



Interoperability in Finland

- a review at past, present time and future

Dr. Vesa Pakarinen, (visiting Mayo, KP, Stanford, VA, NIST, HITSP...)

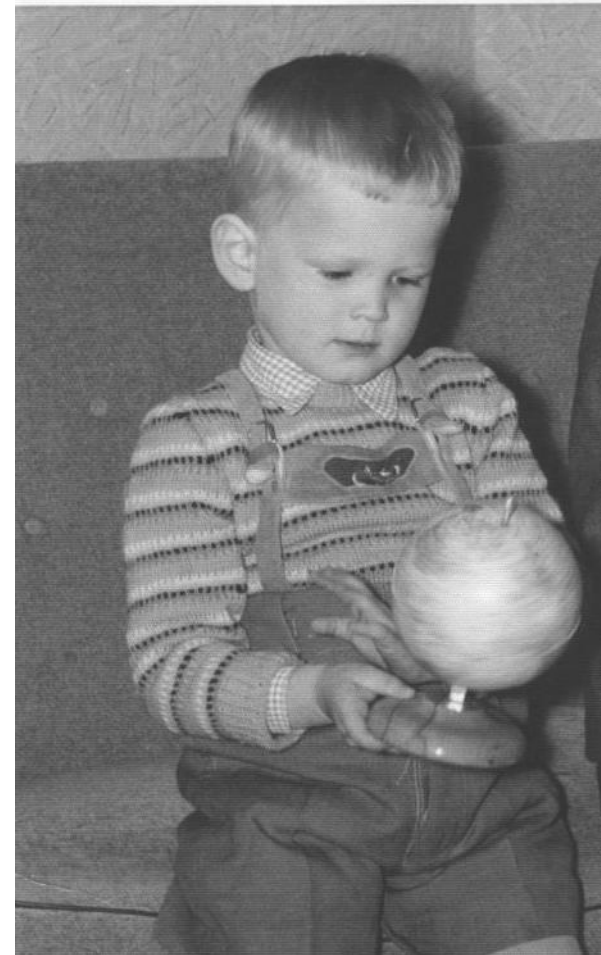
- / Brief introduction to Finnish Healthcare system
- / How has the development gone with IT-systems in HC
- / National IT-strategy in HC and role of HL7 Finland
- / What is the current situation, what are the challenges
- / What do we know about the future ?
- / Questions, discussion

presentation material also provided by (compliments to) :

- Mrs. Annakaisa Iivari, Ministry of Health and Social Affairs
- Prof. Niilo Saranummi, VTT
- Mr. Jari Porrasmaa, Kuopio University (co-chair of Int. HL7 CS)

Some background information about speaker

- Vesa Pakarinen, MD , @VTT, Tampere, Finland
- 25 years of medical informatics
 - COSTAR and VA co-operation from 80'ies
 - EU-projects e.g. Galen, Ehto, Picnic), standardization e.g. ISO TC37, CEN TC251, HL7
 - special interest on EHR systems based on data dictionaries (medical language)
 - during last 8 years informant of HL7 Finland (also web-site maintenance)
 - Consultancy in Sarajevo, Lesotho...
 - during last 5 years project manager of National Health IT-Program (CDA-projects with co-operation of Ministry of Social Affairs and Health)
 - Citizen's eHealth services (this visit is part of the B2C-PRO-activity, <http://b2cpro.vtt.fi>)
 - more information e.g. through www.hl7.fi





Some background information about VTT

- VTT Technical Research Centre of Finland () is the biggest contract research organization in Northern Europe. VTT provides high-end technology solutions and innovation services
-  produces research services that enhance the international competitiveness of companies, society and other customers at all stages of their innovation process. VTT thereby creates the prerequisites for growth, employment and wellbeing
- Established: 1942
- Turnover: 225 M€ (300 M\$) www.vtt.fi
- Personnel: 2 720 (80 % of academic degree)

Finnish Health Care in Brief

- 5.276.955 Finns (end year 2006)
(Population Register Centre, www.vrk.fi)
- Public services provided by municipalities (440)
 - Primary Care
 - 200 HC stations
 - GP's 1:1488 inhabitants
 - Secondary Care
 - ~90 public hospitals
- Health: 7 % of GNP
- Private sector 20 %
 - Pharmacy system



