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Executive Summary

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This eHealth report was produced by FinnTelemedicum, the Centre of Excellence for Telehealth at the University of Oulu and STAKES (National Research and Development Centre for Welfare and Health) under assignment of the Finnish Ministry of Social Affairs and Health. The survey shows the status and direction of health care information and communication technology and eHealth usage in 2005. The results were compared to a previous survey made in 2003. This survey included all service providers in public and private medical services: hospital districts or central hospitals for secondary/tertiary care, primary care health care centres, and a sample of private sector service providers. The results show that the usage of Information and Communication Technology (ICT) has greatly progressed throughout the entire health care delivery system.

The core item is the comprehensive electronic patient record. The survey shows that 96% of all primary care health care centres, 20 of the 21 existing hospital districts, and 89% of the private sector service providers, used an electronic patient record (EPR) for narrative texts with high rates of utilisation. Progress has been the most fast in hospital districts, where only two years ago 13 out of 21 hospital districts were utilizing EPR. Primary care health care centres have already shown an over 90% utilisation rate.

The high rate of utilisation of the EPR has made information exchange between institutions feasible. 16 out of the 21 hospital districts, and 45% of the primary care health care centres used an eReferral and eDischarge letter system for communication between the EPR systems in 2005. In comparison to 2003, the numbers were 10 out of 21 hospital districts and 24 % among the primary care health care centres. In most of those institutions, electronic communication is the principal means of patient information exchange.

Exchange of diagnostic information between organisations has increased since the last survey, either through direct communication or by accessing a regional database. Teleradiology was performed in 18 out of 21 hospital districts and 29% of the primary health care centres, while two years ago the figures were 13 out of 21 hospital districts and 10% of the primary care health care centres.

Picture Archiving and Communication Systems (PACS) are now either in the production phase (in 15 out of 21 hospital districts) or in the launch phase (in 6 out of 21hospital districts). This means that a digital imaging infrastructure would enable both regional and national collaboration. Telematic exchange of laboratory data are used in 19 hospital districts and 65% of the primary care health care centres, while two years ago the figures were 10 out of 21 hospital districts and 38% of the primary health care centres.

Direct citizen centred services are taking their first steps, such as web-appointments, informational, and contact services. The prerequisites of these services are the back-office systems mentioned above. Among the majority of the public and private service providers, 90 to 100% of the personnel reading or documenting patient data have basic computer skills. The next evolutionary goal of the Finnish health care ICT infrastructure will be moving from regional networks to a national network operating through the national electronic patient record archive. The current wide utilisation of the EPR forms a solid basis for the development of eHealth services.

Table of Contents

Abbreviations

CDA	clinical document architecture
DICOM	digital imaging and communication in medicine
EBM	evidence based medicine
EBMDeS	evidence based medicine decision support system
EDI	electronic data interchange
EDIFACT	EDI for administration, commerce and transport
EPR	electronic patient record
eHealth	use of information and communication technology locally and at distance in health care
FinnTelemedicum	Centre of Excellence for Telehealth at the University of Oulu
GDP	gross domestic product
GPS	global positioning system
HL7	a set of standards
ICD-10	international classification of diseases
ICPC-2	international classification of primary care
ICT	information and communication technology
ISO	international standard organization
NGO	non governmental organisation
OID	object identifier code
PACS	picture archiving and communication systems
PKI	public key infrastructure
SITRA	Finnish National Fund for Research and Development
SMS	short message service
STAKES	National Research and Development Centre for Welfare and Health
TEKES	the National Technology Agency of Finland
VTT	Technical Research Centre of Finland
XML	extendible markup language

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INTRODUCTION

The Finnish Health Care System and an Overview of Health Policies in Finland

Finland is a large and sparsely populated country of 5.3 million inhabitants, who live in an area of 338,000 square kilometres (Statistics Finland 2006). In the eastern and the northern parts of the country the population density is especially low and distances are great. Health care services in Finland cover all people living in Finland. 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 by OECD on Finland (OECD 2005) 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). Many indicators of health care performance are good. Deaths from heart attacks and strokes have dropped sharply over the past 30 years and the delivery of quality medical care includes high rates of screening for cancer, a high rate of kidney transplants in proportion to patients with renal failure, and a high rate in the rapid treatment of broken hips. However, the system is not perfect. There are inequalities in access to services of a general practitioner. Until recently, many patients faced long waiting times to see a doctor at a health care centre, and there were long waiting lists for elective surgery. However, the introduction of waiting-time targets by the government in March 2005, has somewhat improved the situation. 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 producing themselves or in cooperation with other municipalities, or the purchasing of 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 having the right to collect taxes for it. 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 those people living there. 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. (Järvelin 2002)

The financing structure for health care expenditure, as a whole, went through considerable changes during the 1990s. Government grants to the municipalities were cut, while the proportion

of expenditure borne by the municipalities themselves correspondingly rose. The economic burden on households also rose. This was due to an increase in client fees and a proportionate increase of the costs of medicines and private health care services.

Alongside the municipal system, private and occupational health services also provided health care. 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).

Public Primary Health Care

Every one of the 251 Finnish primary health care centres is owned by a single municipality or by several municipalities together (Figure 1). 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 consist of general practitioners, sometimes medical specialists, nurses, public health nurses, midwives, social workers, dentists, physiotherapists, psychologists, administrative personnel, and so on (Table 1). All are employed by the municipality or the municipalities. The number of inhabitants per health care centre doctor varies, averaging at 1,500–2,000 (Kunnallislääkäri 2001).

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. (Päätalo et al. 2003.)

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 the case of emergencies.

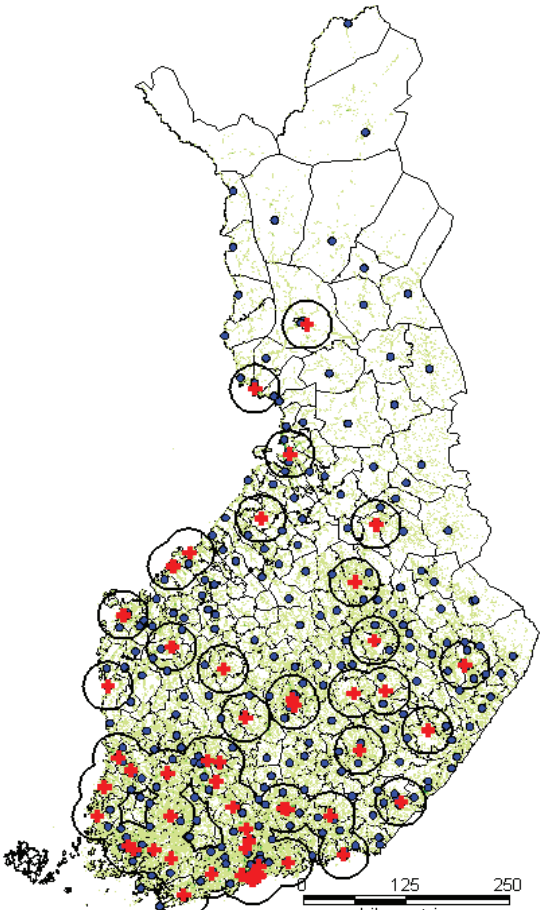

FIGURE1. Finnish somatic hospitals (ringed) and health care centres (dark dots) with beds. The shading in the background reflects population density.

TABLE 1.The availability of common services in health care centres (n = 270*)
(Source: Päätalo et al. 2003)

Primary care physician	100%
Specialist consultations	42%
Dentist services	93%
Public nurse consultations	87%
Physiotherapy	89%
Psychologist services	55%
X-ray	77%
Laboratory test taken	95%

* The numbers of health care centres in 2002.

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 the 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.

Public Secondary and Tertiary Health Care

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).

A hospital district is an administrative entity. In different hospital districts the central hospital may operate in more then one location and there may be supporting regional hospitals as well. The over all number of hospitals is about 70 (Figure 1). 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. The population of hospital districts varies between 70,000 and 1,300,000 inhabitants. Twelve hospital districts have a population of less than 200,000. Each municipality must be a member of a hospital district.

Private Health Care

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 (1,400). Physicians can run a practice within a private company, the number of which was 1,000 in 2005; or as a stand-alone practice (Stakes 2006). 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 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 (Stakes 2006).

The Institutions, Policies and Procedures Relating to Regulation and Self Regulation of the Medical Profession in Finland

The National Authority for Medicolegal Affairs (TEO) (www.teo.fi) is responsible 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 having 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.

Overall Health Policies

The Government Resolution on the Health 2015 outlines targets for Finland's national health for the next 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 (Finnish Government. 2002 A).

The government also introduced the National Health Program 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 (Finnish Government. 2002 B).

In cooperation with the medical profession, a program to create *proper care recommendations* is being carried out. The aim is to improve the quality in care and to 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).

Finnish eHealth Policies

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 (Finnish Government 1995).

This 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 service. 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.

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 its program (Finnish Government 1999). A decision-in-principle to fund the national ICT development was given in 2000. The aim was to

promote Finland as an information technology society (Finnish Government 2000). Between 2000 and 2003, 10 million euros were given to fund ICT projects in the health and social care sector. Between 2002 and 2003, 8–12 regional coordinators oversaw the development projects of different regions (Sinervo 2004). The national *Health Care for the 21st Century* project strengthened the regional cooperation of different development projects, but had no specific funding to offer the organisations (Ministry of Social Affairs and Health 2002).

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, Finnish Government 2003a). The main focus of the legislation was to develop regional cooperation for seamless services, the continuity of care, and to build regional information service systems and adapters between existing legacy systems. The first project on the implementation of the experimental legislation was called "Makropilotti" (from November 1998 to June 2001). In the first phase, seven municipalities, two primary health care centres, and the hospital district of Satakunta participated in developing the *seamless service chains*. In 2001 three new regions, Uusimaa, Pirkanmaa, and Raahe were allowed to start pilot-projects in accordance to the seamless service chains legislation. These regions started building *reference databases* to enable true usability of patient data across organisational boundaries. (Hämäläinen et al 2005, Ohtonen 2002.)

The experimental legislation on *seamless service chains* (811/2000) was made open to all applicants at the beginning of 2004. All hospital districts and most municipalities in the country applied and were included in the pilot-project. Eighteen regional projects began during 2004. In the first four test regions, these projects were a continuance of existing state funded projects. In other areas this was a new project or a new phase to previous EU-projects (Hyppönen et al 2005).

During Prime Minister Lipponen's second term in office, and during the implementation phase for the experimental legislation in the four regions mentioned above, 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 health care was given on the 11 April 2002. The document states that "nationwide electronic patient records will be introduced by the end of 2007" (Finnish Government 2002). 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. The working group has received in funding 800,000 euros a year since 2003 to develop the National EPR Archive (Ministry of Social Affairs and Health 2003 and 2004). Funding given for the implementation of the programme at the regional level was 11 million euros in 2004, 10.5 million euros in 2005 and 5 million euros in 2006. In addition, hospital districts and municipalities have co-funded these projects (with half of the funding coming from the state and the other half from the municipality).

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 the organisations was defined. It included 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.

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 health care, the main principles of which were included in the programme of the new government (Finnish Government 2003B). In addition, the government launched a new information society program. This included an e-Welfare program in order to develop ICT

for social services (Sahala 2005). TEKES (the National Technology Agency of Finland) also has started a technology program that will last for five years (2004–2009) (Tekes 2005). It includes a health care development program (FinnWell).

The government agreed on the 2 November 2006 on a draft bill regulating the use of electronic social and healthcare client and patient information. This proposal was given to the parliament for approval. At the same time, legislation on the use of electronic prescriptions was proposed.

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 Medicolegal 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 (Ministry of Social Affairs and Health 2006A). The parliament has, in December 2006, passed the proposals and the new legislation will come in to effect as of the 1 January 2007.

In the vision for 2015 (Ministry of Social Affairs and Health 2006b), the Ministry of Social Affairs and Health view 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.

DEPLOYMENT OF THE 2003 AND 2005 eHEALTH SURVEYS

The Ministry of Social Affairs and Health in Finland has regularly instructed and followed the implementation of IT or eHealth development in health care. A comprehensive survey on the implementation and the use of ICT has been conducted by the present authors for the first time in 2003 (Kiviaho et al 2004). The survey showed the prevailing situation right before the National Project for Securing the Future of Health Care began. The current 2005 survey shows what has happened halfway through the project. The methodology involved in the survey comprised of a similar web-based questionnaire.

The structured web-based questionnaire was distributed by e-mail to all public health service providers or hospital districts and health care centres, and to a sampling of private health care providers. The questionnaire comprised of: the identification of the responding organisation and the respondent; questions about the adaptation of electronic patient records systems; systems or applications to transfer/exchange patient information between organisations during care processes and the standards in use for the migration of patient information; methods of authentication, identification, and informed consent of patients; the usage of different e-Education systems for staff education; the types of human and material resources needed; systems supporting quality control and service delivery; and the adaptation of different e-Services for patients.

