eHealth strategy and implementation activities in Finland

Report in the framework of the eHealth ERA project

Authors:

Persephone Doupi, Päivi Hämäläinen, Pekka Ruotsalainen - STAKES

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http://www.ehealth-era.org
era@empirica.com

About *eHealth ERA* and this report

This report is the outcome of research in the context of the eHealth ERA project (Towards the Establishment of a European Research Area). The project is implemented by empirica GmbH (co-ordinating partner, Germany), STAKES (Finland), CITTRU (Poland), ISC III (Spain), CNR (Italy) as well as EPSRC and Imperial College (United Kingdom), based on a Coordination Action contract with the European Commission.

The European Commission, Directorate General Information Society and Media, supports this project to contribute towards greater transparency across Member States and other participating countries on eHealth strategies as well as innovation-oriented research and technology development (RTD) initiatives, including the coordination of Member States' eHealth strategy formulation and implementation. Thereby the project aims at fostering the establishment of an effective European Research and innovation Area (ERA) in eHealth. All project results are available on the internet and can be accessed at the *eHealth ERA* website: www.ehealth-era.org.

The status of activities described is generally August 2006.

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Contact

For further information about this country report or the eHealth ERA project, please contact:

STAKES	eHEALTH ERA
National Research and Development Centre for Welfare and Health (STAKES) Lintulahdenkuja 4, 00531 Helsinki, Finland Fax: +358 (09) 3967 2443 Päivi Hämäläinen paivi.hamalainen@stakes.fi	***eHealth ERA*** c/o empirica GmbH Oxfordstr. 2, 53111 Bonn, Germany Fax: (49-228) 98530-12 era@empirica.com

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Executive Summary

The development and implementation of eHealth solutions in Finland is heavily influenced by the strongly decentralised Finnish health care system — the 430 municipalities are each responsible for providing and developing health services for their residents. Moreover, specialized care (secondary and tertiary care) is provided in public hospitals, of which 5 are university hospitals. Public health provision is supplemented by private health care services.

The Ministry of Social Affairs and Health established its first Strategy for the Utilisation of Information and Communication Technologies in Welfare and Health in May 1996, as part of Information Society policies aimed at facilitating information transfer between organisations. Already then, the strategy was built around the principle of citizen-centred, seamless service structures. Citizens and patients were envisioned as informed and participative agents in the healthcare delivery process. The strategy was updated in 1998, placing specific emphasis on several issues, including: the adoption of digital patient and client records in all levels of healthcare and social services, combined with nationwide interoperability between distributed legacy systems; support of high level security and privacy protection, allowing citizens access to their patient records via the Internet, as well as maintenance of a personal digital health and welfare record; and, improved management of service chains.

In 2002, as part of the National Program for securing the Future of Health Care, the Government decided that “a national electronic patient record” should be introduced by the end of 2007. The strategy for the national EPR was published in January 2004. In addition, the national project to develop the use of ICT in social services started in 2003. In 2005, a plan to build a national EHR archive was added to the national policies under the umbrella of Prime Minister Matti Vanhanen´s Information Society Program. The Finnish eHealth roadmap was published in January 2007. The starting point has been the implementation of the EU eHealth Action Plan.

Infrastructure: Health information is transferred using broadband networks managed by commercial tele-operators. There is no specific eHealth network. Instead secure commercial communication channels (e.g. VPN-channel, Secure IP-Channel) are typically rented for healthcare purposes. Hospital regions and many municipalities have also implemented closed intranets, mainly based on VPN-technology. Secondary care hospital intranets are connected

together either via VPN/ATM channel or via the Internet. The National Insurance Agency, KELA has its own nationwide ATM-network. There are also two VPN-based pharmacy networks. Private service providers have institutional (virtual) sub-networks. All service providers are connected to the Internet.

Health Information flow: On the national level there is electronic communication between KELA and pharmacies for drug reimbursement, between KELA and service providers for the ordering of drugs and materials and between service providers and the National Research and Development Centre for Welfare and Health (STAKES) for national statistical data collection.

Regional information transfer is based on regional directory services and interoperable systems, which are already operational in 6 of the 21 hospital regions. In the eastern part of the country a common information system (KAAPO-system) is used as the basis of regional information transfer, while the TELLAPPI-network covers the whole northern part of Finland. 11 of the 21 hospital regions are using a common online certification service. The most commonly used communication standards in Finland are derived from the HL7- family (at present the HL7 CDA R2.x family standards). EDIFACT is used in some applications but newer applications are using XML. For security purposes messages are placed in a SOAP-envelope. eHealth services used on a regular basis include regional level telemedicine services such as transfer of images, e-Referrals, laboratory results and care summaries between primary and secondary care, e-Consultations, billing and e-Booking.

Temporary legislation on implementing seamless service chains was introduced in 2000. Since then a Ministerial WG prepared permanent legislation and another Ministerial WG has defined the national ICT architecture and supporting services. These WGs finalised their work in 2005, and have since steered the respective implementation processes. The legislation on electronic handling and archiving of electronic health care records and the legislation on ePrescriptions were accepted by the Parliament in December 2006 and placed in effect in 2007.