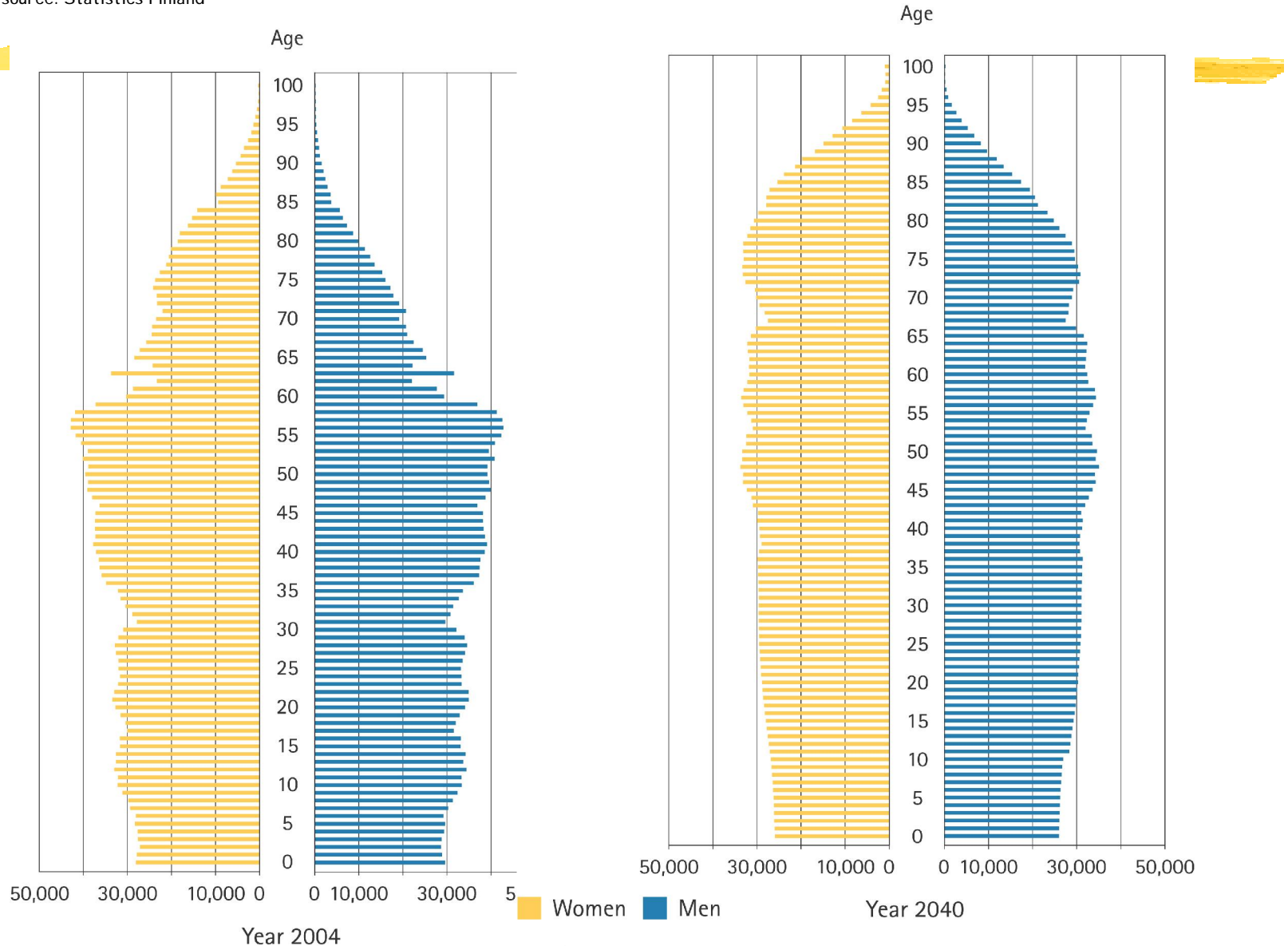


HL7 Finland ry



Finnish Population age structure at the end of 2004 and 2040.

source: Statistics Finland



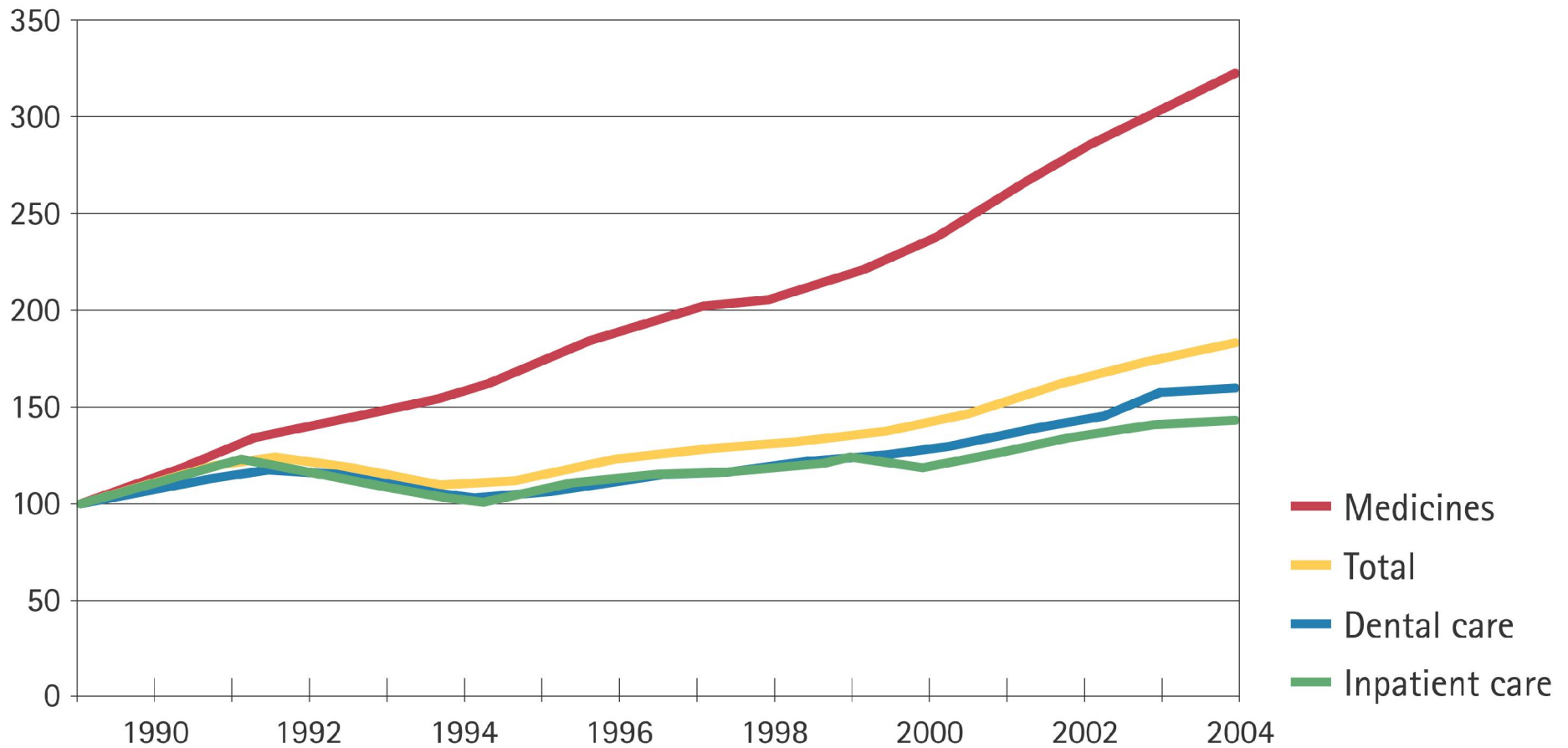


HL7 Finland ry



Development of health care expenditure since 1989, in fixed prices.