The total number of the questions was 97. Most of which also included further questions on how old the system or application concerned was, and the intensity of use. The questions for hospitals, health care centres, and private health care providers differed to some extent, depending on the nature of the services they provided.

The intensity of use told the amount (%) of the action or function being carried out by electronic means. For example, if a service provider used EPR for the documentation of patient data in half of the cases and a paper-based record for the others, the intensity of use of the EPR was 50%. Several of the questions in the survey were copies of questions from the FinnTelemedicum survey of late 2003, using the same web-based data collection methods.

The questionnaire was emailed between October and November 2005 to all public service providers. That is to 21 hospital districts and 251 health care centres. The questionnaire was also emailed to a sample of 65 private health care service providers including 30 of the largest service providers, and 35 who had responded to the 2003 survey.

At the same time, the use of information and communication technology among the providers of ambulance or emergency transportation services was investigated with a specifically tailored web-based questionnaire. This survey has been presented in Chapter Data Transfer during Emergency Transportation.

A full report with a detailed description of the method and all the findings of the survey has been published in June 2006 in Finnish (Winblad et al 2006).

Coverage

Responses to the questionnaire were obtained from all the hospital districts (100%, n = 21). A total of 179 (71.3%) of 251 health care centres responded to the questionnaire. The responses covered 88.2% of the whole population of Finland. Additional data on the use of the EPR was completed by phone from the health care centres which did not respond. Additional data was also

obtained from 27 health care centres, which had not responded to the present survey, but had to the 2003 survey. Data on picture archiving and communication systems (PACS) was obtained from the companies supplying the service.

Results were obtained from 28 private service providers, about half (n = 13) from the biggest private service providers and about half (n = 15) from those companies that had responded to the 2003 survey. The private providers included enterprises, from conglomerates with hospital and operative services, to small part-time general practices. Because the private providers are a heterogeneous group, the results concerning them can only be regarded as indicative.

The health care centres which did not respond were smaller in size than those who did, covering only 12% of the population of the country. Therefore, the answers obtained can be regarded as representative in terms of primary and secondary health care. Because the public sector covers 85% of all health services, the results can be regarded as representative for the whole country.

ELECTRONIC PATIENT RECORDS IN FINLAND

The Development of the Structured EPR

In the 1980's the Association of Local and Regional Authorities designed a set of paper-based health records, which would become widely used, for primary care and specialised care. The municipalities have a strong decision-making power in arranging services, including the utilisation of information and communication technology (ICT). When health care providers started adopting EPR, there was a variety of ICTs and EPR products in use in the municipalities and other organisations, and the understanding of common health record structures diminished. Finland became a country where many organisations used different EPR. Furthermore, in general there was no interoperability to exchange EPR information between organisations. There is legislation in how to handle patient records (Ministry of Social Affairs and Health 2001), but it is not detailed enough for the digital world.

Two different lines of development started happening. When bilateral and regional networking became technically possible, the organisations and regions started to define common structures for e-documents to enable the exchange (teleradiology, PACS, e-Referral letter, e-Discharge letter, e-Laboratory results) at the local level. When the construction of information networks became technically viable, a government supported project "Makropilotti" established ways to read EPRs of another organisation (with the patient's consent) and lessened the need for a common structure (Ohtonen 2002).

The Finnish government stated in 2002 the decision on electronic patient records (Finnish Government 2002), "Nationwide electronic patient records will be introduced by the end of 2007" the working group on EPR strategy (Social Affairs and Health 2003, 2004) defined the common semantic and technical structure that should be utilised in every EPR system in all organisations. This included core data and other codes delivered by a code server containing standards for semantic interoperability. The usage of open standards for interoperability, such as XML-based HL7 CDA R2-standards were also being suggested. The strategy also included national guidelines for the safeguarding of data (informed consent, secure archiving, e-Signature, identification of patients and professionals, documents and organisations with an ISO/OID standard and usage of PKI architecture).

The code server was built in 2003–2004 and has been providing the main codes since 2004. (www.stakes.fi/koodistopalvelu). In production are ICD-10, Nordic codes for surgical procedures, national codes for laboratory tests and x-ray procedures, main HL7 document structures, and some statistical codes. In addition, a large list of other codes are given out from the code server for testing and piloting purposes. The code server stores all the common (i.e. official versions) of different core data elements. The electronic patient record products take the codes into their own products from the server (updates 1–2 per year). Code taking is free of charge and the code server (and the classification work behind it) is supported by the Ministry of Social Affairs and Health.

The project for common structures of the EPR began in 2003, is funded by the ministry, and lead by the Association of Local and Regional Authorities. "The core data" was defined in cooperation with different interest-groups (professionals, administration, software-enterprises). It was publicly available to be commented on through internet and was later finalised and published in 2004. The implementation into the existing EPR-systems of the pilot-project organisations is already happening. The National Health Project includes a cluster project and a subproject for

the implementation of structured core data for EPRs. The work is coordinated by the Association and the Ministry. 7 regional groups have formed clusters with software enterprises. 11 hospital districts and 17 health care centres are involved in this project (Nykänen et al. 2006). Further specifications for certain specialities are being worked on (occupational health care, psychiatry, dental care, child health care, school health care, nursing, and emergency care). Staff training to use the core data and the newer version of EPR products is an ongoing process. The Finnish HL7 Association has defined EPR structures in several main documents, and those structures have been implemented in several products.

The work on structured electronic patient records has included work on nursing data. The National Nursing Documentation project targets a nationally unified and standardised nursing data documentation for the managing of the nursing process and for integration of nursing documentation into the multiprofessional patient record. Already 13 out of 21 hospital districts (including three university hospitals), 17 health care centres, one regional hospital and one private hospital are involved in the pilot project itself and 14 other organisations are networked into the project (Tanttu 2006). Piloting covers special care, primary care, home care and elderly care in a total of 110 institutions.

The Usage of Electronic Patient Records

In *specialised health care* EPR was in use in all but one of the 21 hospital districts. One hospital district had the EPR at a planning stage at the end of 2005. Among the 17 of the 20 users of the EPR the intensity of use was over 90%. One hospital district had the intensity of 50–90%, and two between 25–49% (Figure 2 shows those with intensity of at least 50%). Compared to the data from the 2003 survey, there is a very strong progress both in the coverage in various medical specialities and in the intensity of use. Because of the complexity of secondary care (hospital) medical records, the coverage aspect is an important indicator of EPR penetration.

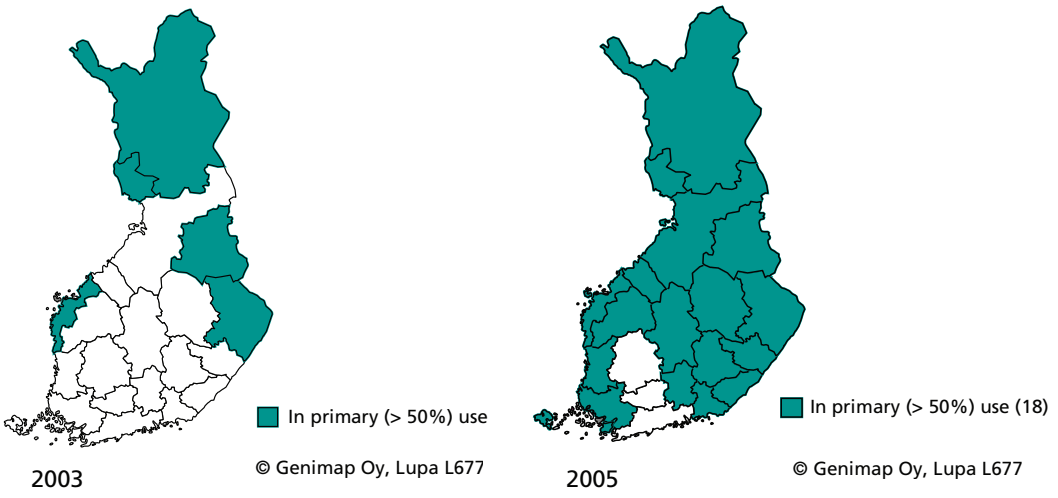

FIGURE 2. Hospital districts (n = 21) with over 50% intensity of the usage of EPR in at least three of the four main responsibility areas (operative, conservative, psychiatry, emergency care) in 2003 and 2005

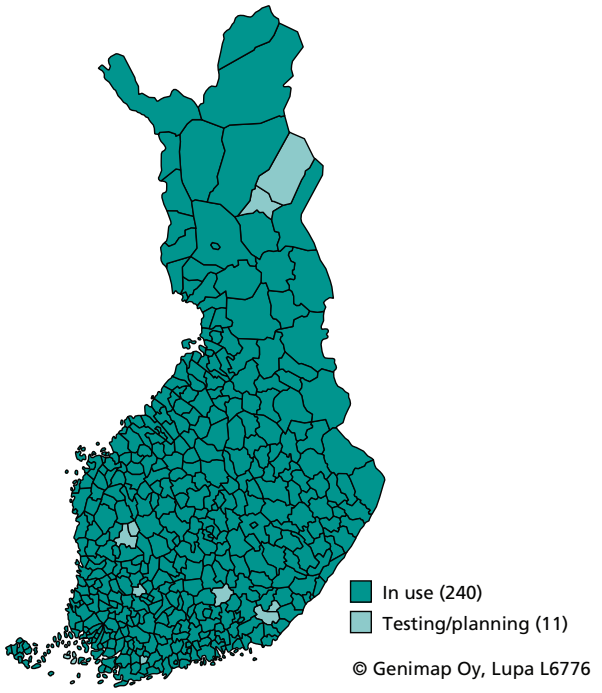

FIGURE 3. EPR in the 251 primary health care centres of Finland in 2005

In *primary health care centres* EPR was in use in 240 (95,6%) of the 251 health care centres, three of them had it at a testing stage, and eight at a planning stage (Figure 3). Compared to the 2003 results, a coverage of 93,6% means that it is near saturation point. The 11 health care centres lacking EPR were small and remote, and some of them were planning on converging with a larger neighbouring health care centre. The intensity of use was very high: Among 91% of the EPR using health care centres, the rate was over 90%, while among the rest it was 50–90%.

Among the 28 responders of the *private health care service providers*, 25 (89%) used EPR. Compared to the 2003 surveys the figures seem to be similar. The intensity of use was high: three out of four providers had an intensity of use of over 90%.

Today, documentation of patient data in the Finnish health system is being realised by electronic means. For health care centres the transition from paper-based to electronic records has happened in the late 1990's (Figure 4), and for hospitals four years ago (Figure 5). The progression towards the saturation point of the implementation of EPR can be constructed from the grounds of the repeated surveys in the use of information and communication technology in Finnish health care (Hartikainen et al. 1999, 2002, Kiviaho et al 2004, Winblad et al 2006). The paper-based records presently serve mainly as an archive of historical data.

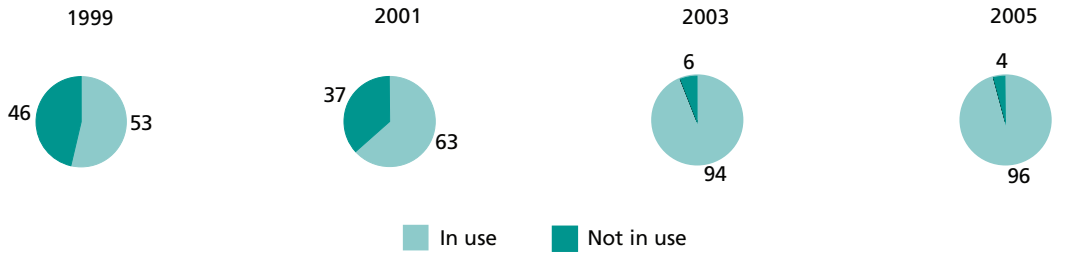

FIGURE 4. Progress in the implementation of the EPR in the health care centres in Finland. The numbers are shown in percentages

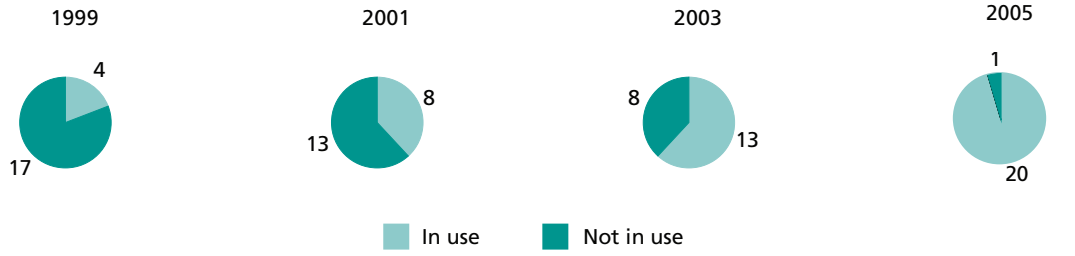

FIGURE 5. Progress in the implementation of the EPR in the 21 hospital districts in Finland. The numbers are shown as absolute numbers

Situation of the Structured EPR and Core Data Usage

While data was being collected for the survey, the cluster project had just begun and information was not yet available from health care centres. In hospital districts the implementation was continuing, and it could be considered that structured core data was in use in five of the hospital districts, and at a testing or planning stage in 14 hospital districts. Six hospital districts used structured nursing documentation, and 13 had it as a testing or planning stage. In relation to code classification from the national code service, the corresponding figures were three and 15, and for their own codes three and 13, respectively.