Electronic Patient Records (EPR) are commonly used. 96% of all primary care health centres use EPRs as the main method for medical documentation, and almost all (20 of the 21) hospital districts and 89% of the private sector service providers currently use an EPR system at least to some extent. The national requirements, such as standards (CDA R2, DICOM, ISO/OID), content and structure of EPRs, as well as data security and data safety guidelines are currently being implemented in the existing EPR systems. Semantic interoperability is included as a target in the EPR project. The interoperable core data set is presently in the early implementation phase. The headings of the EPR and its metadata will be harmonised as

well as the main data types. STAKES maintains the code server where all relevant codes and classifications are stored and from which they can also be downloaded electronically.

A national ePrescription pilot was launched in 2002. The piloting of the system took place in 2004-2006. The permanent ePrescription legislation is now in effect. The system is based on a national ePrescription database hosted by KELA, strong authentication and a smart ID-card for professionals with e-signature systems and SSL-secured messages from health care providers and pharmacies to the database.

A national health portal for citizens is being constructed. The prototype of the portal is demonstrated at a public website (www.tervesuomi.fi). The portal will be finalised during 2008. There are also several municipal and hospital portals with general information for citizens as well as health problem/disease specific portals maintained by patient associations, or other third sector organisations. The major portal for health professionals is TERVEYSPORTTI (www.terveysportti.fi), maintained by the Finnish Medical Society Duodecim. A decision support system for professionals has been built and is being offered as part of the TERVEYSPORTTI services.

For reasons of practicality and economy the information management system in Finland is being organised at least in part at national level. At the heart of the Finnish ICT infrastructure for social and health care will be a national digital archive for patient documents. In addition, there will be one logical connectivity centre for eHealth communication. Exchanging data between organisations will be conducted on a national basis and not regionally. The service will be maintained by the Social Insurance Institution (KELA). The legislation which obliges all health organizations to join the national IT architecture for health came to effect in July 2007. The system should be built by the end of 2011. There will be a national PKI system for health care professionals. The system will be administered by the National Authority for Medico-legal Affairs. Citizens will be better able to access their own data and monitor its use through their PKI-based Citizen Certificate in their Smart ID-cards. This card is managed by The Population Register Centre (www.fineid.fi).

In the new legislation, the Ministry of Social Affairs and Health has a stronger role in steering eHealth Activities in close cooperation with other national authorities such as the Social Insurance Institution (KELA) and the National Authority for Medico-legal Affairs and the National Research and Development Centre for Welfare and Health (STAKES). There will also be a permanent national advisory board for eHealth activities. The members of that board, representing different interest groups will be nominated by the Government (23).

1 Basic facts

Finland is a Nordic country with a population of 5,2 million inhabitants. In terms of its surface area it is the seventh largest country in Europe but the population density is only 15 inhabitants per km^2. In the eastern and the northern parts of the country the population density is especially low and distances are great. The country became independent in 1917 and has been a member of the EU since 1995.

2 Healthcare System Overview and National Level Health Goals

Health care services in Finland cover all people residing in the country. The constitution states that public authorities shall guarantee for everyone, as provided in more detail by an Act of Parliament, adequate social, health and medical services and the promotion of the health of the population.

According to a recent report on Finland by the OECD (1), the Finnish health system performs well. Finnish people are more satisfied with their healthcare than people in many other OECD countries. Health spending is low-cost compared with the GDP (7.4% in 2004). The Finnish health care system, like in so many other countries, now faces severe challenges. These challenges include: technological changes, which are increasing the costs of hospital services and prescribed medicines; rising patient expectations; and a rate of an ageing population, which will be much more rapid than in other European countries between 2010 and 2020.

There were 440 municipalities in Finland in 2005. Many Finnish municipalities are very small with less than 2000 inhabitants. Nevertheless, municipalities have by law the primary responsibility to arrange social and health care services for the people living there. These include both primary and secondary care. Services are provided either by the municipalities themselves or in cooperation with other municipalities, or through purchasing of the necessary services from private or public providers. The obligation to arrange specialised care is carried out by the federations of the municipalities. The responsibility of the municipalities is outlined in *the Primary Health Care Act (1972)* and in *the Act on Specialized Medical Care* (1062/1989). The municipalities have a strong decision making power when arranging services, which also extends to the utilisation of information and communication technology (ICT).

Public health services are mainly financed by the public authorities through taxes. Municipalities are primarily responsible for the financing of health care and have the right to collect taxes for this purpose. The State participates by paying a general, not earmarked, subsidy to the municipalities, which averages 20% of the health care costs. The subsidy payable to a particular municipality is mostly dependent on the age structure of its residents. Other criteria taken into account are the unemployment rate, number of pensions for the disabled (assesses the overall state of health) and the population density. Patient fees cover around 9% of the public health care costs. (2)

Alongside the municipal system, private and occupational health service providers also offer health care services. The compulsory *Sickness Insurance Act* (1963) provides daily allowances in case of sickness and also in the case of maternity, paternity or parental leave. It also refunds part of the costs for medicines and transportation, as well as part of the costs for private sector services. All residents are insured on an individual basis, even children. Residency in Finland is defined by *the Act concerning Residence- Based Social Security* (1993).

Each one of the 251 Finnish primary health care centres is owned by a single municipality or by several municipalities together. Primary health care is provided in the health care centres. A health care centre can be defined as a functional unit or as an organisation that provides primary curative, preventive, and public health care services to its populace. It is not necessarily a single building or a single location where health care is provided. The number and type of personnel in each health care centre depends on the size of the population it serves and on local circumstances. The staff consists of general practitioners, sometimes medical specialists, nurses, public health nurses, midwives, social workers, dentists, physiotherapists, psychologists, administrative personnel, and so on. All are employed by the municipality or the municipalities. The number of inhabitants per health care centre doctor varies, averaging at 1500–2000 (3).