(1989 = 100, source: STAKES)





Organisational structure of health care

- Municipalities have, by law, a responsibility for arranging health and social services
- 440 municipalities (population varies between 100 - 560 000)
- The National Health Insurance scheme covers loss of income during illness, provides partial reimbursement for outpatient medication and costs of examinations and treatment by the private sector and provides rehabilitation
- Private health care in Finland comprises mainly outpatient care

● 251 health centres

- health education, maternity and child clinics, school, student and occupational health services, primary medical care and rehabilitation, parts of mental health care bed wards, home nursing, oral health care, ambulance service
- at present time, many of the HC's have outsourced some of their services, like hours –on duty to private (virtual) (leasing) companies
- tendency towards "own-doctor" philosophy – population based responsibility
- the use of PC is free of charge to citizens (or nominal fee)

Specialized care

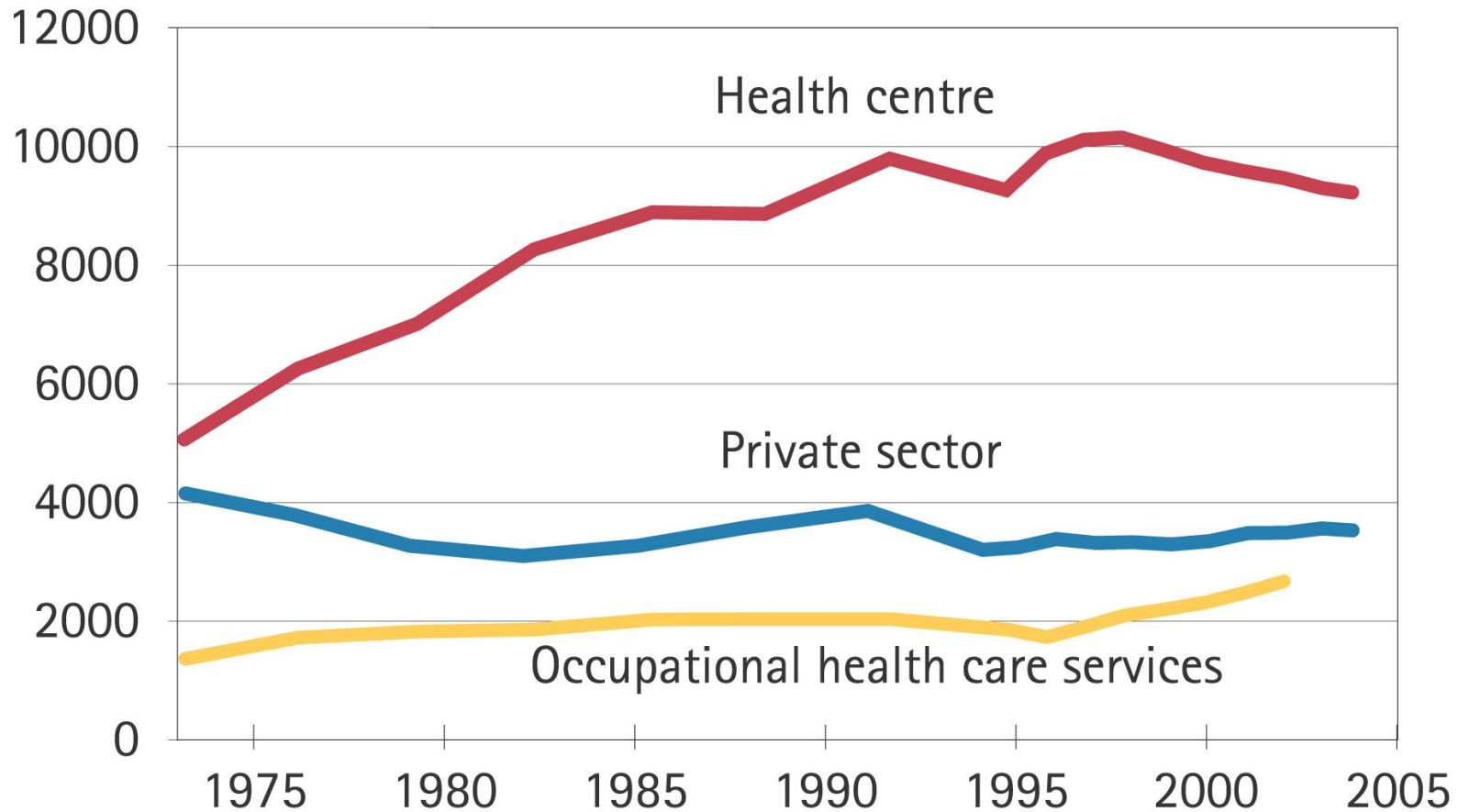
- Municipalities are obliged by law to arrange also specialised care
- Hospitals owned by joint municipal boards (hospital districts)
- Finland divided into 21 hospital districts (70 public hospitals)
- Each hospital district usually comprises 1-3 short-term hospitals and 1-2 psychiatric hospitals. Hospitals provide both inpatient and outpatient care. Long-term care is provided by the local health centre hospitals, that are not an administrative part of the hospital district.
- 5 university hospitals, 15 central hospitals and 40 district hospitals
- Just a few private hospitals (5 % of hospital days, 1400 beds) and 2 state owned psychiatric hospitals.



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Number of annual visits (1,000) to the doctor at health centres, in occupational health care services and in the private sector in 1973–2004.



Sources of public information:



- **Health in Finland** publication in different formats (PDF, JPG, PowerPoint, including 50 figures)