INTRAORGANISATIONAL AUXILIARIES OF EPR

Digital Dictating, Speech Recognition and Wireless Usage

The auxiliaries of the EPR mean the various systems and functions which support data and information management by health care professionals. The dictation of documents was digital or integrated into the EPR systems in half of the hospital districts and health care centres (Figures 6 and 7). A speech recognition system produces written documents almost simultaneously and offers for the health care professional a possibility to immediately check if the document is correct. The main benefit is a faster delivery of the test results or the doctor's notes to other members of the care team. The system was in production use in only two health care centres, but was at a testing or planning stage in many hospitals and health care centres.

The wireless use of EPR means mobile documenting and browsing of patient information making work in wards and emergency/casualty units smoother and more effective. Almost a half of the hospital districts had wireless access to EPR, and the wireless system was at a testing or planning stage among the rest.

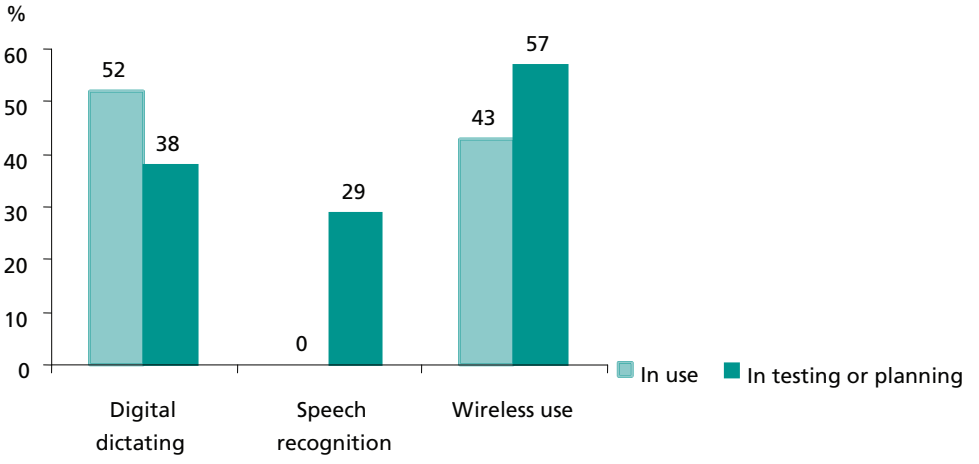

FIGURE 6. The present coverage (%) of the use of some applications of EPR in proportion (%) to the 21 hospital districts

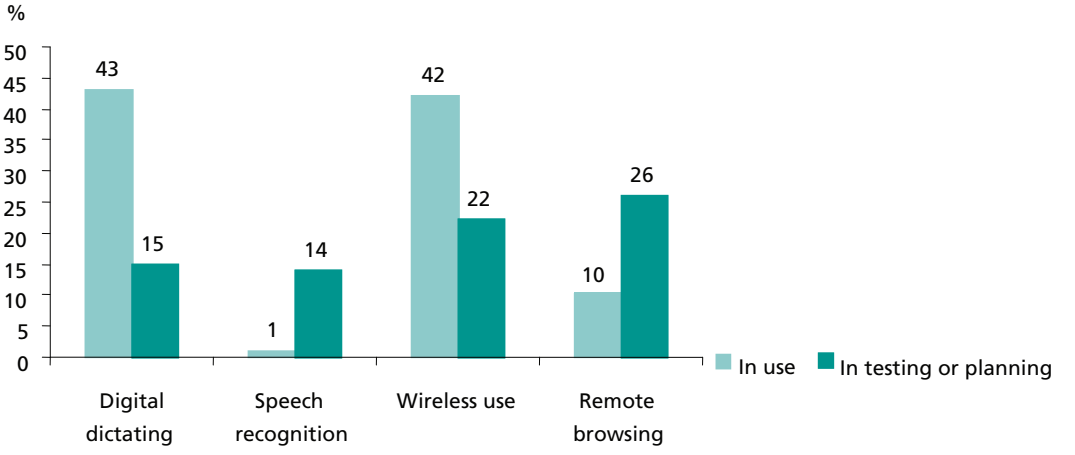

FIGURE 7. The present coverage (%) of the use of some applications of the EPR, in proportion (%) to the 179 health care centres

According to 179 *health care centres*, half of them had wireless access to the EPR, but only about a half of the rest intended to have one. There are small health care centres without a ward with beds, and for those the benefits of the system are narrower.

Home nursing belongs under the responsibility of the health care centres. About one tenth of the health care centres supported home nursing with the availability of remote browsing of the EPR (Figure 7).

Among the 28 *private health care service providers* three of them used digital dictation, and one had a speech recognition system, and two planned to purchase. Three of the providers used EPR wirelessly, and two were testing or planning to use one.

Decision Support Systems

Decision support systems are information or knowledge based systems that support the decision making process. The question of the surveys concerned only with systems that are integrated with the EPR, offering automatic support. The EPR systems used so far in Finland include mostly functions alarming about pathological laboratory results. In addition, some hospital districts' and health care centres' EPR systems included reminders informing about drug interactions or whether a patient had been prepared properly for laboratory tests. EPR terminals also had access to local, regional, and national databases and guidelines with search engines. The access to these databases exists even with mobile devices.

Advanced electronic decision support systems, which could automatically give evidence based medicine (EBM) guidelines; being able to cover a wide variety of clinical topics based on structured core data from the EPR system, has achieved the testing stage by the Finnish Medical Society Duodecim and its collaborators (www.kaypahoito.fi). The systems are able to give additional information or recommendations to the health care professionals. This EBMDeS (evidence based medicine decision support system) utilises data from various EPRs, which are compatible with the national EPR standards. With a help of an expert script language, EBMDeS brings context sensitive information from a central server directly to the EPR of the very patient. Databases for the decision support system have been designed for physicians, nurses, and other health care professionals in primary and specialised health care. (Komulainen et al 2006).

Picture Archiving and Communication Systems

Picture Archiving and Communication Systems (PACS) started to develop in Finland after implementation of the DICOM (Digital Imaging and Communication in Medicine) standard in 1995, and the first filmless hospitals began appearing towards the year 2000 (Reponen 2004).

The secondary care responses to the surveys were obtained from all the hospital districts of Finland (100%, n = 21). The results from 2003 and 2005 on PACS installations are presented in Table 2.

TABLE 2. PACS installations in 21 Finnish hospital districts in 2003 and 2005

Measure	2003	2005
PACS in production phase	10/21	15/21
PACS in pilot phase	1/21	2/21
PACS in installation phase	10/21	4/21
PACS usage > 90%	*6/21*	*15/21*
PACS usage 50–90%	*3/21*	*1/21*
PACS usage < 50%	*4/21*	*1/21*

The adoption of PACS and teleradiology in everyday practice is high in Finland. Starting from 10 years ago, the progress, especially in the last two years, has been especially fast for PACS. During the year 2006 all the hospital districts will finally have a PACS in production. What is more important is the percentage of PACS usage in the daily production of radiological images. Already in 2005 15 out of 21 hospital districts were producing over 90 % of their medical images only digitally. The target is to have a totally filmless environment, which makes PACS a very real component of the EPR.

The adaptation of PACS to hospital districts is important and forms a basis for regional and later for national archiving of medical images. The survey also revealed that the next challenge is to integrate PACS with workflow management and EPR software. The geographical distribution of the hospital districts in terms of PACS is shown in Figure 8.

In the primary health care centres, the current trend is not to have a PACS of their own, but to combine their efforts with a regional hospital or with a hospital district. There are many innovative solutions available. E.g. in the most northern hospital district all the primary health care centres are fully digitised and store their images at the central hospital. Those images can be accessed directly from their physician's desktop. In some areas small regional hospitals have a combined image archive and distribution with the primary health care centres.

For this present survey we received information from PACS vendors about their customers at primary health care centres. For the purpose of this study we counted so called Health Areas (which combine a small regional hospital and its neighbouring primary health care centres) as one primary care unit. According to the vendors, in year 2005 their systems or system components are in use in 95 out of 179 primary health care centres (53%). For the previous survey in 2003 the PACS usage information was obtained directly from the primary health care centres and they then announced that PACS components were used in 27 (15%) primary health care centres. Even though the methodology is different, this information reveals that the use of PACS at the primary health care level has increased in Finland.

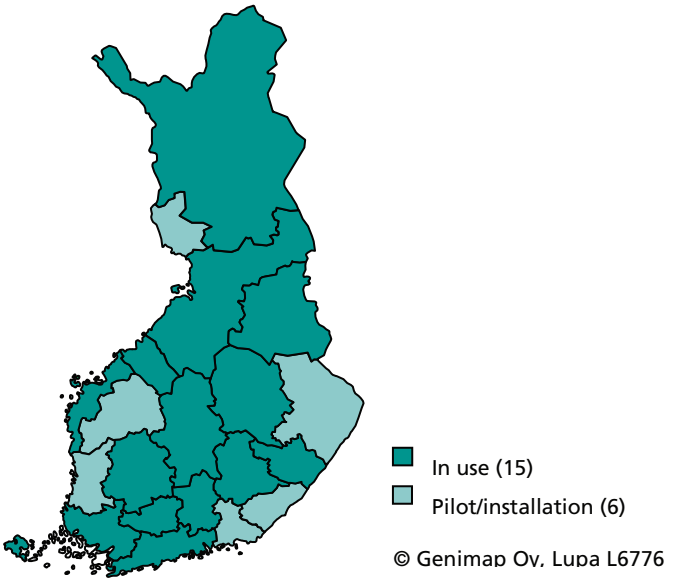

FIGURE 8. Distribution of PACS in the 21 hospital districts, based on the status of implementation

In the private sector there were a total of 146 different installations of PACS systems or components made up until January 2006. This included both fully self-sufficient archiving systems for major private health care service providers and smaller systems for dentist surgeries.

The growth rate of PACS usage in Finland has followed the general adoption of electronic patient record systems (EPR). This is natural, because the full utilisation of PACS requires the distribution of images to the end users. This has not been possible without the proper amount of computer terminals and the terminals that came with the EPR systems. The tight integration of images with narrative texts in EPR and not only with RIS (radiological information systems) has been one of the golden standards in the development. In most cases, images are very successfully embedded into the EPR interface.

EXCHANGE OF ELECTRONIC PATIENT INFORMATION BETWEEN ORGANISATIONS

The exchange of electronic patient information between providers of health services necessitates the use of networks with high data security, which can be actualised through different kinds of intranet solutions or secure internet connections. This interorganisational data exchange is increasing rapidly in Finland. This is because digital data depositories in individual health care institutions are in active clinical use, and protected data connections enable the communication of electronic patient information.

Before discussing many different and yet at the same time partially overlapping forms of data exchange, a couple of definitions are needed. *Electronic referrals* are basically sent to another institution in order to transfer the responsibility of patient care. Electronic discharge letters are then returned to the sending institution once the patient's treatment is finished. The referral can evolve to an *electronic consultation letter*, if neither responsibility for the patient, nor the actual patient is transferred, but professional advice or opinion for treatment is sough. There are special cases like *teleradiology* which can be used for consultation but also for information distribution, the same applies also to the *telelaboratory. Regional patient data repositories* or *exchanges* can serve many purposes: they can provide a source of reference information for past treatment, a basis for current patient data distribution in a geographically distributed health care environment, as well as a data depository for consultation services and workload distribution. They can also provide a common citizen access point to health care data. In a normal medical practise, the various forms of data distribution complement each other.

For collaboration between primary and specialised health care, the most important messages are referral letters, consultation letters, and feedback or discharge letters. In addition to a narrative text, the letters can include results of laboratory tests and radiological examinations.

e-Referral and e-Discharge letters

The e-Referral letter signifies a course of action by which the referring physician, usually a general practitioner, draws up a message with an intention to transfer a patient and the responsibility of care to a hospital. The role of hospitals in this kind of collaboration with health care centres is to receive referral letters, and provide a letter showing the treatment, and to give feedback through a discharge letter.