Health care centres offer a wide variety of services: out-patient medical care, in-patient care, preventive services, dental care, maternity care, child health care, school health care, family planning, care for the elderly, physiotherapy and occupational health care. Legislation does not define in great detail how the services should be provided, and in most cases this is left to the discretion of the municipalities. Legislation does not require the municipalities to actually produce the health services. An increasing part of the services are acquired by the municipalities, either from other municipalities, or from the private sector. The provision of local ambulance services is also one of the responsibilities of a health care centre. (4)

The in-patient department of a health care centre works in much the same way as the department of a hospital. A typical health care centre has 30 to 60 beds. The number of in-patient departments within a health care centre varies - large centres have several. The majority of patients in these departments are the elderly and the chronically ill. However, in remote sparsely populated areas, health care centres provide rather comprehensive short-term curative inpatient services for the general population. In the public health care service system patients need a referral to see a specialist, the exception being in case of emergencies.

Long-term care is given by the municipalities in wards of the health care centres and non-medical long-term care in institutions for the elderly. The latter is considered a part of social welfare services. In recent years, several different kinds of out-patient services have been established in order for the elderly to live in their own home as long as possible. These services include home-help services, home nursing, day hospitals and other daytime care centres, part-day nursing and service houses i.e. houses where people live in their own apartments but are offered different kinds of services, such as meals, nursing and other help needed for daily living.

Each municipality belongs to a particular hospital district, containing a central hospital. Of the central hospitals, five are university hospitals that provide specialised tertiary levels of treatment. Each hospital district organises and provides specialised hospital care for the population in its area. Finland is divided into 20 hospital districts. In addition, the semi-autonomous province of Ahvenanmaa forms its own district (Ministry of Social Affairs and Health). (5)

A hospital district is an administrative entity. In different hospital districts the central hospital may operate in more than one location and there may be supporting regional hospitals as well. The overall number of hospitals is about 70. This includes the five university hospitals, 16 central hospitals and over 40 smaller specialised hospitals. Hospitals have out-patient and in-patient departments. The range of specialised care varies according to the type of hospital. Federations of municipalities, i.e. hospital districts, own all the hospitals. Each municipality must be a member of a hospital district. (6)

Private health care in Finland mainly comprises of out-patient care, which is available mostly in the larger cities. There are around 3,000 private health care providing companies in Finland. The most typical private health care provider in Finland is a physiotherapy unit (1400). Physicians can run a practice within a private company, the number of which was 1000 in 2005; or as a stand-alone practice (7). The majority of doctors working in the private sector are specialists, whose full-time job is at a public hospital or at a health care centre. Patients do not

need a referral to visit private specialists at private clinics. Physicians working at private clinics are allowed to send patients with a referral either to public or private hospitals. There are only a few private hospitals, providing less than 5% of the total bed-days in the country.

There are about 1600 full-time private practitioners in Finland (8 % of physicians). Public health service doctors are also allowed to have an out-of-office time private practice, 25 % of physicians do so. One out of three hospital physicians and one out of eight primary health care physicians have a private practice in addition to their public ones. About 2,4 million people visited a private physician in ambulatory care during 2005 (7).

The National Authority for Medico-legal Affairs (TEO) (www.teo.fi) is subordinate to the Ministry of Social Affairs and Health. TEO is responsible for licensing and monitoring in the field of health care. Official proceedings in matters concerning health care professionals are instituted through complaints. Complaints of death or serious bodily injury of a patient are considered by TEO. The State Provincial Offices, as local authorities, are in charge of the supervision and monitoring of health care professionals locally and also have the responsibility for the supervision and monitoring of health care organisations, both public and private. TEO does not monitor organisations. State Provincial Offices give private health care organisations their licenses to operate. To receive a license the minimum requirements for providing health care services have to be fulfilled. The Ministry of Social Affairs and Health and TEO supervise health care organisations at the national level. (6)

National level health goals

The Ministry of Social Affairs and the Parliament define the national health and health care policies and run programmes to implement the policies. The Government Resolution on the Health 2015 outlines targets for Finland's national health promotion for a period of 15 years. The main focus of the resolution is on health promotion. It is a program based on cooperation reaching over various sectors, which are often seen as being outside the traditional health sector, such as lifestyle, living environment, and quality of products (8). The overall health and health care policy is presented in a document called “Strategies for Social Protection 2015” (9).

The government also introduced the National Health Program 2002-2007 called “Securing the future of health care”, with the aim to identify problems and challenges of the near future. The main challenges include securing health services to an aging population, where the public health personnel equally face important turn-over rates due to retirement. In addition, the internal migration in Finland is substantial, leaving rural and remote areas with a significantly reduced active population and rising health costs (10).

In cooperation with the medical profession, a program to create *proper care recommendations* is being carried out. The aim is to improve the quality of care and reduce the differences in customary practice. The national best practice guidelines are available to all health care professionals and the general public through the internet (www.terveysportti.fi).

3 Strategic eHealth Plans and Policy Measures

The first Finnish national strategy for applying information technology to health care and welfare focused on developing and implementing ideas that would help answer the needs for an efficient, accessible, affordable and high quality health care. It was drawn up in 1998, following the initiation of an information technology development program during Prime Minister Lipponen's first term in office in 1995 (11).

