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## Strategic Intelligence Monitor on Personal Health Systems, Phase 2:

### Country Study Estonia

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## List of abbreviations

DALYs	Disability adjusted life years
DREAMING	The elderly-friendly alarm handling and monitoring
EHIF	Estonian Health Insurance Fund
EHIS	The Estonian Health Information System
ERDF	European Regional Development Fund
ETCH	East-Tallinn Central Hospital
HTA	health technology assessment
ICT	Information and communication technology
LTC	Long-term care
OOP	Out-of-pocket
SEES	<i>Saaremaa ettevõtluse edendamise SA</i> (Saaremaa Business Developing Foundation)
TAI	<i>Tervise Arengu Instituut</i> (National Institute for Health Development)
TUAS	Turku University of Applied Sciences
UAS	University of Applied Sciences
VIRTU	Virtual elderly care services on the Baltic islands

# 1. Overview of Estonian Health and Social Care System

## 1.1 Socio-demographic background

### 1.1.1 General country overview

Estonia is the smallest and the northernmost of the Baltic States which are located on the east coast of the Baltic Sea. At the beginning of 2011 the population of the country was estimated at 1.34 million people which living on the area 45,227 m<sup>2</sup> makes Estonia one of the least densely populated countries in Europe. Estonia is a democratic parliamentary republic and has been a member of the European Union and NATO since 2004 and a member of the eurozone and OECD since 1st January 2011.

Since regaining independence from the Soviet regime in 1991, Estonia has kept a steady political regime which has enabled the country to execute several key reforms that have allowed Estonia to start closing the vast development gap between Estonia and the European countries unaffected by the Soviet rule. Due to its openness, compared to other EU countries, Estonia has shown above average economic growth, e.g. in the 10-year period preceding the economic crisis, the average real GDP growth of Estonia was nearly 8% (Riigikantselei 2008). However, for the same reason, in the period 2008 – 2010 I quarter, Estonia also suffered a vastly larger economic downfall compared to that of most other EU countries. At the peak of the crisis in 2009 II quarter, Estonian economy shrunk by more than 16% (YoY) with unemployment reaching as high as 16.9% in 2010 (Eurostat 2011). Unemployment and coping with the shrinking economy have thus been the key challenges for Estonia in the recent years. The government has reacted to these challenges by executing severe austerity measures in the public sector. These measures have enabled Estonia to keep a low public debt level (6.7% of GDP in 2010) as well as achieve a budget surplus (0.2% of GDP in 2010) while most other countries in the World are struggling with high public debt and vast budget deficits (Statistikaamet 2011f).

### 1.1.2 Overview of social indicators

Estonia can socially and demographically be considered a transition society on its way to resemblance with the Old Europe. In some aspects such as high literacy of 99.8% measured in 2000 (Statistikaamet 2001), low infant mortality rate of 3.3 measured in 2010 (per 1000 live births) (Statistikaamet 2011a) or the aging of the society, Estonia is already nearly identical to the Western countries, whereas in many other aspects there is much development still ahead.

Estonia can be characterized as a loosely bound society with far less activity in the third sector than in most developed economies, and relatively weak social cohesion. According to OECD (2011) research, only 22% of Estonians report volunteering time, donating money or helping a stranger in the last month, which is well below the OECD average of 39%. Relative social cohesion has decreased especially during the crisis years in which unemployment (16.9% in 2010) and the relative poverty rate (16.1% in 2010) increased significantly leading many people to emigrate (Eurostat 2011, Statistikaameti ajaveeb 2010). In addition to people who would be otherwise unemployed, representatives of many professions such as medical personnel and teachers have emigrated in significant numbers in the search of more competitive salaries. Working abroad in nearby Sweden or Finland often brings about a salary that is 4-5 times higher than the compensation for equal work in Estonia.

The minimum salary in Estonia is 278 €/month and the average salary in 2011 II quarter was 857 €/month. At the same time, the real wages have been decreasing since 2008 due to high inflation (Statistikaamet 2011g). The average monthly expenditure in 2010 was 265 € of which 45% on average was spent on basic needs expenditure (housing and food) (Statistikaamet 2011d).

Estonians are relatively well educated as 82.2% of the population has achieved at least a secondary education and 34% have achieved a higher education diploma (Heidmets et al 2011, Eamets 2011).

In spite of quick development in the past two decades, income inequality remains high. For example, 25 % of the population is still living below the national absolute poverty line. The health indicators of our socially vulnerable groups are among the worst in the European Union. The most alarming fact is that more than one third of the children up to the age 16 live in families, whose income is below the poverty line. Additionally, more than one fourth of the households live in lack of privacy, as they are forced to live together with another household. A quarter of households do not have washing facilities or an indoor toilet. (TAI 2011).

Ethnically, Estonia is a country of two main nationalities. During the period of Soviet occupation a large Russian minority developed in Estonia (30.3% in 1989). As almost one third of the Russians migrated from Estonia in the period 1989–2000, the proportion of this minority in Estonia has decreased to 25.7% (2006). Other minority groups include Ukrainians (2.1%) and Belarusians (1.2%). Over 90% of the Russian-speaking population live in Tallinn and the cities of North-East Estonia, near the border of the Russian Federation. (Koppel et al 2008)

### 1.1.3 Overview of demographics

There are three key characteristics to Estonian demographics: 1) aging population and low natural increase in population 2) emigration 3) compared to Old Europe, low estimated life expectancy and large gap between the life expectancy of males and females. (Ainsaar & Stankuniene 2011, Krumins 2011)

The aging of Estonian population has sped up in the recent decades due to sharp decline in natural population growth just after the re-independence of Estonia in 1991. This tendency seen also on graph 1 caused by severe economic and social uncertainty of a new economic system has led to an especially low number of people in the age group 7-16. (Ainsaar & Stankuniene 2011) Although some of the problems caused by this change in demographics such as convergence of schools and downsizing in higher education institutions are already undergoing, the more severe consequences of low birth rate are projected into the future, e.g. it is estimated that by 2060 there will be 4 dependent individuals for every 5 working individuals. (Statistikaamet ajaveeb 2010) This despite the fact that in the decade 2001-2010 natural population growth consistently moved towards levelling out: while the rate of natural population growth in 2001 was -4.31, in 2010 it was already positive (0.03) (Statistikaamet 2011e).

The division of age groups in the society and the dynamics of the age group populations are presented in Table 1.

**Table 1 – Population distribution by age group in Estonia**

Age group	1980	1990	2000	2010
0-14	319,900 (21.7%)	349,200 (22.3%)	246,500 (18%)	204,200 (15.3%)
15-65	972,800 (65.8%)	1,037,400 (66.1%)	916,200 (66.9%)	907,400 (67.7%)
65 and over	184,200 (12.5%)	182,577 (11.6%)	206,400 (15.1%)	228,400 (17.0%)

Source: Statistics Estonia

In recent years, Estonia has consistently experienced a negative migration balance as presented on graph 2 due to socio-economic factors forcing people to look for alternative places to live and work (Ainsaar & Stankuniene 2011). The most common destination country for Estonians is estimated to be Finland where almost 22,000 Estonians reside officially, 45% of whom are according to research done by Kristi Anniste not considering returning (Inga-Gretel Linkgreim 2011). The official numbers



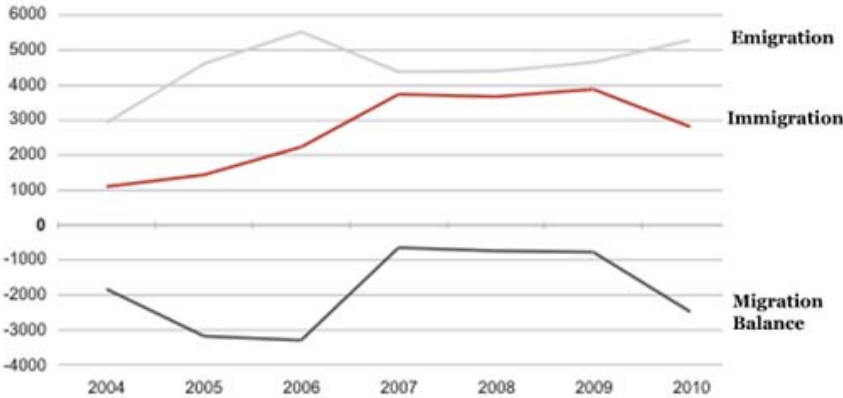
of migration are however likely to be underestimating the actual migration balance which will be most accurately determined during the general census taking place in Estonia in 2012.

**Figure 1 – Estonian population pyramid in 2010**



Source: Statistikaamet 2011c

**Figure 2 – Estonian migration 2004 – 2010**

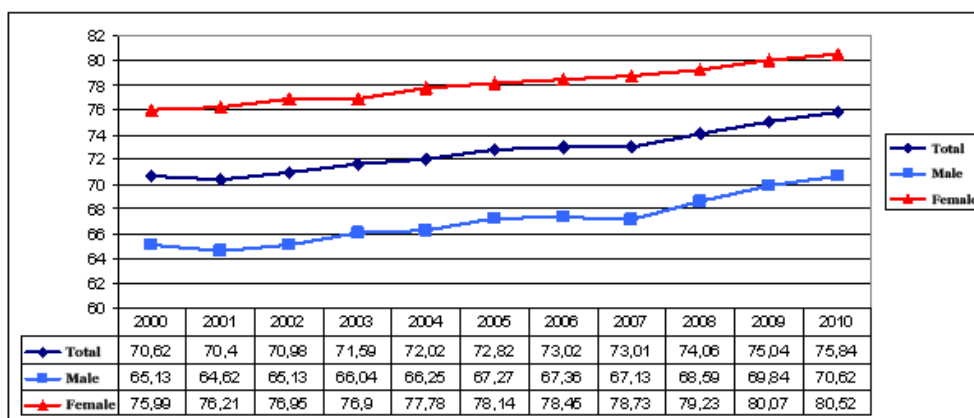


Source: Statistikaamet 2011b

Although average life expectancy at birth has been increasing in Estonia since 1995 (Krumins 2011) and especially in the decade 2001-2010 (graph 3), the third major issue in Estonian demography is still low estimated life expectancy which for males born in 2010 is 70.62 years and for females born in 2010 is 80.52 years. For males, this average is 8-10 years less than in the Old EU countries, which is especially alarming (*ibid*). The large gap between estimated life expectancy of males and females is very characteristic of Estonia. The causes for this tendency are rooted in enhanced risk behaviour of the males, higher rates of malignant tumours in males and in the smaller likeliness of males to seek medical support in case of suspected medical issues. As in all three Baltic States also in Estonia, an especially strong positive correlation has been found in the life expectancy and the level of education (Stirbu et al 2010).

In Estonia, 69% of the people live in urban areas (World Health Organization 2011).

**Figure 3 – Estonian average life expectancy at birth 2000 - 2010**



Source: Vabariigi Valitsus (2011)

### 1.1.4 Internet coverage and use

According to Statistics Estonia (Soiela 2011), 71% of households in Estonia are connected to the Internet with Internet penetration among 16-34 age group almost at 100%. At higher age groups, the percentage using internet decreases significantly: in age group 55-64 approx. 50% of members use the Internet and of 65-74 year-olds only 25%.

With rapid development in 3.5G technology and ADSL broadband connection coverage, nearly all of Estonia is covered with an internet connection. In the case of mobile connections (3.5G ad where not available EDGE), such a connection can be acquired for less than 10€/month. However, internet penetration in rural areas is still significantly lower than in the large cities. In the capital city Tallinn, 79% of households are connected to the Internet, which is in contrast with the rural counties of Estonia such as Jõgeva County (54.4%), Lääne-Viru County (56%) and Viljandi County (58.8%). Thus the use of Internet connection based solutions may still be questionable in some very remote areas of Estonia.

## 1.2 Welfare and healthcare financing, funding, service provision, coordination, challenges

The Estonian system for providing care can be characterized as somewhat split as despite health care and social care depending upon each other, the health care and social welfare systems are relatively separate from each other, which causes problems in terms of the transfer of individuals between the different systems. This is largely rooted in the fact that welfare and health care systems are financed from different sources – the first from the state budget and the second through the Estonian Health Insurance Fund (EHIF). (Paat & Merilain 2010)

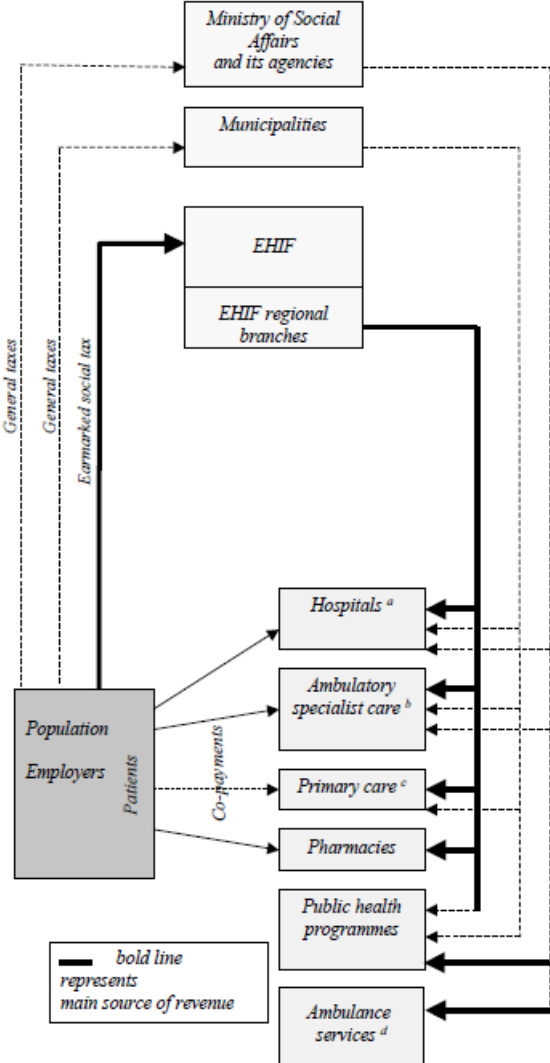
### 1.2.1 Healthcare

The Estonian health system is built around a basis of compulsory, solidarity-based insurance and universal access to health services made available by providers that operate under private law. The Estonian health care system is mainly publicly funded through social health insurance (SHI) contributions in the form of earmarked social payroll tax, which amounts to approx. 65% of total funding (see table 2). This earmarked tax is then pooled by the EHIF, which has four regional branches but acts as a single purchaser of care.

Other purchasers/payers of health care, who are funded instead by general tax revenue, include the Ministry of Social Affairs, which is responsible for covering the costs of ambulance care and emergency care for uninsured people and is the largest contributor to public health programmes; and the municipalities, which have a relatively small role. Private expenditure comprises

approximately a fifth of all health expenditure, mostly in the form of co-payments. (Koppel et al 2008) The funding scheme for Estonian healthcare is presented on graph 4. The current healthcare system configuration in Estonia was established by the new Health Services Organization Act in May 2001.

**Figure 4 – Central funding scheme of Estonian healthcare system**



Source: Koppel et al (2008)

Stewardship and supervision as well as health policy development are the duties of the Ministry of Social Affairs and its agencies. The financing of health care is mainly organized through the independent Estonian Health Insurance Fund (EHIF), which has also increasingly become one of the leaders in health-related innovation. The Ministry of Social Affairs and its agencies are responsible for the financing and management of public health services, that is, the share paid by the state budget. Local municipalities have a minor, rather voluntary, role in organizing and financing health services. (Koppel et al 2008)

In Estonia, regulation and planning of health services is carried out not only by the Ministry of Social Affairs and the EHIF, but also by other public agencies. The State and local municipalities exert an influence on the regulation and planning process of hospitals through participation in Supervisory Boards, and patients are represented in working groups and commissions of the Ministry of Social Affairs, as well as holding positions on the EHIF Supervisory Board. In general, the governance of the health system is based on regulation and contractual relations rather than subordinate relationships. (ibid)

The division in financing of Estonian healthcare is presented in table 2.

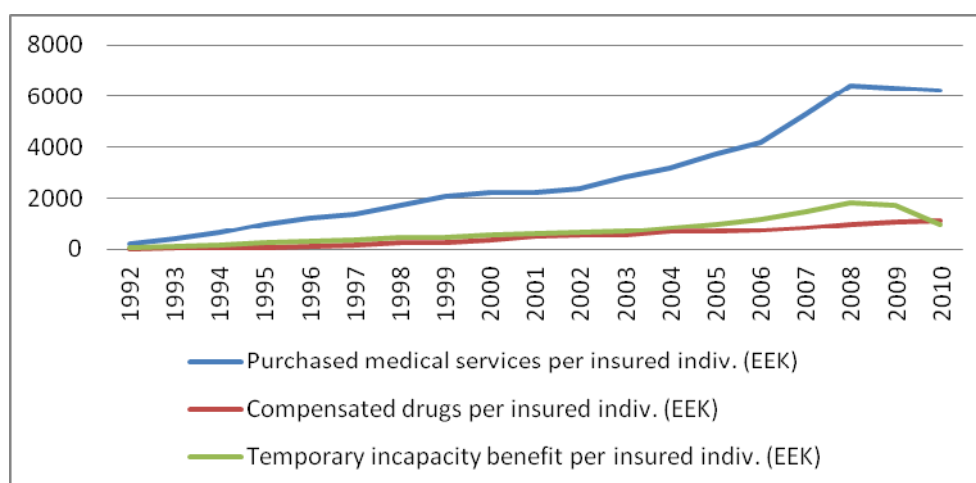
**Table 2 – Division in financing of Estonian healthcare costs**

	1999	2004	2009
<b>PUBLIC SECTOR (%)</b>	<b>76,9</b>	<b>75,5</b>	<b>75,3</b>
incl Government (%)	8,7	8,5	8,8
incl Municipal Government (%)	2,2	1,3	1,5
incl EHIF (%)	66,0	65,7	65,0
<b>PRIVATE SECTOR (%)</b>	<b>19,6</b>	<b>24,0</b>	<b>20,8</b>
incl Private Insurance (%)	0,8	0,1	0,2
incl Out-of-pocket payments (%)	14,0	21,3	20,3
incl NGOs financing (%)	n.a.	0,0	0,0
incl Private enterprises (%)	4,8	2,6	0,3
<b>EXTERNAL WORLD (%)</b>	<b>3,5</b>	<b>0,5</b>	<b>3,9</b>

Source: TAI 2010

In the second quarter of 2011 the rate of people insured by the EHIF was (of total population) 93.6% (Eesti Haigekassa 2011a). The dynamics of the EHIF covered medical compensations are presented on graph 5. Rapid economic growth in 2006-2008 resulted in higher tax revenues and thus in an increase in spending by EHIF. Economic recession in 2008 led to lower tax revenues and decrease of EHIF's budget in 2009 and 2010, although reserves were also used.