This service is presently provided by 16 of the 21 hospital districts (Figure 9). Rapid progress has been made during the last couple of years, when in 2003 the service was available in about half of the hospital districts, in 2005 three fourths used such systems.

In addition to the fact that the service was now available in most of the districts, the intensity of use had increased in 2005 (Figure 10). The intensity of use was also investigated by the departments of different specialties (internal medicine, surgery, psychiatry, gynaecology, ophthalmology, etc.) of the hospitals. No prominent differences were found, except in psychiatry where the use was somewhat lower than in other specialities.

A total of 80 (44%) of the 183 health care centres were able to send electronic referral letters to specialised health care. The amount has almost doubled in the last two years (Figure 11).

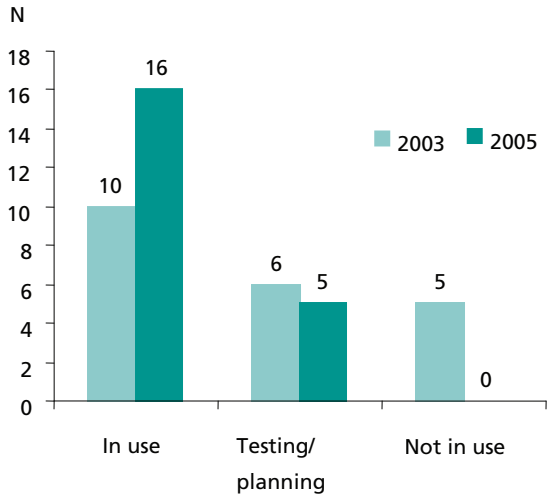

FIGURE 9. The numbers of 21 hospital districts providing referral letter and discharge letter service in 2003 and 2005

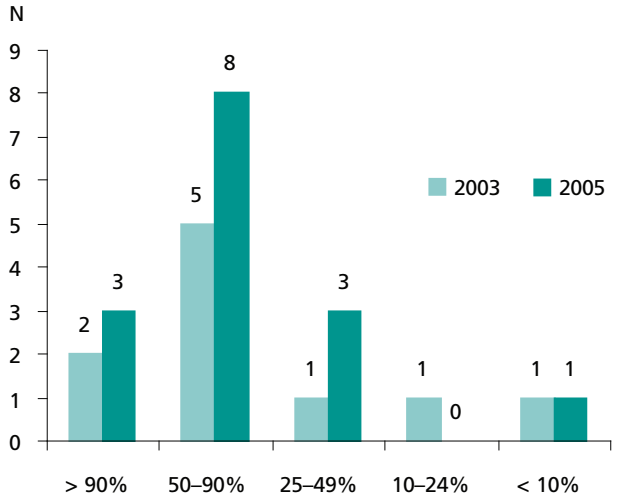

FIGURE 10. The intensity of use of the referral letter and discharge letter service in numbers of the 21 hospital districts

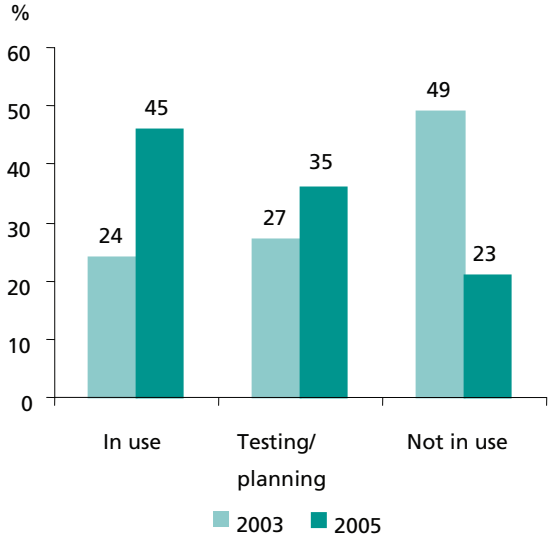

FIGURE 11. The distribution (%) of 183 health care centres by the use of an electronic referral letter

It should be noted that the coverage of this function was the highest at the remote sites of the country (Figure 12). This means the success of moving towards an equality of delivering of health services, as stated in the National Health Program (Finnish Government 2002).

Not only has the use of the electronic referral letter become more widely used, but also the intensity of its use seems to have increased significantly since 2003. Among the health care centres using the service, almost all (94%) used it as a principal mode (more than 50% of referrals were digital). There is an increase in comparison to the corresponding figures in 2003 which were 56% (Figure 13).

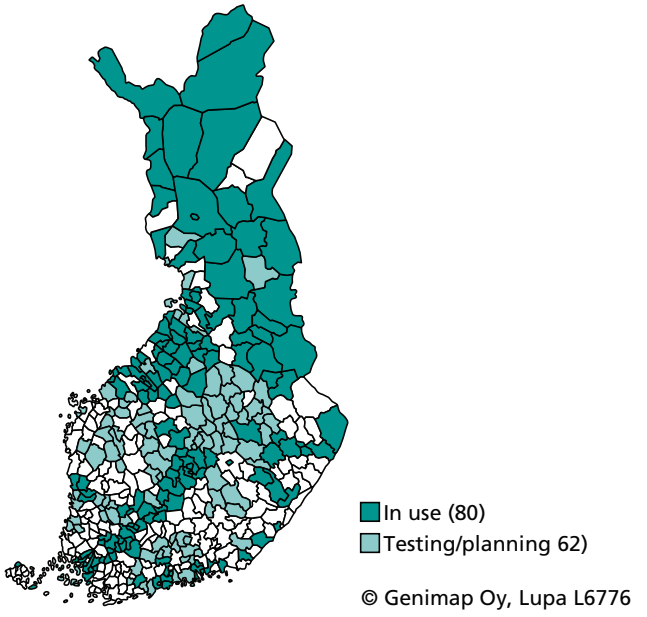

FIGURE 12. The geographical distribution of the 142 health care centres in which electronic referral to specialised health care was in use or at a testing or planning stage

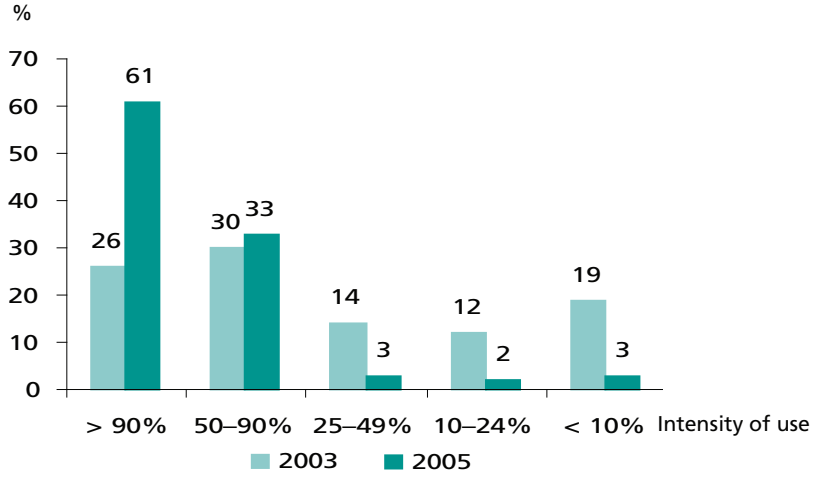

FIGURE 13. The intensity of use of electronic referral letters. The distribution (%) of the 69 health care centres who answered to the question

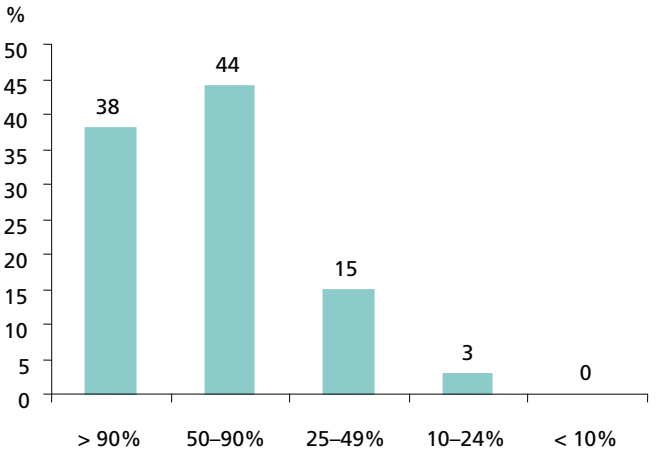

FIGURE 14. The distribution (%) of 71 health care centres which answered the question of what proportion (%) of the discharge letters they received were in electronic form

Hospitals mail a *discharge letter* or a feedback letter after the patient's visit at an out-patient department or bed ward to the health care centre concerned. About four fifths of the 71 health care centres which answered the question received discharge letters primarily in electronic form (Figure 14).

Five (18%) of the 28 *private health care service providers* received electronic referrals from primary health care centres, and nine were testing or planning on its use. One of the private health care service providers used electronic referrals to send patients to public specialised care, and 11 tested or planned on using a similar systems. Information transfer between private providers in the form of electronic referrals was used in five (18%) and was being at a testing or planning stage in seven of the 28 providers.

Treatment and care in a bed ward of a hospital can continue in a bed ward of a health care centre. In these kinds of cases a *document of nursing* is attached to the discharge letter. Of the 179 health care centres which answered the question, 18 (10 %) received them electronically, and 49 (27%) planned to implement it.

Electronic and Remote Consultations

The consultation letter signifies a course of action by which a physician, e.g. a general practitioner, draws up a letter with the intention to have a specialist's advice or opinion for the treatment and care of a patient. The responsibility of care is not transferred to the consultant. The consultation letter is a more developed way of collaboration between primary and specialised care than the conventional referral. This is because it exploits the functionalities of electronic information exchange better e.g. flexible negotiations between the physicians before decision making.

Electronic consultation was provided by about half of the 21 hospital districts, except for one hospital district, it was at a testing or planning stage in the rest of the hospital districts (Figure 15).

About one third (35%) of the 179 health care centres purchased electronic consultations from hospitals. Another third had said to be planning it or having even tested it (Figure 16).

The health care centres purchasing electronic consultations seemed to be very active with its use: among 70% of the 49 health care centres which answered the question it was their principal mode for consultation (Figure 17).

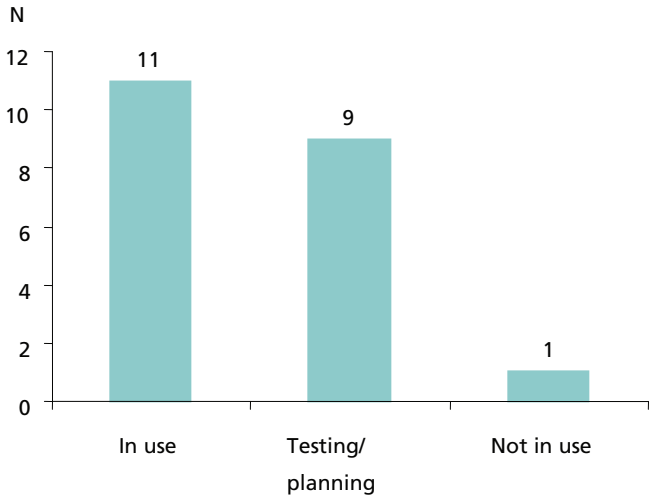

FIGURE 15. The numbers of hospital districts providing electronic consultation services to primary health care

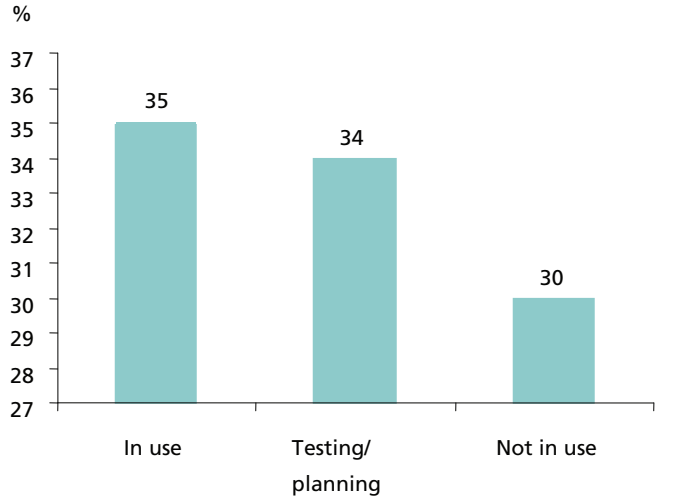

FIGURE 16. The distribution (%) of 179 health care centres, based on the use of electronic consultation letters

