs to be financially supported by the government, through incentives for investments in ICT for institutions and through covering the costs for patients by the public health insurance. ICT for care needs to be affordable, addressing socio-economic gaps. The creation of new market opportunities and funding for near-market solution will further ensure the successful development of novel technologies in this sector**Create a**

5 Examples are the Master's degree in Telemedicine at the Donau-University Krems, the Master in Digital Health at the St Pölten University of Applied Science and the Master's degree in Medical Informatics at the Medical University of Vienna.

solid legal framework regarding the liability for medical decisions based on data generated by wearable devices

Eradicate uncertainty among health care professionals regarding their liability and responsibilities in the quality of treatment and accuracy of diagnostics mediated via ICTs.

- **Plan telehealth and telecare services for formal and informal care**

Any extensive rollout of telemedicine services in care home needs to take into consideration the informal care sector. Advances in the use of telemedicine and telecare in nursing homes should not create divides between those receiving care in professional and in family settings.

- **Address gaps in ICT education for health care professionals and family carers**

Provide adequate training and education opportunities for health care professionals and include ICT in the curriculum of higher education and professional education. Provide specialized training for family carers.

- **Promote a human-centered approach to the implementation of ICT in health care.**

Telemedicine and telecare need to be tailored to the needs and rights of the patient, doctors, nurses, care professionals and family carers. This includes a strategy to develop telemedicine and telenursing for particular conditions, treatments and patients. Furthermore, telemedicine needs to be based on the informed consent of patients, who need to have the right to opt out of telemedicine or telecare.

- **Streamline National and European Policies**

Combine efforts on the national level and ensure efforts are not duplicated on the European level. Exchange information and policy advice with other European governments, to facilitate cross-border care and standardization of e-health practices.

Efforts in advancing telemonitoring and telehealth in medical settings can and should be translated to the care sector. The proposition is therefore to adopt an inclusive, multi-stakeholder approach to developing ICT use in Austrian (health) care.

DIGITAL MEDICINE

The impact of Digital Technologies for Healthcare is more visible as the paradigms of the current healthcare systems change. This process, which is happening later in Italy than in other countries in

Western Europe, demands a more personalized and holistic approach when it comes to finding healthcare solutions. Monitoring systems of vital parameters, prevention, and the patient's wellbeing should be at the forefront of this process, and they should be achieved combining quality and economic aspects in the most ideal way. Taking this into consideration and looking at an evaluation of the digital market in a healthcare framework, Gartner's variables "Hype Cycle for Digital Care Delivery Including Telemedicine and Virtual Care, 2020" (Hakkennes et al., 2020) were analyzed. These variables consider elements of digital medicine and their implementation at a legislative level. Moreover, digital medicine applied to healthcare highlights some of the aspects that can simplify the life of patients and caregivers, such as apps and telemedicine, which reduces the distance between the patient's home and medical facilities by collecting health data through electronic medical records. Medical records can also play a major role for pharmaceutical recognition and reconciliation. Digital Medicine is therefore a cultural transformation of traditional healthcare: it spans beyond the use of new technologies and allows to provide services and goods, live experiences, and find, define, and make large quantities of contents available, creating new connections between people, places, and things (Ministry of Health, 2014).

Digital Medicine can be applied to many diseases, not always classified as "chronic".

It can also be an important resource for patients affected by rare diseases who face a great challenge today: transitional care. This means transitioning the management of health treatments from children to adults. This change determines the quality of life, treatment safety and, last but not least, the patient, caregiver and health professional's concordance (Ministry of Health, 2013).

INFORMATION and COMMUNICATION TECHNOLOGIES (ICT) FOR HEALTHCARE

Integrating treatment models through ICT can help develop a network to improve the treatment offer and limit the costs for chronic illnesses. This project aims to promote the reorganization of how chronic illnesses are managed by defining, transferring, and supporting the use of methodological and operational instruments at a regional level. These instruments should help define innovative and local methods on how to handle chronic diseases. Innovation here means promoting - both at a central and territorial level - a multiprofile and multidisciplinary approach to support the necessary organizational dialogue that will help regions and healthcare companies assess and plan actions and investments to support the challenge of managing chronic diseases with the support of ICT (Ministry of Health, 2020). This includes strategies, methods, and instruments to identify innovative health management models supported by digital technologies (paying attention