The Strategy for the Utilisation of Information and Communication Technologies in Welfare and Health was first established by the Ministry of Social Affairs and Health in May 1996. The strategy was built around the principle of citizen-centred, seamless service structures, based on existing social policy strategies. Among the main targets of the strategy were the horizontal integration of services (social, primary, and secondary care) and the development of shared, coordinated services delivered closer to home. Citizens and patients were envisioned as informed and participative actors in the healthcare delivery process. Since seamless services require seamless information access, the utilising of information and communication technology became an absolute necessity in the realisation of this vision. The partnership between service providers and industry was encouraged, as well as a new contract-based model between municipalities and private service providers, paving the way towards providing regional level services. The strategy was updated in 1998, placing specific emphasis on the following targets: adoption of digital patient and client records in all levels of care, combined with a nation-wide interoperability between distributed legacy systems, and being supported by a high level of security and privacy protection. (12, 13)

The strategy introduced the idea of implementing seamless service chains in the Finnish health and social care system. “Seamless” was understood to mean a smooth care process when two or more responsible organisations are involved in the process. The privacy protection regulation, e.g. the *Personal Data Act* (523/1999) sets conditions to the exchange of information (i.e. patient data) between different register controllers. There was a need to regulate the process and to define the client’s or patient's role in it as an active partner in care.

Prime Minister Lipponen's second term in office (1999–2003) included the enhancement of *seamless health and social care service chains* in the government's program (14). The legislation on *Experiments with Seamless Service Chains in Social Welfare and Health Care Services* was adopted in 2000. This pilot ends at the end of 2007 (Act 811/2000). The main focus of the legislation was to develop regional cooperation for seamless services, support continuity of care, and build regional information service systems and adapters between existing legacy systems. Pilot-projects in accordance to the seamless service chains legislation were started. These regions started building *reference databases* to enable true usability of patient data across organisational boundaries. (15, 16)

During Prime Minister Lipponen's second term in office, and during the implementation phase for the experimental legislation, a new initiative was started to improve the health care system of Finland. The Decision-in-Principle by the Council of State on Securing the Future of Healthcare was given on 11 April 2002. The document states that "nationwide electronic patient records will be introduced by the end of 2007" (10). The National Health Project Programme was launched and an electronic patient record project was included in the programme. The Ministry of Social Affairs and Health formed a working group (Ministry of Social Affairs and Health 2003), which produced a definition of electronic patient records and their implementation strategy. (17, 18). Both the state and the municipalities have funded the implementation of the project (6).

The strategy document of the ministerial working group (Ministry of Social Affairs and Health 2003) describes how the implementation of the nationwide electronic patient record system can be completed by 2007. The common content and structure that should be used in every EPR system in all organisations was defined. It includes a clinical consensus on core patient data, some national services such as a code server, open standards for interoperability, and national guidelines for the safeguarding of data. The basic elements of the architecture needed for the construction of a national data transfer system and its mechanisms were also described. (6, 18)

After the election in 2003, a new government with Prime Minister Vanhanen was formed. The new government was dedicated to the Decision-in-Principle by the Council of State in Securing the Future of Healthcare, the main principles of which were included in the programme of the new government (19). In addition, the government launched a new Information Society Program. This included an e-Welfare program in order to develop ICT for social services (20). TEKES (formerly National Technology Agency of Finland - now: Finnish Funding Agency for Technology and Innovation) also has started a technology program that will last for five years (2004–2009). It includes a health care development program (FinnWell) (21).

The government agreed on 2 November 2006 on a draft bill regulating the use of electronic social and healthcare client and patient information. At the same time, legislation on the use of electronic prescriptions was proposed. The parliament has, in December 2006, passed the proposals and the new legislation will come into effect as of July 1st 2007.The legislation on handling electronic patient information covers archive services, encryption and certification services, and the patient's access to the data. The services will be regulated by the National Insurance Institution, the National Authority for Medico-legal Affairs and the National Research and Development Centre for Welfare and Health. The creation of a common archiving system is expected to promote patient and client care, confidentiality, and an increase in the efficiency of healthcare services. The law makes mandatory the incorporation of all public health care units into the electronic archiving system, as well as private health care units that do not use paper-based archives. The creation of the data service is expected to cost 10 million euros and the transfer to the new system to take four years (22, 23).

In the vision for 2015 (Ministry of Social Affairs and Health 2006B), the Ministry of Social Affairs and Health views that information and communication technology can enable the efficient management of client information and process management using real-time data. It can help improve the position of the citizen by giving access to reliable information on health, welfare and the service system, and by offering citizens the option to manage their own information and to interact with the service system flexibly. Quality control of social welfare and health care services will emphasize the advancement of supervision, advice giving, guidance, and the monitoring of the information given to service providers. Achievement of the goals by 2015 presupposes an intensified control from the authorities and a nationwide information system architecture that fulfils data protection and information security requirements. When adopting information technology applications, social welfare and health care organisations must be supported with up-to-date legislation, national guidelines, and information systems services on the national level. Information technology provides the best support for a productive health service system when compatible joint standards and applications are used nationwide. (6, 8, 23, 35)

3.1 Main actors of eHealth policies

The Ministry of Social Affairs and Health has the leading role in eHealth policy. The same Ministry also has the responsibility to develop the regulatory framework and the legislation for the management of personal digitalised health information. Municipalities and their jointly owned hospital districts have, by law, a strong decision making power in all health policy matters including eHealth. The Prime Ministers office established an Information Society Programme 2003-2007. The Ministry of Justice, through the Data Ombudsman Office has

established a permanent security and privacy protection group for health care (TELLU). The State IT-organisation, which is financed and guided by the Ministry of the Interior, is co-ordinating national development in the field of eGovernment. The Ministry of Transport and Communications has the leading role in eInclusion development. The Ministry of Trade and Industry is financing the Finnish Funding Agency for Technology Development and Innovation (TEKES)(www.tekes.fi/eng). TEKES is funding R&D programs. The Ministry of Education participates also in the Information Society Programme.