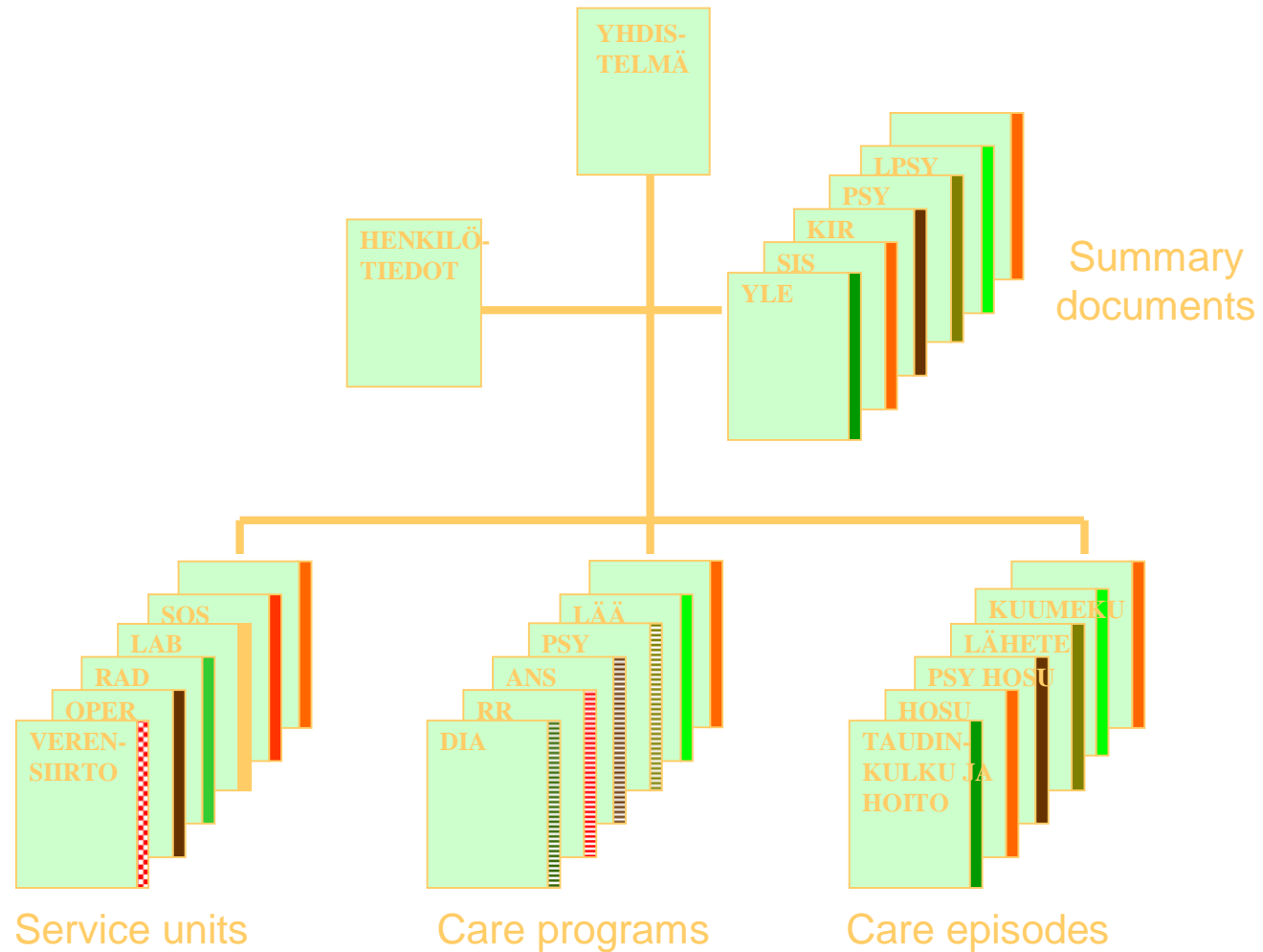
- <http://www.ktl.fi/hif/>



Some background information about IT in HC

- early adoption of M-Technology in 1980'ies
 - primary care, hospital care
- development of devices, laboratory, PACS and IC-systems
- many implementatations during 1990'ies, lack of interoperability. Some experience about Edifact
- HL7 Finland was founded 1995 to promote system integration, HL7 (v 2.3) was selected as a tool that time
- Systems integration is the function when information systems are made to work together in their federated domain. Systems integration comprises in addition to the technical integration of information systems also the redesign or streamlining of the care processes supported and enabled by these IS's. It also means that a systems integrator must be highly competent in people and project management.

Paper-based EPR-structure





HL7 Finland ry



eHealth of Finland -check point 2006

● Electronic patient record in production

Primary health care

in 96 % ,the intensity of use comprehensive

Specialized health care

in 20 of 21 hospital districts

Private health care

in 89 %

- Every health care organization/provider is responsible for administrating patient records register; patient data can be transferred between different registers mainly only by patient´s consent



eHealth of Finland ...

eReferral and eDischarge letter in production

- Primary health care
 - in 45 %

- Specialized health care
 - in 16 of 21 hospital districts

- Private health care
 - in 5 % (2004)



eHealth of Finland...

PACS

- are now either in the production phase (in 15 out of 21 hospital districts) or in the launch phase (in 6 out of 21 hospital 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.



eHealth of Finland...

- Health care professionals
 - Good access to Internet
 - Good access to medical data bases
 - 30 – 50 % of the units use eSystems for decision making support

- Direct custom eServices
 - Home pages in 74,5 % of PHCs, 86 % of SHCs, 71 % of Private HC

- 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.



eHealth of Finland...

- Exchange of diagnostic information between organizations 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.
- The next evolutionary goal (paradigm shift) 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. KELA (The Social Insurance Institution of Finland) will arrange services
- <http://www.stakes.fi/verkkojulkaisut/raportit/R1-2007-VERKKO.pdf>

Principles for ICT in Health Care

- Towards an information society for all
- Overcoming organisational borders = towards a seamless service system
- Municipal responsibility for provision of services
- Empowering clients
- Better privacy protection and data security
- Interoperability and integration of information systems
- Skilled staff
- Increase R&D
- Well-being cluster





Government Decision in Principle on securing the future of health care

11.4.2002

Role of ICT in developing services / EHR

- » Interoperability
- » Common data structure
- » Common architecture
- » Electronic signature
- » Digital archiving
- » Electronic intelligent forms
- » Increasing role of the patient



IT Infrastructure Strategies

- Standards to be revised by 2005 (=> 2007)
 - National package for interoperability and data security
 - messaging (HL7 v 2.3) -> HL7 CDA/ XML and SOAP
 - medical terminology (FinMeSH, Dublin core ...)
- Codes, Classifications and Headers
 - Minimum Data Set - ICD-10, ICPC-2, ATC, ...
 - National Directory Service ISO-OID codes
 - for patient records, organizations and professionals



Gov. Programme for information society

Social welfare and health

- Continuity of care
- Interoperability of electronic patient records
- Electronic prescriptions and medication management
- Promoting independent living with the help of ICT
- New operating models in health care (e.g. digital imaging)
- Providing citizens with reliable health information over the Internet
- Extensive plan for the utilisation of ICTs in social services
- Electronic certification service for health care personnel
- Data security and privacy
- Decision support systems for health care personnel