mostly to chronic diseases and to the patient's journey: from the diagnosis to the treatment), also considering successful cases coming from the National Strategy for Inland Areas and methods that can support the efficiency and effectiveness of investments (planning and costs) with regional ESI Funds relating to ICT-aided actions for chronic illnesses (also in synergy with the National Smart Specialisation Strategy) (Presidency of the Council of Ministers, 2020). An example is given by the activity carried out by the National Institute on Health and Aging (INRCA), commissioned by the Italian Ministry of Health, that was involved in several international research projects, also promoting the ICT and the PON GOV Chronicity - "ICT-aided Support to Chronic Care Challenges".

PON GOV CHRONICITY, AGENAS RESEARCH AREA

The PON GOV Chronicity (CUP J51H16000170007) project is part of the PON GOV Institutional Capacity 2014-2020, which aims to effectively contribute to reinforce public administration, specifically in regards to two of the objectives of the Partnership Agreement and the 1303/2013 EU Regulation: "Reinforcing the institutional capacity of public authorities and stakeholders and make efficient the public administration" (Thematic Objective n.11) and "Improve access to information technology and communication, as well as their implementation and quality" (Thematic Objective n. 2). Investing simultaneously into these two objectives accelerate the realization of the digitalization plan designed for the public administration, and it also helps maximize the contribution offered by the European Commission. PON GOV Chronicity refers to the Agency of the Territorial Cohesion - the authority managing the program - and the Public Administration Department of the Presidency of the Council of Ministers - identified as an intermediate organization. The Ministry of Health - Director-General of Planning in Health (DG PROGS) in collaboration with the Digitalization, Health Education and Statistics General Direction (DG SISS) for the convergence of many topics related to the digital healthcare Pact and other e-government guidelines - is the beneficiary of the project. The project's goals include promoting the reorganization of chronic care management processes with the use of digital technologies as well as defining appropriate change management strategies. The project, started operationally in 2018, lasts 5 years and will end in September 2023. It is financed by the European Social Fund with an amount of Eur 20,192,469.00 to support the chronic care challenge in the 2014-2020 cohesion policies. The Italian Ministry of Health called on support from the National Agency for Regional Health Services (AGENAS) for the management (direction and coordination) of all the project's activities. In order to carry out these activities, the Ministry and AGENAS closed a specific collaboration agreement

under a public-public partnership (AGENAS, 2020). Moreover, part of these activities is also the introduction of Digital Therapeutics (DTx) in chronic care management processes.

DIGITAL THERAPEUTICS (DTx)

2020 was an important year for Digital Therapeutics (DTx), which were created to treat patients by adjusting their lifestyle and by applying digital cognitive-behavioral interventions. Currently, Digital Therapeutics focus on chronic illnesses, mental diseases, rehab, and sleep quality (Bhavnani et al., 2017). In Italy, it's necessary to plan the whole institutional and regulatory process in order to be able to prescribe (and refund) a digital therapy (Higher Institute of Health, 2020). In some European countries, different procedures available are already available for accessing and refunding DTx. However, these are individual initiatives that lack European coordination in terms of legislation, regulation, technology evaluation (HTA), access, and refund. This evaluation is today necessary to determine the therapeutic value and the position in the treatment process of the Digital Technologies for Healthcare, in order to unify decisions related to purchase, refund, and use. The Ministry of Health, together with AIFA, AGENAS and the regions' representatives has worked on a highly detailed HTA National Program.

DTx AND POLICY RECOMMENDATION

A coherent and shared legislative and procedural framework in Europe is necessary in order to regulate the development of DTx, authorization processes, criteria and evaluation methods, and the relating access and refund procedures. These procedures vary within the different European welfare systems; in Italy specifically, we are looking at the National Health Service (SSN) and Basic Levels of Care (LEA).

Currently, DTx in Europe follow the new medical device 2017/745 EU Regulation from April 5, 2017, which repeals the 90/385/CE (Active Implantable Medical Devices) and 93/42/CE (Medical Devices) directives. This regulation was published on the EU Official Journal on 5/5/2017, became effective on 5/25/2017, and should have been implemented by Italy by 5/25/2020, but it was postponed by a year due to the COVID-19 emergency (Agricola and Di Marzio, 2020).