3.2 eHealh Roadmaps

The Finnish Ministry of Health and Social Affairs published the first policy document that can be viewed as an eHealth roadmap in 1996 (The Strategy of utilizing ICT in Welfare and Healthcare 1996 (12). In The National Health Care Program for Securing the Future of Health Care the government stated on the policy level the introduction of national electronic health record systems (10) and launched the project for the definition and implementation of electronic health record systems. The working group gave out a document that was published as a policy document also by the ministry of Social Affairs and Health (13). All the ideas were also included in the Information Society Program 2003-2007 (19). The main ideas of the Finnish eHealth policies were drafted in to the new eHealth legislation of 2007 and also included in a document published by the Ministry of Social Affairs and Health called "The Finnish eHealth road map". This document was made public in February 2007, but the main content of the document has been public in earlier documents etc. since spring 2006 (24, 25).

A working group of the Ministry of Social Affairs and Health; established in 2005 with representation from Stakes, The National Institute for Social Security (KELA), the private sector and the municipalities had the responsibility for drafting the latest national eHealth roadmap. The 'implementation chain' of the eHealth roadmap of Finland can be described as follows:
The Government → The Ministry of Health → Hospital Districts/municipalities and the national institute for social security (KELA) → Projects with several collaborating partners (healthcare personnel, software developers, consultants etc) (24).

4 Extending eHealth implementation to the field of social care

Social sector is included in the Information Society Program and the project to enhance social sector services in general (started in 2004). ICT in the social sector is operating as an own

project organisation under the umbrella of the national social care project. This project works in close communication with the eHealth program. Experience is shared. The new legislation on electronic handling of patient material includes social sector customers. (19, 20)

5 Multi-lateral cooperation among other Member States in the field of eHealth

Finland participates in the Nordic network of competence centres and is a member of the Telemedicine working group established by the Nordic Council. Finland participates also in the Netc@rds Project. Bilateral communication and expert support took place in the context of the Finland-Turkey eHealth working group in 2006.

6 Dissemination and co-ordination activities

The Ministry of Social Affairs and Health has led the dissemination and coordination activities. Various media have been utilised for eHealth roadmap awareness. These include expert meetings, group consultations, work-shops, conferences and seminars. Also newspaper articles, other publications and press conferences have been used. The Ministry of Social Affairs and Health has a dedication section for ICT issues in the ministerial web site. No direct means for public feedback on eHealth issues to policy makes has been established (22, 24, 26).

7 Investment and Reimbursement framework

The Ministry of Social Affairs and Health has provided during 2004-2007 support to ICT implementation projects of munincipalities and hospital districts, which has also included some investment. The over all state funding during the years 2003-2007 for the implementation of the project on the national level has been around €4 million. During these years the Ministry of Social Affairs and Health has supported the development of national services (eArchive, communication platform, code server and EHR-registration services).The state has given around €40 million funding to the regional and municipal level during the years 2004-2007. In addition, hospital districts and municipalities have co-funded these projects with more than €40 million (6, 24, 39). Service providers are using around 2% of their yearly oprerational running cost for the development of local/regional ICT-systems and applications. Service prviders have the main responsibility for finacing the implementation of their ICT-systems and the regular yearly running and investement costs. The extra support by the Ministry of Social Affairs and Health has not covered most of the hardware investments. Regional, stuctural and other funds have not been used during the last years of the development. (6)

There is no specific reimbursement scheme for eHealth, but if telemedicine services are a part of some private health care service, the reimbursement mechanism follows the normal rules for this service. The same applies when municipalities purchase care from hospital districts etc. (36)

8 eHealth deployment status

8.1 eHealth infrastructure

8.1.1 Physical networks

The telecommunication backbone is based on broadband networks managed by commercial tele-operators. There is no dedicated healthcare network, nor plans to establish one. Instead, it is possible (and typical) to rent a secure part of the commercial communication channel for healthcare purposes (e.g. VPN-channel, Secure IP-Channel).

Hospital regions and many communities have implemented closed intranets. Those networks are in many cases based on VPN-technology. Secondary care hospital intranets are connected together either via VPN/ATM channels or via the Internet. KELA has its own nationwide ATM-network. Private service providers have institutional (virtual) sub-networks. Some of those are using commercial (centralised) communication centres. All service providers are connected to the Internet. There exist some eHealth services based on the use of the Internet (e.g. Virtual Hospital and eBooking services). There exist two VPN-based pharmacy networks.

The GSM- network is also used for some eHealth services (e.g. messaging and data collection). There seems to be a trend towards increased use of the Internet (SSL and secure WEB-services).

Services that are utilized mostly in communication between regions are:

- Telemedicine applications
- Transferring of images
- e-Referrals and care summaries
- e-Consultation
- billing
- e-Booking.

