Estonian Health Information Exchange platform –
Regional Remote Medical Care and Examples of Applications of Medical Information in Estonia

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Facts about Estonia

- Basic facts:
  - Population is 1.3 million inhabitants
  - Area 45,227 km²
  - Member state of the European Union since 2004
  - Native language is Estonian
  - Income tax 21% (flat tax); Currency – Euro
  - Every citizen has unique ID-number (like in Scandinavia)

- Health care system
  - Compulsory health insurance paid by employers; 13% of payroll tax
  - Health care costs make up to 6% of GDP (9.5% in OECD)
  - Healthcare providers are private, municipal or governmental
  - Hospital system – publicly owned private hospitals
  - General practitioners are private entrepreneurs
Facts about e-services

- 2000: Launch of e-Tax Board
- 2000: Launch of m-Parking
- 2003: Launch of ID bus ticket
- 2005: e-Voting was introduced
- 2007: Introduction of m-ID
- 2007: Launch of e-Police system
- 2008: Launch of e-Health system
- 2010: Launch of e-Prescription
- 2012: e-census
Facts about e-services

- 100% of schools and government organisations have broadband connection
- 71% of families have computer at home
- 68% of homes have broadband connection (2011)
- EstWin project – 98% of households gets a broadband connection by 2015
- 99% of bank transfers are performed electronically
- 94% of income tax declarations made via the e-Tax Board
- 24% of votes were cast over the internet on 2011
- 62% of persons have completed the e-census (2012)
Estonian e-state architecture

Public sector
- Population Register
- Health Insurance Register
- Vehicle Register
- Document record management systems
- Documents repository

Private sector
- Energy
- Telecom
- Banks

Internet X-ROAD
- Security server
- Central server I
- Central server II
- HelpDesk
- X-GIS
- X-road certification center
- Administrative system of the state information system
- ID-card & Mobile ID

Certification Center

User interfaces
- KIT Citizen view
- EIT Enterpriser view
- AIT Public servant view

Governmental Portal - Your Estonia
State portal www.eesti.ee
Information society strategy

- By 2013
  - All public services are digitally available
    - eHealth services
  - Public infrastructure is service oriented (x-road)
  - Digital authorisation of users based on the ID-card or mobile-ID that are the best available in the world
  - Data is stored where it is collected and exchange of the data is available to those who need it
Estonian nation-wide Health Information Exchange platform (HIE)

- The Estonian HIE is unique as it
  - Encompasses the whole country
  - Registers virtually all residents’ health history from birth to death, and
  - Is based on the comprehensive standard based IT infrastructure
Basic components

- The HIE platform consists of 3 main layers
  - The secure internet-based data exchange layer
  - Health information exchange database and software
  - Application and service layer
Main characteristics

- The data exchange layer is a messaging middleware which works as system integration layer
- Based on usage of Web Services
- Meets high security requirements
- Works as a service bus
- Provides uniform way for the offering, discovering and using services
- Highly scalable
Main drivers

• Clear governacne of Estonian e-health services
  • Estonian E-Health Foundation
• Legal clarity
• Mature ecosystem for e-services in Estonia
  • Secure data exchange platform provided by the state
  • Established on-line identification methods
    • ID-card
    • Mobile-ID
• Agreement about access rights
• Standardization
  • Medical data
  • Data exchange
Governance. Organisation

Ministry of Social Affairs
Society of Family Doctors
Tartu University Clinic
East Tallinn Central Hospital
Union of Estonian Medical Emergency
North Estonian Regional Hospital
Estonian Hospital Association

Estonian e-Health Foundation Board
Management board
Estonian HIE platform operation
Marketing and Communication Management

Standards and Services Development
Family doctors
Hospitals
Nursing Care
Patient Portal
Health Authorities
eHealth services in Estonia

- Nation-wide health information system
  - Available documents
    - Medical files
      - Time critical data (allergy, chronic diseases)
      - General practitioners and hospital visits
      - Summary of ambulatory and stationary case
      - Link to medical images
      - Referral letter
  - ePrescription
  - Digital images
    - Available all over the county
  - eReferral
  - eAmbulance
The Health Services Organisation Act regulates the development and maintenance of the health information system
  - Lay down the necessary requirements to the patient, health service provider, document standards, etc.