In Italy, it is still unclear if the DTx shall be sole responsibility of the Ministry of Health - Department of Pharmacy and Medical Devices - or if the Italian Medicines Agency (AIFA) shall also be involved for HTA evaluations and refunds of medical devices and telemedicine.

NATIONAL GUIDELINES FOR TELEMEDICINE SERVICE PROVISIONS

The “National Guidelines for Telemedicine Service Provisions” document, version 4.4, authored by the Italian Ministry of Health in 2020, has identified opportunities, such as the control over diseases that are particularly relevant for the SSN’s governance, the accessibility to diagnostics and care continuity, remote monitoring, earning/fare system, prescriptions, booking, accounting, and telemedicine implementation fields. The latter include: televisit, medical teleconsultation, teleassistance by health professionals, and telereporting, which formalizes telediagnostics with a digital signature validated by the responsible physician. All these instruments represent an innovative, concrete organizational element in the care process. However, telemedicine services do have some issues when it comes to medical certifications and governance of clinical data, as mentioned in the 679/2016 General Data Protection Regulation (GDPR), which include: instant data transmission, acquisition of medical records, and safe and instant release of certifications. In order to connect telemedicine activities to LEA in terms of fares, accounting, expenditure sharing, it’s important to clarify the difference between the types of services provided as indicated in the Diagnostic and Therapeutic Care Pathways (PDTA).

NATIONAL CHRONICITY PLAN

In Italy, a particular and specific area of interest for the application and refund of Digital Health Technologies is represented by the Diagnostic and Therapeutic Care Pathways (or Path Diagnostic Therapeutic Care) (PDTA) as part of the National and Regional Chronicity Plans.
Below are listed five chronic diseases, for which a PDTA in the context of the National Chronicity Plan (PNC) has been defined, that can be test areas for the implementation, evaluation, and refund of Digital Health Technologies: Diabetes, Chronic Obstructive Pulmonary Disease (COPD), Heart Failure, Breast Cancer, Colorectal Cancer.
It is of actual interest for Digital Health Technologies: the reference within and as an integral part of the National Chronicity Plan to telemedicine and to Web – Health (page 78-81 of PNC); the implementation of the New Guarantee System (NGS) of the Basic Health Care Levels (LEA), which is referred to in the Health Pact 2019-2021 approved by the State-Regions Conference: “To this end, it is convenient to give an operative boost to the previously mentioned New Guarantee System (NGS), intended as a measurement tool that, through the assignment of scores related to a

set of indicators, is able to highlight the guaranteed situations of LEA as well as any critical issues that may determine a Region's shortcomings in the delivery of essential levels of assistance, both globally and at the level of individual assistance areas, including the presence of great intra-regional variabilities among the challenges". In the Ministerial Decree of 12 March 2019 published in the "Gazzetta Ufficiale" on 14 June 2019 "New Guarantee System (NGS) for the monitoring of Health Care", ten indicators are defined for the monitoring and evaluation of the five PDTAs included in the NSG of the LEA. A goal of great interest is to include proven efficacy Digital health Technologies, selected on the basis of an HTA process, within the PDTA sequence. On the operational level, the goal is, therefore, to identify, for each of the new PDTA of renewed construction relating to the pathology of interest, the therapeutic value of Digital Health Technologies. Finally, it should be underlined that the COVID-19 pandemic has greatly increased the use of digital technologies in Italy, and this facilitates both access and use of Digital Health Technologies. Moreover, the recent Relaunch Decree has enhanced territorial assistance for chronic diseases with funding equal to EUR 1.256 million. The size of this grant is of particular relevance for the development and refund of Digital Health Technologies in Italy (Ganascia, 2020), also considering the regulations indicated not just nationally, but also regionally.