Services operating on a National level are:

- communication between KELA and pharmacies (drug reimbursement)

- communication between KELA and service providers
- ordering of drugs and materials
- national statistical data collection (STAKES)

The national plan includes establishing one logical connectivity centre for eHealth communication. This will be organised by KELA (6,24).

Regional networks are operational in Pirkanmaa, Satakunta, HUS, Etelä-Karjala, Kotka, Kainuu, and Pohjois-Pohjanmaa regions. There exit many successful regional PACS-implementaions. TELLAPPI-network, mainy for imaging, covers the whole northern part of Finland. In the private sector there is one nationwide communication network (MEHILÄINEN) and also some smaller (regional) networks. (27).

8.1.2 Legal and regulatory framework

There is national legislation in the country addressing the following issues:
data protection (1999), telecommunications (with regard to data protection and confidentiality) (2005), digital signatures (2003), eHealth service provision (experimental legislation 2000-2007), electronic handling and archiving of electronic health care records (2007) and ePrescription (2007). The legislation on data protection and e-signature has been harmonized with the corresponding EU directives.

Details of the legislation:

General legislation:

- Constitution of Finland
- Data protecting in electronic communication (516/2004)
- Act on personal data protecting (523/199)
- Act on services in the information society (458/2002)
- Act on electronic communication on the duty (13/2003)
- Criminal law
- Act on Electronic Signatures (14/2003)

Health care specific laws and decrees:

- Act on patient's rights
- Act on Specialized Medical Care (1062/1989)

- Act on Experiments with Seamless Service Chains in Social Welfare and Health Care and with a Social Security card (811/2001)
- Decree on the preparing of patient documentation (2002)
- Act on eletronic prescriptions (2007)
- -Act on the management and use of eletronic health and social care data (2007)

The Ministry of Social Affairs and Health has got the main responsibility to both develop and co-ordinate health care specific regulations, support the Data Ombudsman´s Office (Tietosuojavaltuutetun toimisto), the National Authority for Medico-legal Affairs, Stakes, The Association of Municipal Authorities, the Finnish Medical Association, State provincial offices, Hospital Districts, patient associations and national experts.

The co-ordination of general legislation for eSociety is the duty of the Ministry of Telecommunication, Ministry of Interior and Ministry of Finance.

The practical implementation of the regulations on management of patient's informed consent has been challenging (15). The technical solutions of health care providers do not yet support the full implementation of the acts. According to the new legislation they have been given time untill the end of 2011 to upgrade their systems (6, 24).

8.1.3 Education and training on ICT and eHealth

The most know education programme available on the national and regional level to promote the acquisition of necessary general ICT skills by the general population is the Computer Driving Licence. It is organised by the Finnish Information Society Development Centre (Tieke). National representatives participated in a recent effort to define a healthcare specific application to the European Computer Driving License (ECDL). Since 2006 there is a Finnish ECDL office operational, which provides training and examinations for the various ECDL licences (6). The Open University and municipal adult education institutions provide low cost ICT training for the public.

In the healthcare context, ICT training is provided by hospital districts and areas, municipal social care departments and health care centres. Mostly this is basic ICT training. Training dealing with privacy and data security, the function of seamless service had been less than extensive. ICT training programmes are targeted in particular to medical personnel. According to a recent study (28) half of the hospital districts felt that the computer skills of their medical physicians were satisfactory, but the skills of the nursing staff were not considered to be at the same level. Communication and Information Officer (CIO) is a typical post in hospitals and

also in bigger health care centres. CIOs are usually the heads of ICT departments/units of a health care provider organisation.

The health care organisation's own intranet was used for education and training in 13 (%) of the 21 hospital districts in 2006. The regional extranet was utilized for education and training in eight hospital districts and seven were at a testing or planning stage. A total of 30 (16 %) out of the 179 health care centres used their own intranet for education and training. Among the 28 private healthcare providers, 18 (45%) had an intranet for the purpose of education and training, and one used a regional extranet. (6)

Training in health informatics is not currently available as a standalone line of study, with the exception of the University of Kuopio which offers a Master's Degree programme in Health Information Management. The curricula of undergraduate studies in medicine do not include health informatics training. Rather, the emphasis has been on training healthcare practitioners to acquire the necessary IT skills. (6)

8.2 eHealth applications & services

8.2.1 Electronic Patient Records

Finland has been an early adapter of EPR systems, but at first they had no interoperability features. The EPR deployment level in Finland is high. 96 % of primary care organisations use EPR systems while coverage in hospital districts reached 100%, when the last hospital district also introduced EPRs during 2006. In the beginning of 2006 10 out of 21 hospital districts were able to share electronic patient information between health care organisations inside their regions, but exchange of electronic patient data on the national level has not been possible yet (6).

The Finnish government gave a decision in principle in 2002 on the introduction of nationwide electronic patient records by the end of 2007. The electronic health record implementation project is an ongoing (2002-2007) project to realize the national EHR implementation strategy as a sub project of the National Program for Securing the Future of Healthcare (2002-2007). (10, 18) The EPR strategy defined the common semantic and technical structures that should be used in all EPR systems. "The minimum common set of patient information or "the core data" was defined in co-operation with different interest-groups such as professionals, administration and software-enterprises. In 2004 begun the definition of the core structured data required for the fields of dental care, occupational health, children and youth services, and psychiatry. The main partners in the project are The Ministry of Social Affairs and Health, The Association of Finnish Local and Regional Authorities (Suomen Kuntaliitto) and Hospital

districts' vendors. A cluster process has been introduced; the health care providers that use certain EPR trademarks have joined together to work with the companies to implement the core data in to the products. STAKES maintains the code server where all relevant codes and classifications are stored and from which they can also be downloaded electronically.