**Figure 5 – EHIF fund compensations per insured individual, 1992-2010**



Source: Eesti Haigekassa (2011b)

The health expenses of non-contributing individuals (47.9% of the insured population in 2010, up from 45.5% in 2006) are implicitly subsidized by the other categories, showing a strong element of solidarity within the system. These non-contributing groups (including children, pensioners, those receiving a disability pension and students) are eligible for the same benefits package as everyone else in the insurance pool, without any contribution by either themselves or the State. The State officially makes contributions for only a small proportion of the covered population (6.2% in 2010), including individuals on parental leave with children under three years, individuals registered as unemployed (eligible for up to nine months' coverage) and caregivers of disabled people. The State's contribution for these groups is defined annually when the state budget is approved and depends upon the number of eligible individuals. (Eesti Haigekassa 2010)

Health care providers in Estonia are autonomous. Most hospitals are either limited liability companies owned by local governments, or foundations established by the State, municipalities or other public agencies. In this sense, they are owned and managed as public institutions, either on a profit-making (limited liability Company) or non-profit-making (foundation) basis. Most ambulatory providers are privately owned. (Koppel et al 2008)

For hospitals a diagnosis-related group(s) (DRG) system has been implemented since 2004, complementing the fee-for-service payments and those related to bed-days. With regard to primary care, age-adjusted capitation, fee-for-service payments for selected areas and basic allowances have been complemented by a quality bonus system, implemented in 2006, which aims to foster disease prevention and management of selected chronic conditions. (Koppel et al 2008)

In the annual EHIF general survey on health service assessment, in 2010 63% of the population evaluated the health system to be good and 32% to be bad, however in terms of accessibility only 55% of the people assessed it to be good (and 42% to be bad). By far the biggest cause for dissatisfaction in the system and accessibility to medical services (39% of all replies) was commented to be the long queues and long lead time before getting to a doctor, this was assessed to be an especially large concern in the case of family physicians (70% of replies); and in the case of specialist doctors (88% of replies). Other main issues concerning the system as a whole included the high cost of services (13%) and careless attitude of the medical personnel (8%). (Saar Poll 2010) Estonia has also fallen in the last (2009) Euro Health Consumer Index rankings placing 18th among 33 participating countries with an index of 638/1000. In the last measurement it was especially stressed that Estonia which had been a leader in the healthcare quality/price ratio section, is giving away in that dimension due to extending lead times and decreasing service quality. (Health Consumer Powerhouse 2009)

Key future challenges for the current healthcare system setup include mainly the aging population and the increase in the rate of the chronically ill, both of which are projected to increase the rate of non-contributing individuals adding additional strain on the financing of the system (Couffinhal & Habicht 2005). Additional problems are projected to arise from the increasing urbanization, leaving rural areas more and more sparsely covered and decreasing accessibility to healthcare for many people (Sotsiaalministeerium 2008).

Potential solutions in terms of public financing include the broadening of the health insurance revenue base (taxing other incomes in addition to salaries) and persuading local municipalities to increase their financing by expanding their responsibilities, for example, by providing health care services for the uninsured population. These and other options have been discussed openly in various forums in recent years, yet no decisions have been made because the underlying alternatives demand strong political commitment and significant reallocation of resources. Another topic under discussion is the expansion of private financing by fostering more favourable conditions for private insurance or by increasing out-of-pocket (OOP) payments. OOP payments have been increasing in an attempt to activate macro-level cost-containment in public funding by rationalizing use of health care services and pharmaceuticals. Therefore, the impact of rising OOP payments on different social groups should be evaluated, especially considering the fact that current evidence shows that access to medicines may already be constrained. (Koppel et al 2008)

### **1.2.2 Social care with stress on long-term care**

The strategic aim of the welfare system in Estonia is to increase decentralisation, focus on individuals and to provide a flexible system of services.

Since 1995 the Social Welfare Act (*Sotsiaalhoolekande seadus*) regulates the issues related to social care and the Social Benefits for Disabled Persons Act (*Puuetega inimeste sotsiaaltoetuste seadus*) from 1999 regulates issues related to disabled persons. The care system is person-/client-centred and the service package provided is put together based on the individual needs with the aim to guarantee the client relative independence and an opportunity to use general public services. Social insurance and social welfare offer guarantees for the risks of

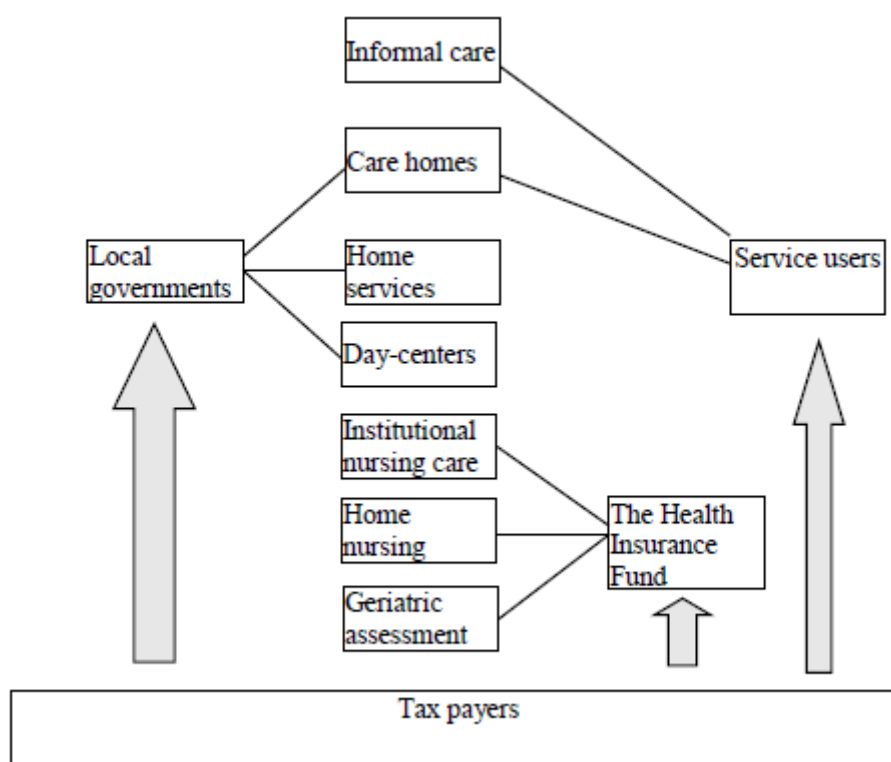
sickness and disability. Benefits both in kind and in cash are granted to residents of Estonia. (PRAXIS 2010)

According to the Social Welfare Act long-term care is a continuous health and nursing care given to persons who need assistance on a regular basis because of chronic impairments and a reduced degree of independence in their daily activities. The constant (24 h) long-term care is applicable to all age groups; however the majority of the service users are elderly persons. (*ibid*)

The long-term care concept in Estonia consists of two main areas: nursing care and welfare. The assessment of the need for welfare services is done by a local social worker, who will take necessary actions considering the needs and wishes of the person and their family. The assessment of the need for nursing care is done by a doctor (either general practitioner or a medical specialist). The general practitioner only has the role of assessing the need and does not take part in service provision. According to the Act of Organization of Health Services (*Tervishoiuteenuste korraldamise seadus*) nursing services include nursing healthcare services and are provided as home-based, day care and institutional services. On more difficult cases of nursing care of the elderly, a geriatric assessment possibility has been available in Estonia since 2004. Interdisciplinary (geriatric) assessment team performs the assessment of the needs of clients and draws up individual plans of nursing care. The team includes a physician (geriatrician or an internist trained in geriatrics), a nurse, a social worker and other specialists if necessary. Geriatric assessment service is part of the nursing services.

Long-term care services are mostly financed by the local government from local government budget and by the person and/or their family, although benefits in cash can in some cases also be provided by the state. At the same time, geriatric assessment and nursing care are mostly paid for by the EHIF indicating a funding scheme that is much more diverse than that of strictly healthcare. Either way, the financial constraints of the service are significant due to very limited local government and EHIF budgets. The care quality is therefore often insufficient and does not meet contemporary requirements and expectations due to inadequacy of premises; there is lack of trained personnel (nurses, caregivers) and a lack of appropriate financing for the services. Many LTC hospitals and welfare institutions are faced with an acute shortage of space and the standards are relatively low. In addition, there is still a shortage of long-term care beds. (Paat & Merilain 2010) The financing logic of long-term care in Estonia is presented on graph 6.

**Figure 6 – Long-term care financing by segments**



Source: Integrated Long-Term Care in Estonia

In general, social care and especially long-term care (LTC) in Estonia have been paid relatively little attention compared to other health care services. There are different development policy documents that might affect the field significantly (but no active progress has been in the last 2 years).

The Ministry of Social Affairs is operating under the strategy **“The Long-term Care System Strategy of Estonia for 2004-2015”** which states its central goal to be: The 2015 operational care network has been evolving according to the strategy and covers Estonia with demanded care services evenly. The central goal is divided into sub-goals: 1) The increase in quality of both ambulatory and stationary care, including the purposeful use of health insurance funds in the process; 2) The development of more diverse care services which satisfy the specific needs of the population, and 3) at providing care services, the detailed needs of the patient are taken into account. (The Long-term Care System Strategy of Estonia for 2004-2015)

In April 2009, MoSA prepared the regulation **“Nursing and long-term care infrastructure development measure”** which aims at ensuring better quality and availability of nursing care through building new hospital premises. The general goal is defined as improvement of inpatient and outpatient care services, purposeful usage of health insurance funds, and offering more diverse long-term care services that meet population needs. The measure is financed by the European Regional Development Fund (ERDF). The measure aims at increasing capital investments into long-term care hospitals because: 1) state support has so far been relatively small, and 2) several municipalities have undertaken their own steps to improve the situation (e.g. Tallinn Municipality). (Paat & Aaviksoo 2009)

**The Social Welfare Act** sets out the following main goals for welfare services: 1) less state and more individual and local government contributions; 2) the development of case-management methodology; and 3) the development of housing services. (Paat & Merilain 2010)

**“The Nursing Care System Strategy of Estonia for 2004–15”** lists the main goals in nursing care:

- 1) to reach certain proportions of funding for total nursing care expenditures by 2015, i.e. 56% by health insurance, 31% by local government and 13% by service users. The aim is to provide all services free of charge for service users, except services in care homes and nursing homes;
- 2) to increase the number of nursing care beds in nursing care up to 2010 to meet the need (based on calculations of 10 beds per 1,000 persons aged 65 and older);
- 3) to ensure that all nursing care beds do not have time limitations on occupancy (now the maximum time of occupancy is 120 days), so that the nursing care time will be dependent on the need;
- 4) to improve the quality and accessibility of nursing care services. Properly assessed needs should be considered when supplying services. More variety and needs-based services should be offered;
- 5) to facilitate service users moving among different services according to care needs;
- 6) for home nursing care to form the base and active nursing care the top level of nursing care, indicating a change in the focus of development planned for 2004–15;
- 7) to create an effective network of nursing care by 2015 according to the objectives set in the national strategy. Also the aim is to uniformly cover the need for services everywhere in Estonia; and
- 8) to decrease institutional services, to focus on the individual and provide flexible, integrated, community-based care services. (Paat & Merilain 2010)

In addition Tallinn's City Government decided in 2008 to participate in a project called "Future Care - Integrated Model of Care for the Aging Europe" as a regular partner to INTERREG IVC (ERDF). The project is expected to last until 2011.

Strategies to optimize integrated care in Estonia have been developed by interdisciplinary working groups, but at the time of writing have not been implemented yet. For successful implementation, consensus between the different care sectors is required, along with legislative support from state bodies.

In 2009 PriceWaterhouseCoopers (PwC) made an analysis of the LTC system in Estonia and according to their calculations with respect to the projected need, total expenditures on LTC services should be about 5 times higher (1,06% of GDP) compared to the 2009 level. Alternative calculations by the Institute of Estonian Demography have shown that approximately a quarter of the 65+ population needs formal care services, whereas in 2010 only 5.6% of the 65+ population did. Hence the gap in care has been indicated to be indeed large. (PRAXIS 2009) There has been some progress in addressing this need – there is a small, but gradual increase of financing of ambulatory nursing care by EHIF (10% in 2011) and a 10% rise is planned for year 2012.



### 1.3 Key Health Indicators

This chapter provides an overview of Estonian key health indicators according to statistics provided by World Health Organization (2011), National Institute for Health Development (Tervise Arengu Instituut 2011) and Estonian Finance Ministry (2011). The indicators are provided in table 3 for year 2010 (unless noted otherwise).

**Table 3 – Key health indicators in Estonia in 2010 (unless noted otherwise)**

INDICATOR	VALUE
<b>MORTALITY</b>	
Life expectancy (BOTH/M/F)	75 / 70 / 80 yrs
Adult mortality rate (per 1000 adults 15-59 years)	153
Under-5 mortality rate (per 1000 live births)	5
Maternal mortality ratio (per 100 000 live births)	12
<b>DISEASE INCIDENCE</b>	
Prevalence of HIV (per 1000 adults 15-59 years)	12
Prevalence of tuberculosis (per 100,000 population)	33
Incidence of mental disorders (per 100,000 population, data from 2009)	4 773
Incidence of respiratory system diseases (per 100,000 population, data from 2009)	52 969
Incidence of malignant tumour (per 100,000 population, data from 2009)	500
Incidence of skin and subcutaneous tissue diseases (per 100,000 population, data from 2009)	11 782
Incidence of genitourinary system diseases (per 100,000 population, data from 2009)	11 862
Incidence of circulatory system diseases (per 100, 000 population, data from 2009)	6 006
Incidence of musculoskeletal system and connective tissue diseases (per 100,000 population, data from 2009)	15 883
Incidence of digestive system diseases (per 100,000 population, data from 2009)	7 432
Incidence of endocrine, nutritional and metabolic diseases (per 100,000 population, data from 2009)	3 372
Incidence of nervous system diseases (per 100,000 population, data from 2009)	3 302
Incidence of poisoning, injury and other effect of other external factors (per 100 000 population, data from 2009)	19 343
<b>MEDICAL PERSONNEL</b>	
Physicians per 10 000 population	34.1
Nurses and midwives per 10,000 population	68.2
Average total hourly wage for physicians	8.95 €

Average total hourly wage for nurses and midwives	4.47 €
Average total hourly wage for caring personnel and assistant nurses	2.56 €
<b>HEALTH BEHAVIOUR</b>	
Tobacco smoking adults (% , M/F, data from 2006)	47.8% / 25.3%
Adult (20+) obesity (% , M/F, data from 2008)	20.2% / 17.6%
Exercise at least 30 minutes once or less than once per week (% of 16-64 yrs of age)	60.8%
Alcohol consumption a few times a week (% of 16-64 yrs of age)	22.7%
Amount of pure alcohol consumed per inhabitant per year (l)	9.7 l
<b>OTHER</b>	
Share of health expenditure in state budget, % (2011)	13.4%
Share of total health expenditure in GDP, %	7 %
Share of public health expenditure in GDP, %	5.3 %
Rate of hospital beds per 100,000 inhabitants	543
Rate of care beds per 100,000 inhabitants / per 100,000 inhabitants aged 65 and older	116.2 / 683

#### 1.4 Chronic diseases prevalence and costs

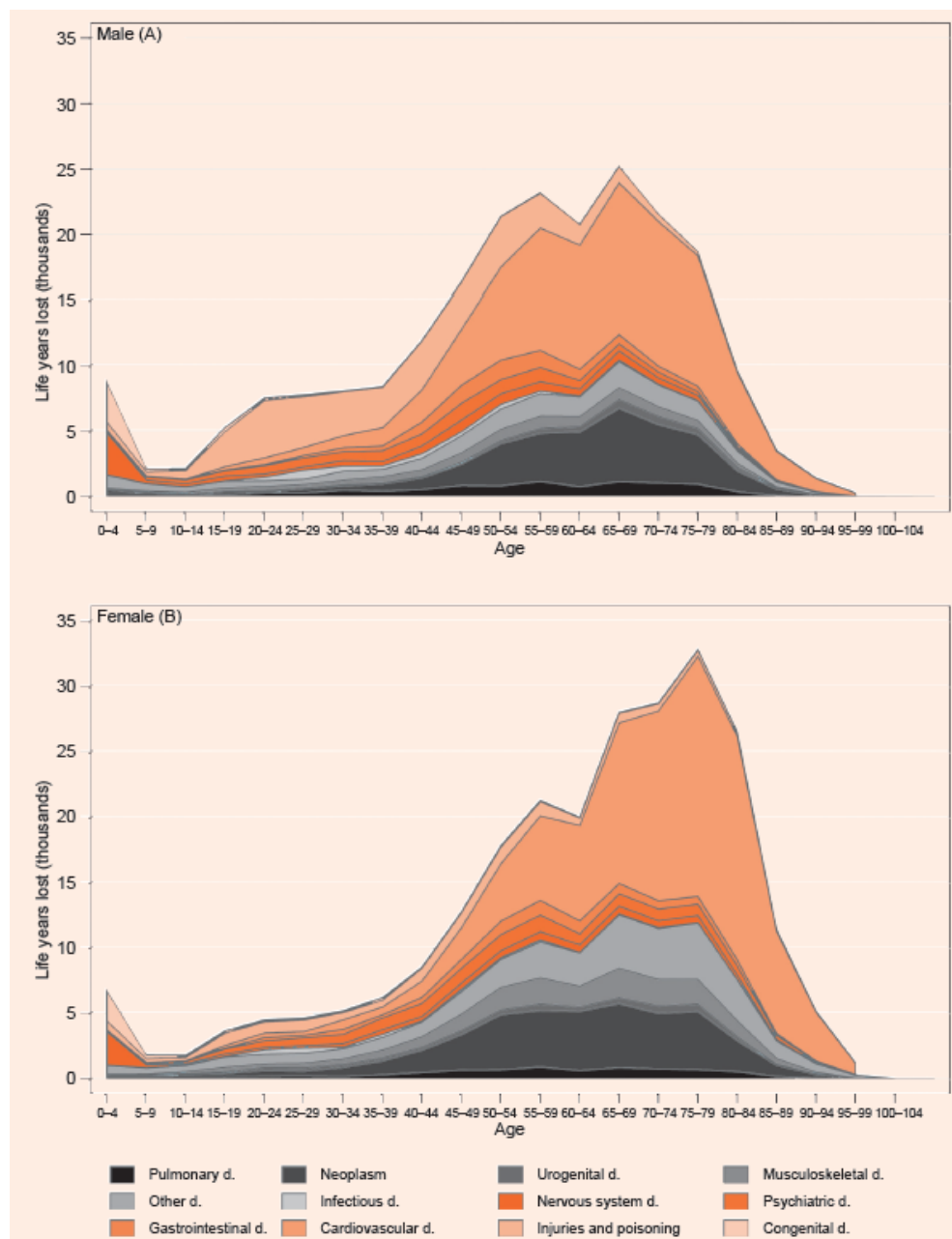
According to research conducted by Vainu (2009), 33% of Estonians between ages 15-74 have a chronic condition. As expected, the occurrence positively correlates with age: among age group 50-64, already 52% of the population have a chronic condition. The same number for among age group 65-74 is 64%. Of the chronically ill people, a third (34%) believes that the condition has significantly limited their everyday activities. Another 53% feel the limitations but assess it to be less-than-significant.