LOMBARDIA REGION CHRONICITY PLAN

In Lombardia Region, the opportunity to re-define the offers' network, provided by L.R. n. 23/2015, requires a strongly rethinking of the healthcare system in the perspective of personalized responses to any demand in health, and territorial differentiation. The key element introduced by R.L. 23/2015, that found correspondence in the new system setups (ASST and ATS), is the will of the legislator to make a change of paradigm, evolving from a system oriented to the offer towards a proactive system oriented to taking charge of different groups of users according to their respective needs for care and assistance, and aimed at improving the accessibility to health services and at ensuring the integrated management of the entire patient journey. The Regional Council has already adopted a series of measures to start the implementation of the new way of taking charge: "Regional guidelines for taking charge of chronicity and fragility in the Lombardy Region" (DGR n. X / 4662/2015), and "Guidelines for the adoption of the Company Strategic Organization Plans - POAS" (DGR n. X / 5113/2016)". The strategic objectives are confirmed as well as what has already been started in the several trials of the Chronic Related Groups (CreG). With these regulations, operational information is liked to be offered to the different categories of subjects involved, analyzing the process of taking charge especially from the point of view of the

representation of the request, starting from the identification: of the target population, of the stratification's criteria and procedures, of the new treatment path. The management model of chronicity and geriatric care has emphasized, with the introduction of the legislation of Region Lombardy (Deliberation n. X/6164 of 30 January 2017), an innovative re-assessment of the healthcare system. The Lombard organization model has highlighted the need to adopt a classification system for managing the complexity of care by categories, paying particular attention to the needs of elderly people with fragility and/or chronic diseases and to the healthcare demand. The pathologies that will progressively be considered are 62 and they all represent pathologies that have emerged as the main ones.

The stratification of the levels of complexity, starting from the classification model CReG, with reference to the main pathology, the presence of any elements of socio-health fragility, and to the level of complexity is defined on the basis of the number of comorbidity or the presence of conditions of fragility (Level 1-2-3). The tool used to identify chronic patients on the basis of the main pathology and the level of complexity is the Assisted Database (BDA) algorithm. The latter divides the subjects with the same main pathology on the basis of three levels of complexity, as follow: Level 1, subjects with a high clinical fragility, who, besides the main pathologies, are affected by three other comorbidities; Level 2, subjects with poly-pathologic chronicity and one or two comorbidities; Level 3, subjects characterized by an early stage of chronicity, and the presence of just the main pathology. These levels of complexity are already part of the Lombard organization model. The deliberation of Region Lombardy n. X/6551 of 04/05/2017 defines, in addition, the main application modules for taking in charge, which are currently provided as part of the Lombard organization model; they are organized in: form to manage demographic data of the chronic patient; form to register consents to the treatments provided for by taking in charge; form to create plans of care for the different levels of request and to managing the recruitment of chronic patients; form to draft individual plans of care (PAI), which are then integrated with the Electronic Health Record (EHR), which in turn is updated; form to report the performed activity; and form related to telemedicine. Moreover, all these tools integrate other innovative health technologies, such as assistive technology (AT) devices and information and communication technologies (ICT).

ASSISTIVE TECHNOLOGY AND MOBILE ICT

The adoption of assistive technology (AT) devices and information and communication technologies (ICT) are fundamental, if these devices consider the elderly people lifestyle and their

own characteristics (such as, for example, health conditions, age, education level and technology interest).

On this basis, as shown in literature, several AT and ICT models can be used. In Italy, the use of these devices is classified into four areas of application: 1. health and safety monitoring; 2. management of chronic diseases, a subject also discussed in the previous paragraphs; 3. diagnosis and treatment of pathologies; 4. rehabilitation. Projects, such as, for example, TECH@HOME, GER-e-TEC™ and UP-TECH, are essential to ensure the integration of the constituent features of the technology enable care (TEC) services, such as, telemedicine, remote assistance, and tele-coaching (Chiatti et al., 2013, Chiatti et al., 2017) and the Robot-assisted rehabilitation.
Additional examples of innovative projects are presented by the Digital Innovation in Health Observatory and thanks to collaborations with universities, such as “Politecnico di Milano”.

Technology-assisted care will likely be a key part of the patient journey in the future health services. Moreover, implementing electronic health (E health) processes, related to the ICT, offers opportunities as well as challenges for the redesign of economic and services structures in terms of production and information (Marino, Pariso, 2019, 2020). In Campanella et al. 2016, the evolution of these studies on E Health with particular reference to the Electronic Health Record (EHR) is shown; this study highlighted the difference among the delivery of digital services, the unequal access to them, and the spread of information to the patients (Marino et al., 2020). The key and central element of this process will be to focus the attention on aspects of both the refund process and funding system, to ensure the digital innovations a stable and clear staying on the marker, and the innovation of both products and organization models (Brewer et al., 2020).

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