Nationwide EHR

The main principles:

- Structural key/minimum data in all EHR systems
- National Code Server (terms, classifications and codes)
- Identification of organizations, documents etc. by ISO/OID code system
- Electronic verification of professionals; electronic signatures based on the national service (National Authority for Medicolegal Affairs)
- Implementation of national recommendations concerning data safeguarding
- Open standards for interoperability (CDA R2)
- Collecting electronically statistical data from patient records
- National ICT architecture for health
- The patient should have access to her/his personal health data; also the right to check log information concerning the use and transfer of patient data
- Support for regional implementation

Regional and national networking

- » reference information model
 - supporting access in distributed architecture
- » centralised archiving and PACS-systems
- » teleconsultation, videocommunication
- » centralised emergency duty



Objectives of the Ministry 2004-7

- Fostering regional co-operation in service provision
- From local to regional and national implementation
- National services
 - security policy / authentication / decision supports / codes & terminology / statistics
- Information for the public / National portal
- Ageing population, independent living

Vision

- National EHR by 2007 (project 2003-2007) => 2010
 - e-health records will be readily available to staff and 'for patients to help maintain the quality of information'
 - professionals are able to deliver effective, safe, seamless and high quality care
 - allow managers better planning of services and availability to better quality data

Why?

- To improve the quality, continuity and cost-effectiveness of care
- The municipalities have a strong decision-making power (arranging services, which includes also the utilization of ICT)
- Most hospitals still have paper-based journals (unified base)
- Legislation not detailed enough for the digital world
- EPR-systems differ, data transfer is difficult
- No common standards/guidelines for interoperability (or data security)
- The patient data is usually recorded in an unstructured way (text) and cannot be used effectively



What ? (Strategy Jan 2004)

How it all will be done by the year 2007?

- The common content and structure that should be used in every EHR system in all organizations
 - Clinical consensus concerning the patient data
 - National services (like the Code Server)
 - Open standards for interoperability
 - National guidelines for data safeguarding
 - Support for regional implementation



1. Clinical consensus: the structured data

- every EPR system should provide structured data "minimum data set"
- data structure and coding is decided in co-operation with different interest-groups (professionals, administration, software-enterprises), also publicly available for comments through internet
- implementation into existing EHR-systems in pilot organizations, specifications for certain specialities will be done 2004 – (occupational health care, psychiatry, dental care etc..)

Benefits

- finding the essential information is easier -> structured data works as a link to free text
- saves time - > data is available in different forms
- interoperability between different EHR systems - > continuity of care
- integration of decision-making support
- quality management, evaluation, benchmarking and statistics (pilot projects started)



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The structured data (core elements) consists of

- patient identification data (name, social security number, etc..)
 - organizational identification data
 - episode of care
 - risk information
 - health related data (e.g. smoking)
 - physiological monitoring (e.g. length, blood pressure)
 - problems and diagnosis
 - the nursing minimum data set (e.g. diagnosis, interventions, outcomes, discharge summary)
 - elective procedure codes
 - test and examinations (e.g. laboratory, radiology)
 - medication etc.
 - statements
 - functionality
 - assistive devices (e.g. wheelchair)
 - organ testament
 - discharge summary
 - follow up care plan
 - informed consent
- > is the information that can be coded and has the most significance in making decisions about treatments



2. The Digital Code Server

<http://sty.stakes.fi/FI/koodistopalvelu/koodisto.htm>

Administered by STAKES (the National Research and Development Centre for Welfare and Health)

All codes, classifications and headers, including OID-codes, needed in EPR-systems will be delivered by an internet server



3. Standards for interoperability

- xml-based HL7 CDA R2-standards
- the open standard for EPR have been specified in the national project and the software enterprises have been involved in this process
- data transferring between health care organizations, e.g. referrals, laboratory, medication list
- data transferring between health care organizations and the Social Insurance Institution of Finland
- data transferring between health care organizations and insurance groups
- digital archiving



4. National guidelines for safeguarding information

The guidelines for

- administrating patient's right to issue informed consent in a digital context
- secure digital archiving
- e-signature
- identification of documents
- identification of professionals and organizations by ISO/OID-standard
- implementing PKI architecture in health care.
- Also building a national authority for administering digital identification of health care professionals.

5. Implementation

- National level norms, rules and standards
- An open process, availability
- A common will, central steering
- Regional implementation projects
 - about 20 million euros/year 2004, 50 % funding by the ministry)
 - the funding will continue 2005-07 (=>)



Finnish eHealth roadmap 2007

- Finland's national objective is to secure the access to information for those involved in care regardless of time or place.
- The means used to achieve that objective have include
 - a comprehensive digitalisation of patient data
 - development of the semantic and technical compatibility of the electronic patient record systems in regard to the entire content of a record
 - development of the national health care infrastructure and information network solutions, identification and verification solutions and electronic signature
 - maintaining of information that supports decision-making on the net.



eHealth roadmap... .

- Another major objective is to enable the involvement of citizens and patients, to increase the citizens' access to information and to ensure a high quality of health information.
- The measures have included development of a health information portal for citizens, providing citizens an access to their own patient/health records and log information, and enhancement of interactive electronic services.
- Publication at <http://www.stm.fi/Resource.phx/publishing/documents/10546/index.htm>



National strategy... .

- Carrying out the national electronic database management for social affairs and health:
 - strengthen the role of the MSAH in the guidance of social and healthcare data management. In addition to legislation, the ministry is responsible for guiding and defining national projects and data system services.
 - The main collaborative partners are the National Insurance Institution, the National Authority for Medico Legal Affairs, the Association of Finnish Local and Regional Authorities, HL7 Finland,, the University of Kuopio, Duodecim, the Office of the Data Protection Ombudsman and the Ministry of the Interior's MunicipalityIT Unit.
 - goal of the next few years is the attainment of an electronic archiving service for patient documents and, later, for the archiving of social care client records. The National Insurance Institution is responsible for the service
 - <http://www.stm.fi/Resource.phx/eng/strag/proje/electronic/index.htx>