The monetary costs of diseases (including chronic diseases) have not explicitly been assessed in Estonia but there have been analyses of the burden of disease. Most recently it was assessed that in 2006, the population of Estonia lost 474,521 disability adjusted life years (DALYs) of which mortality contributed with 52% and morbidity with 48%. This means that each year each individual in Estonia loses about a third of a year of high-quality life on average. By far the largest portion in this amount can be contributed to cardiovascular diseases (approximately 37% of DALYs in Estonia) (see graph 7).

From graph 7 it is apparent that especially females are more likely to suffer life year losses in the second half of life when chronic conditions like cardiovascular, musculoskeletal diseases and other aging-related health problems such as vision and hearing loss become more prevalent. Data from the previous years (up to 2006) also indicates that the impact of chronic diseases on DALYs is increasing due to increasing life expectancy (especially of women).

Information about particular diseases can be found in previous chapter in Table 3.

**Figure 7 – Burden of disease by gender, age, disease group and component, 2006**



Source: Lai & Köhler (2009)

## 1.5 Disease management programmes and prevention

Estonia has a wide variety of programmes that deal with the prevention and management of various diseases. However, there are no disease management programmes as such. National programmes are mostly designed as public health programmes; in some cases components of medical services are also included.

The leader-role in developing and implementing such programmes has been taken by National Institute for Health Development (*Tervise Arengu Instituut, TAI*). The programmes covered by TAI and the key approaches in each programme are described shortly according to TAI (2011).

**Cardiovascular diseases:** Frame policy in the programme is “National Strategy for Prevention of Cardiovascular Diseases 2005–2020” which bases itself around dealing with four main topics: healthcare, physical activity, food and nutrition & smoking and sets the main goal of the strategy as: The premature CVD morbidity and mortality of the population will decline steadily.

**Child health:** Currently no one frame document in the programme but several smaller projects; previous frame policy was “National Health Programme For Children And Youth 2005”. The Programme as well as the current projects was/are aimed at children and adolescents and involved(-s) activities in kindergartens and at schools. Main areas include: 1) prevention and early detection of mental disorders and psychological problems in children; 2) nutrition and eating habits of children and adolescents; 3) physically active lifestyle training for children; 4) prevention and early detection of health disorders in children; 5) healthy nursery school and school routine and environment. The previous programme did not run as smoothly as planned.

**HIV / AIDS:** Frame policy in the programme is “National HIV/AIDS Prevention Strategy For 2006-2015” which bases itself around dealing with five main topics: 1) increasing awareness of HIV, especially among youngsters; 2) syringe and needle exchange; 3) HIV testing and counselling system financed mainly by the state; 4) free access to antiretroviral therapy for people living with HIV and AIDS; 5) good co-operation with non-governmental organizations, hospitals, foreign organizations etc. Main goal of the strategy is to achieve a permanent decline in the spread of HIV in Estonia.

**Cancer:** Frame policy in the programme is “National Cancer Strategy 2007-2015” which bases itself around four main areas: cancer prevention, early detection of cancer, diagnosis and treatment of tumours and diagnostic, and rehabilitation and palliative care, nursery services. Two main goals of the strategy are: 1) to permanently decrease the incidences of preventable malignant tumours among population and 2) to increase cancer patients’ survival, improve quality of life and decrease death rate.

**Tuberculosis:** Frame policy in the programme is “National Tuberculosis Control Programme 2008-2012”. Main areas of the programme include: 1) awareness and positively transforming health behaviour; 2) guaranteeing of health services to people in risk of tuberculosis; 3) screening; 4) quality control in diagnosing; 5) the strict following of directly controllable treatment system by all medical establishments; 6) guaranteeing of treatment to already ill people, and 7) careful data collection to estimate the situation very accurately. The main goal of the strategy is to decrease incidence of tuberculosis to 20 novel cases per 100 000 population by 2012.

In addition to national agencies such as TAI, in many areas, professional associations promote international programmes and/or develop their own policy documents. A good example would be Estonian Heart Association which is actively promoting activities derived from the EuroHeart Programme. Another example is the Estonian Cancer Association that is in association with their partners organizing widespread campaigns such as breast cancer and cervical cancer screening for women of certain ages. The Estonian Cancer Association (Eesti Vähiliit 2011) also organizes home support care for terminally ill cancer patients (funded from different sources including state financing on project basis).

Additionally, each year EHIF concentrates on particular areas in an attempt to raise awareness and direct people to take care of themselves and people around them. In year 2011, these areas are: health promotion in schools and kindergartens, health of children’s teeth, pre- and post-natal counselling, and prevention of injuries at home and in the free time. In 2010 these areas were: safe and healthy development of children and adolescents, and healthy lifestyle, including prevention of injuries.

The main disease categories are therefore relatively well covered with public health programmes and policies. However, their focus is on prevention and broad national level support activities. Disease management components are only growing to gain attention, mostly driven by patient support organizations.

## **2. Role of ICT in promoting integrated care**

### **2.1 Context**

#### **2.1.1 National eHealth system**

At the time of writing, Estonia has a country-wide secure health data exchange platform called The Estonian Health Information System (EHIS) which all health care providers must send standardized summary information (Aaviksoo & Saluse 2010).

The development of the national eHealth system is in the stewardship and supervision of the Ministry of Social Affairs. Everyday management of the system has been delegated to The Estonian eHealth Foundation, which is responsible for actual planning and development of the EHIS and most of its components.

The development of country-wide eHealth projects was initiated in Estonia at the beginning of year 2000 when The Ministry of Social Affairs started implementing a 1998 act that established the use of digital-only patient health cards by the year 2001. Although the act was later annulled, it initiated a widespread planning cycle during which the concepts of Electronic Health Record, Central Digital Image Repository, Digital Booking and Referral System, and Digital Prescription were developed. The different projects were later united under a common Health Information System project as different developmental stages. (Žmenja 2009)

The Estonian E-Health Foundation was established in 2005. Official launch of some components of the EHIS were planned in 2007, formally promised in 2008 and actually implemented in 2009. Many services (patient portal, e-prescription) were only launched in late 2009 or in 2010, and there are still technical problems which prevent the full use of the services. Legally, the Estonia-wide Health Information System was established in detail by The Health Information System Statute in 2008 which was an extension to the 2001 Health Services Organisation Act that in its section 59 established the basis for the Health Information System. (Aaviksoo & Saluse 2010)

Despite the lags and technical problems, as of 2011, all the four main components of the EHIS have been developed and integrated together and are fully operational to the extent that service providers make use of the system. (eTervise SA 2011a) Estonia is one of the few countries that has managed to digitalize the entire Digital Prescription sequence from electronic capture of the prescription in the GP office to the electronic transfer and dispensation (Stroetmann et al 2011).

The main ideological points behind developing the EHIS were: 1) projected increase in healthcare service speed, 2) projected increase in healthcare service accessibility, and 3) the assisting role of the information system in helping medical personnel with administrative as well as medical issues – the access to much more complete information about the patient and their history. The three drivers combined together would increase the quality of the service and help save costs through enabling a faster and more accurate healthcare service provision. Additionally, 4) the ambition of a paperless healthcare system to cut additional costs and the environment was also considered as a key driver.

The main benefits of the unique country-wide EHIS are the following:

- Patients' health information is securely stored in a digital database and can be accessed by both the patient and the authorized medical personnel from any healthcare establishment
- The patient does not have to move around with actual papers anymore as every doctor he/she visits already has access to the relevant health information enabling the doctor a much more complete understanding of the patient's medical status
- Such storage and accessibility of information additionally also saves the patient and the healthcare system from having redundant analyses made

The central collection of health data can be considered successful. However, the non-monetary price of implementing the system has turned out to be high. Most of the changes have been introduced as mandatory requirements through law and end-user investments are left onto them or are minimally compensated after long bargaining. Any new developments are much harder to introduce,

especially if the overall poor financial situation in the health system is taken into account. An additional downside is that the current IT investment level both at central and end-user side will probably not give any financial gains or create systemic impact on quality or access to services. This makes it even more difficult to justify further investments and negotiate with stakeholders to make their contribution. (Aaviksoo & Saluse 2010)

As of October 2011, approximately 55% (732,500 individuals) of Estonian population have their personal digital patient record, the system contains over 5 million medical documents and is actively used by more than 450 healthcare establishments in Estonia. Because of its mandatory nature, all providers are expected to join into the system. (eTervise SA 2011b). By law, the date of full implementation of the health information system is the 1st of January, 2013. As far as sanctions are concerned, the Health Board under the Ministry of Social Affairs can revoke the practicing licence of the provider, if the provider has not joined the system.

### **2.1.2 Social services register STAR**

STAR (in Estonian: **S**otsiaal**T**eenuste **A**ndme**R**egister; Data Register of Social Services) is a ICT-based system of gathering, processing and managing data (Sotsiaalministeerium 2011). STAR was started in 2005 by Estonian Ministry of Social Affairs. The system is meant to replace an outdated social information system SIS that had been in use for 10 years. STAR was developed in Estonia in order to gain a better understanding of the causes of regional differences and to identify solutions to existing problems.

The expected outcome of the application of STAR is as follows: the data reflecting social services and benefits are collected in the central database where they are comparable and ready for processing in order to create statistics, which in turn shall ensure the improvement of the quality of services and the need based approach to the client's problems. Further, the implementation of STAR shall give the state better overview of services provided on the level of local governments and more specific needs, it shall give better possibility to plan national resources and demand for training and to assess the quality and activeness of social work in local government units. Presumably the cooperation between specialists shall improve while applying STAR as a case management tool. (Medar, Puhm 2010) As we learn later on in the report (see VIRTU case-study) the implementation of the system has not been very successful so far.

### ***ICT expenditure***

In 2008 the ICT expenditure by providers (including hospitals, family doctors, private clinics, dental clinics, ambulance services) was €10 million (1.3% of the total revenues) . This does not include central government expenses on ICT (€0.66 million by Estonian Health Insurance Fund, approximately €0.75 million by the Ministry of Social Affairs and Estonian e-Health Foundation).

## **2.2 Health Technology Assessment**

In Estonia there is no formal system of health technology assessment (HTA) that is based on international experiences. Assessment of new services to be included in the publicly funded benefit package is partly regulated by the Health Insurance Act and respective government regulation. Actual evaluation is done with varying quality and methodology. For example, before a new health service is added to the positive list of health services reimbursed from public funds, it must be assessed through a process led by the Estonian Health Insurance Fund (EHIF). However, the assessment is prepared by the organization which submits the proposal of the new service to be included in the reimbursement list. The capacity to prepare true HTA is questionable. (Aaviksoo et al 2009)

In order to establish routines for HTA in Estonia, the research and public policy institutions have initiated a process of developing capacity and formalizing HTA in Estonia. The goal is both to increase the capacity of health economics and improve the role of economic decision-making in health policy in Estonia. The practical purpose is to create conditions for an institution with formal responsibilities and capacity to carry out HTA analysis. It is intended that such an institution should

work in close collaboration with EHIF, but remain independent to maintain an unbiased approach and image. (Aaviksoo et al 2009)

HTA promises to bring many benefits to both The Ministry of Social Affairs and the Estonian Health Insurance Fund (EHIF) with its potential to significantly better the process of choosing technologies to finance. In the long run, HTA should improve the quality, efficiency and accessibility of health services, leading to better health conditions for patients. Patients and doctors can also use this information to understand why different technologies are financed variously and how to gain the long-term goals. The solid and wide accepted assessment system enables Estonia to use experiences from other countries (data, models etc) and to compare the results between Estonia and other countries. (Aaviksoo et al 2009)

As a start, the Department of Public Health of the University of Tartu has participated and is participating in several international health technology assessment projects in conjunction with international organizations likes EUnetHTA, NICE, FinOHTA etc. The public policy think-tank "Praxis Centre for Policy Research" has conducted several assessments of national public health programs. As an additional benefit it can be foreseen that, once decision makers get used to methodologically robust HTAs and especially when these occur regularly, these analyses will get a stronger impact on their decision. (Aaviksoo et al 2009)

## **2.3 Current situation with tele-health and tele-care**

### **2.3.1 Tele-care**

In the field of tele-care one may distinguish between first, second and third generation of tele-care technologies and services. In Estonia however there is evidence only for using 1st generation tele-care products. Several municipalities have introduced the concept of social alarm buttons which have only recently started to spread. The largest of such projects has been the Tallinn City Government launch of reimbursed alarm buttons in 2007. The state does not interfere with such projects and it is up to each municipality whether to introduce such services. Additionally, individuals anywhere can rent their own from privately held service providers – meaning that this kind of tele-care service is generally not reimbursable for users. (Aaviksoo & Hallik 2011) Also, with the help of Swiss and Norwegian know-how and funding, The Estonian Neighbourhood Watch has implemented an alarm button service of their own that has passed its initial pilot phase and is currently in the business concept development phase (Melder 2011).

Concerning video-telemonitors and videophone based services, a pilot project called „VIRTU“ involving the Saare county has been initiated. The project aims is to provide teleconference solutions at homes and in the carers' offices to enable video-connection between carers and patients and between patients themselves, however it only involves 8 patients currently with another 30 on the waiting list (*ibid*) The project will be analyzed below in more detail.

### **2.3.2 Tele-health**

In Estonia, home tele-health is still in the phase of proof of concepts or pilot exercises. Tallinn city government was the first to attempt a widespread tele-monitoring service provision but failed to achieve funding from Interreg after which the project was put on hold due to budget restrictions. Otherwise, the same logic as in tele-care would have implied: every municipality concerns with their own tele-health projects. (Aaviksoo & Hallik 2011)

The tele-health pilot projects of Dreaming (tele-monitoring of chronic patients - EU project) and ELIKO (telemonitoring technology in development phase) will be analysed below in more detail.

### **2.3.3 General overview**

There is no strategy which directly covers the role of ICT in long-term and/or home care. On the national level, the focus is set on public health in general, the framework of which includes goals in providing long-term care but does not state the ICT implications of it. At developing eHealth, the focus has so far been on acute care, the ICT role in which is also covered thoroughly in strategic documents. While some of the points in such documents could be extended to long-term care, in

practice they are not. So far, the combination of long-term care and ICT has been slightly out of focus. (Aaviksoo & Hallik 2011)

The most direct care implications are covered in development documents of local municipalities whose responsibility the organization of long-term care is. However, in general these do not have ICT implications in them or only have them on a very basic level, such as the reimbursement of a very limited number of 1st gen tele-care solutions.

On the national level, there are two direct references to ICT and long-term care. The first is made in a "Guidelines for Good Practice" document from July 2010 which covers tele-medicine implications for chronic obstructive pulmonary disease treatment. The document states that so far, ICT penetration into long-term care has been scarce and hence the goal for the near future would be to promote the few emerging pilot projects to introduce ICT in long-term care in general (with the example of tele-care provided). A similar intention is expressed in the Elderly Policy (approved in January 2008) that states the goal of promoting at least two tele-monitoring pilot projects by the end of 2009 (policy has not been re-made since then and to our knowledge has not been implemented either. Reason: the coalition of the government has changed and the economic crises brought forward more pressing matters). Neither document however covers the topic of ICT thoroughly enough to make any particular implications.

In principle, the extension of Estonian Integrated Health Information System (Tervise Infosüsteem) into long-term medical treatment (including home treatment) is being planned, but no concrete discussions have been initiated yet. However, it is very important to note that long-term care is not included in these intentions. The two areas have been strictly separated and are to remain as such for the short-term future.

As stated, there are a few pilot projects in the field of home care but these are still in a raw introductory state which can be described to be happening "despite existing policies" rather than "as a result of existing policies". These few pilot projects currently concern mostly either social care (Virtu) or secondary/tertiary care (DREAMING and Eliko) with very limited impact on primary care institutions. Concerning the role of family physicians, they are the key mediators between the patient and the rest of the medical system, often also the social care system. Referrals are made to specialist doctors, geriatric assessment, nursing care services (etc.) and also to the local municipality who is responsible for social care. The level of follow-up by the family physicians, however, may vary from passive (upon next visit of the patient, the family physician asks how things have progressed) to more active (family physician undertakes home visits or contacts the patient residence via telephone to check up on their progress) depending on the particular doctor. What is more certain, however, is that the few pilot projects discussed in this document (Eliko, DREAMING, Virtu) have very minor connections with the primary care centres (only Virtu channel in theory mediates patients and doctors) and although these applications may be assessed to have a positive impact on the general mentality of promoting ICT-enabled care, their direct benefit for home care introduction on the family physicians' side is very limited.