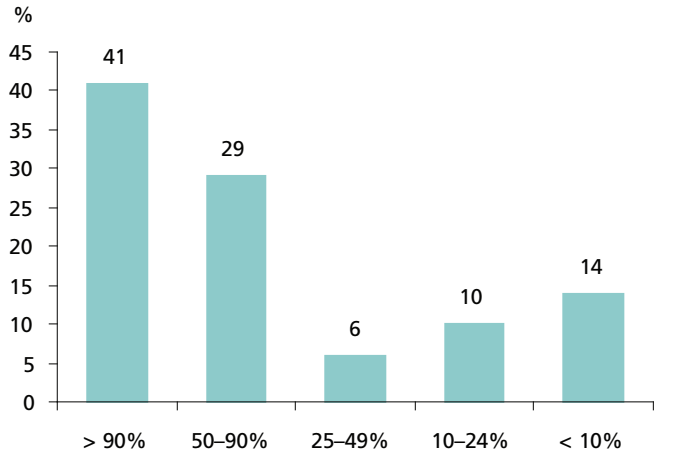

FIGURE 17. The distribution (%) of 49 health care centres, based on the intensity of use of electronic consultations

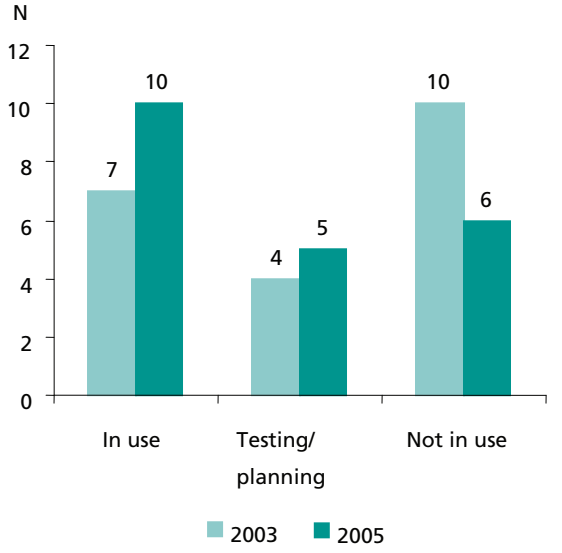

FIGURE 18. The use of video conferencing for consultations with health care centres based on the number of hospitals

None of the 28 *private health care service providers* did offer electronic consultations to health care centres, but ten of them had tested it or had planned to test it. Electronic consultations with public specialised health care were not in use, but eight providers planned for such a service. In the private sector electronic consultation was used by three, and was being tested or was being planned by seven of the 28 respondents.

Consultations by televideo conferencing between health care centres and hospitals takes place according to the following procedure: at the health care centre the patient, the general practitioner, and the nurse attend the video session. In the hospital a specialist accompanied by a nurse gives the consultation. This service has increased in hospitals since 2003 and about half of them provide it today (Figure 18).

Among 179 health care centres which answered the questionnaire, 21 (12%) purchased video conferencing in order to consult a specialist of a hospital. In addition, ten health care centres had been planning or were testing it. Although specialist consultations by video conferencing were now being provided by more hospitals than earlier, the number of health care centres purchasing the service had not increased from 21 in 2003.

None of the 28 *private health care service providers* maintained televideo consultation services, but two planned to have such services later on.

A particular mode of consultation is what is 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. These numbers had not changed since 2003.

The electronic referral letter and consultation letter, and televideo conferencing mean transferring patient identifiable data. In addition to that, a primary care physician can consult a specialist *by e-mail about a patient case without identification.* This function was in use in 2005 among 20 of the 179 (11%) health care centres which answered the question. In the 2003 survey, the corresponding number of health care centres which used e-mail for consulting a specialist was much bigger or 50 – a clear decrease can be seen. One reason could be that other methods of electronic data transfer are supplanting the consultations without patient identifiable data.

Among the 28 *private health care service providers*, four of them used *specialist consultations without patient identification*, and one planned to implement it. Equally a decrease can be seen, because in the 2003 survey, 12 responded that they had used it.

ePrescribing and Other Exchange of Patient Information

In Finland a national *e-Prescribing* pilot-project was launched in 2002. The pilot-project ran from 2004-2006. 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 with 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 (Hyppönen et al 2006, stakes.fi).

STAKES evaluated the starting points and development process of the Finnish ePrescription system as well as the clinical piloting of the system (Hyppönen et al 2006, stakes.fi). The evaluation showed that a system based on a national prescriptions database can provide benefits especially on a national level. These benefits may include reductions in prescription fraud, harmful drug interactions, and an ability to use of the database for research. Immediate user benefits, for example, in terms of time saved, are not so evident. In order to gain the benefits, there are still some unsolved questions, mainly related to the patient's status, rights, and meeting the many differing needs of patients. The conditions for using data for purposes other than care, for example for research, has not been mapped out. The usability and utility for end users needs to be further developed, since a prerequisite for the realisation of the national benefits is a wide acceptance and use of the system by its end-users. It has been foreseen that to achieve this, a better integration of legacy systems, the prescriptions database, pharmaceutical databases, and advanced decision-support and warning systems is required.

At present, permanent e-Prescription legislation has been given to the parliament and has been 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 systems and SSL-secured messages from health care providers and pharmacies to the database will be used. The Finnish ePrescribing is aimed to be fully integrated with the different EPRs and a centralised receipt data file, to cover all pharmacies, and to contain continuously updated knowledge about all prescribed drugs of the patients, all using highly secured networks. The application to be built offers an usable platform for decision support for the drug safety. The legislation is expected to come in to effect in April 2007.

The transference of a medical certificate, for example to the Social Insurance Institution or insurance companies, has not progressed into productive use anywhere. Although, there has been some pilot projects at some hospital districts.

e-Welfare and Exchange of Data between the Health and Social Sectors

The Act on Experiments with Seamless Service Chains in Social Welfare and Health Care Services (2000–2007) is a temporary, normative measure. The Act is applicable to municipalities and joint municipal boards that participate in the pilot project after an application to the Ministry of Social Affairs and Health. The social service sector has been a participant from the very beginning of the experiment. The first project on the implementation of the legislation was called "Makropilotti" (from November 1998 to June 2001). It started developing the *seamless service chains*, where the social service sector was invited to participate in. Since then the social service sector has in legal terms participated in the pilot in 12 out of 22 hospital districts. However, in practice, the

participation of social care client register controllers has been quite small. (Hämäläinen et al 2005).

According to a study in 2005 (Hämäläinen et al 2005), no actual electronic client data had been exchanged between social services and health care services in the participating municipalities. A more in-depth analysis shows that some e-Welfare activities from the social sector can be found (Tenhunen et al 2006). The administrative region of Kainuu, where the health care and the social care belong to the same organisation, both sectors are participating in the regional health and social care network. The regional exchange of data within social care is operational, but even here the different structures of data make it difficult to exchange information between social and health care sectors. In some municipalities, some electronic data exchange happens between the institutional care of the elderly and home care.

The Ministry of Social Affairs and Health has in 2003 launched an e-Welfare program in order to develop ICT for social services. It is a part of a larger program to develop the social service sector (Ministry of Social Affairs and Health 2003B). One main focus of the e-Welfare program is to develop the electronic documentation of social care clients in social care service processes. Defining the common structures of documents has begun and will be finalised in 2008. The history of social care work client documentation has been very fragmented and a national consensus on document structures will be drawn from the work of several expert groups (Kortelainen and Kärki 2005). In addition, the need to exchange client/patient information between health care and social care organisations has to be taken into account.

Regional Data Exchange Systems

Due to a well developed public communications network, investing in creating a closed, healthcare dedicated network was not deemed necessary. The demands of healthcare telecommunication have been served through the use of commercial high speed public data networks and virtual private network (VPN) tunnels over the public network.

Regional patient data repositories are equally used by many health care organisations and institutions for the exchanging of data. According to this survey, nine out of 21 hospital districts have a regional patient data repository in clinical use and six districts are running pilot projects (Figure 19).

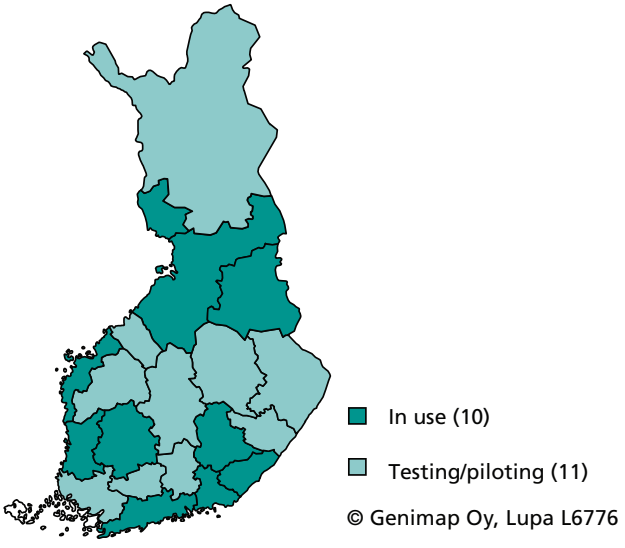

FIGURE 19. The updated situation (1.1.2006) of the implementation of a regional data exchange systems by the 21 hospital districts

In those nine hospital districts which had by the year 2005 entered the clinical phase of regional data exchange systems, four different architectural models could be identified depending on the selected infrastructure:

1) The *master patient index model* is used in three hospital districts. Each of them has a centralised reference database of available selected information in customer organisations. Authorised users can then use these references as a link to the original data and have access to those selections in the customer organisations. The contents of the original selected data include: core narrative texts, digital x-rays, and laboratory data.
2) The *web distribution model* is used in three hospital districts. Authorised users can have full access to a web based electronic record of the patient when situated in a secondary care unit. That includes all texts, images, and laboratory data that a patient has authorised for the treating physician to see. Because of web distribution, no special viewer is needed, only a secure connection.
3) *Regional sharing of electronic patient data* is used in two hospital districts. If the patient grants permission, the physician has direct access to the electronic patient record in another institution. That includes all the texts, images, and laboratory data. In this case both the viewer and the provider are using the same proprietary software.
4) *Mixed model of patient data sharing* is used in one hospital district here primary and secondary care are provided by one authority. No extra viewing permission is needed, but because there are two different electronic patient record software vendors, a special solution of master patient index model with software adapters is utilised.

While regional patient data repositories can exchange many different types of patient data, from images to biosignals. The founding function is the transfer and *exchange of narrative texts* from different specialities. According to this survey, the regional exchange of narrative texts, including the delivery, the receiving and remote reading was being formed in 11 hospital districts, as a pilot-project in two hospital districts and at a planning stage in six hospital districts. The results show that already two hospital districts were using the transfer of narrative texts, even though other aspects of the regional data repository were still under construction.

According to the information from the hospital districts, one fifth of the primary health care centres under their responsibility access to the regional data repositories.

Teleradiology and Image Distribution through a Regional Archive

Teleradiology has been one of the first applications of telemedicine in Finland. The first experiments were made already in 1969 (Reponen 2006) and real implementation started at the beginning of the 1990's. In 1994 all the five university hospitals had teleradiology services (Reponen 1996). The regular service started in the sparsely populated northern areas, but has then spread all around the country.

The boarder line between teleradiology and image distribution through a regional archive is gradually vanishing with certain services. In the current survey, we investigated all the methods used for image transfer. 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.

Responses were obtained from all the hospital districts of Finland (100%, n = 21). The results of 2003 and 2005 on teleradiology and regional image distribution/archive services are

TABLE 3. Teleradiology and regional image distribution/image archive systems in the 21 hospital districts in 2003 and 2005

Measure	2003	2005
Teleradiology in production	13/21	16/21
Teleradiology at the pilot project stage	4/21	2/21
*Teleradiology usage > 90%**	*2/21*	*5/21*
Teleradiology usage 50–90%	*2/21*	*0/21*
Teleradiology usage < 50%	*11/21*	*9/21*
Reg. Archive (with PACS) in production	3/21	10/21
Reg. Archive at the pilot project stage	0/21	3/21
*Reg. Archive usage > 90%**	*0/21*	*3/21*
Reg. Archive usage < 50%	*3/21*	*4/21*

Cumulative Results**		
Image Transfer: Either regional archive or teleradiology service in production	13/21	18/21

* Not all the hospital districts gave answer to the usage question.
** In 2005, two hospital districts did not have teleradiology as a separate service as in 2003, but had integrated it within the regional archive services from their PACS.

presented in Table 3. Also the usage percentage is given, if available. Since teleradiology services could be independent of local PACS or a regional archive, a combined look at image transfer services is given. The key information is that 18 out of 21 (86%) hospital districts utilise some form of electronic distribution of radiological images.