Core data elements include information for patient identification, clinical data such as diagnoses and medications, and risk data. Core data elements are located inside electronic medical documents from which they can be extracted and then “recycled” to be included in new documents, for example referrals, doctor’s orders and medical certificates.

The header has structured identification data. A narrative part of the body with plain text is always needed by physicians. After that follows the structured/standardised part of the body. The official versions of different core data elements, like classifications for example, are stored in the national code server and delivered from there to electronic patient record products. Core data can be used in patient care, clinical decision support, scientific research, quality assessment, statistics and administration.

During 2006 Finland has started to build a national EPR archive. This architecture will put the benefits of the core data concept into a real life test. We shall see if the interoperability between organisations and regions that has been planned can truly be achieved.

8.2.2 e-Prescription

In Finland a national *e-Prescribing* pilot-project was launched in 2002. The pilot-project ran from 2004-2006. In this project a prescription database was built by the National Social Security Agency, and e-signature systems and connections from health care providers and pharmacies to the database were experimented. Main partners and actors in the pilot were the Ministry of Social Affairs and Health, the National Social Security Agency, Helsinki University Hospital Region. the National Authority for Medico-legal Affairs, University Pharmacy, the Association of Finnish Pharmacies, the North-Carelian Hospital Region, and selected health care centres. An experimental legislation was in effect for the pilot. (29)

The system was tested in two hospital districts and in a couple of health care centres. Finland opted for a system based on a national prescription database. In the pilot-project system, a doctor creates a prescription with a legacy system, signs it with a strong electronic signature, and sends the secured message to the national prescriptions database. The patient goes to a pharmacy, where the pharmacist accesses the database through the pharmacy’s system. The pharmacist makes the required changes and marks the dispensing information on the

electronic prescription, signs the markings with a personal smart card, and saves the markings to the prescription in the database. The medicine is then dispensed to the patient (29).

Permanent e-Prescription legislation was accepted in December 2006. The system described in the draft legislation is based on the experiences of the pilot-project. A national e-Prescription database hosted by the Social Insurance Institution (KELA) will be created and strong authentication and a smart ID-card for professionals with an e-signature system and SSL-secured messages from health care providers and pharmacies to the database will be used. The Finnish e-Prescribing is aimed to be fully integrated with the different EPR systems and a centralised receipt data file, to cover all pharmacies, and to contain continuously updated knowledge about all prescribed drugs of the patients, by using highly secured networks. The application to be built offers a usable platform for decision support for the drug safety. The pertinent legislation came into effect in April 2007 and the building of the system has started (6, 23, 24).

8.2.3 Patient, Citizen and Health Care Professional Identifiers, Health Cards

Smart Citizen ID-card with PKI-based Citizen Certificate is in production. This card is managed by The Population Register Centre (www.FINEID.FI). About 60.000 cards have been distributed. Only a small amount of services where the card can be used are available. The basic patient identifier is the citizen mumber ("social security number"). Its electronic equivalent is the "FINNSATU"-number. The Finnish banking services give out a different system for identification. This system is in general use in the banking sector, but has been introduced to several eServices of the state sector also. All citizens above 16 year have the health insurance card distributed by KELA. This card is a plastic card with one-dimensional bar codes. About 400.000 EHIC plastic cards have been distributed (30). Finland has made a policy decision that no health related information is stored in the e-cards. Cards are used only for identification.

Health professional cards (HPC) and Health Professional-certificate services are used in 11 out of 21 Hospital districts. The Finnish Medical Association will publish in the year 2007 a multifunctional smart card with a HPC certificate for the physicians. The new eHealth legislation gives the National Authority for Medico-legal Affairs the responsibility to built a national HPC system. This will be done by joining the systems of the hospital districts with the register of the National Authority for Medico-legal Affairs (23).

The electronic signatures of health care personnel was being used or in a testing or planning stage in 15 hospital districts. There were different methods employed in electronic signatures. A second password method with a password list was used. In Finland it is available as a

commercial solution of the banking sector and can also be built as a regional agreement within the health care system. Developed signature (EU-signature directive) is being piloted in a project led by the National Authority for Medico-legal Affairs, but is not in routine use (6).

8.2.4 Health Portals

Finland has portals for citizens, portals for patients and a portal for professionals. The Ministry of Social Affairs and Health and the Public Health Institute have began a joint project to build a national health information portal for citizens (www.tervesuomi.fi). The national health portal for citizens' project is presently ongoing. The portal is under construction and is planned to be opened to the public during 2008. Municipal health care providers keep "yellow pages" of their health care services, but several of the portals include general health information also. Many health problem- or disease-specific portals are maintained by patient associations or other third sector organisations (A-klinikka, syöpäsäätiö, Allergialiitto). 20 out of 21 hospital districts and 79 % of all the health care centres maintained their own *websites*. (6, 23)

The major national portal for health professionals is TERVEYSPORTTI (www.terveysportti.fi). It is maintained by the Finnish Medical Society Duodecim. In a 2006 survey the portal "Terveysportti" was found to be used extensively by all health care organisations. Both the Physician's and Nurse's professional databases were used. (6) The national health portal also provides of a comprehensive set of guidelines. In 2005 it was calculated that every Finnish physician reads an average of 1,5 guidelines a day from the portal (32).