## 3. Case-studies

### 3.1 Case study - VIRTU Project

[www.virtuproject.fi](http://www.virtuproject.fi)

#### 3.1.1 Background

“Virtual elderly care services on the Baltic islands” (VIRTU) is a 3-year pilot deployment project of personal integrated assistance using videoconferencing solution. The project was initiated by Turku University of Applied Sciences (TUAS), who is responsible for project coordination. The collaborating parties are the Novia University of Applied Sciences, the Laurea University of Applied Sciences as well as the Municipalities of Naantali and Sipoo (Finland). The collaborating parties in Sweden are Åland University of Applied Sciences and well as the Municipality of Eckerö. In Estonia, the project is carried out by Saaremaa Development centre Saaremaa Arenduskeskus (representing the Municipalities of Saaremaa), Kuressaare Hoolekanne SA (Kuressaare’s Social Services and Municipality) and the Hiiumaa development centre Tuuru SA.

The project is conducted at international level, but current case study focuses on Estonian partners and innovation development and dissemination in Estonian islands Saaremaa, Hiiumaa, Muhumaa, Ruhnu. The municipalities that are taking part in Estonia are Kuressaare, Kaarma, Kärla, Leisi, Lümända, Orissaare and Ruhnu. From Hiiumaa County only Foundation Tuuru (local development centre) is a partner in the project, but through them the service will reach people in Kärđla and Kõrgessaare.

Saaremaa Business Developing Foundation (abridgment in Estonian is called SEES) is the Estonian project manager. SEES is part of the public support system, which was created as part of the preparations for joining the EU. Today there are similar establishments - county development centres - in every county of Estonia. Tuuru Foundation, also a partner in the VIRTU project, is the development centre of Hiiumaa County. The function of the county development centres is to support local development and it is performed under service contract with Enterprise Estonia (EAS, [www.eas.ee](http://www.eas.ee)). Service contracts include support and counselling for everyday and development activities of entrepreneurs with focus on start-ups; local municipalities; NGO-s.

Coordinating the VIRTU project the Saaremaa Business Development Centre is fulfilling its mission to develop the local area. They manage the network of local authorities engaged in this project. In Estonia local municipalities are responsible for arranging social care in their area. In Saaremaa County every municipality is struggling with this assignment on its own, lacking sufficient resources both in money and professionals. Thus the Estonian lead partners’ main motivation to participate is that virtual services could be the solution for local municipalities to provide better services, improve the organization of everyday-work for professionals and also making different municipalities to collaborate and exchange knowledge and experiences. In sum, the driver is to help municipalities in their overarching goal: raising the quality of life for elderly and handicapped people in Estonia.

#### 3.1.2 The core of the Project

##### **Objectives**

The main aim of the VIRTU project at the individual level is to help elderly in the archipelago area to live at home, support their social interaction, improve their quality of life and increase their safety. The larger-scale aim is to create a functional social and health care service model based on the use of virtual technologies for the archipelago areas. The purpose of the service is not to replace human contact with receivers, but to support and complement the existing services and to provide additional services to those who, for many different reasons, do not have the possibility to use the traditional primary care services. The VIRTU channel increases the opportunities for social interaction for elderly, thus promoting wellness. Besides elderly, the service model will also benefit municipalities and their social and health care professionals. The project aims to utilise collaboration that crosses sector boundaries.

The project has two more concrete expected outcomes.

It is planned to test the market with a goal to become sustainable by the end of the project (April 2013) and to be able to continue the service on a wider scale. VIRTU project itself is funded mainly by European Regional Development Fund (ERDF, 85%). The expectation is that the VIRTU channel as a service model will extend widely outside the participating municipalities after the completion of the project. The benefits and advantages of the interactive well-being service are seen as an alternative that makes the basic services of the municipalities more versatile.

Secondly, in two years, it is expected around 30 elderly people in Estonian islands will be provided the videoconferencing solution.

In 2010 a background study was conducted and among other things it revealed the VIRTU project partners hopes that virtual services could be a part of the solution to:

- diminish isolation and loneliness,
- give an answer to long distances and diminish travelling,
- help elderly people to whom it is hard to travel to keep in touch with the society,
- socialize people who live alone,
- help elderly people to keep in touch with the relatives far away
- find new ways to communicate/connect/consult elderly people and health/social care personnel and student.

### ***The service***

The VIRTU service allows the users to interact via video and audio transmissions simultaneously with two or more people. Teletraining and tele-connection between homes and between homes and carers (or doctors) is possible, thus being an example of personal integrated assistance. However, this service derives from a WellBeingTV concept and thus another part of the service is the so called VIRTU-channel with live-shows: organised discussions, exercises etc. The users' participation is voluntary and based on their own activeness.

The service is currently developed with elderly people living in the archipelago areas of Finland, Åland and Estonia. The project brochure advertises that at the VIRTU channel people can:

- Speak to the care staff such as a nurse or a physiotherapist.
- Participate in, for example, exercise, relaxation and singing sessions.
- Get up-to-date information about nutrition, health and world events from various guests.
- Take part in discussions on various topics and enjoy refreshing social activities
- Keep in touch with other elderly people.

### ***Target group***

The VIRTU channel is designed to serve:

- Elderly people living at home
- Professional staff working in home care. In Estonia the main users are social workers, home care givers, and maybe in the future primary care such as family (general) physicians.
- Educational institutions / organisations wanting to introduce their students to a methodology for their future profession. In Finland VIRTU well-being-TV sessions have been developed in Universities and held mainly by health and social care students. However, in Estonia none of the project partners are education institutions. There is an agreement on the way with Kuressaare Training Centre (vocational school) for them to provide one activity session for the VIRTU service. Project partners see the importance to engage more with educational institutions and students in Estonia in the future, but they probably will not become regular VIRTU-session host due to financial problems and lack of due preparation.

- People who want to keep in touch with their elderly relatives using a technology that enables visual contact. This is one of the possibilities to earn income for the service.
- Public, private and third sector parties that want to offer different kinds of services for the elderly. Here the main focus is on municipalities. Cooperation projects with third sector organizations for creating VIRTU channel regular content might become an option in the future.

The main target-group are elderly people (older than 65 years old), who live in the archipelago or periphery far away from the centre. But there are also social and clinical dimensions that can be further addressed. These have been defined.

The Social criteria include elderly who:

- are social enough and active but have troubles in participating into activities
- feel lonely
- are in risk of social exclusion
- are older couples
- are family carers (spouse with dementia)

The clinical criteria include:

- cognitively healthy but have difficulties to move
- have a disability
- need monitoring

In the future for a service like this the target-group could be those not yet accounted for in the social care system. Thus people who are younger, to-be- and early pensioners. It could also function as a preventive tool of social exclusion and communication deprivation.

In these municipalities the population in 2011 is 28,721 people, 7,160 of them are 60 years old and older. These are the probable target group of pilot project. Only ca 30-40 people get to participate in the pilot – that is 0.4%. In those municipalities the proportion of 60+ years old people is between 23.3% (Kuressaare) and 30.6% (Leisi). The proportion of pensioners in Estonia in 2011 is 29.5%, in Saaremaa County 30.5% and Hiiumaa county 28.1%.

### **3.1.3 Technology**

The service can be used with a device that is based on a very easy-to-use video call technology. It works through the internet connection. The device allows users to create a connection for visual and oral communication with each other. The service requires end user devices and big sender devices.

The end user device is delivered and installed ready for use at the users' home. It consists of a thin monitor with touch-display, that has a computer inside, a small camera on top, and a speaker-microphone "hub" placed in front. On top of the monitor there are big buttons for on/off and restarting the machine. The big sender is basically the same, but with a more sophisticated program.

Users are instructed during installation on how to use it and a testing session also takes place with a social worker at the other end of the line. The installation and testing usually takes about 3 hours and is in the patients' mother tongue. Users also get a short manual with the most important instructions, reminders and contact information. Feedback from the first 8 users revealed that the technology is easy to use and instructions given have been sufficient.

The main problems in installing the device have been with internet connection. The technology needs broadband internet, but that does not reach most rural areas in Saaremaa and Hiiumaa. Currently, Wimax internet and Wimax antenna is being tested in rural areas in order to improve this situation. There is a very good 3G spread in rural areas, but technology developers cannot guarantee a good quality of videoconferencing on 3G. However, a possibility to connect the device with 3G data communication systems has emerged. The Estonian project manager is planning to test this alternative in one of the municipalities.

### 3.1.4 Costs and funding

The total budget for the VIRTU international project is € 2,185,000 of which € 1,661,000 comes from the EU's Central Baltic programme and the rest from national public co-funding organized by all project partners. The Estonian share is € 220,614, ca 10%. It is divided between three organizations: Project lead-partner Saaremaa Development Center € 94,684, Foundation Kuressaare Hoolekanne (social care institution of Kuressaare municipality) € 101,966, and Tuuru foundation ca € 24,000. The budget for each organization depended on the possibilities of co-funding and, mostly, on the amount of people planned to test the VIRTU service.

50% of the Estonian budget is planned for technological testing and development work and additional 3% for testing, development and dissemination of the service model – all together € 116,234. The main cost articles here are device installation costs € 4,096 and device renting from a Finnish technology developer € 100,718.

45% goes into project management and coordination, additional 2% planned for communication and project publicity – € 104,080. Estonian organizations' participation in the research activities is very scarce and only € 300 planned to cover travelling to research team meetings.

The biggest cost item is the equipment, followed by salaries of personnel employed by the project.

There are neither investments nor in-kind contribution planned or income created by the project activities. According to the project manager that ERDF rules prohibit making profit during the project for using it as co-funding. Budget co-funding comes from those three Estonian organizations budgets. However, since Estonian development centres are financed by municipalities and the state, and Kuressaare Hoolekanne is a municipality governed foundation, the co-funding comes from local municipalities and own-revenues.

The interviews revealed that in the VIRTU project there is a problem with developing a sustainable service model. The fact that Estonian partners questioned the most was the use of students in the Finnish model. In Finland using students for developing the service content, activities and hosting different sessions has been intrinsic part of this virtual service model. However by now it is getting some criticism, because using cheap or free student labour hasn't made service developers think about the sustainability of the virtual service. At the same time, this represents an opportunity for the Estonian parties to find alternative solutions.

Since testing the innovation is in its' first stages now, it is not clear yet, what the cost of the service will be. The main cost articles for developing and providing this kind of virtual care service are: equipment installation, end user device rent, big sender device rent, personnel (manager, social workers, activity and/or program hosts), and electricity. Looking at the budget planned for 2012 (€ 50,360) and possible number of users (both patients and municipalities involved), the installation per user could be around € 50-60, and monthly rent per user could be around € 84-140. It is known by now, that the device takes electricity at a cost of € 5 per month (€ 60 a year according to current prices). Another great cost article is personnel. During the project there are several parties needed to develop, provide and disseminate the service: project manager or manager of the organization that will be the central service provider; social care workers; service live-content and session providers. During the pilot project there is € 3,420 planned for external content providers, € 4,755-5,401 for project manager, € 8,836 for two social care workers. Thus the yearly personnel cost is around € 17,657, average monthly cost thus € 1,471.

This is not a kind of service that becomes cheaper with every additional user. The problem is that the technology sets boundaries: there can be up to 9 people together in one live session, the host and up to 8 service users. Thus the more people there are participating in live sessions, the more separate sessions a social worker, a guest star or a session host must give. For example if there are 30 people subscribed for a virtual training session, a social worker has to carry out 4 sessions. Thus it might be concluded that the higher the amount of registered people in different sessions and activities, the more time it takes for the care-worker or hired host and thus the personnel costs are

likely to rise. Of course there is a possibility to develop an optimal or minimum activity program with a volume guided by the budget possibilities.

The expectation is that implementing the VIRTU technology will bring monetary savings on treatment/care costs. Especially for home and open-care services where the monitoring of patients is very frequent. Using virtual conference technology enables to cut back on travelling to those peoples' homes to check up on their health, wellbeing and living-environment situation. At the same time the problem is the lack of data confirming these savings on transportation and time of care givers. VIRTU project is in the first stages of implementing this technology in Estonia and most installations are still on the way. But also, the interviews revealed that there isn't a methodology in place to measure the time of caregivers spent on VIRTU and on other/previous methods of work. On one hand the VIRTU channel is seen by Kuressaare Hoolekanne AS as a non-distinctive part of open-care and home care services, thus it can be argued that there is no need to quantify it. On the other hand, however, if not started now it becomes difficult later on to calculate distinctive costs and develop a sustainable business plan.

It is one of the goals of the VIRTU project, that in future, the ways to produce the service will become more versatile and the service will be available to anyone who is interested. But looking at those numbers, knowing the price sensitivity of target groups and municipalities' social services costs during recent years, it is very difficult to see, how municipalities could be able to pay for this service after the pilot project. The financing of home-care services in Estonia has not changed during the years. In 1998-2010 97-99% of finances have come from municipalities who have the responsibility by law to offer such services to its population. The rest is financed by the service end users themselves: 1-3% through the years, 2.7% in 2010.

### **3.1.5 The status of the project**

Bearing in mind overall service phases of an innovation<sup>1</sup>, VIRTU project deals with a phase of proof of concepts and/or pilot exercises. The focus of the project is to be a pilot deployment project to test the market. The initial plan was to test different technological solutions. At procurement stage, it already became clear, that this was not possible given the budget and timeframe constraints of the project. Thus, the technological solution offered by a Finnish company called Videra won the procurement proceedings. Their technology was most developed and cheapest. Other offers came from Finland also, but their technologies were in the final stages of development and thus it wouldn't have satisfied the project timeframe.

There have been delays in installing the end user devices in Estonia. Thus producing service content and activities has also been delayed. Due to this delay there isn't a lot of information about the effect of the VIRTU service. 8 elderly people have been using the device since August and the rest ca 30 people are on the waiting list. The Estonian project manager is hopeful that all installations could be made by the end of 2011 and the result could be evaluated towards the end of 2012.

Those 8 people have been contacting daily with their social worker, who monitors their wellbeing. This has been successful both for the elderly and for the social workers. The latter used to monitor the elderly by phone calls and home visits. Now they can plan the monitoring more effectively, do less house visits, because they see the patient via videoconferencing device. Also, while such video calls don't replace human connection, they are better in creating close connection than phone calls were. The mental wellbeing of the participating elderly has also showed positive changes. First, dealing with this technology demands a level of sharpness from their brain. Also, now they are more excited to chat with people due to video calls: they feel better connected and not so deprived of human contact. Also, they are excited to work on themselves, change clothes, clean the room, to comb hair etc – in a wait for the daily video call.

Another successful activity of VIRTU service has been that those 8 can connect with each other. They actively use the possibility to video call each other and take part in group chat.

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<sup>1</sup> E-Benchcare Estonia report, 2011

According to the manager of Kuressaare Hoolekanne SA the plan is to start adding activities to VIRTU channel. Starting from November a virtual training session begins and will take place once a week. The rest of the sessions are in preparation and will start once more users have received their devices.

The Ministry of Social Affairs has not supported the project. However, they are interested in seeing and hearing about the results, and possibly thinking about the future developments with the VIRTU Estonian project partners.

### **3.1.6 Key issues**

#### ***Drivers***

The main driver at this time is VIRTU project initiated by Finnish partners and funded by European Commission regional fund. Also, there is a sense of understanding of the important effects virtual services could have on the delivery problems of Estonian social care services.

The Ministry of Social affairs seems to support a bottom-up innovation model and puts high hopes on initiatives such as VIRTU. Thus it is important for the success of this pilot, that project partners now involved were supportive of the idea. One of the drivers at this stage is the favouring background of the key people involved in Estonia. The current director of the SEES Piret Pihel and a consultant Anneli Rasu previously worked at Kuressaare Training Centre (vocational school) that trains social care professionals. Piret Pihel is also a member of the council of the Kuressaare Hospital Foundation and 9th year member of the council (now chairperson) Kuressaare Hoolekanne Foundation. Kuressaare Hoolekanne Foundation is also a separate member of the VIRTU project. Also, the project manager was teaching different subjects of computer science in Kuressaare Training Centre. Thus, she has personal experience with getting the elderly people using new computer technologies. Anneli is now learning IT Systems Development in the Estonian IT College, a private non-profit higher educational institution (UAS - University of Applied Sciences), putting her close to the best know-how in this field and keeping open the possibility of future co-operation with IT College.

SEES personnel have helped Saare County Government to analyze and build a proper structure of development strategy for social care of the county level until 2015. In that document are verbalized the main goals of social care – collaboration and development of services amongst the main ones. The document is also giving precise overview of which social care services are provided in every municipality and where the deepest problems lie. This knowledge might not be an active driver, but certainly is an important foundation for developing services.

#### ***Barriers: Governance***

One barrier for the development of virtual services seems to be the fact, that providing social care services is the duty of local municipalities and not the state. State is responsible for arranging the provision of some services, but overall 97-99% of the costs of social care services are covered by municipalities. And while there are 226 municipalities in Estonia for a population around 1.3 million, the municipalities now even have problems covering even the most basic needs on their people. Thus it is problematic to think, that municipalities could manage the development and innovation needed for virtual care services to Speed to such volumes, that it could change the face of social care service in Estonia.

Another problem with municipalities is the lack of cooperation to create service centres. As seen in the implementation of the VIRTU project in Estonia, the county development centres (funded by EAS and municipalities) could take a role in connecting local authorities to develop joint service systems. The manager of SA Kuressaare Hoolekanne agreed that there could be an elderly service centre in every county in Estonia. And that centre could be developed alongside one existing and biggest or better functioning

Thus there is a palpable need for an active role by central government institutions in order to:

- integrate social care and primary healthcare systems

- integrate ICT developments and social care systems
- support the development of technology suitable for virtual health and social care services, either by financing it or by advocating the idea or bringing together partners etc
- update the training of social workers, developing courses on digital services as a possible future.