HL7 Finland

- Founded 1995 to “promote system integration”, HL7 was selected
- In early years got some partial funding from Tekes (National Technology Agency of Finland, www.tekes.fi)
- Nowadays ~ 80 members, mostly software vendors who are funding the localisation projects
- During the last 4 years has become also the national actor to support the implementation MOSAH strategy 2003-7 (partial funding from Ministry), especially Finnish Electronic Patient Record and the role of CDA



Short history of HL7 Fin

- International HL7 Affiliate Status 1996 (5th affiliate)
 - now there are 30 affiliates or more
- Now 76 members in HL7 Finland
 - Providers (hospital districts)
 - Vendors
 - Consultants
 - Organisations
- SIGS: Laboratory (Active), Document (very active), PACS (dead => IHE ??), Common Services (Active)
- Technical Committee becoming as “the clearing house”
- HL7 is well known and has wide coverage



Main target of HL7 Finland

- Main target is to help in healthcare systems integration
- Main tool in that is to help with HL7 implementation, HL7 Finland has the HL7 mandate in Finland (as an affiliate organization)
- HL7 Finland is officially not restricted solely to HL7
- Our specifications must be good and implementable, not theoretically perfect (we want them out now)
- No official status (No official fights)
 - de facto standard
- Co-operation with
 - Kuntaliitto (Association of Finnish Local and Regional Authorities)
 - Stakes (National Research and Development Centre for Welfare and Health)
 - STM (Ministry of Social Affairs and Health)
 - Kuopion yliopisto (University of Kuopio), PlugI T-project, Common Services



Implementation support history

- Localisation of version 2.3 in 1997
- Implementation guides for v. 2.3 1998
- Localised messages and implementation guide for Laboratory (1998-2004)
- Localisation and implementation guide of CDA R1 2002 (1.10.2002)
- Implementation of CDA R1 in reference databases, "Open Adapters" 2002-2003 (3.2.2003)
- National Health projects (with MOSAH)
 - 2003 Open CDA
 - 2004 Implementation of CDA R1 for EHR
 - 2005-7 CDA R2 implementations, v3 (death certifications), CS (scheduling), Help desk, technical support + further development



Co-operation

- EHR CDA R2 implementation means much work, but other standardised interfaces and mechanisms are also needed
- Kuopio University is helping via our Common Services SIG and via new (TEKES) projects (www.uku.fi/tike/his)
 - International influence via HL7 Finland
 - more specifications to reach HL7 Finland status:
 - local interfaces for patient, user, authorization, code sets, clinical information: basic interfaces, mechanisms and semantic content, web services
 - Local software interfaces compared to traditional HL7 messaging: less content (but anyway HL7), but more functionality

HL7 and Finland in Future

- HL version 2.x will be in use for many years (don't want to replace it where it works)
- CDA R1 and **Context Management solutions** (CCOW) are in production
- First implementations of **CDA R2** (for EHR)
- **Common services specifications (-> International HL7)**
- CDA R2 is the bridge to HL7 Version 3 messaging



W3C solution - "A whole new alphabet soup"

stack	standards	purpose
Discovery	UDDI	<i>Locating services</i>
Description	RDF, WSDL	<i>Describing services</i>
Packaging	XML, SOAP	<i>Requesting / performing services</i>
Transport	HTTP, Jabber	<i>Transporting requests</i>
Network	TCP/IP	<i>Network</i>



Contents of Finnish Open CDA

- National project is defining the core components of Finnish EHR and coding needed
- HL7 Finland is defining the structure and technical coding needed in CDA R2
 - we try to learn also from international EHR projects
- Main (semantic) parts of open CDA will be
 - medication list, diagnosis list, procedure list, lab results, referral, discharge letter, summary of episode, care plan and electronic form of most common paper forms used in Finnish Healthcare
- Technical part contains signatures, consents, using of code servers (vocabulary), transfer methods between code servers and use of SOAP messaging