In the primary health care sector, 31 primary health care centres out of 179 informed that they received daily radiological imaging results electronically through a regional database and 72 informed that they were at either a testing or planning stage. Teleradiological image delivery using other methods was being used in 31 primary health care centres. The combined results show that 52 primary health care centres out of 179 (29%) had some method of teleradiological image delivery in production. This is a remarkable increase compared to 2003, when 15 primary health care centres were using teleradiological image delivery.

The results show that the use of teleradiology has increased, but at the same time new regional image archives are taking over the role of previous teleradiology applications for consultations between primary and secondary care. Only time will tell if traditional teleradiology will find new applications in e.g. the redistribution of the excess radiology workload.

Telelaboratory

Regional distribution of laboratory results through a regional archive was utilised by 11 out of 21 Finnish hospital districts, one was at the pilot-project stage and three were planning to provide such a service in the near future. In addition, 16 out of 21 hospital districts utilised some other form of electronic transmission of laboratory results to the primary health care centres in their region. These other services partially overlapped with the usage of the regional archives. The combined results showed that a total of 19 out of 21 (90%) hospital districts had some method for the electronic distribution of laboratory results in 2005. This figure has nearly doubled from 2003 when 10 hospital districts used telelaboratory services.

In the primary health care sector, 48 health care centres out of 179 (27%) informed that they received daily laboratory results electronically through a regional database and 71 informed that

they are either at a testing or planning stage. In addition, 89 out of 179 (50%) health care centres received laboratory results by some other form of electronic transmission. These other services partially overlapped with the usage of the regional archives. The combined results showed that 65% (117 out of 179) health care centres utilized some electronic method for receiving laboratory results, while two years ago the corresponding figure was 38%. This means that those dealing with primary care will accept new services like receiving telelaboratory data as soon as the hospital districts can provide it.

The Future, a National EPR and Other Patient Information Archiving Systems

The Government has decided that for reasons dealing with the practicality and economy, the information management structure of Finland should be at least in part organised on the national, instead of the regional level. The core of the national Finnish ICT infrastructure for social and health care will reside in 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 and not a regional level. The service will be maintained by the Social Insurance Institution (KELA). As of April 2007 legislature will obligate all health organisations to participate in the construction of a national IT architecture for health - a project that is expected to be finished by the end of 2011. It will include a national PKI system for health care professionals. The system will be administered by the National Authority for Medico-legal Affairs. The legislation dealing with the creation of a national level IT infrastructure for health was received by parliament in October 2006 and was passed in December 2006.

DATA SAFEGUARDING

The strategy of the working group *Steering the Implementation of Electronic Patient Record Systems* included national guidelines for the safeguarding of data (informed consent, secure archiving, e-signature, identification of patients, documents, professionals and organizations by ISO/OID-standard, and PKI architecture) (Ministry of Social Affairs and Health 2004).

Management of Informed Consent

The informed consent of the patient is needed by medical practitioners in order to access the patient records in another health care organisation. A completely electronic system using an electronic signature of the patient was not used anywhere in Finland. Below are outlined current, different ways to handle informed consent within regional data systems. This handling could consist of access to reference information (date and department) or to a whole document of a treatment in another organisation (Table 4).

One out of 28 *private health care service providers* use electronic management of the patient's informed consent to handle the patient's record, six out of 28 private health care service providers were still at a testing or planning stage.

Four out of 28 private health care service providers use paper-based management, and three of the private health care service providers are looking into it.

TABLE 4. Managing a patient's informed consent in the 20 hospital districts and 164–166 primary health care centres, which answered to the question

	Access/references				Access/whole document			
	Only electronic n (%)		Electronic and paper n (%)		Only electronic n (%)		Electronic and paper n (%)	
	In use	Prelim.*	In use	Prelim.*	In use	Prelim.*	In use	Prelim.*
Hospital districts	3 (14)	11 (52)	3 (14)	4 (19)	2 (10)	10 (48)	6 (29)	5 (24)
Health care centres	9 (5)	45 (25)	25 (14)	40 (22)	7 (4)	44 (25)	58 (33)	24 (13)

* prelim means: at a testing or planning stage.

Electronic Signatures and Identification

The electronic signatures of health care personnel was being used in four hospital districts, and was at a testing or planning stage in 11 of them. 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 bee built as a regional agreement within the health care system. Developed signature (EU-signature directive) is being piloted a project lead by the National Authority for Medicolegal Affairs, but is not in routine use. Smart cards were used for the identification on professionals in three hospital districts, and at a testing or planning stage in ten of the hospital districts.

According to the health care centres smart cards when entering regional data systems was mentioned as the most common technology used for the identification of medical personnel. Two health care centres reported that they used electronic verification for patients.

DATA TRANSFER DURING EMERGENCY TRANSPORTATION

In Finland, municipalities are responsible for organising the emergency transport of patients. In most cases it is organised by purchasing the service from private providers. Ambulance services can also be under direct control of the municipality. The number of ambulances in use depends on the size of the municipality. The average population of a Finnish municipality is about 6,000 inhabitants, thus 1–3 ambulances are typically in use at any one given time and with a total of 4–6 emergency medical personnel. The educational background of the personnel corresponds usually to that of a nurse or a practical nurse with extra training in emergency response. Every ambulance has to have at least one driver and one trained medic. The County Administrative Boards are responsible for the supervision of the emergency services. The practical supervision is usually done by the medical director of a health care centre. The health care centres and the emergency wards in secondary and tertiary care hospitals work in cooperation with the provider of the ambulance service.

The Government Decision-in-Principle on Securing the Future of Health Care in Finland highlights the need for effectiveness, productivity and quality of services in health care in Finland. In emergency transportation the accomplishment of these objectives are challenged by long transportation times due to distance. Especially in the scarcely populated northern part of Finland the distances from remote villages to emergency units in secondary/tertiary hospitals can be over 500 km, which means a 7–8 hour ride in an ambulance to the patient. Even the distance to the nearest on-call physician can be 100 km or more.

It is not unusual for ambulance personnel to have to consult a physician during transportation. Traditionally, the transference of information was done by communicating over mobile phone or radio. There is a need for a more versatile way to exchange information between the ambulance and the hospitals or health care centres.

In order to discover the current readiness for multimedia messaging between ambulance personnel and a hospital's or health care centre's staff, a web-based questionnaire was e-mailed to all the ambulance service providers listed by the Ambulance Services Union (Sairaankuljetusliitto – www.sairaankuljetusliitto.fi). Further information of ambulance service providers was inquired from health care centres. To those ambulance service providers who did not have an e-mail address, the questionnaire was sent by a regular mail.

The questionnaire contained questions pertaining to the organisational structure of the service provider, the wireless equipment used (besides a mobile phone), electronic documentation, and questions dealing with opinions on cooperation and training. According to the list provided by the Ambulance Services Union there are 208 private ambulance service providers in Finland and 80 public ambulance service providers, including municipal fire departments and health care centres. 25 ambulance service providers are owned by non-governmental organisations (NGO), such as the Finnish Red Cross. The questionnaires were e-mailed or sent by post to 218 ambulance service providers who explicitly provide emergency transportation and whose contact information could be found. This consisted of 185 private ambulance service providers, 30 municipal, and three NGO ambulance service providers.

The total response amount was 62% (n = 135). The response rate was 58% (n = 107) for private businesses, 87% (n = 26) for public providers and 66% (n = 2) for NGOs. The average

number of ambulances maintained based on the responses was two (range 1–21). Most who responded to the questionnaire had a GPS locator and equipment for wireless transferring of ECGs on their ambulances. Only a minority had a data transmission capability that could be used for other purposes (Table 5).

Among the 130 ambulance service providers that responded to the question, the recording of patient data was completely digital in two (2%), 44 (34%) had both digital and manual recording abilities, and 84 (65%) had exclusively manual. Most of those who responded regarded cooperation with hospitals and health care centres in the planning, implementation, and the use of information technology as being insufficient. This was also true in terms of education and training (Table 6).

The response rate to the survey was not high, but it was enough to map out the situation. Most of the ambulances could transfer digital ECGs and show their location real-time. Only a minority had the capability for other types of data transfer. Nearly nine out of 10 ambulances were capable in transferring a wireless electrocardiogram, but only six out of the 21 hospital districts and only 48 % of the health care centres could receive it. There is a need to improve the cooperation between those purchasing ambulance services and those providing them, in order to maximise the use of information and communication technology. Another important area to develop cooperation between the ambulance services purchaser and the provider is with mutually supportive training.

TABLE 5. The prevalence of wireless equipment (excluding mobile phones) for information exchange in ambulances (n = 130), listed according to purpose

Purpose/equipment	Available % (n)	Not available % (n)	Missing % (n)
Electrocardiogram	89 (115)	12 (15)	0 (0)
Patient history and status in text mode	22 (29)	76 (99)	2 (2)
Other vital patient data *	39 (50)	59 (77)	2 (3)
Other data exchange**	16 (21)	75 (98)	9 (11)
GPS locator	62 (80)	37 (48)	2 (2)

* Blood pressure, pulse, oxygen saturation, **fax, etc.

TABLE 6. The opinions of ambulance service providers on cooperation in planning, implementation, and the use of information technology, as well as education and training

Topic	Sufficient % (n)	Insufficient % (n)	Can't say % (n)	Missing data % (n)
Collaboration	21 (27)	62 (81)	14 (18)	3 (4)
Education	14 (18)	56 (73)	29 (37)	2 (2)

STANDARDS FOR DATA EXCHANGE BETWEEN ORGANISATIONS

The Finnish registries use international classification systems such as ICD-10 and ICPC-2. The EPR Minimum Data Set will also be coded based upon these classification systems. In terms of communication and security, Finland has chosen to adopt international standards, such as HL7 and DICOM, and the ISO 17799 standard for Information Security Management (based on the BS7799).

HL7 (Health Level 7) standards will serve as the base communication standard and the use of XML (eXtendible Markup Language) as a basis for the transfer of patient information between health care organisations. CDA (Clinical Document Architecture) is a XML based clinical document architecture for the exchange of various types of documents. DICOM (Digital Imaging and Communications in Medicine) standard enables users to retrieve images from digital imaging devices.

EDI (Electronic Data Interchange) was still in use in 12 of the hospital districts and also in about one fifth of the health care centres. It was at a preliminary stage only in two health care centres. Release 1 of the CDA was being used in 13 hospital districts and in 35% of the health care centres. Release 2 of the CDA was being implemented in four hospital districts and in 8% of the health care centres, and it was at a planning stage in 13 hospital districts and in 19% of the health care centres (Table 7).

12 hospital districts used XML messaging, and except for two, the implementation was at a planning stage in the rest of the hospital districts. Roughly one fourth of the health care centres used XML messages and 15 % of them planned to implement it in the future.

Except for two, who were still planning on its implementation, the DICOM standard had been implemented in all of the 21 hospital districts. The standard was in use in one fifth of the health care centres with another 10 % of the health care centres at a preliminary stage.

Three out of the 21 hospitals districts were using their own object identifier (OID) codes, and 13 were at a planning stage. Among the health care centres, the corresponding numbers were six (3%) using and 39 (22%) planning. While among the 28 private providers three (11%) using and two (7%) planning.

An Identifier for a care chain is given to every patient during their first visit, when dealing with a new or undiscovered ailment. Every contact to a medical professional dealing with that ailment by that patient carries an identifier code. This way it is possible using the identifier to string individual medical contacts into a care chain, allowing for better follow-up and a lessening of waiting times for treatment (Stakes 2006). So far the identifier has not been routine use between organisations.

When interpreting the figures concerning the answers from the health care centres, it needs to be mentioned that 21–30% of the health care centres were not able to answer questions on standards.

TABLE 7. The use of technical standards for electronic messaging with amounts and percentages in hospital districts and health care centres

Providers	EDIFACT n (%)	HL7CDA R1 n (%)	HL7CDA R2 n (%)	XML messages n (%)	DICOM n (%)
Hospital districts	12 (57)	13 (62)	4 (19)	12 (57)	19 (90)
Health care centres	40 (22)	63 (35)	14 (8)	47 (26)	34 (19)

INFORMATION EXCHANGE BETWEEN HEALTH CARE ORGANISATIONS AND PATIENTS

General Health Information

20 hospital districts and 79% of all the health care centres maintained their own *websites*. The hospital district and a half of the health care centres who still did not have an individual website were running pilot-projects or were planning the implementation of their own website.

An anonymous question and answer service was being used in one hospital district and was being planned in five others. A similar anonymous question and answer service was being used in 22 health care centres and being planned in 16 others.

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).

Exchange of Patient Identifiable Data

The direct *electronic order of an appointment* means that a patient can reserve an appointment with a physician over the internet. According to a recent report (Vähäkuopus et al 2006), two thirds of all phone calls to doctors office in primary health care centres concerned making an appointment. Direct electronic ordering could potentially significantly save the time of health care staff.