The Data Register of Social Services (STAR) is an ICT-based system of gathering, processing and managing data with a multi-layer use and functionality. It was opened for use in April 2010, but the ministry is still having problems using it and getting the data needed from local municipalities via STAR. According to the initial idea it should play a major role in increasing administrative efficiency, but according to the ministry official interviewed it is still not functioning as planned and not delivering the expected outcomes. For one thing, implementing STAR uncovered the greater problem of localities defining social services differently – this is one of the reasons why the Ministry has a priority in unambiguously describing all local social services and their minimum quality norms.

The Ministry of Social Affairs could be interested in such initiatives as VIRTU service on the islands. Providing services there has higher costs and remote digital systems can be of help in terms of efficiency and accessibility. However the developments of Estonian ICT sector and primary health and social care systems are not integrated. In 2008 and 2009 the ministry was very active in drafting a concept for integrating social and nursing care services (long-term care), but this process has stopped and there are no future plans of systematic integration.

Also, now there are no plans for cooperation on integrating ICT developments and remote social care services. Here the ministry prefers a bottom up solution, that municipalities or other organisations providing services come up with innovative solutions, test them and provide evidence of the innovations' effectiveness. Every year the ministry of Social Affairs gives grant support for such innovative projects through The Council Of Gambling Tax Programme. The ministry official interviewed did not know of other projects such as VIRTU, but there have been several alarm-button projects that have gotten a yearly grant. Important barrier inside the ministry seems to be the lack of such special expertise. With the funding of European Social Fund ministry has outsourced several studies, but so far none of them focus or even touch ICT developments as a possible solution for main problems, accessibility to and quality of social services.

All people interviewed feel that there need to be some changes made in the curriculum of social carers and social work managers. It is a barrier now, that social work students do not get the information about future trends of social services. Now, there is an acute need for knowledge on how to best co-operate between municipalities, to provide a best standard service which is also effective and efficient to manage. Integrated knowledge about ICT developments, virtual, tele- and e-services seems to be part of the solutions, but social care students are not familiarised with these possibilities in their curricula, and IT-students don't have the means to cooperate with social service providers.

Estonian county average has been between 42-47 care-workers rendering homecare services through the years 1998-2010 (without Tallinn, 34-40). The number of care works has been declining during the last decade. In Hiiumaa and Saaremaa County the number of care-workers in home-services has changed from 17 to 9 and 12 to 19 respectively – so the level of homecare giving is below the Estonian average.

### ***Barriers: Innovation***

The main challenge of developing virtual health and/or social services for rural areas is the type and speed of internet connection. The explanatory note on Estonian Annual State Budget 2012 draft also addressed the problem of access to speedy internet connection in rural areas. The lack of connection and suitable speed leaves the people, entrepreneurs and other organisations without the possible access to the same public and digital services as people are using in urban areas. 41.1% of end users have connections with speed below 2 Mbit/s (EU average is 13.3%). In 2012 the government plans to continue EstWIN project in cooperation with the Estonian Broadband

Development Foundation. The goal is to give all residential houses, businesses and authorities a chance to connect to the next-generation broadband network with a transmission speed up to 100 Mbit/s by the year of 2015. In the scope of EstWin project more than 6000km of fibre-optical cables will be installed and more than 1400 connection points will be constructed. The construction of basic network should provide that 98% of the residential houses, businesses and authorities are located closer than 1.5 km from the basic network. Some regions in Saaremaa and Hiiumaa are also planned to get internet connections in 2012.

In Finland educational institutions and organisations have had important role in developing the VIRTU well-being-TV and advancing the social care methodology for a more demanding future. Students of IT, media and social care are not systematically and broadly engaged in service development and delivery in Estonia. Also, students of social care and medicine – the future social workers, general physicians – are not taught about the possibilities of delivering municipal services in cooperation nor virtual and tele-services as the possible future of social care development.

Informants:

- Anneli Rasu – Estonian-side project manager for VIRTU, project manager in Saaremaa Development Center. (2h interview)
- Tiia Tammsalu – the manager of SA Kuressaare Hoolekanne. Partner in VIRTU project. (1h interview)
- Matti Lüsü – project manager in Tuuru Foundation (short phone conversations and e-mails regarding the research workpackage of VIRTU project)
- Maarja Kraiss - Head of services on the Elderly and People with Disabilities, Social Welfare Department of the Ministry of Social Affairs. (1h interview)

### **3.2 Dreaming project**

[www.dreaming-project.org](http://www.dreaming-project.org)

#### **3.2.1 Background**

The elderly-friendly alarm handling and monitoring (shortened for DREAMING) is a EU pilot project to demonstrate new services to support the independent living of elderly people. The project intends to pilot new, economically sustainable home assistance and inclusion services able to extend the independent living of elderly citizens in their homes and break their loneliness thus improving the quality of life of the elderly.

DREAMING project is centrally coordinated by Tesan - Televita Srl, Italy and it employs 12 medical institutions in 7 different European Union countries. In Estonia, the corresponding partner is The East-Tallinn Central Hospital (ETCH). The technological pilot period of the project started in 2009 and it will last until April 2012.

#### **3.2.2 The core of the project**

The DREAMING project is a framework bringing together a set of services which, packaged together, allow extending the independent life of elderly people while providing them with an equivalent level of safety as that they would enjoy in a protected environment such as an elderly home, and offering them a way of staying in touch with their loved ones even when the latter are away. Additionally, the DREAMING services facilitate the management of chronic conditions in a home setting reducing the need to use the resources of acute hospitals to a bare minimum.

#### ***The services***

The services included in the DREAMING framework fall into three different categories:

- 1) **Monitoring and Alarm Handling services.** At the core of the DREAMING project is a system that connects medical devices and environmental sensors located at the patients' and a powerful Decision Support System which is able to detect risk situations based on the specific profile of the individual user or of the category to which the user belongs, that is



located at the medical institution. Data is delivered synchronously over the Internet from the patients' location to the central server in Germany from where a copy of the data is sent to the local medical institution enabling medical personnel to consistently monitor the health performance and detect potential threats quickly.

- 2) **Elderly-friendly videoconferencing services.** A videoconferencing system that has been specifically designed for elderly people establishes a connection between the medical personnel and the patient, bringing the two closer together. The interface at the side of the patient is provided through a TV set and an infrared remote control.
- 3) **Non-ICT based services.** Although the focus of the project is to pilot technology-based services, the project partners are also servicing their patients outside the frame of technology by providing support that enables elderly people to live independently in their homes. Contrary to the previously named two services, the non-ICT based services are not charged to the project budget. (Dreaming 2011)

### ***Project design***

The DREAMING clinical trial (2009-2012) is a multicenter randomized controlled trial which is conducted simultaneously in Denmark, Belgium, Estonia, Germany, Italy, Spain and Sweden. The pilots are aimed at verifying the impact of the service on the quality of life of elderly people, their formal and informal caregivers and their relatives, on economic and clinical indicators, its financial sustainability and the satisfaction of users. This will help to refine the DREAMING business case in view of a large-scale deployment. (European Commission 2011)

In order to come to reliable results, the project is designed to include a sample group, the members of which receive services within the three main application categories, and an equally sized control group that continues to receive medical and wellness services as provided to the general public.

### ***Main objective***

The main aim of the DREAMING project is to keep elderly people (defined as aged 65+) in their home environment as long as their physical and mental conditions allow it, enabling them to be full members of the society for longer. Deriving from that, the core objectives of DREAMING are:

- 1) To enable elderly people to continue to live in their home, without compromising their level of safety, as long as they wish or until their physical and mental conditions make mandatory a transfer to an elderly or nursing home.
- 2) To provide elderly people with a simple and effective way of staying in touch with their loved ones even when they are physically away.
- 3) To increase the appropriateness and the timeliness of interventions by health and social care professionals, including emergency services. This translates not only into a better use of the limited resources available but also into reduced intrusion in elderly people's private life and arriving at a better medical understanding of the health dynamics of the elderly.
- 4) The containment of health and social care expenditure. Demonstrating that significant savings are achievable in healthcare is one of the main challenges of DREAMING. Prior to the designing of the clinical trial, a meta-analysis on the previous tele-medical and tele-monitoring activities was conducted to identify the disease groups in which by replacing the classical monitoring with contemporary tele-monitoring the biggest potential financial benefit may be reached. In the pilot stage, health and social care expenditure of three disease groups are being targeted: diabetes, COPD and heart failure.

The strategy of the DREAMING project is centred around the goal of measuring the real impact of the monitoring and inclusion services on the quality of life of the elderly people, the cost of social and health care delivered to them and on a number of clinical indicators. The final goal of DREAMING is to demonstrate, through reliable and representative pilots, that the impact of the DREAMING framework services on a number of key wellness indicators is significant for the services to become economically sustainable in the future. (Dreaming 2011)

### **3.2.3 The status of the project in Estonia**

#### ***The participants***

As in the other 6 participating countries, in Estonia, the trial period of DREAMING is currently ongoing until spring 2012. The project has one participating partner institution in Estonia: The East-Tallinn Central Hospital (ETCH) which originally enrolled with a sample group of 30 elderly (aged 65+) patients and a control group of another 30 elderly patients.

#### ***Design***

The majority of the DREAMING project configuration employed in Estonia originates from the project coordinator and was sent over as a package. This especially applies for the technological component of the project. However, there are some differences. A key difference between the Estonian set-up and the set-up at some other pilot locations is that in ETCH, only a very limited number of medical personnel are connected to the system. The data gathering and analysis is localized and constrained to the computers of three nurses at ETCH. The pool of patients is divided between the nurses and each nurse gains access to their patients through the particular application in their computer. The few doctors handling the cases gain access to the data in these same computers. Because of these constraints, medical support is only available during weekdays and during working hours. The localized database and the fact that the medical platform of DREAMING is not integrated with The Estonian Health Information System has also severely limited the availability of health data for other members of ETCH and caused many episodes of confusion inside the institution (described in the Key issues section).

#### ***Current status***

Although at the time of writing, the clinical trials of project DREAMING are still ongoing, at mid-term in 2010, a round of general preliminary results about the progress of the pilot project was made. In Estonia, this review most significantly noted that the hospitalization rate of the sample patients was indeed significantly lower than that of the control group. However, another trend was also revealed in that the sample group patients visited their family physicians less because they felt that they were already monitored.

Aside the specifically DREAMING-caused results which are largely to be determined in the final analysis after the trial period ends, in Estonia the project has perhaps more importantly initiated a holistic thinking process about innovation in providing medical and social care services. Before DREAMING, the field was largely unknown but now that the trial is soon to end, tele-monitoring and tele-medical applications have gathered a small number of supporters among physicians. Analysis concerning the feasibility and business-logics of different tele-monitoring and tele-medicine applications has thus been initiated. This discussion along with lessons learned in the DREAMING project have provided valuable input into the Eliko project (also described in this study) but also acted as input into the following projects that Estonian partners have recently joined:

- Regional Tele-medicine Forum which aims to develop instructions for the deployment of tele-medicine related policies and particular tele-medicine applications. The project is financed in the frame of Interreg IVC and it connects partners from nine different countries: Denmark, Norway, Sweden, Italy, Spain, France, Poland, UK and Estonia.
- eMedic project that aims to develop non-invasive technology for home monitoring of certain patient groups (most notably, diabetics). This is a collaborative project involving Sweden, Finland, Estonia and Latvia.

### **3.2.4 Technology**

DREAMING was planned to be based on technologies which were available off the shelf. This should have allowed for a fast set-up of the pilot sites and enable trials long enough (30 months) to gather sufficient experimental data to strengthen the business case and plan the subsequent deployment phase. However, the project was severely lagging at the beginning as the technology arrived approximately 9 months later than planned. In Estonia, this made several already enrolled patients sceptical and lead many to withdraw their agreement to participate. A second round of enrolment therefore had to be organized.

The technological base of the project consists of three main types of technologies:

#### ***Monitoring and Alarm Handling Systems***

The personal alarm system is based on the combination of the following components:

- An application that is in the program elsewhere but was not deployed in Estonia: An environmental monitoring subsystem, which is able to detect movements in the flat and construct a normal user's profile for each flat or house. Sudden changes to the normal pattern are detected and reported to the Contact Centre. The Contact Centre is then able to establish voice communication with the flat or house to check the real occurrence of an accident before the emergency procedure is launched. The environmental alarm system can be extended with a large variety of wireless detectors (smoke, gas, water leak, etc.) which can render the environmental monitoring more comprehensive and more reliable by cross-checking a large number of parameters to detect anomalous situations.
- A health monitoring subsystem, which is composed by a set of self-operated medical devices, the number and the type of which is determined according to the specific health condition of each single individual and the main health threats to which he/she is exposed. Environmental sensors and medical devices are linked to a local concentrator (the H.I.S. Central Unit) through wireless communications (Bluetooth or RF). Measurement of the vital parameters of each individual will be taken according to a schedule which is personalised to the specific needs of that individual, and sent by the H.I.S. Central Unit through fixed (PSTN or ADSL) or mobile (GPRS or UMTS) communication links to a Decision Support System located at the hospital (CenterSight™).
- An application that is in the program elsewhere but was not deployed in Estonia: A mobile alarm and localisation system consisting of a cellular phone called the Butler, which has been purpose-designed for use by elderly people. The Butler provides a number of remarkable features such as an integrated fall detector and a positioning system based on a combination of cellular network and radio beacons. Thanks to the Butler, the elderly person can be monitored and located wherever he/she is and, through the combined use of the fixed H.I.S. Central Unit and the Butler, the residence and the individual can be monitored independently from one another.

#### ***Institution-side data management tool***

Data transmitted to the Contact Centre are received, analysed and stored by a Decision Support System named CenterSight™ which operates on the basis of a set of personalised rules which will be agreed with each pilot site and depend on the specific profile of each elderly person and on the type of problem detected.

CenterSight™ gathers data in a computerized environment where the medical personnel can analyse it with the assistance of the system. Based on this data, the medical personnel can for example contact the patient for additional information, alter their course of treatment or even issue an emergency signal to be treated by the ambulance service. In the opinion of one of the nurses using CenterSight™, the system is assessed to be relatively user-friendly although the statistical module may require alterations to provide better aggregate information.

### ***Elderly-friendly videoconferencing***

The videoconferencing environment is a software-based solution which runs on a standard PC-based Set-Top Box under MS-Windows or Linux and allows point-to-point sessions. To offer an acceptable quality of images, the communication link must have a guaranteed bandwidth of at least 128Kbps, using ISDN or ADSL protocols.

The videoconferencing environment has been designed to function on any IP network and uses proprietary audio and video codec. The TV-like user interface does not require the use of a keyboard or any other PC-specific input device. Selections are made using a normal infrared remote-control.

The videoconferencing system is compatible with the Session Initiation Protocol (SIP) standard.

In general, patients find the technology user-friendly although a doctor involved in the program commented the videoconferencing application to be less appealing to the patients than the other machines in the package. After a few years of use, the hardware of the system may already be morally old but despite its many wires and somewhat archaic interface, in general it has provided a reliable service. This was also confirmed by an interviewed patient who commented DREAMING to provide a lot of additional emotional insurance that your health is being monitored and thus problems also detected.

Additionally, if any technological problems arise, in Estonia the patients have full access to technical support that arrives upon a phone-call.

### **3.2.5 Future of the project**

#### ***The short-term future***

At the end of the project pilot in April 2012, ETCH as well as other project partners will conduct a larger-scale data analysis to draw conclusion on the success of the trial. During the analysis, data is gathered from two main parallel sources: 1) patients' diaries which they have been encouraged to keep throughout the whole trial period, and 2) the medical information systems where data has been automatically stored. This includes data in the DREAMING platform as well as in databases of The Estonian Health Information System and The Estonian Health Insurance Fund where all medical services provided to the patient are recorded. Additionally, an analysis will be made of the assessment sheets that have been fulfilled throughout the trial period about social factors such as the life quality and the depression levels of the patients.

This elaborate data analysis together with the analysis issued by the other project partners will enable ETCH to assess the possible financial gain rising from the use of the DREAMING platform (and similar future platforms) in comparison to the control group.

#### ***The longer-term future***

Despite the project trial still being active, assessments of the possible future of the project or its successors in Estonia were made by several key agents within ETCH:

- The approach used in the project is expected to fade away after the end of the pilot as participants are sceptical towards finding a sustainable financing scheme within Estonia to carry on using similar technology to increase the wellbeing of the elderly. Since DREAMING is rather a tele-monitoring service than a medical service, according to the financing logic in Estonia, such applications would be considered social care services and thus be expected to be organized and financed by the local municipalities. However, local governments are in a chronic lack of funds to support such activities. The other possibility would be to profile any successors of DREAMING as a strictly medical application which in Estonia would be financed through The Estonian Health Insurance Fund (EHIF). At EHIF, cost-benefit is the key driver and to have a chance at financing, it would indeed need to be significant. Additionally, EHIF is a policy-driven organization, indicating the need for a change in mentality to bring about change (see also the Key issues section).

- This because in Estonia in general, tele-monitoring has not been raised as an alternative to the classical medical and social care service provision. Tele-medicine or tele-monitoring has so far not been prioritized in any governmental development plans and thus the positive background that supports the establishing of such services is largely lacking promising many obstacles for those who attempt to institute it.
- In ETCH, specifically, the enthusiasm of the beginning times of DREAMING is largely gone. Financial interest towards the system among medical personnel inside ETCH is low and focus is instead put on services that are financially beneficial to the hospital. Due to financial strain, the council at ETCH is not as innovation-oriented anymore and DREAMING is often even seen as just an obligation. Therefore it is likely that ETCH will not pursue the continuation of the DREAMING framework activities.

Deriving from these points, it is very possible that DREAMING project or its further developments will not be sustained in Estonia after its pilot period ends and the devices will be gathered back together from the patients. If the project ends with positive results, however, it may prove a valid base for lobbying for policy change and introducing a more positive attitude towards the use of tele-medical and tele-monitoring applications.