All healthcare providers must send certain health data to national HIS
  - The set of documents is defined by the law

Access only to licensed medical professionals
  - The attending doctor concept

Patient has the right to close own data \((opt\ out)\)

The ethical committee was created to lead the discussions of patients’ rights and to select the proper system for the HIE platform

Citizen can
  - Access their own data
  - Declare intentions and preferences
  - Monitor logs
The access to HIE is secured by using the electronic identity card (ID-card) solution issued by the state. ID-card is a compulsory and primary document for the purposes of personal identification in Estonia. All attempts to view health care data are monitored both by patients and Estonian eHealth Foundation. In case of the suspicions of the unlawful access to the data, the necessary actions are taken immediately.
Major architectural decisions

- Integration through central platform (Opt-out)
- Data exchange standard – HL7 v3 (extended)
- Documents are kept in XML format (HL7 CDA)
- All structured data fields have OID-s
- Only final versions of clinical documents are exchanged through the HIE
Acceptance

- ePrescription covers 94% of issued prescriptions
- Over 90% of Hospital discharge letters are digital
- Ambulatory case summaries sending level is low
- Patient portal usage is low
  - 49 885 unique visitors (3.7% of population)
  - 1 036 500 persons have documents (79% of population)
Difficulties

- General acceptance of hospital personnel to share medical data in patient portal with patient
- Much attention had to be paid on the security and electronic authentication of the users
- In some cases users could not log in as their ID-card software or certificates had not been updated
- Also some data saving problems during the appointment time booking were observed
- Not all internet browsers were supported
ePrescription (94%)
Acceptance

Retrieval of medical documents by healthcare professionals
Users of the iPatient portal (2007 – 2011)

- Male
- Female
- Total

Yearly Users:
- 2007: 63,116
- 2008: 15,163
- 2009: 38,232
- 2010: 58,948
- 2011: 74,947

Total Users from 2007 to 2011:
- 90,264
The aim of iPatient portal usage (2008 – 2010)

- Viewing of EPR
- Booking
Logins to iPatient by age and gender in 2012

*2012 January - August
During 12 months (Jan-Dec 2010) there were 3750 (11/day) patients accessing their images from outside the hospital.
Potential research topics
Opportunities for research (1)

- **Test-base for new e-services** in clinical and medical technology research
  - Monitoring of effectiveness and potential adverse effects of new medicines or technologies could be performed on-line using Estonian HIE and e-governance eco-system.
  
  HIE provides the infrastructure, legal environment and organisation to follow on-line data flow from patients’ location to research unit.

  - Allows quick testing to enter new markets of medicine and/or medical equipment
Opportunities for research (2)

• Big data
  • Pervasive access to the comprehensive nationwide databases
  • Investigation of
    • trends in medicine
    • public health, and
    • social care
  • Relate medical data with environmental, social care and other information crucial for health related research
Opportunities for research (3)

- **Citizens’ on-line access to medical data**
  - Opportunity to investigate trends of new socio-technical settings and applications
    - patients’ behaviour
    - preferences, and
    - on-line access to his/her medical data including medical images.
  - Researchers and industry can use the on-line access data to develop and test new applications and services using real life service environment.
International cooperation

Projects
- epSOS – http://www.epsos.eu/
- MOMENTUM – http://www.telemedicine-momentum.eu/
- SUSTAINS (Support USers To Access INformation and Services) – http://sustainsproject.eu/
- eMedic – http://www.emedicproject.eu/
- PrimCareIT – http://www.primcareit.net/
- Chromed
  - The objective is to evaluate the impact of adopting a health and lifestyle status management system to support elderly patients with a combination of chronic diseases involving respiratory and cardiovascular systems

Partners
- Denmark
- Finland
- Sweden
- Norway
- Scotland
- Italy
- Poland
- Spain
  - Catalonia
  - Basque country
- Germany
- France
- Latvia
- Belorussia
Thank you!
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