The direct electronic ordering of an appointment was not used by any of the hospital districts, but it was at a testing or planning stage in ten of them. The system was in use in two health care centres and at a testing or planning stage in 7. In the public sector the service was hence available only in two health care centres, but in private sector it is somewhat more common (Table 8). Using e-mail to make an appointment was in the public sector used by four (2%) of the health care centres, and with five (18%) of the 28 private providers.

SMS messaging for the purpose of making an appointment did not already exist with hospital districts, but being planned among four of the hospital districts. An SMS appointment system was not in use in the health care centres, but in one of the private providers. The questions dealing with the electronic means to make an appointment was completed by a question on the use of outsourced contact centre services. For this reason, it concerns the implementation of an electronic means for ordering an appointment. In the public sector the service was being used only by six health care centres.

TABLE 8. Distribution (amounts and percentages) of health care providers based on the electronic ordering of an appointment

Provider	Direct electronic ordering n (%)		E-mail n (%)		SMS messaging n (%)		Outsourcing service to contact centre n (%)	
	In use	Prelim.*	In use	Prelim.*	In use	Prelim.*	In use	Prelim.*
21 hospital districts	0	10 (52)	0	4 (19)	0	4 (19)	0	8 (38)
179 health care centres	2 (1)	7 (4)	4 (2)	10 (6)	0	9 (5)	6 (3)	14 (8)
28 private providers	6 (21)	6 (21)	5 (18)	2 (7)	1 (4)	5 (18)	1 (4)	2 (7)

* Prelim. means: at a testing or planning stage.

It should be noted that in the context of ordering an appointment in Finland, the primary health care physicians have the role of a gate keeper into specialized health care. For this reason, primary health care and specialised health differ when dealing with appointments.

Exchange of Information on Treatment and Care with the Patients

Information exchange with patients by SMS messaging was only used by one and tested by three of the hospital districts. It was used by nine (5%) health care centres and tested by 11 (6%) of the 179 health care centres. With private providers information exchange with patients by SMS was used by three (11%) and tested by 4 (14%) of the 28 private providers.

Only one health care centre used secure e-mails in information networks, but 15% of them used conventional e-mail. Remote browsing of EPR by the patient was not in use anywhere, but was planned to be implemented by two hospital districts, three health care centres, and one private care provider (Table 9).

It has been planned that the National EPR Archive will offer citizens a chance to browse selected personal health information - namely, reference information for the use of services, referral and discharge letters, certificates, statements and results of examinations, and access log data about the visits to the to the personal patient record.

Citizen initiated recording means a function by which a patient can transfer personally conducted laboratory tests into the patient record health care system. The service was in use in two hospital districts, and eight hospital districts had tested it or planned for it. One health care centre used the citizen initiated recording and three health care centres tested it. None of the private health service providers used the service, but three had tested it or had run pilot-projects.

Teleconferencing means a situation where the physician is at one location, while the patient and the nurse are at another. The physician uses two monitors, one for video and the other for the patient record. Three health care centres used the service and two have been planning it.

TABLE 9. The electronic modes of information exchange with patients presented by the amount and proportion (%) of the health care providers

Provider	SMS messaging n (%)		E-mail/secured networks n (%)		Ordinary e-mail n (%)		Remote EPR browsing/patient n (%)	
	In use	Prelim.*	In use	Prelim*	In use	Prelim*.	In use	Prelim.*
21 hospital districts	1 (5)	2 (10)	0	4 (19)	3 (14)	1 (5)	0	2 (10)
179 health care centres	9 (5)	11 (6)	1 (1)	10 (5)	27 (15)	28 (16)	0	3 (2)
28 private providers	3 (11)	4 (14)	5 (18)	6 (21)			0	1 (3)

* Prelim. means: at a testing or planning stage.

HUMAN AND MATERIAL RESOURCES

Professional Education and Training

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

The national health portal "Terveysportti", was used extensively by all health care organisations, including both the Physician's and Nurse's Database. The portal and the databases are provided by the Finnish Medical Society, Duodecim (Table 10). The national health portal consists of a comprehensive set of guidelines. It has been calculated in 2005 that every Finnish physician reads on average of 1,5 guidelines a day from the portal (Kunnamo 2006).

Regional clinical quidelines refer to the quidelines and clinical practices made in collaboration with hospitals and health care centres. About two thirds of the public providers use them over the internet.

TABLE 10. Distribution (%) of health care organisations based on the use of professional databases and educational teleconferencing

Provider	Health portal n (%)	Physician's Database n (%)	Regional clinical quidelines n (%)	Nurse's Database n (%)	Televideo for education n (%)
21 hospitals districts	21 (100)	19 (11)	16 (76)	15 (71)	16 (76)
179 health care centres	164 (92)	164 (92)	114 (64)	124 (69)	44 (25)
28 private providers	22 (79)	11 (39)	10 (36)	11 (39)	0

Computer Skills of Health Care Personnel

In over half of the hospital districts, at least 90% of the whole personnel had basic computer skills. The corresponding numbers among health care centres was 57% and among private providers 61% (Figure 20).

Of the 20 hospital districts in which the EPR was in use, over 80% of the personnel documenting and reading patient information had computer skills. In 80% of the health care centres at least 80% of the personnel had computer skills. Private health care providers followed a similar, equally high trend. (Figure 21).

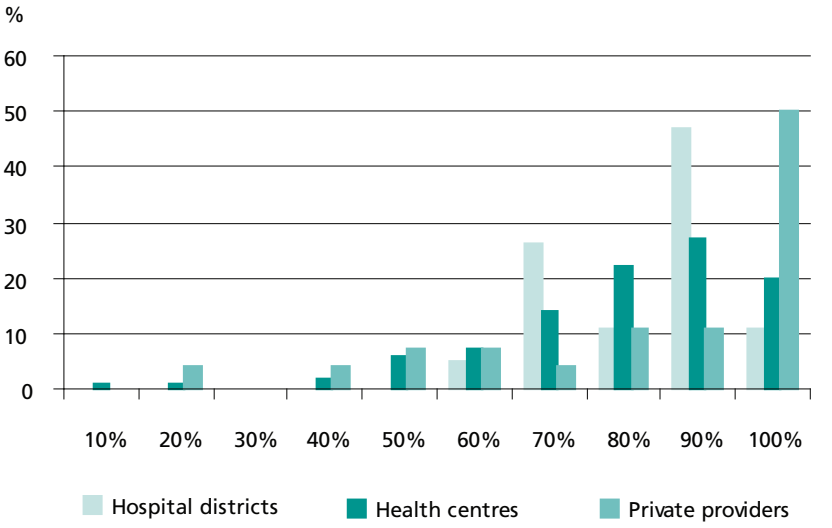

FIGURE 20. Distribution (%) of the health care organisations based on the proportion (%) of personnel with computer skills

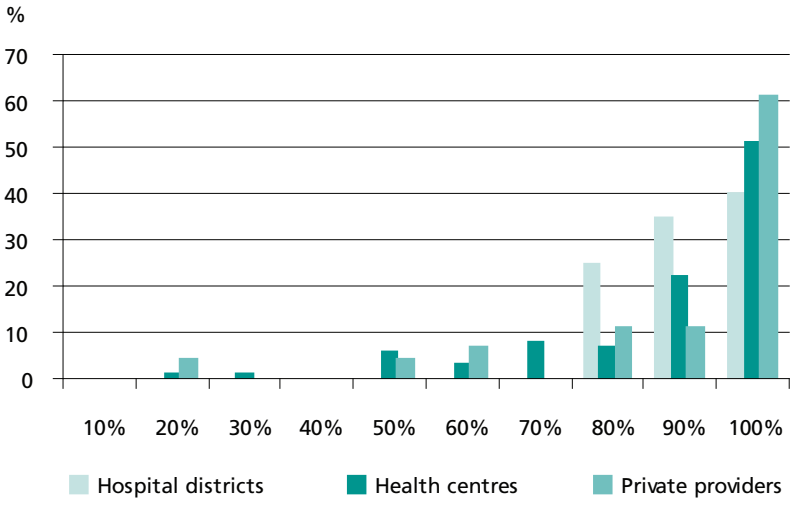

FIGURE 21. Distribution (%) of the health care organisations based on the proportion (%) of the personnel with computer skills, documenting and reading patient information

Availability of Computers and Internet Connections among Health Care Personnel

Among 70– 80% of the public and private health care providers all personnel who documented or read patient information had computers (Figure 22).

With 60% of the hospital districts, all the personnel documenting and reading patient information had access to the internet. The percentages were higher with health care centres at 70% and with private health service providers at 75% (Figure 23).

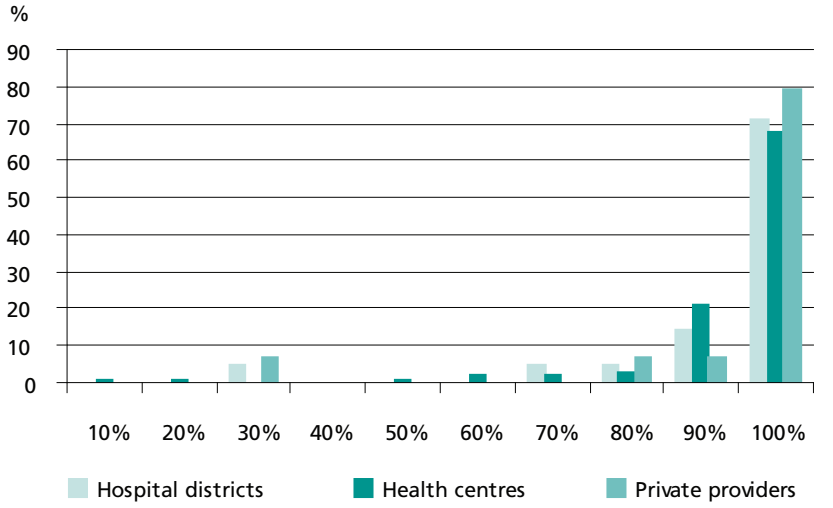

FIGURE 22. Distribution (%) of the health care organisations based on the proportion (%) of the personnel documenting and reading patient information with computer skills

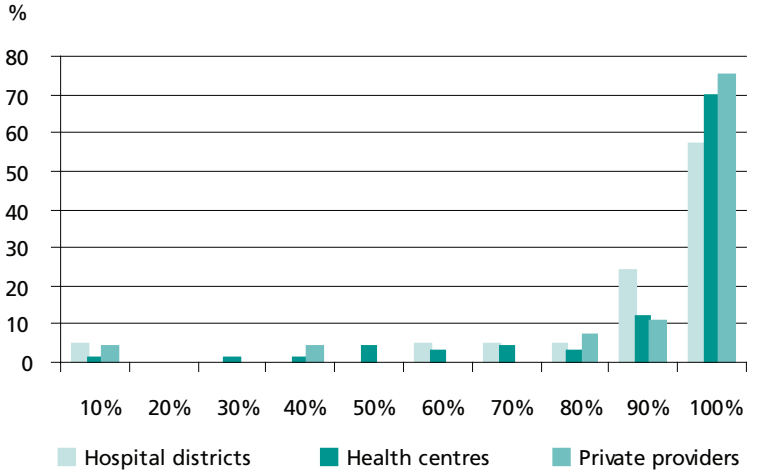

FIGURE 23. Distribution (%) of the health care organisations based on the proportion (%) of the personnel documenting and reading patient information with access to the internet

Needs for ICT Training

An investigation on the need for ICT training and teaching materials among social and health care professionals, and the challenges to enhance training was initiated by the Regional and Municipal Consulting group at STAKES in 2006 (Veikkolainen and Hämäläinen 2006). The principal aim of the investigation was to gather a comprehensive, nationwide information on the need for ICT training and teaching materials among social and health care professionals working for municipalities, joint municipal boards and hospital districts, as well as for any planning or provision for training.

The study by Veikkolainen and Hämäläinen (2006) inquired in detail about computer skills of medical staff in hospital districts. Half of the 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. About two thirds of the districts felt that their nursing staff had some, or major deficiencies in their computer skills. This study was conducted at the same time as the eHealth study. It shows that adequate computer skills cannot be found among all the sections of the medical staff and that a general overview may paint an unrealistic picture, unless the individual sections are reported separately.

The investigation also showed that while ICT training was provided by hospital districts and areas, municipal social care departments and health care centres, the quality and the extensiveness of training was not sufficient. Most respondents had organised basic ICT training. By contrast, training dealing with privacy and data security, the function of seamless service had been less than extensive. However, the need for further training had been recognised in several units. The ICT training programmes had been targeted in particular to medical personnel. According to reports by senior social and health care officials, there was an obvious need for training so that goals dealing with the provision of seamless service and dealing with the introduction of electronic client/patient records could be met. Institutional and home care personnel in services for older people were assessed to have the greatest need for ICT training, while physicians were assessed to have the least.