### **3.2.6 Key issues**

#### ***Drivers***

The interests associated with DREAMING in ETCH have been two-fold: 1) the hospital has a large ambulatory patient base but significant space constraints in the hospital section, thus creating a need to find alternative means to treat this vast base of patients. Keeping patients home can enable this. Additionally, since keeping people in the hospital is very expensive, keeping them home also significantly helps to reduce costs associated with treating elderly people. 2) The hospital also planned to use DREAMING as a marketing-approach to introduce ETCH as an innovative medical institution. From the start on, ETCH and its key members such as the former head of development at ETCH Peeter Ross saw DREAMING as a great project to test something that would significantly help improve the provision of medical services in ETCH and in Estonia as a whole.

Secondly, the overall ICT-savvy attitude of the Estonian government and people created a positive background that led to the initiation and deployment of several healthcare technological application before the economic downturn.

#### ***Barriers***

In addition to potential financing being the central challenge for the DREAMING platform in Estonia, the project has met additional challenges that may have an implication on the tele-medicine and tele-monitoring fields in Estonia as a whole:

- At the moment, the project platform assumes extra work from the medical professionals at handling the remote cases and communicating with the project coordinators. The costs of that work are not covered by the project. Due to that, finding physicians and nurses who would be willing to participate, was difficult and is likely to be similarly difficult for future projects as well.
- DREAMING project has created confusion inside ETCH because when patients are communicating with medical professionals (such as ER doctors) who are not participating in the project, they often expect the professionals to have all their health data. However, without the connecting link between DREAMING database and other medical databases, these professionals have no access to this data.
- Although the problem is significantly smaller in Estonia than in most other developed countries, some patients have found the regular data transmission somewhat intrusive to their privacy. Many have rescheduled the data transmission from a daily to a weekly basis, decreasing the data available for later analysis. Patients also often go out of town where they cannot take the machines along, causing a longer data gap. Sometimes patients forget

to announce that in which case the nurses contact the patient to see if everything is in order.

- Some patients are troubled by the increased electricity cost of keeping the monitoring equipment working and they often plug them out for most of the day which would be a significant problem if the data flow needed to be ongoing throughout the day.
- Due to the DREAMING feedback module concentrating on the assessment of DREAMING impact on social issues (life quality, depression etc.) rather than on medical results, physicians have not been as deeply interested in the project. However, this profiling of the project also indicates that theoretically, the continuation of the services may not require the direct participation of a medical institution at all which would potentially make the service as a social care oriented one easier to offer in the future.
- Particular medical institutions are in fact discouraged to employ tele-monitoring technologies because the gain received from keeping people out of hospitals is not theirs, but belong to the society (through EHIF). Hospitals would just lose this gain anyway and to them, it is currently not incentivised (in case of EHIF financed nursing care) to send patients home (or not take them in at all) as quickly as possible. The motivation of hospitals to start promoting the use of tele-monitoring (-medical) applications is therefore an important challenge for the future.
- Physicians in general are not IT-savvy and the interest towards tele-medicine is therefore slow to come. The positive mentality background and the appropriate political framework to support such services have not been developed yet.

Additionally, the project has very strongly pointed to the shortcomings in the Estonian wellbeing financing logic that distinguished between medical and social care services and sets two completely different parties in responsibility of these fields. DREAMING effectively bridges these two care categories and thus has supported the growing understanding in Estonia that the current financing system needs to be reviewed.

### **3.2.7 Costs and funding**

In the DREAMING project, the cost allocation was done in the following way: The project coordinators organized the hardware and development of the software with EU funding where 48% of the project costs were covered from the pockets of the participating organizations. The total yearly expenditure of ETCH associated with the project is assessed to an average of 100,000 €, of which 120,000 € has been spent on the technology. The total costs of ETCH therefore amount to approximately 400,000 €.

The share of technology in this project is approximately 30%. The rest is spent on the day-to-day management of the system and especially of the salaries of the involved personnel. In reality, the particular doctors and nurses involved in the program receive their normal salaries but have altered their work habits to accommodate the use of the system so the costs allocated to the project are difficult to distinguish. Most of the costs are therefore absorbed by the different budget lines inside the hospital.

For the patients, the service has been completely free of charge (except for the cost of the electricity for the machines).

Informants:

- Peeter Ross, MD. Former head of development at East-Tallinn Central Hospital (ETCH), tele-medicine expert at The Estonian eHealth Foundation. Led the deployment of DREAMING at ETCH.
- Kai Sukles, MD. Doctor of internal disease at ETCH. Currently engaged with the service provision through DREAMING at ETCH
- Marko Parve, head of medical technology service at ETCH
- A patient participating in the pilot

### **3.3 ELIKO project**

#### **3.3.1 Background**

Eliko is an Estonian competence center in electronics-, info- and communication technologies that was established by eight companies and Tallinn University of Technology as an independent research organization. Its main goal is to develop innovative technologies and products, based on intelligence embedded systems.

Among their developments were also technologies that in Eliko's assessment were best tested in the field of tele-medicine such as signal collection, transmission and reading, gathering information with sensors etc. Thus, to better develop these technologies, Eliko decided to channel their development to a particular field and to continue researching these areas in the practical context of tele-medicine and initiate a tele-medicine project that would best accommodate this decision.

#### **3.3.2 The core of the project**

##### ***The services***

In the period 2008-2011, Eliko has developed a tele-care system prototype that is intended for different medical applications such as:

- 1) supervision of the elderly, considered the lowest-costing of the Eliko applications,
- 2) mobile tele-medicine aimed towards fast data collection on the chronically ill (e.g. diabetics) or on pregnant women who belong to certain risk groups,
- 3) rehabilitation, including post-op rehabilitation.

Although the system has different applications, the main technology is roughly the same and these applications can therefore be considered as representations of the same project, the aim of which is to connect the patient, hospital and emergency care provider (if indeed) to deliver data quickly and efficiently. Such data delivery and its analysis are expected to reduce the costs associated with providing patient screening activities as well as delivering the screening services faster. Ultimately, this is expected to bring about an increase in the quality of the screening activities and hence also the increased wellness of the patients involved.

##### ***Project design***

As Eliko's key activity is technology development and research and not medicine, they have involved partners in the project. Two are most significant: OÜ Girf, the software company that is responsible for the actual software development, and the Estonian 3rd largest hospital East-Tallinn Central Hospital, which is providing the necessary medical data, feedback to the system as well as should be the testing ground for the various applications of the system. Recommendations at developing the system have also been acquired from eTervise SA (Estonian eHealth foundation), the Estonian society of family doctors and the city of Tallinn.

##### ***Main objective***

The main aim for the project is to create an economically feasible tele-medicine service that can be employed in practice at the provision of health-related services. Economic feasibility is a key issue because in Estonia the cost model of Estonian health insurance system is case driven and due to that, the central way to achieve attention as a viable technological solution would be to emphasize improved efficiency that helps doctors and hospitals to serve more patients at lower costs. Therefore Eliko is also in parallel to developing the system, keeping a cost analysis research stream open to know at any point, what would the requirements of a particular technological solution be in order to be economically feasible.

#### **3.3.3 The status of the project**

At the first phases of the project, the developed tele-medicine solutions were very primitive. In time, many layers have been added to the system and by the end of 2011, the project is in its testing

phase in which its business model is being developed. Eliko aims to develop the system up to a stage at which another institution with sufficient investment capabilities can take over the stewardship of the whole system (or in the course of spin-offs, parts of it), because Eliko, according to its profile, would not be suitable to run the system in its entirety themselves.

### ***Current status***

Currently the system has been reviewed by medical personnel but attempts to initiate testing with patients have so far failed (see Key issues for reasons). In the diabetes section, testing has been planned for 20+20 patients, in the risk-group pregnant, for a few patients per month. With the other main applications of the system, Eliko has not entered into the testing planning phase yet. The only successful testing so far has been through a mobile phone application that enables diabetics to enter their data online to later be shown to medical personnel from a web-application. The app is available on Android market, but has gathered a marginal amount of users.

### **3.3.4 The technology**

With various different application fields, the technology employed in the course of delivering these applications is relatively versatile. On the side of the medical personnel, the system is uniform, meaning that information flows from the different applications are gathered together and presented to the doctor on one particular information system platform. Data gathered on the patients' side can both be used on spot or stored in a database. Therefore the technology also has a potential link with The Estonian Health Information System (EHIS). The system uses semantic data coding (based on SNOMED CT), which makes it possible to estimate risks or episodes.

On the side of the patients, the system has been built to use various application devices such as:

- 1) A receiver similar to that of digital television receivers. Was tested in the earlier phases of the project and proved to be a failure as commercial digital television receivers spread quickly and left no room for a similar device in the medical field.
- 2) Digital picture frame which through local connections to numerous measuring devices and signal providers can act as a patient side central screen.
- 3) Baby/embryo-monitor which with a Bluetooth connection transmits information to a smart-phone which in turn transmits it to the server.
- 4) ECG-device that similarly to baby/embryo-monitor transmits data through Bluetooth and smart-phone to the server.
- 5) Rehabilitation monitoring device through which the instructor can instruct the patient at doing rehabilitative exercises and assess whether the exercise is done correctly or not.

### **3.3.5 Future of the project**

#### ***The short-term future***

In the short term, the Eliko project is on a path of incremental development and gradual testing. Patient-testing has become a key requirement to continue so in the near-term future, the clinical trials of the system would need to commence.

In the medium term therefore, the key issues for Eliko are: 1) finalizing the prototype through customer testing and feedback loops to remove potential problems associated with the system, and 2) finding financially capable partners to hand the system over to.

#### ***The long-term future***

Ideally, Eliko sees the future of the system as joint managed by the state, hospitals and private enterprises. However, there are several problems associated with this vision which are described in the Key issues section of this case study.

Meanwhile, although the longer vision of Eliko is still unclear, Eliko is actively looking for opportunities to still improve their technology and be involved in different projects. Recently, Eliko



technology became the base for the eMedic project that attempts to develop non-invasive technology for home monitoring of certain patient groups (most notably, diabetics). This is a collaborative project involving Sweden, Finland, Estonia and Latvia.

Therefore although in the long run, Eliko's future is still largely unclear, they are simultaneously developing their technology further and lobbying/networking to increase the awareness and possibilities of tele-medicine in Estonia and in the region.

### **3.3.6 Key issues**

#### ***Drivers***

The Eliko project has become possible due to the general thrive towards innovation in Estonia. Many institutions, including the universities, have understood that in order to achieve the national goal of a knowledge-based economy, an environment that encourages rapid developments and prototyping is necessary. Eliko is the result of such understanding. Established in the cooperation of a university and several enterprises, its main goal is to do exactly that – test and prototype.

At the same time, the former board at ETCH also took a clear direction towards standing out as innovative and began to look for projects that would enable them to obtain that image. The Eliko tele-medicine project is largely a result of the cooperation and mutual interests of these two organizations which has been supported by the Estonian general positive mindset towards the use of ICT solutions.

#### ***Barriers***

However, the development of the Eliko tele-medicine project has also met several key challenges. These include the following:

- The IT-skills of Estonian medical personnel are often limited. This also means that the medical personnel are resistant towards using information systems and especially testing new information systems. For many, it is seen as a disturbing additional obligation. Instead, doctors would much rather act in the field of pharmaceutical research or on medically more interesting issues. Additionally, doctors in Estonia are over-booked and meeting with them or requesting them to employ the systems for tests is thus very difficult. The attention span of the doctors is more or less already filled with day-to-day medical activities. Eliko applications have been test-ready for six months but have gathered no test-patients so far. These difficulties at finding test-patients are likely rooted in the lack of incentives for doctors and hospitals on the operational level to promote and employ innovative systems. Additionally, doctors would be expected also to take the responsibility for the use of the system as a technology company cannot be responsible for medical questions. This further distances doctors from promoting the system.
- In the Estonian context, tele-medicine technology is very expensive. The system Eliko has created is very cheap compared to its competitors. Yet, in Estonia, it is still much more feasible to employ manual labour instead of technology, e.g. in the form of using home visits to the elderly. The local governments, which are responsible for organizing social care in their municipalities, are not well financed and are thus incapable of paying for such services. The small size of the Estonian population also determines that commercialization can currently only be made on the most general wellness-oriented tele-medicine solutions because the number of people suffering from a particular disease is in most cases tiny compared to the needed clientele in order to achieve economies of scale with a particular technological solution (application). Even at these potentially commercial wellness-oriented tele-medicine services, patients are expected to at least share the costs. The willingness to do that is still low, however.
- To support the medical applications of tele-medical systems, the only viable option would be fee-for-service financing from The Estonian Health Insurance Fund (EHIF) according to interviewees. EHIF support for innovative solutions in health care is at the same time low as

is the ability of EHIF to assess these applications adequately. EHIF is also influenced by the different associations of doctors and thus making it to the list of financed services would require that the service and its providers appeal to both EHIF and the associations of doctors at the same time.

- Financially capable local investors are very difficult to find as the Estonian market is considered too small for any of such investments to generate a profit. The state is a potential investor; however such thrive for long-term wellness has not been prioritized by the state yet. Accessing potential foreign investors has at the same time proved to be very difficult as they lack trust towards technology developed in Estonian.

### **3.3.7 Costs and funding**

In the current untested prototype versions of Eliko applications, the costs associated with the development have so far been absorbed by Eliko from their central budget. Although there have been discussions concerning the income model of the system, currently no particular income model is employed or under serious development.

Financing for Eliko (and the project) is coming from two main sources: 1) depending on the period, Eliko receives 66-75% of their funds from Enterprise Estonia in the course of participating in their competence centre program, and 2) the rest is financed by private enterprises which are looking for potential new business opportunities arising from Eliko's activities. Although distinguishing between the costs of the tele-medicine system among all the activities conducted by Eliko is not easy, the scale of investments made into the system thus far is approximately 20-25% of the total budget of Eliko.

## **4. Analysis and discussion**

### **4.1 Background**

Estonia is in general considered an ICT-favouring society where the penetration of information systems into societal processes has become significant. There are many such examples that the country is proud of: e-IRS, e-voting, online business registry etc. The same drive towards integration of physical-life processes and virtual systems is also making its way into health- and social care.

In the field of care, the largest integration of physical healthcare and virtual systems has been made in the framework of the Estonian Health Information System (EHIS) which currently integrates four different health-related information systems that are all fully operational (eTervise SA 2011a). EHIS implementation which was initiated in 2009 was very clearly a top-down process in the form of strong political will behind the project. In the particular case, most of the changes were introduced as mandatory requirements through law, instituting a general change in the way medical institutions employed information systems.

However, EHIS case can be considered as a rarity because at the same time, as also apparent in the few Estonian cases in this study, despite the relative success of EHIS, the diffusion of ICT-enabled care innovation can best be described as clusters of initiative and activity on a larger background of weaker initiative and inactivity. The number of innovative ICT-employing care solutions in the pipeline in Estonia is relatively small, equally so in the case of healthcare and social care. There are several key issues associated with this tendency which will be discussed in the current chapter in the course of a discussion on the positions of the key stakeholders in the care provision in Estonia. These stakeholders are namely the government (local and central), the medical professionals, the tele-care evangelists, the patients and the business people.

### **4.2 Governance and the role of government**

In Estonia in general, tele-care has not been raised as an alternative to the classical medical and social care service provision. Tele-medicine or tele-monitoring has so far not been prioritized in any governmental development plans so the positive background that supports the establishing of such services is largely lacking. The ability of The Ministry of Social Affairs to pipeline different initiatives is also not high and therefore long-term solutions such as the implementation of tele-care applications are often overshadowed by more urgent short-term matters. As in most other European countries, the harmonization of the EU tele-medicine directive with Estonian law has so far failed, also indicating a lack of legal framework for the provision of tele-medical services.

The state is however a key enabler and also a key barrier to the matters related with tele-care, mostly because of its key position in the funding-related issues. External funding (such as EU) is available for pilots and testing, but when it comes to long-term service provision, the role of the state promises to be a crucial one nevertheless. The lack of policy prioritization makes the question of funding especially acute in the case of tele-care related issues and thus the current chapter will concentrate on the monetary relation of the state and innovative care applications such as tele-care.

Among the key problems in instituting care-sector innovation in Estonia is the internal division of care services funding. In Estonia, the healthcare and the social care funding are two completely different systems, the first managed and financed by the central government mostly through Estonian Health Insurance Fund (EHIF), and the second via the local municipalities. For classical services, this system has held up, however as many technological solutions have started to bridge these two fields of care, the central logic embedded in this division is clearly causing problems. A good instance of this is the DREAMING project which is positioned in the exact touching point of the two systems and has already showed indication that it is eventually embraced by neither. Estonia is clearly lacking a holistic view on the integration of care services and although The Ministry of Social Affairs has undertaken the task of instituting an integrated care strategy, its development has been lagging at the Ministry for a while already.

In addition to the division of care being an important issue, the actual capacities of financing are of central importance as well. The following three sub-chapters will mostly concern with this topic.

#### **4.2.1 Role of local governments**

In the case of social care funding, in 1998-2010 the finances on the average came 97-99% from the municipalities and 1-3% from the end users themselves. According to the law, the municipalities are supposed to dominate here but they are chronically under-funded to provide social care services and thus this dominance is effectively also an indication of the low capability of the private sector to finance care services in the case the local municipality is unable to do so. In most municipalities, because of limited financing and understaffing the main criteria for selection of which services to support is the cost effectiveness of the service which needs to be proven very strongly to stand a chance at being included in the local municipality budgets. This is on the one hand a good incentive for both governmental and non-governmental organizations to organize pilot studies on technology use that aims towards proof of effectiveness. At the same time, the utmost importance of the effectiveness criteria is also an important barrier because in most cases in Estonia, it is still much more feasible to employ manual labour instead of technology, e.g. in the form of using home visits to the elderly. This because even if the technology proves cost-efficient in the long run, the initial investment in this technology has thus far been mostly seen as way above the budget capabilities of the municipalities. In the majority of the Estonian municipalities, the situation concerning deployment of innovative solutions can therefore best be described as a stalemate – not that they don't wish to, but just not right now, as there are no funds.