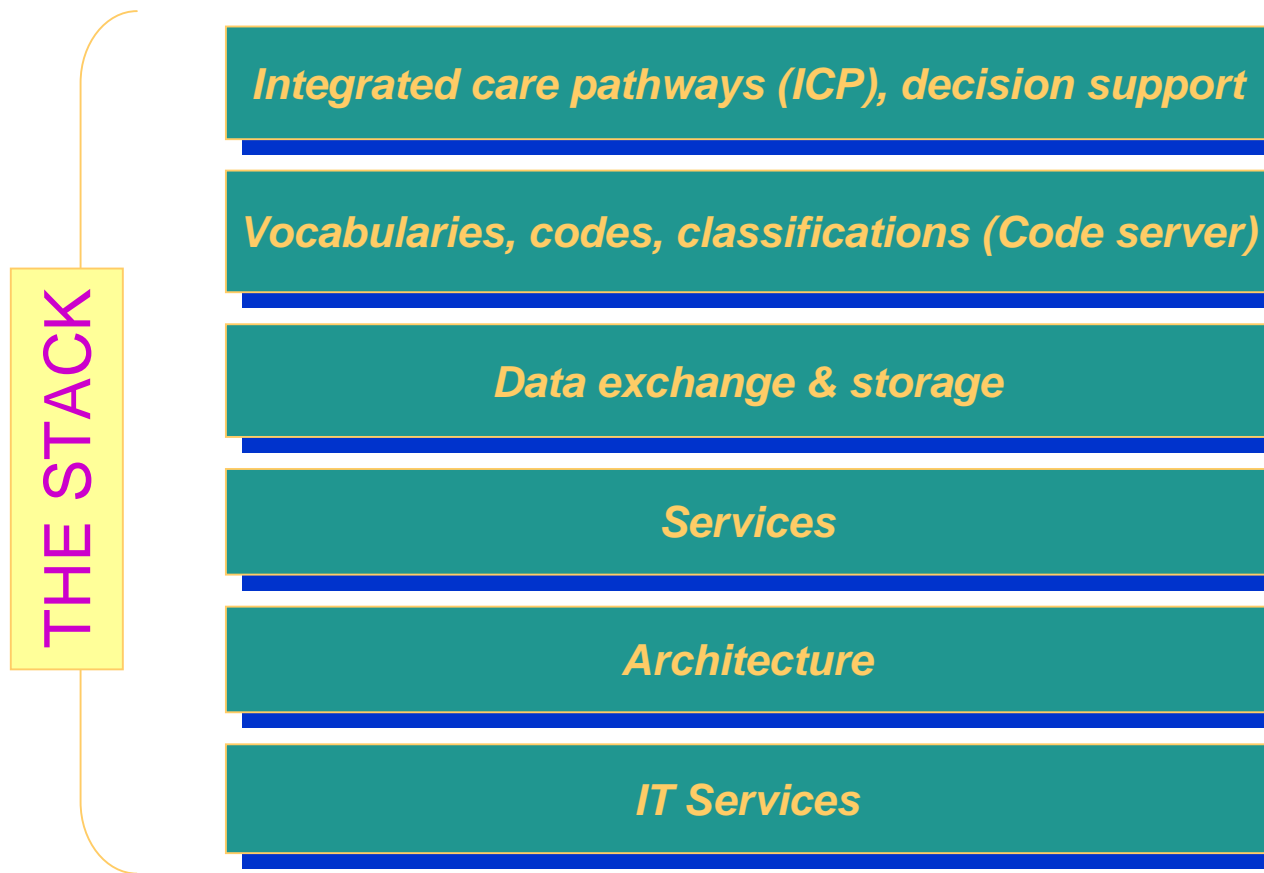


Some ideas e.g. digital signatures

- W3C digital signature is used in CDA
- signatures are in detached mode (not enveloping)
- signature stored inside the same XML file, there is a placeholder for the signature in the "CDA R2 header" in hl7fi namespace
- instructions for dsigs is given in the patient record and forms guide (kertomus ja lomakkeet in finnish)
- document can be signed multiple times by different persons and/or systems, e.g. different portions signed by different professionals
- reference to the signed part is done with XML IDs (xpath could be used but it is not recommended)
- small tec. demo at <http://kettinki.uku.fi/CDASignature/>



STANDARDS FOR THE FINNISH EHR SERVICE



STANDARDS FOR THE FINNISH EHR SERVICE

WHAT WE SELECTED

*Integrated care pathways (ICP), decision support
EBM (Terveysportti, Terveyskirjasto), scripts*

*Vocabularies, codes, classifications
Finnish core, later Loinc, Snomed CT?*

*Data exchange & storage
HL7 V3 MR + CDA R2, Dicom, biosignals?*

*Services
OID, PKI, "PIDS", "IHE/XDS"*

*Architecture
SOA, Web Services*

*IT Services
ASP*



HL7 Finland ry



EU
eHealth AP

Roadmaps

National
EPR &
HIN
programs

ISO 215

CEN 251
13606 EHR
SPC, Vital

**de jure
SDO's**

guidance

IHE

Continua?

IEEE
P2407?