Hospital districts and units in the municipal social and health sectors perceived themselves to need extensive support in order to be able to teach ICT skills to their personnel. In particular, the surveyed organisations needed financial support to organise ICT training. Support should be offered to hospital districts and municipalities for planning and organising training, and for the development of cooperation.

SYSTEMS SUPPORTING THE QUALITY AND DELIVERY OF SERVICE

An intranet for administrative purposes was in use in all but one of the 21 hospital districts. The intranet in the one hospital district being at a testing stage. A regional extranet for administrative purposes was being used in 13 hospital districts and five were at the testing stage or at the pilot-project stage of using a regional extranet.

Systems for Quality Related Iissues

Public health care providers are obligated to comply with the law to allow the patient access to immediate treatment during office hours at a health care centre, or with non-critical matters an assessment for a course of treatment within three days. The law obligates hospitals to give the patient an assessment for the need for treatment within three weeks, and a course of treatment within six months. At the time of the survey the law had been in effect for nine months. Electronic systems for this purpose were in use in 15 of the 21 hospital districts, but only in one of every fifth health care centre (Table 11).

Systems to measure the quality of service were in place in almost half of the hospital districts, but were quite uncommon elsewhere. An electronic registry system for adverse events (disasters) was being used by some health care providers. A data security plan was being used among three fourths of the hospital districts, and about half of the health care centres and private health care providers.

TABLE 11. Distribution (amounts and %) of health care organisations based on the use of some systems supporting service delivery

Provider	Access to care follow up n (%)		Quality follow up n (%)		Adverse events' Registry n (%)		Data security Plan n (%)	
	In use	Prelim*.	In use	Prelim.*	In use	Prelim.*	In use	Prelim.*
21 hospitals districts	15 (71)	5 (24)	9 (43)	2 (10)	4 (19)	4 (19)	16 (76)	3 (14)
179 health care centres	37 (21)	66 (37)	4 (2)	16 (9)	5 (3)	10 (6)	81 (45)	43 (24)
28 private providers	5 (18)	2 (7)	3 (11)	2 (7)	1 (4)	3 (11)	15 (54)	5 (18)

* Prelim. means: at a testing or planning stage.

Systems for Registering Treatment and Care

Health care providers with beds are obligated to report the diagnosis, length of stay, and possible surgical procedures to the national registry at the point of discharge from care. All of the hospital districts make the reports electronically, they are then collected and transferred to the registry. The reporting by health care centres with beds falls under the responsibility of hospital districts.

Registers of Adaptive Home Care Medical Equipment

The loaning of adaptive home care medical equipment (e.g. wheelchairs, crutches, walkers) to patients is included in the services of the health care providers. Among 15 of the 21 (71%) hospital districts, 116 (65%) of the health care centres, and four (14%) of the private providers maintained electronic registries of borrowed adaptive home care medical equipment.

COSTS FOR SYSTEMS OF INFORMATION AND COMMUNICATION TECHNOLOGY

Annual costs for purchasing, maintaining, developing information and communication technology, and training were received reliably only from the hospital districts in which those proportion of the budget varied between 1–6%, with a median of 2% (Figure 24). The average costs for health care centres seemed to be about 1%. For the private providers the costs were typically 1–3% of the annual budget.

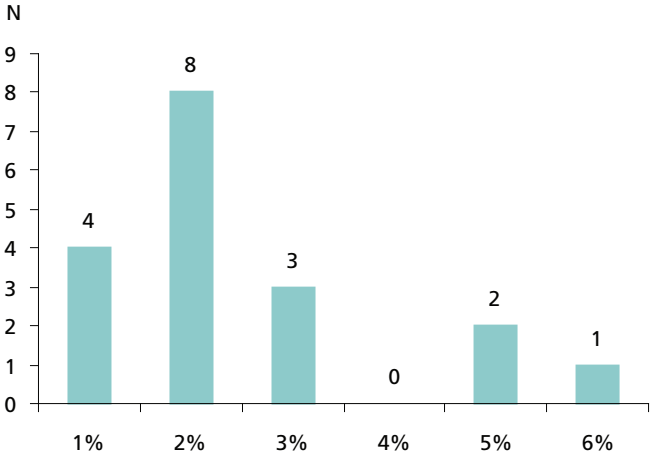

FIGURE 24. Distribution of amount by the 18 hospital districts answered to the question, based on the proportion (%) of ICT-related costs in the annual budget

ADDITIONAL INFORMATION ON FINLAND eHEALTH

Research, Development and Training in Health Care Informatics

Funding for research and development in health informatics originates primarily from the public sector, such as the Ministry of Social Affairs and Health, the Finnish Academy of Science, the Finnish National Fund for Research and Development (SITRA) or from the semi-public sector (such as the National Technology Agency – TEKES). The allocated funds are primarily targeted at pilot-projects and the promotion of eHealth applications, as well as at the further standardisation of existing tools. Additionally, there are funds available at the local level, through the regional hospital districts' own development schemes for services as well as through some local technology centres.

Research on medical imaging and bio-signal processing and analysis is performed at the Helsinki University of Technology and at the Tampere University of Technology. Also, a Health Informatics laboratory operates as a part of the VTT Technical Research Centre of Finland (VTT). Considerable research work on an international level is undertaken in the fields of bioinformatics and genomics. However, there is not yet been a direct connection to health informatics research. The National Research and Development Centre for Welfare and Health (STAKES) undertakes and coordinates research work in the area of eHealth (secure communications, eArchiving, assessment of eHealth applications, strategies and implementations).

Training in health informatics is not currently available as a standalone line of study, with the exception of University of Kuopio which offers a Masters degree programme in Health Information Management. The curricula of undergraduate studies in medicine does not include health informatics training. Rather, the emphasis has been on training healthcare practitioners to acquire the necessary IT skills. National representatives participated in a recent effort to define a healthcare specific application to the European Computer Driving License (ECDL).

Professional Activities

There are two main professional organisations active in the Health Informatics field in Finland: the Finnish Society for Telemedicine (FST) and the Finnish Social and Healthcare Informatics Association (FinnSHIA) (Reponen 2005). For more than a decade, several annual national conferences have been organised. Topic-specific seminars, workshops, and international health informatics events have been regularly hosted around the country.

Finnish representatives participate in the activities and working groups of international health informatics organisations such as the European Federation for Health Informatics (EFMI), International Medical Informatics Association (IMIA), the International Society for Telemedicine and eHealth (ISfTeH), the European Health Telematics Association (EHTEL), as well as the standardisation activities of ISO and CEN.

International Collaboration

At the Nordic level, Finnish representatives have participated in telemedicine surveys and projects supported by the Nordic Council of Ministers and the Nordic University Network (NordUNET) since the early 1990's. Finland was a founding member for the Nordic Telemedicine Association

(NTA). Recently, the Nordic Council of Ministers has established "The Nordic Telemedicine Collaboration Forum" (Nordisk telemedisinsk samarbeidsforum). This forum has up to two representatives from each Nordic country, including the autonomous areas of Greenland and the Faroe Islands. Representatives mostly come from national ministries or other national bodies as well as the Nordic Telemedicine Association. The task of the forum is to investigate legal and other barriers for cross-border telemedicine between the Nordic countries. Reports on the findings from the forum will be given to the senior health officials of their respective countries.

Finland has been actively involved at the European level in discussions and preparations of eHealth issues. It gave expert and secretarial support to the Health Telematics Working Group of the High Level Committee on Health, which gave its Final Report in 2003 (European Commission 2003). It has also participated in the implementation and coordination of the *European eHealth Action Plan* of April 2004 (European Commission 2004). Finland has participated actively since 2005 in the *eHealth Working Group, under e2005.* Finland has also participated in the *High Level Group on Health Services and Medical Care* during 2005 (European Commission 2005).

After launching of the concept of the *European eHealth Area in* the strategic framework of *i2010 – European Information Society 2010* setting as priorities the completion of a single European information space, Finland has actively participated in the i2010 subworking group on eHealth and also in work on eInclusion. The member states of the i2010 eHealth have been invited to form, with expert support from the National Competence Centres, *ad hoc* groups to work on patient summaries, patient and practitioner identifiers, and the emergency data set. The Finnish Ministry of Health and Social Affairs has nominated STAKES Unif for eHealth and eWelfare to represent Finland in the ad hoc group. Finland has sent a ministerial delegation to the ministerial level eHealth conferences of Brussels 2003, Cork 2004, Trømso 2005 and Malaga 2006. During each conference different aspects of the Finnish eHealth development have been presented during the sessions and/or as part of exhibitions. The first results published of this report were shown as an exhibit by the Finish Ministry of Social Affairs and Health in Malaga in May 2006. The results have also been shown at the World Health IT Conference in Geneva, Switzerland in October 2006.

Finland has also participated in some EU projects aiming at bettering European eHealth coordination and interoperability. These projects are the ERA project (www.ehealth-era.org), The Netcards project and the Semantic Mining project. Preliminary results of the eHealth ERA project confirm the observation that interoperability issues are high on the agenda of most eHealth strategies and roadmaps of member states. In the area of *semantic interoperability,* Finland is participating in the European discussions and looking at different possibilities of harmonising the national and the international needs for development.

The Finnish national version of an eHealth roadmap has been developed in a ministerial working group between 2005 and 2006 and will be finalised by January 2007. The ideas stated in the European action plan, of citizen-centred and patient-centred services, improvement of patient safety along with the full continuum of care, and the support of citizens with tools that enable them to become both well-informed and self-assured patients, and optimal medical services are not in conflict with the ideas of the Finnish roadmap. Finland supports joint efforts for more eHealth collaboration in Europe. Steps should be taken to reach out to these goals for the benefit of Europe, its citizens and its societies, and thus supporting the longer-term objectives of the Lisbon Strategy (European Council 2000).

CONCLUSIONS AND FUTURE PROSPECTS

The eHealth surveys made in Finland have shown a rapid progress in the use of ICT technology during the past 10 years. The contributing factors have been governmental strategies, regional activities, and general progress in available technology. According to our surveys, the speed of development has been the fastest during the last two to four years. Focused financial contribution towards technology implementation projects and the increasing collaboration of national strategies have worked in concert with published guidelines and new legislation to the promotion of ICT technology.

The methodology used in surveys made by FinnTelemedicum and STAKES in 2003 and 2005 takes into account both the distribution and practical use of various health care ICT solutions. The main emphasis has been in the clinical point of view, being an excellent measure of the true influence of ICT technology. It has been important to measure all the relevant software components that form EPR to decision support systems in order to have a proper situational overview.

The Electronic Patient Record is the most important tool for health professionals in acquiring and documenting information about patient care. In Finland 95,6% of the primary health care centres and 95% of the hospital districts used EPR as their primary tool for patient data. Among primary health care centres, the figure was already 93,6% in 2003. Knowing this, one can say that the penetration of EPR is no longer a measure of ICT usage and that new indicators need to be sought.

One new indicator is the exchange of information between health care institutions. In Finland, regional exchange of information has been possible because of the high usage of EPR systems within institutions. Regional exchange of radiological and laboratory data has been one of the first applications, but these days eReferrals and eDischage letters directly from EPR to EPR are on the increase. These all contribute to the seamless service systems of the patient. The popularity of regional data exchange has resulted in four different widely used data exchange systems, which gives with the patient's consent, the physician instant access to previous patient data from other institutions through a secure connection.

The convergence of ICT tools into one desktop is also another noticeable trend. EPR, PACS, laboratory results, databases, and decision support systems are all now available in electronic form at the point of care. The national nursing recording project pinpointed what needs to be taken into account from different medical personnel in combining care for the patient. The next challenge is the usability of the systems. The technical functionality is not enough if normal workflow is not supported. The national core data project makes it easier to exchange information between systems and also unifies data structures. This makes it easier for medical personnel to change from using one system to using another.

Once the backbone for electronic management of patient data in Finland is ready, the next major challenge is the construction and implementation of the National EPR Archive. The task is not a minor one. There are changes that need to be made in legislature, technology, and ways in conducting daily tasks in health care. A transition period of several years is needed. The greatest challenges may occur in communication between local and regional systems and the national archive. This might require major changes in the current software being used in hospital districts and health care centres. The goal is increased access to electronic personal of health records, both by the physician and the patient.

This survey is now a second of its series. The first one in 2003 at the beginning of the national health project revealed that health care services, especially in secondary care were starting to implement ICT. The current survey shows that the core EPR systems are reaching a saturation point, but information exchange between organisations and value added services like decision support systems are only now beginning to emerge. There is a definite need to continue to chart in further surveys that the progression and targets of the National health projects are achieved. The follow-up studies should also record the progress of unified core information, usability aspects, and process influences of the new e-tools. Finally the targets of the National EPR Archive are worth evaluating.

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