This problem is further enhanced by the smallness of Estonian municipalities. For a population consisting of just above 1.3 million people, having 226 municipalities (the biggest one Tallinn already has more than 400,000 people, making the average municipality outside Tallinn about the size of 4,000 people) renders it very difficult to achieve any economies of scale for any service that is more than just the very basic first level tele-medicine such as alarm buttons. There are several municipalities that offer this basic service and it can be considered one of the two actually operational sustainable tele-medical solutions on the Estonian market; the other being the family physician consultation telephone. Various projects have been introduced that attempt to implement ICT solutions on a more comprehensive level but none of them have been able to start operating without extensive external funding (usually EU). Nor have any of the more comprehensive services arrived at a feasible business model that promises self-sustainability. But the more progressive municipalities do keep on trying because the motivation to undertake such projects is still very much there, because such projects, even if they are only pilots, still enable the municipalities to provide better services, bring diversity into everyday work for professionals and also lead different municipalities to collaborate and exchange knowledge and experiences. In a few of the municipalities, the drive towards finding new projects to test out is therefore very much present.

#### **4.2.2 Role of central government**

In the healthcare segment, the drive is similarly towards cost efficiency and in some cases proof from either the local market or more often from projects done in the outside World have encouraged local activists to apply for a service to be put on the EHIF paid-for services list. In Estonia, before a new health service is added to the positive list of health services reimbursed from public funds, it must be accessed through a process led by the Estonian Health Insurance Fund (EHIF) but the actual readiness of the participants of this process (EHIF, the Ministry of Social Affairs and of the associations of medical professionals) to assess and support technological innovations has proved to be low. Often the activists compose project materials in the amount of a doctoral thesis but despite the efforts, the general reply to such initiatives states that the lack of current funds to implement the service would not allow EHIF to put it on the list despite the strong proof of long-term gains. Meanwhile, the political will to support different tele-care solutions on their journey to EHIF funding has drastically dropped under the resource constraints of recent years.

At the same time, as also apparent in the current study, there is an acute need to address the following issues:

- To integrate social care and primary healthcare systems
- To integrate ICT developments and social care systems
- To support the development of technology suitable for virtual health and social care services, either by financing it or advocating the idea by bringing together partners etc
- To update the training of social workers, developing courses on digital services as a possible future.

These issues can largely only be addressed by the state in a top-down approach. The state is actually properly incentivised to deal with the issues as well, because the current allocation of funds to hospitalization is indeed huge and this is a good example of an area where significant gains could be achieved through introducing of tele-care services. This potential monetary gain achieved from replacing hospitalization with other types of care (e.g. tele-monitoring, tele-care etc.) would not be a gain for the hospitals but for the society as a whole. But the initiative of the state to make a longer step into instituting tele-care services has nevertheless been low and the status quo of classical medical service provision has so far proved difficult to shake. Therefore, in general, it appears that although on paper and in strategies, innovation of services is considered an important point, the statements have not made it into actual practice yet.

### 4.3 Innovation diffusion

The following table will provide an innovation diffusion analysis based on the methodology framework in annex 1.

**Table 4 – Overview of innovation diffusion analysis**

<b>Selection of innovation diffusion attributes</b>	<b>Short discussion about applicability or references if appropriate</b>
Technology uniqueness	The technology of VIRTU and Dreaming projects is not unique, as they are provided by the international project co-ordinator. In case of Eliko the equipment and software have been developed in Estonia and are regarded rather cost-efficient by the developer in international comparison.
Compatibility	The general ICT-friendly environment has promoted compatibility with patient's values and norms, but in some cases (elderly) the inexperience and distrust towards such technologies is rather evident. However, as the small progress made in the first stages of VIRTU project shows, the fears of the elderly can be overcome with good training and ongoing support.
Complexity	In the case of the Dreaming project the technology was regarded as simple to use by the patient who was interviewed. Also the health care provider regarded it as rather simple with a clear user-interface and customer friendly application. The devices that are used in the VIRTU project are also regarded as easy to use both by care-personnel and elderly people. Also see sections "Medical professionals" and "Patients" below.
Reinvention	There is no significant possibility to adapt, refine or modify the technology by the adopters of Dreaming and Eliko technologies. Eliko regarded the simplicity of the technology as more important than the possibility to modify the user-interface. In the VIRTU project each used device can be programmed according to the users' needs and interests.
Risk	No special risks were identified during the interviews about the different technologies. In a broader sense, if a technology company (based on Eliko technology) sells the technology or the service then it cannot take the risk that something happens to the patient. A health care worker still has to be there as a mediator. There is no information regarding the harmfulness or riskiness of VIRTU video call technology. The user device is never installed in the user bedroom and the video camera is also in only when the user switches it on –

thus there should not be any ethical harm done either.

Knowledge required to use it	In the case of the Dreaming project, there is not much extra knowledge needed to use the technology (by the patient). In the case of VIRTU the technology is easy to use but basic knowledge on using technology is needed. That will be provided for all users during the installation of devices and there is ongoing support by care workers when needed. However, to provide a well-being TV service, the care personnel need to learn to provide the so called wellbeing TV: how to provide their service on a distance, for example giving instructions on exercises.
Augmentation/support	There are helping services available - in the case of the Dreaming project a technical specialist can be called by the patient in case of a technical problem. VIRTU: elderly can call Kuressaare Hoolekande SA and care personnel in case of a technical problem.
Opinion leaders, champions	See section “Evangelists” below about opinion leaders, who have promoted the adaption of innovations.
Boundary spanners	There is evidence of boundary spanning. People with significant social ties both inside and outside East Tallinn Central Hospital have been able and willing to link the organization to the outside world in relation to the particular innovation; capturing ideas from outside (e.g. coordination with Eliko, EU institutions, universities, eHealth Foundation etc.) Also in VIRTU the people interviewed among Estonian project partners could be called boundary spanners. They also see the VIRTU service as a pilot that could be spread to other municipalities and that similar technology could be developed in cooperation with a local telecommunications company – so there is more potential for spanning in the near future.
Structural determinants of innovativeness	The organization of East Tallinn Central Hospital is large, rather mature, functionally differentiated (divided into semi-autonomous departments and units), and specialized with foci of professional knowledge. But the organization does not have slack resources to channel into new projects. The workers themselves have been active in promoting innovations such as Dreaming and Eliko projects, which shows there is some decentralization of technology management in ETHC. In the VIRTU project there are three different organisations involved from Estonia, so it is a project partnership structure. Kuressaare Hoolekanne, that is the organisation providing the service for the elderly, has the required personnel and one worker will be employed specifically to provide services on the VIRTU channel and to develop it. However, the organisation, as others in the project, have scarce resources to continue developing and providing the service after the VIRTU project ends in spring 2013.
Absorptive capacity for new knowledge	ETHC (projects ELIKO and Dreaming) and VIRTU project in Estonia cannot be regarded as systemically or centrally able to identify, capture, interpret, share, reframe and recodify new knowledge in terms of tele-medicine and tele-care, as there are no such frameworks available (see also section “Evangelists”). Nor is such a framework in place on governing level (see section “Governance and role of government” above).
Need for change	There is a need for change as far as the the social and health care budget is under pressure due to the aging of population. Thus tele-care and tele-health solutions could be possibilities to ease the financial pressure by providing more efficient care. Local municipalities, which provide 98% of social services, feel budgetary tension, but seek solutions elsewhere than in technological innovation of services.
Capacity to evaluate	In the VIRTU project for example there is research planned for the whole

the innovation	time-span of the project. To evaluate the effect of the innovation they are conducting a life quality survey among all users, when they first start using the service and one year later. However, the research team is located outside Estonia and Estonian organisations do not have the expertise to design evaluations and thus local capacity to evaluate the innovation is low. Please also see section “Health Technology Assessment”.
Wider environment	Please see the section “Overview of Estonian health and social care system“ about uncertainties in wider healthcare, social –care environment.
Organizational structure	The ETCH (projects Dreaming and Eliko) and VIRTU project cooperation can be regarded as adaptive and flexible.
Leadership and management	There is no specific top management support in ETCH for the innovations of Dreaming and Eliko at the moment. There is support from the top management of the organisations involved in the VIRTU project. But those organisations are small.
Human resource issues	There were no significant problems with human resource issues (although the project was extra work for health care workers) as far as the Dreaming project was concerned. In case of Eliko two problems could be outlined – up to now there has been a lack of co-operation in testing the equipment (extra work for doctors) and the IT skills of doctors are low. In the VIRTU project there were no problems recruiting care specialists, because existing ones are sufficient and they were trained. See Governance barriers in the chapter of VIRTU case study.
Funding	Future state level funding has been regarded important in all the projects. In the case of Eliko the future funding is a problem, as the payment capabilities of patients are low and thus funding by EHIF could help to implement the innovation. As the Dreaming project is project-funded, the funding will stop when the pilot phase finishes. For VIRTU the future funding of the service and technology development is a problem, because the project is now funded mainly by the EU’s Central Baltic programme which finishes by spring 2013. There is minimum funding by local governments, but they will not have the means to pay for the service after the project ends. The state has not supported the VIRTU project in any ways. So far the project organisations are looking for ways to cooperate with telecommunications companies and for ways to make this service cost-effective – state-level funding and political support would be important to uphold such positive innovations in the archipelago areas of Estonia.
Feedback	In case of Dreaming, feedback has been gathered but the feedback module is concentrating on the assessment of impact on social issues. In the VIRTU project technical feedback is also gathered from technology adopters. However it is difficult to evaluate at this stage whether the feedback gathered is adequate or timely.
Adaption/reinvention	In the VIRTU project we saw local adaptations of the service. For example this technology will be also tested for primary care system, because in remote places it is difficult for the elderly or the sick to go to their family (general) physicians. There are no criteria for adapting such innovations state-wide. Please also see section “Governance and role of government” above.

## **4.4 The role of different stakeholders**

### **4.4.1 Medical professionals (hospitals)**

As discussed in the previous point, the incentives for hospitals to target the replacement of hospital bed-days with tele-medical applications is low as the revenue model of the hospitals for long-term care is based on EHIF funding per day spent in hospital. This is possibly an important one among the many reasons why the interest of hospitals to invest either time and/or money to implement new ICT-enabled monitoring services is weak. Although there have been positive cases, namely these of The East-Tallinn Central Hospital (ETCH) and Tartu University Hospital who have occasionally prioritized their innovative image as a means to stand out in the competition between hospitals, most other hospitals (especially these outside of Tallinn and Tartu) are very far from including tele-medicine in their service portfolios. Most likely, the information of such possibilities has not even reached these hospitals in the first place.

This corresponds well with the individual level of medical professionals. The IT-skills of Estonian medical personnel are often limited. This also means that the medical personnel are resistant towards using information systems and especially testing new ones. For many, it is seen as a disturbing additional obligation. Instead, doctors would much rather act in the field of pharmaceutical research or on medically more interesting topics. A good example comes from the Eliko case where the system has been test-ready for six months but the physicians have so far not been able to gather test-patients. Additionally, according to the EU legislation, doctors would be expected also to take the responsibility for the use of any healthcare related technological solutions. This further distances doctors from promoting such systems.

The medical personnel and the hospitals are at the same time key players in the market and little can be done without their support. Therefore the barriers of diffusion of innovation between the active few and the inactive majority would have to be torn down. Only then is it likely that tele-care as an approach can gather enough momentum to become widespread. This point will be elaborated under the conclusion of this chapter.

### **4.4.2 "Evangelists"**

At the same time, there are also many innovation-prone medical professionals who have taken on the task of fighting for the popularization of tele-medicine as a mindset. The group of tele-care activists is a relatively tight-knit one as the society is small and people tend to know each other well. Despite the small number of such activists, their lobby work both domestically and abroad is largely behind the import of such pilot cases as presented in the course of this study in the first place. Estonian partners are taken seriously by various European projects and invitations to participate in different programs are received on a weekly basis. Estonians have also been able to become full-fledged partners in various international programs instead of being just a primary data correspondent. Activities are also gaining more momentum domestically and the institutions in Estonia that have a more progressive attitude towards tele-medicine are also more and more able to tap into the global and the European communities on that issue.

General know-how on ICT-based services as well as specific know-how about implementing such services in healthcare is very much present in Estonia, albeit not any more in a centralised form. The Estonian eHealth Foundation, that used to be the leading proponent of tele-medical services in Estonia, has been weakened after recent political events. With the weakening of the eHealth Foundation, the focal point of such projects together with some of the key people have shifted from the Estonian eHealth Foundation to the Institute of Clinical Medicine at Tallinn University of Technology which has the ambition to become the leader in the field of tele-medicine in Estonia in the mid-term future.

### **4.4.3 Business approach**

In the discussion of establishing tele-care services in Estonia, the business community has mostly stayed in the background. It seems likely that while the few proven sustainable concepts have still immature business-plans investing into the unknown may not be as tempting. Also, it is clear that



the Estonian market size and capitalisation is not sufficient to cover even the first round of development costs. All successful technological health care innovations have been brought into the market by companies from outside of Estonia.

However, as Estonian products are increasingly being taken more seriously and technology is moving forward fast, the time when some of the more comprehensive tele-medicine projects are deemed feasible may well be nearing. This creates an opportunity for entrepreneurs who may attempt to penetrate the market with new tele-care applications. There are some like Eliko which already develop services using partly private funding. For them too, finding interested investors has been a problem due to the small size of the Estonian economy and the difficulties in achieving economies-of-scale. The opportunity to enter the markets of close-by welfare societies such as Sweden and Finland does offer valid export opportunities for tele-medicine services that may in the short- to mid-term future be competitive enough to gather substantial investment.

Know-how is really present in Estonia and the cost of providing services from Estonia would be up to ten times lower in comparison to the above markets. In fact, the likelihood of this seed investment coming from the same nearby target markets is quite high as Finnish and Swedish companies are well accustomed to investing in the Estonian market. Gathering the attention of such potential investors could be a motivational factor for the developments in Estonia, as has already been the case for Eliko.

Although on a more holistic level, such entrepreneurial approach to tele-care may not be coordinated and the diffusion of tele-care applications in Estonia therefore promises to be less uniform than what many of the visionaries had hoped for, a general increase in the awareness of tele-care products among business people, policy-makers, medical professionals and most importantly among the patients would certainly be a positive development.

#### **4.4.4 Patients**

In the discussions about tele-care and the prioritizing of tele-care, the patients are probably the largest main stakeholder group that has stayed completely in the background. At the same time, patients stand to gain most out of these applications. This relative invisibility of the patients is most likely a result of unawareness of the prospects associated with innovative care provision but also underdeveloped movement of patient rights.

The patient group that is most connected to the particular type of service are the elderly. However, the sources of information for the elderly are scarce. Much of the information they have about medical applications likely comes from people in the same age group who ultimately get it from the medical professionals. Thus the patients are reflexions of the attitudes of the professionals who are generally similarly unaware of tele-care possibilities.

At the same time, when some knowledge diffusion is initiated, the patients may actually be an important influencing group to lead institutions and the state to support care innovation. Already, many of the participants of the DREAMING project have for example expressed their regret that they will not be able to keep the service after the trial period ends. Although, coming from a fraction of the total patient base, such behaviour may be taken as an indication of the interest of the patients on the topic. Hopefully, therefore, in time, the Estonian patient will be able to gain both courage and enough information to step into the discussion and start demanding better services.



## **5. Conclusion**

### **5.1 Impact assessment**

The current study may paint a relatively bleak picture of the level of tele-care services in Estonia: with only two proven operational very basic level tele-medicine applications and a few tele-care projects in pilot or development stages, the field appears to be largely underdeveloped. At the same time, the concept of innovatively through ICT provided care has slowly started to spread. The group of distinguished activists, many of whom were also interviewed in the course of this study, have worked hard to introduce the idea that things can be done differently from the current model of care service provision. The inclusion of Estonians in international projects is good proof of that and although the pilot studies currently in progress may never reach a sustainability stage, they have been purposeful in terms of widening the thinking of the participants and these around them to increase the size of these who are positively aware of the tele-care possibilities. The main impact of the already finished or in progress projects is therefore that of a seed and basis for further developments.

### **5.2 Drivers and barriers**

There are several drivers and barriers for the implementation of tele-care and tele-health patient monitoring services. A number of important drivers and barriers will be provided below as a summary-list:

#### **Drivers:**

- International initiatives (VIRTU and Dreaming are international projects)
- Estonian ICT-friendly environment and thrive towards innovation in general
- Evangelist/enthusiasts who have initiated the adoptions of such technologies in the sector
- The possibility to use the innovation as a marketing-approach
- Pilot-projects being a learning material for future projects

#### **Barriers:**

- Low integration of health and social care systems
- Small market combined with relative lack of financing from the state
- No active role of central government in supporting the development of technology suitable for virtual health and social care services
- Underdeveloped health technology assessment practices
- Lack of cooperation between municipalities (in case of social-care)
- Low integration of ICT developments and social care systems
- Low/varying internet connection speed in local areas
- Low interest in tele-health and tele-care technologies by medical personnel
- No incentives for hospitals to implement home-monitoring (counter-productive payment policies)
- Limited IT-skills of Estonian medical personnel on average
- Financially capable local investors very difficult to find

### **5.3 Future developments and policy implications**

The future of tele-care is much determined by the ability of the growing group of informed and positively minded participants (the evangelists) to spread this mindset further outside the borders of their stakeholder segment.