8.2.5 Risk Management and Patient Safety

A patient safety project coordinated by the MoH started in 2006. A techonlogy innovation founded (Tekes) project to develop a technology tool and a model for collecting and handling incidence reports in health care organisations has been ongoing in 2005-2007 (HAIPRO).

8.2.6 Personal Wearable and portable communicable systems and other ICT tools assisting prevention, diagnosis, treatment, health monitoring, lifestyle management

Personal wearable tools (" a wrist clock") are used for elderly people to monitor their location in some houses for the elderly (it is a commercial product). Many hospitals are using plastic patient-ID bands with machine readable bar codes. One hospital is piloting wearable RFID-identification chips.

Typical portable communication tools are laptops and GSM-communicators. Many hospitals have plans to be wireless in the future.

Many different kinds of tools are available as commercial products and used in some pilot projects but are also more rarely in routine use by public health care providers. These tools include pedometers, pulse rate monitors, personal fitness clocks (e.g. POLAR and SUUNTO), computerised fitness training equipments, digitalised blood sugar meters, digitalised blood pressure metes, fat calculators, microprocessor-guided walking poles and shoes. These items have been developed by the industry. The FinWELL program of TEKES has been supporting the development of several innovations. (36)

8.2.7 Telemedicine services

In Finland several professional-to-professional telemedicine services are a routine, but patient-to-professional telemedicine services are rarer.

Teleradiology is in daily use in several hospital districts, where DICOM pictures and shared archives are common. 18 out of 21 (86%) hospital districts utilise some form of electronic distribution of radiological images. (6) Teleradiology has been one of the first applications of telemedicine in Finland. The first experiments were made already in 1969 (33) and real implementation started at the beginning of the 1990's. In 1994 all five university hospitals had teleradiology services (34). The regular service started in the sparsely populated northern areas, but has then spread all around the country.

The borderline between teleradiology and image distribution through a regional archive is gradually vanishing with certain services. In a 2005 survey it was found that all the methods used for image transfer are in use in Finland. For a regional service, the basic assumption was that a hospital should have a local PACS installed. Then, the technical infrastructure behind the implementation of a regional image distribution could differ. In some areas, image viewing is through a regional reference database. In other areas there is a dedicated common regional radiological database ("regional PACS"). A third solution is to view images through regional access to an EPR archive, which contains also images. (6)

Telelaboratory services between organisations are common. 90% of the hospital districts had some method for the electronic distribution of laboratory results in 2005. 27% of the primary care centres informed that they received daily laboratory results electronically through a regional database. (6)

In 2005, 12 % of health care centres purchased video conferencing in order to consult a specialist of a hospital. Telepsychiatry and teleophtalmology are among those used. Using document exchange in a consultation is more common. 36 % of health care centres use

electronic consultation of this kind. A particular mode of teleconsultation is that needed during an emergency transportation. Ambulances have a quite good preparedness for wireless data exchange. Six of the 21 hospital districts, and 48% of the 179 health care centres could receive telemetric electrocardiograms from ambulances in 2005 (6).

Telemedicine services between the patient and the professional are still rare. Secure information exchange with patients by SMS messaging is used by one and tested by three of the hospital districts. *Citizen initiated recording* where a patient can transfer personally conducted laboratory tests into the patient record system of the health care provider was, by the end of 2005, in use in two hospital districts, and eight hospital districts had tested it or planned for it. One health care centre also used it. *Teleconferencing* where the physician is at one location, while the patient and the nurse are at another is used in three health care centres and planned in two. (6)

8.3 Interoperability and standards

8.3.1 Technical and Semantic Interoperability

Most common communication standards in Finland are derived from the HL7- family. HL7-implementation started in 2004. At present HL7 CDA R2-family standards are widely used. EDIFACT is used in some applications but the newer applications are using XML. For security purposes messages are placed in a SOAP- envelope. The most common ISO-standard is DICOM. There is a plan to implement ISO 27799 in Finland. Health care specific CEN-standards are not used.

In the future Finland is exploring the use of HL7version 3 RIM-based standards in ISO-standards. Finland is also following the decisions or proposals made at the EU-level in the area of interoperability and identity management.

Decision making for health care coding and classification systems is done by the Ministry of Social Affairs and Health to cover the needs of the national health care ICT architecture. For classifications used in national health care statistics Stakes is the decision making body. Stakes also makes the decisions on the content of the national code server. (38)

Semantic interoperability is included as a target in the national EPR project (40). The interoperable core data set is in the implementation phase. Headings of the EPR and its metadata will be harmonised, as well as the main data types. Several classification and codes are in use or under implementation. This include: classification of diseases (ICD-10), National Care Register codes (HILMO-codes), Nordic classification of surgical operations, ICPC2-codes, codes for service providers (ISO OID-codes), laboratory test names and ATC-codes for

medicines. Classification of diseases (ICD-10) and Nordic classification of surgical operations have been defined as mandatory for statistical information by the Ministry of Social Affairs and Health. They are included in most of the EPR products. ICD-10 was introduced in the late 1980`s. It has been electronically available from the code server since 2004. (37)

8.3.2 Accreditation procedures

There are no accreditation procedures in use. A sheme was suggested by the working group of the National EPR project. The Ministry of Social Affairs and Health has launched a project to describe the qualification criteria for joining the national electronic health records archive. Since joining the archive will be obligatory for the public sector care providers,an accreditation procedure will be built during the next few years.

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