de facto SDO's

IEEE
P1193

Dicom

HL7

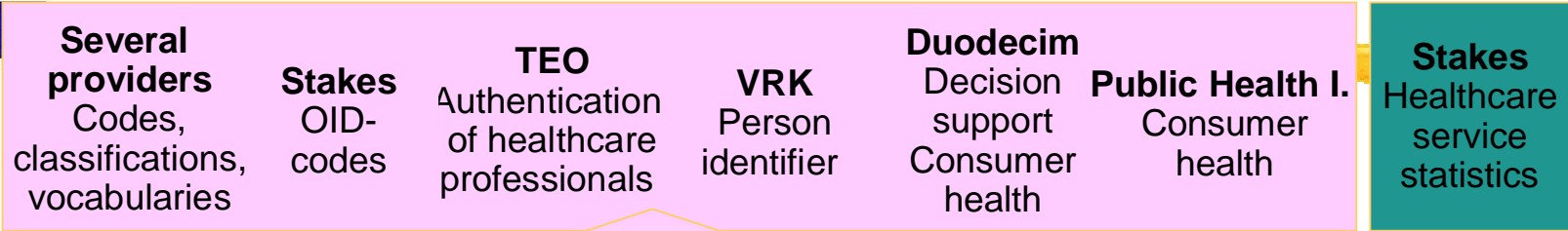
Snomed CT

Industry, HC providers, professional societies

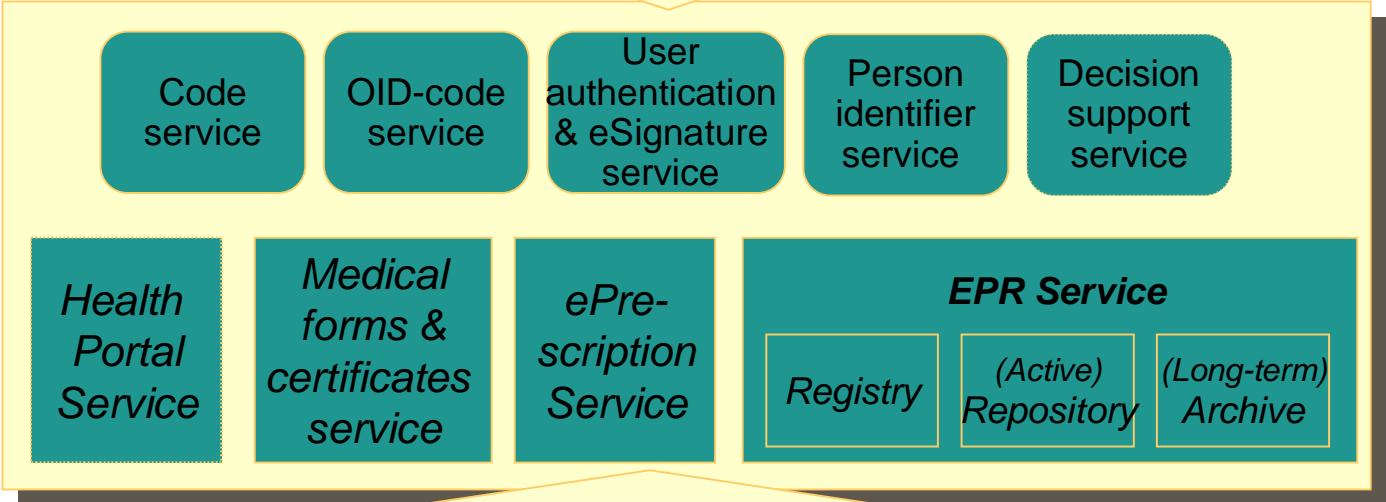


HL7 Finland ry

Content providers



National EPR Service



Enabling services

Core services





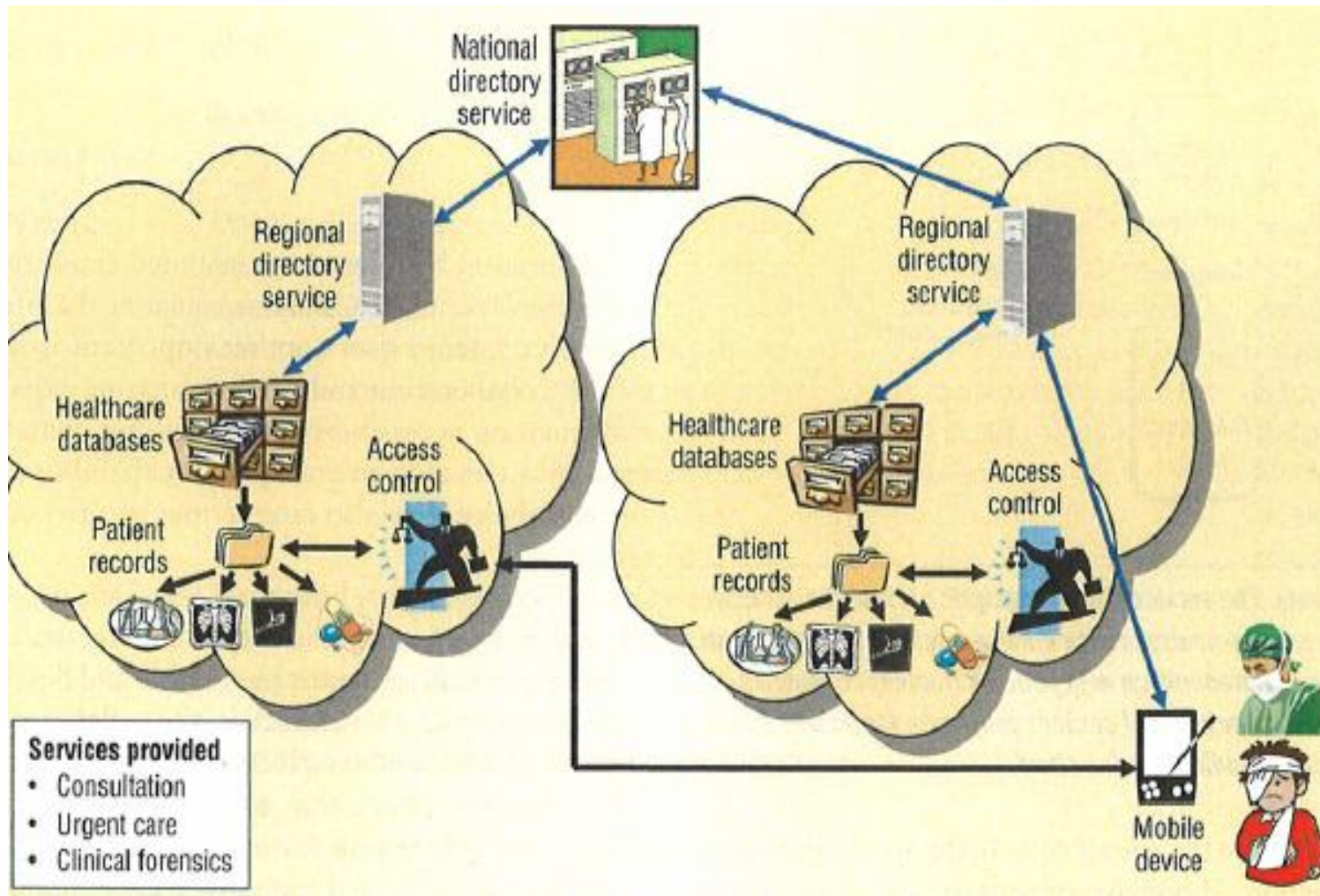
MODIFICATIONS TO PATIENT INFORMATION SYSTEMS to be done by the vendors)

- Information model to be updated according to "structured core patient data definitions"
- Use of Codes and OID's
- Use of CDA R2 for document generation
- Open interfaces for interchange of CDA R2 documents
- (Access to decision support services)
- Ability to use of the EPR, ePrescription etc. services
- Functionality to filter user tailored views from retrieved patient documents

- Desktop integration & SSO
- User authentication, signature, consent management
- Migration to uniform production versions & use of ASP

These should be procured at the regional level by the regional IT management actors

WE ARE NOT ALONE



Continuation - some ideas

- Strengthen co-operation between US and Finnish HL7 affiliate and Ministry, especially with use of CDA R2
- Citizen's eHealth services !!

- What
- When
- How
- Who



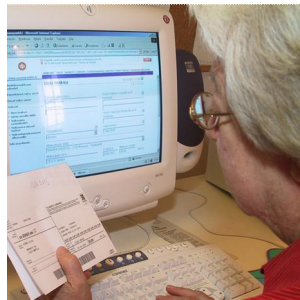


Citizen

- Electronic services to support health

- Doctor's/Nurse appointments
- Laboratory result information
- Disease management
- Traveler's health services
- Occupational absenteeism mgmt

SELF CARE



National Health Portal
Citizen's own Health Card, CIR

Health advice, care management



HEALTH SERVICES

Electronic Health Record

- Archive for Health info (EHR)

Health Care Competence Center
• Collaboration with emergency services

PACS

- Digital picture archive

National Archive



Danish example of citizen's eHealth portal (2005)

- Directory of names and addresses
- Contact information
- E-services (booking, prescription renewal, consultation)
- Health appointment calendar
- Comparison of prices, quality and accessibility
- E-commerce (pharmacies)
- Information about prevention and treatment
- Contact information
- Medical information (eg. information about treatments)
- Waiting list information from hospitals
- Preventive medicine
- Health laws and regulations
- Access to own health data
- Cross-sectorial personal electronic medicine profile
- Patients' medical history (since 1977)
- Shared care: Pregnancy Records
- Online Donor Registration and access to own data

Finally ...

- Thanks for the Mayo Clinic, especially to Dr. Chris Chute and Calvin Beebe for this occasion
- Contact Information:
Vesa.Pakarinen@vtt.fi
- Questions, comments ???