With the inclusion in new international projects (such as eMedic or Regional Tele-medicine Forum) and the frequent requests to participate in projects, the flow of case-by-case applications will continue in the future. Then, the question is largely about how well the results can be communicated to the other stakeholders. The positive progress may be initiated from the side of any of the other main stakeholder groups, however ideally, the positive cycle would be initiated

through a significant change in the national (EHIF) reimbursement policy. As this has proved to be very difficult to lobby for, other approaches need to be considered as well:

- Raising awareness among individual doctors and the medical institutions to initiate the cycle on the side of the medical professionals. Selling the concept there has the potential to influence the attitude of medical associations which are key stakeholders to the EHIF and Ministry of Social Affairs. The goal might be a dedicated programme for the support of implementation of novel health-care services and technology.
- Raising awareness among patients to initiate the cycle on the very grass root level with the hopes that patients would be able to influence their physicians. Although a long shot, some amount of patient awareness raising would probably need to be done anyway to convince them that the use of tele-care is actually much to their own benefit in the first place. Convincing patients to increase their out-of-pocket payments to get a better care service may have been very difficult a decade ago, but with the increasingly well off middle class, instituting such services without the involvement of the state may be a viable option. It has already worked on the alarm button case as some of the alarm buttons in Estonia are rented out by a private enterprise.
- Raising awareness among the business people to initiate the cycle on the innovation creation side. Business people would best be able to get involved in the actual development of the services and the business models that are then lobbied for either government support or the support of the clientele. Eliko is a good example of such approach, proving that it can be done.

An additional option would be significant developments on the EU level. The topic has been prioritized there already, but the effects of this prioritization are not to be seen as directly on the national level yet. However, with additional legislative changes and additional funding directions, the support to local activists would no doubt be significant. Dissemination of proven technologies and solutions is vital for large scale success (this also requires trustworthy clinical evaluation studies). It is critical to support the scale-up of pilot-stage developments into mainstream service provision.

#### **5.4 General conclusion**

Estonia is a society in transition and slowly but steadily catching up with the old Europe in terms of living standards and people's priorities. This transition is creating a setting in which there appears to be an important place for medical service innovation such as the introduction of wide-spread tele-care applications. The Estonian society is relatively ICT-friendly and the will to evolve seems to be present, making Estonia a potential future tele-care champion, as seen already in other fields of ICT-enabled public sector service provision. Having a nation-wide electronic health record base system (with a significant amount of users) also provides a necessary precondition for moving on to tele-care and tele-health practices. However, the Estonian society is also increasingly aging, a trend which reduces the tax-base and increases the number of people suffering from aging-related and chronic diseases. The economic factors are also not the most favouring and future is seen by many as uncertain and ambiguous. Nevertheless, as a conclusion to this study, at least in the care provision service, there is a potential new direction which may help Estonia meet these challenges.

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## ANNEX 1 – INTERVIEW METHODOLOGY AND SCHEDULE

### ESTONIAN FIELD WORK METHODOLOGY AND PRELIMINARY INTERVIEW SCHEDULE

Desk research and personal interview methods will be used for data collection. The table below presents overall case-study framework

Data	method	Person responsible for technology equipment	Doctor (or other healthcare professional)	Patient	Person responsible for management of project or the implementing organization	Person responsible for policy-making, government officer
General background of project	desk research of official sources, project plans, budgets and other documents provided by organizations of case studies, site visits	x*	x		x	
Economic aspects (incl HIA)	personal interviews, site visits	x	x	x	x	x
Innovation diffusion aspects	personal interviews, site visits	x	x	x	x	x
Governance aspects	personal interviews, desk research of government sources and strategies	x	x		x	x

\*marked with a cross if the question is suitable to ask from the specific interviewee

Below is an overview of Estonian case studies.

<b>Project, case study</b>	Dreaming <a href="http://www.dreaming-project.org/">http://www.dreaming-project.org/</a>	ELIKO (Competence Centre in Electronics-, Info- and Communication Technologies established in 2004 by Tallinn University of Technology and private companies as an independent state supported research organization).	VIRTU project <a href="http://www.virtuproject.fi">www.virtuproject.fi</a> Virtual elderly care services on the Baltic islands.
<b>Description</b>	Monitoring and Alarm Handling services. These are provided through a combination of medical devices and environmental sensors and a powerful Decision Support System which is able to detect risk situations based on the specific profile of the individual user or of the category to which the user belongs and on any combination of sensors measurements including trends over a certain period of time.	The project involves a tele-care system prototype, which will be tested at East-Tallinn Central Hospital. The aim is to connect the patient, hospital, emergency care provider (if needed) by sensors for patient monitoring, thus the system integrates several institutional and information systems.	Project is an example of personal integrated assistance using videoconferencing solution. A pilot deployment project to test the market with a goal to become sustainable by the end of 2013
<b>Goal of project</b>	The main aim of DREAMING project is keeping elderly people in their home environment as long as their physical and mental conditions allow this.	The main goal of particular tele-medicine solution is to attract (new) patients in conditions of competing healthcare service market. Important is the visit time reduction for practicing doctors.	The purpose of VIRTU project is to support and complement existing services and advance homecare services, to promote wellness of the elderly.
<b>Other information</b>	Tele-health	Tele-health	Tele-care
<b>Project phase</b>	2009 – April 2012	Expected to start in the end of 2011	August 2011 – April 2013
<b>Local or international</b>	International project; research focus on local Estonian implementation	Local (Project partners include public and private research organizations, software companies and the Estonian 3rd largest hospital)	International project; research focus on local Estonian implementation
<b>People to be interviewed:</b>			

**1 - Person responsible for Technology**

Name	-	<b>Alar Kuusik</b>	-
Position	-	Technology side project manager	-
Name of the institution	-	ELIKO	-

**2 – Healthcare professional**

Name	<b>Kai Sukles</b>	-	<b>Tiiu Tammsalu</b>
Position	Doctor	-	Manager
Name of the institution	East-Tallinn Central Hospital	-	Foundation Kuressaare Hoolekanne (social care institution of Kuressaare municipality)

**3 - Patient**

Name	<b>Patient</b>	-	-
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**4 - Project manager / Organization**

Name	<b>Marko Parve</b>		<b>Anneli Rasu</b>
Position	Head of Medical Technology		VIRTU Project manager in Estonia
Name of the institution	East-Tallinn Central Hospital		Saaremaa Enterprise Centre

**5 – Policy-level**

Name	<b>Pille Saar</b>	-	<b>Maarja Kraiss</b>
Position	Health Policy Department	-	Head of services on the Elderly and People with Disabilities, Social Welfare Department
Name of the institution	Ministry of Social Affairs	-	Ministry of Social Affairs

### Other policy-level interviews

Interviews with no direct connection with the above-discussed case-studies, but these people have been connected previously and play a role in wider IPHS and ICT context (same interview schedule apply, organization and policy-level questions).

Name **Peeter Ross**  
 Position Expert at E-Health Foundation, Former Member of Board at East-Tallinn Central Hospital  
 Name of the institution eHealth Foundation, East-Tallinn Central Hospital

Name **Madis Tiik**  
 Position Former Member of Board of E-Health Foundation  
 Name of the institution E-Health Foundation, Tallinn University of Technology

### Interview Structure

Below is the preliminary interview structure. The relevant questions, aspects, discussion points are outlined according to SIMPHS2 field work research protocol distinction: HIA and economic aspects, innovation diffusion, governance. The relevant information and questions for Estonian cases are marked with “x” in case each interviewee applicable. On the basis of that framework the relevant interview schedules of every specific interviewee can be compiled (extracted) easily.

### INTRODUCTORY QUESTIONS

General overview	Question	Tec h	Pati ent	Do c	Or g	Pol
	Who and what initiated the project?	x		x	x	
	How is it operationalized? (details on service delivery and data integration/management)	x	x	x	x	
	What is expected from the project (as a whole)?	x		x	x	
	Are there plans from the outset to measure the impact of the project on health outcomes and/or in economic terms?	X		X	X	
	Are you aware of such projects in the field of tele-health and tele-care?		x			x
	How can such initiatives/innovations generally benefit the patient?		x	x		

## ECONOMIC AND CLINICAL ASPECTS OF THE PROJECT\*

<b>Economic and clinical aspects</b>	<b>Question</b>	<b>Tech</b>	<b>Patient</b>	<b>Doc</b>	<b>Org</b>	<b>Pol</b>
<b>Costs</b>	What are the costs generally?				x	
	What resources have been invested?	x	x	x	x	
	Expenditure per year?	x			x	
	Length of project?				x	
	Number of patients, services? / Planned number of patients, services?	x		x	x	
	Which administrative costs incurred?			x	x	x x
	Costs of equipment development?			x		
	How are treatment costs measured?				x	x
	Training of staff, time and costs?					
<b>Incomes, benefits</b>	Will there be monetary savings on treatment/care costs with implementing the innovation?				x	x
	Did the innovation start with a budget (public? Private?) and is the allocation of resources adequate and continuing?			x		x x
	Are there any other benefits?			x	x	x x
	Patients' time used? Relative to ordinary treatment?				x	x
<b>Transferability issues</b>						
External validity	Are the conditions during the trial realistic in practice?			x	x	x x
	Cost function: To what extent does the cost per patient vary with number of patients?			x		x x
<b>Clinical effectiveness</b>	Please describe, which measures of clinical effectiveness are in place?				x	x
	Were there any effects on mortality?				x	
	Were there any effects on morbidity?				x	
	Were there any effects of the physical health?				x	

	Were there any effects of the mental health?			x		
	How was the quality of life improved?		x	x		
	What were the behavioural outcomes (e.g. exercise)?		x	x		
	Did the utilization of health services change and to what extent?			x	x	
	Can results be transferred to other diagnostic groups or other patient groups?			x	x	

<b>Evaluation / clinical effectiveness</b>	What is the official evaluation methodology?				x	
	What data is used for evaluation of such project?	x		x	x	
	How is data collected, gathered?	x		x	x	
	Number of interactions per day?	x	x	x	x	

**INNOVATION DIFFUSION ASPECTS (on the basis of Greenhalgh et al 2004 and SIMPHS2)**

<b>Innovation diffusion attributes</b>	<b>Question</b>	<b>Tech</b>	<b>Patient</b>	<b>Doc</b>	<b>Org</b>	<b>Pol</b>
<b>Background</b>						
Role of ICT	What is the role of ICT in the project?	x			x	
The adoption /assimilation process	Could you please tell us about the adoption process of the project from the health professionals and patients perspective? (adoption by individuals)		x	x	x	
	Could you please tell us about the adoption process of the initiatives from the organizational perspective?				x	
Communication and influence (diffusion and dissemination)	Could you please tell us how were these initiatives launched? Who made the proposal?	x		x	x	

	To what extent are these initiatives consolidated within your organization? Any attempts to facilitate the consolidation of these initiatives?			X	x	
The inner (organizational) context	Could you tell us what were the main drivers and barriers within your organizations to launch these projects?	x		X	x	
	What future challenges will you foresee to consolidate these initiatives?			X	x	
The outer context: interorganizational networks and collaboration	What about the external factors, what are the main drivers and barriers?	x			x	x
<b>Technology</b>						
	How is the technology unique from other similar ones? Alternatives?	x		x		
<b>Innovation</b>						
Relative advantage	Does the innovation have a clear, unambiguous advantage in either effectiveness or cost-effectiveness? Please describe the advantage.	x		x		
Compatibility	In your opinion, Is the innovation compatible with the intended adopters' values, norms, ways of working and perceived needs		x	x		
Complexity	Is the innovation perceived as simple to use? Please explain why do you think so.	x	x	x		
	How would you describe the user-interface of the innovation?	x	x	x		
Trialability	Can the intended users experiment the innovation on a limited basis?	x		x		
Observability	To what extent are the benefits of the innovation visible to intended adopters?	x	x	x		
Reinvention	Can and if yes, how can the potential adopters adapt, refine or otherwise modify the innovation to suit their own needs?	x		x		

Fuzzy boundaries	Does the innovation have a hard core (the irreducible elements of the innovation itself) and a soft periphery (the organizational structures and systems required for the full implementation of the innovation)?	x		x	x	
Risk	Does the innovation carry a high degree of uncertainty outcome that the patient could perceive as personally risky? Please explain.			x		
Task issues	Is the innovation relevant to the performance of the intended user's work and how does it improve task performance?		x	x		
Knowledge required to use it	Which special knowledge and capabilities are required of adopters to use the innovation?	x	x	x	x	
Augmentation/support	What kind of helping services and implementation support are there for carers and patients?		x	x	x	
	Who are providing support services, disseminating knowledge and capabilities needed? ( <i>links to dissemination network structure</i> )			x	x	
<b>Adoption by individuals</b>						
General Psychological Antecedents	How are the patients selected or is there some kind of volunteering system?		x	x		
	Were you happy to participate in the program?		x			
Context-Specific Psychological Antecedents	Does the innovation meet an identified need of the intended adopter? If yes, which need?		x	x		
Meaning	Does the meaning attached to the innovation by individual adopters match the meaning attached by top management, service users, and other stakeholders? Open discussion.	x	x	x	x	
The adoption decision	Is the decision to adopt a particular innovation independent of other decisions? Why did you agree to participate?		x	x	x	



Concerns in preadoption stage	Are the intended adopters aware of the innovation? Are they aware how the innovation would affect them personally, for example, in terms of costs? How is this information communicated to them?		x	x	x	
Concerns during early use	Do the intended adopters have continuing access to information about what the innovation does and to sufficient training and support on task issues? How is this organized?		x	x	x	
Concerns in established users	Will the intended adopters be provided adequate feedback about consequences of adoption? And do the intended adopters have sufficient opportunity, autonomy and support to adapt and refine the innovation to improve its fitness of purpose? How is the feedback organized?	x	x	x	x	
<b>Diffusion and Dissemination</b>						
Opinion leaders	Could any opinion leaders be identified, who would promote the adoption of the innovations?			x	x	
Harnessing the opinion leader's influence	Have such opinion leaders been identified? Could they be described as monomorphic (influential for a particular innovation only) or polymorphic (influential across wide range of innovations)?				x	
Champions	Are key individuals in their social network willing to support the innovation? (maverick, transformational leader, organizational buffer, network facilitator)				x	
Boundary spanners	Does the organization support boundary spanning (people with significant social ties both inside and outside the organization are able and willing to link the organization to the outside world in relation to the particular innovation; capturing ideas from outside)?			x	x	

Formal dissemination programs	Is there a planned dissemination program used?	x			x	
	To what extent are program organizers taking full account of potential adopters' needs and perspectives, with particular attention to the balance of costs and benefits for them?	x			x	
	Are different strategies built to different demographic, structural and cultural features of different subgroups?				x	
	Which communication channels do you use?				x	
	Which evaluation and monitoring methods of defined goals and milestones are used?				x	
<b>System Antecedents for Innovation</b>						
Structural determinants of innovativeness	Is the organization large, mature, functionally differentiated (divided into semi-autonomous departments and units), and specialized with foci of professional knowledge, does it have slack resources to channel into new projects, does it have decentralized decision making structures?				x	
Absorptive capacity for new knowledge	Is the organization systemically able to identify, capture, interpret, share, reframe and recodify new knowledge; to link it with its own existing knowledge base; and to put it to appropriate use? How has this been achieved?				x	
	How is knowledge transfer supported at policy-level?				x	x
<b>Linkage among components of the model</b>						
Linkage at the development stage	Is the innovation centrally developed (eg research centre)? If yes, how are the potential adopters engaged in the innovation development process?	x	x		x	

<b>System readiness for innovation</b>						
Tension for change	Could a tension for change be identified to support the innovation? What kind of tension? ( <i>helping questions will be added here</i> )			x	x	
Innovation-system fit	Is the innovation in accordance with the organization's existing values, norms, strategies, goals, skill mix, supporting technologies and ways of working?				x	
Assessment of implication	To what extent have the the implications of the innovation fully assessed and anticipated? How has this been done?			x	x	
Support and advocacy	Have there been any opposition for the innovation adoption? By whom and why?			x	x	
Capacity to evaluate the innovation	How would you evaluate your organizations skills and capacity needed to monitor and evaluate the impact of the innovation?	x		x	x	
<b>The outer context: inter-organizational network and collaboration</b>						
Informal inter-organizational networks	How does project inter-organizational collaboration work? How are the roles and functions divided?	x		X	x	
Intentional Spread Strategies	Are there any intentional spread strategies in place? If yes, please describe them.	x			x	
Wider environment	What are the uncertainties in wider healthcare, social –care environment?	x		X	x	
<b>Implementation and routinization</b>						
Organizational structure	Adaptive and flexible organization structure?				x	
Leadership and management	Is there top management support for the innovation?				x	
Human resource issues	Were there any problems with recruiting ICT and health care specialist?				x	

	Should the state promote the schooling of ICT and healthcare specialists?				x	x
Funding	Will there be ongoing funding?				x	
	Do you regard state-level funding important for such initiatives?			X	x	x
Feedback	Is there any adequate and timely feedback gathering planned?	x		X	x	
Adaption/reinvention	Will it be adapted to the local context?	x		X	x	
	Are there any criteria and what are the criteria for adapting such innovations state-wide?					x

## GOVERNANCE ASPECTS

		Tech	Patient	Do c	Or g	Po l.
<b>General ICT context in Estonia</b>	What role has the greater ICT context in Estonia played?	x			x	
	Could you describe the benefits and barriers of the ICT context in Estonia?	x			x	x
<b>Government support for IPHS and patient monitoring</b>	In your opinion, has the state provided a sufficient environment for developing such innovations?	x			x	x
	What are the problems of the environment, how could it be developed?	x			x	x
	Has there been any state or local government support for the project? If yes, in what form has this support been (financial, consultation, linkage with national ICT systems)?				x	
	Do you see any possibilities for state / local gov support in the future? (5 years, 10 years)				x	x
	What kind of financial help is needed? In what form should it be? Reimbursement, project-based funding? Fee-for-service?	x			x	x
	What kind of central consultation / knowhow / standards would help the innovation development and	x			x	x

	dissemination?					
	Please evaluate the government's capability and readiness to offer central consultations and/or financial support?					x
	Do you see any other sources of financing?	x			x	x



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## **Abstract**

This study presents and discusses the status of integrated personal health systems (IPHS) in Estonia. It aims to illustrate through case studies the patient and health monitoring systems that are available, the level of implementation of these systems, the impact they have on the general socio-economic context, as well as their cost-effectiveness where applicable. The analysis presented in this report is based on interviews with key experts and stakeholders from Estonia and a substantial secondary data collection.

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