Lights and shadows of healthcare digitalization
Estonian experience since 2007

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Tampere, Finland
Outline

- Facts about Estonia
- Estonian nation-wide Health Information Exchange platform
  - Services for healthcare professionals, citizens and society
- Utilization of existing services
- Actors in digitalization
- Primary and secondary use of data
- Future trends
Facts about Estonia

Basic facts
- Population is 1.3 million
- Area 45,227 km²
- Native language is Estonian
- Member state of the European Union since 2004
- Income tax 20% (flat tax); Currency – Euro
- Every citizen has unique ID-code (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
Estonia. Facts about e-services

- 100% of schools and government organisations have broadband connection
- Annual reporting 100% on-line
- 99% financial transactions (bank transfers) carried out electronically
- mParking in main cities
- 88% of households have broadband connection (2015)
- 96% of income tax declarations are made via the E-Tax Board (2014)
- 31% of votes were cast over the internet on (2014)
- 62% of persons have completed the e-census (2012)
- 90% fishing permits given out electronically
The Estonian HIS 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
HIS platform history

- Planning initiated
- eHealth Foundation established
- eHealth Projects (2006-2008)
- Digital stamp

2000

- Electronic Health Record
- Digital Images
- Digital Prescription
- Digital Registration

2003

- Funding decision by Ministry of Economic Affairs

2006

- National HIS

2008

- ePrescription

2010

- Implementation of new e-services

2015
Estonian eHealth architecture

Secure data exchange layer provided by the state
Basic components

- The EHIS platform consists of 3 main layers
  - The secure internet-based data exchange layer
  - Health information exchange database and software
  - Application and service layer
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
  - Drug-drug interaction service
  - Cross-sectoral services
    - Health declaration for driver licence exchange
    - Working incapacity assertion
Current situation

- **24 397 387** medical documents
- **14** different documents
- Health information about **1 490 879** inhabitants (Estonia has **1 320 000 million** inhabitants)
- Ambulatory case summaries – **13 107 254**
- Exam reports – **5 863 450**
- Stationary case summaries – **1 525 280**
Digital Public Services: eHealth

100% of Estonian General Practitioners send prescriptions electronically to pharmacists (27% in the EU) and 72% exchange medical information electronically with other healthcare providers (36% in the EU).

Source: Benchmarking Deployment of eHealth among General Practitioners
Patient Portal

- Log in with ID-card or Mobile-ID
- View and update personal data and add contact data of close relative
- View his/her medical data (electronic health records) from health care providers
- View electronic referral letters
- View all electronic prescriptions
- Add representatives for him-/herself for different actions (e.g. buying out e-prescriptions);
- Make declarations of intent (e.g. donation of organs);
- Access health insurance data;
- Mask sensitive health data for doctors or representatives;
- Fill in a health declaration form before doctors’ appointment
- Get the overview from a log file of who has viewed his/her data.
Anamnees, diagnoosi põhjendus ja haiguse kulg

Anamnees
Tüdla: ITK - radioloogia alamis 1994-a, praegu 0,5 koormusega, 166 arvutiga, E-kas kirurgipäev. Tööaegsoon on TYT õppejõud.
Ootul ei terviselaebusest ole ega. Kr haigust ei tab.

Objektiivne leid

Uuringud ja protseduurid

Kuupäev HK Hinnakirja kood
07.01.2016 7903 - Röntgenülevõtete rindikese plirkonnast (üks ülevõte)

Analüüsid

<table>
<thead>
<tr>
<th>Nimevõttes</th>
<th>Referentsväärtust</th>
<th>Tulemused</th>
<th>Ühik</th>
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FINDINGS – LIGHTS AND SHADOWS
98% of prescriptions are issued in electronic form.
Use of eHealth platform by healthcare professionals, Estonia

Number of queries

- Sept 2009
- Sept 2010
- Sept 2011
- Sept 2012
- Sept 2013
- Sept 2014
- Sept 2015
- Apr 2016
Acceptance

- ePrescription covers 98% of issued prescriptions
- Close to 100% of Hospital discharge letters are digital
- Ambulatory case summaries sending level is high
- Patient portal usage is good and increasing
  - 224,302 unique visitors (15% of population)
  - 1,490,879 persons have documents
- 100% of insurance claims are digital
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.
Human Capital: Digital Skills

In Estonia 61% of citizens have basic digital skills (54% in the EU) and 7.8% have above basic digital skills (5.7% in the EU).

Digital Skills (2014)

EE

7.8%
31%
61%

EU

5.7%
41%
54%

% of individuals

Source: Pilot work carried out by DG CONNECT in relation to action 62 of the Digital Agenda to propose "EU-wide indicators of digital competence". It is proposed for regular implementation starting with the 2015 survey.
Utilization of data – current situation

<table>
<thead>
<tr>
<th>Actors</th>
<th>Primary use of data</th>
<th>Secondary use of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizen/Patient</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Physician</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Nurse/Midwife</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Physiotherapist/Other medical specialist</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Social worker</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Paramedics</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Researchers</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Insurance worker</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Civil servant</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
Distribution of costs and benefits of large scale health information system

Saluste et al. 2010. Assessing the Economic Impact/Net Benefits of the Estonian Electronic Health Record System DIGIMPACT.
Observations and difficulties

- Physician and other professionals have to change the way they fill in the medical files in some extent – the trend is towards more uniform language
- General acceptance of hospital personnel to share medical data in patient portal with patient is problematic
- Much attention has to be paid on the security and electronic authentication of the users
- User interface development is underestimated
- Medical data is not what people are looking for – they are interested of services
- Huge change management issues that digitalization brings to healthcare masks real benefits of secondary use of health data
FUTURE TRENDS
Digital stamp for general practitioners

Documents sent by GPs 2012 - 2013

Vocations

Vocations

Digital stamp
Different scenarios

- Virtual registers
  - Simultaneous queries from different data repositories
- Shared services
  - Social care and healthcare
  - Crowd diagnosis
- Personalized medicine
  - Use of genome and phenome data
  - Personalized care pathways
  - Bright chances for personalized promotion, prediction and prevention
New e-services

Secure data exchange layer provided by the state
- X-Road, ID-card, mobile-ID, State IS Service Register
- Coding Centre - Handlers of medicines
- Health care providers - Health professionals - Dispensing chemists
- Quality registers, Cancer, HIV, Myocardial infarction, Tuberculosis, Etc.
- Population Register
- Business register
- Hospitals 2009
- Family doctors 2009
- Pharmacies 2010 January
- School nurses 2010 September
- EMERGENCY MEDICAL SERVICE 2014

Driving licence
Health certificate application 2015

Patient portal 2009

X-Road gateway service 2009

Pharmacies and family doctors 2009

Nation-wide health information exchange platform 2008 December

SFINX drug-drug interaction database 2016

Prescription centre 2010 January
Public service. Driving licence application

Tere tulemast!

Olete Maanteameti e-teeninduse avalikel.
Toimingu sooritamiseks palume sisse logida.

Maanteameti e-teeninduses saab:
- vormistada sõiduki ostu-muuli või kasutajate muutmist 20%
soodsmma reglääri jaтелida sõiduki registreerimistunnistust
postiga tasuta koju,
- sõiduki registri ajuselt kustutada,
- vahetada juhiba.

22.01.2015 Tänasest saab taotleda erilubasid kuni
52tonnisteks puiduvedudeks

Maanteamet väljastab alates tänasest, 22. jaanuarist erilubasid
kuni 52tonnise 150km/a ümärku võrgus ning maanteedele, kus
tee on kulmuna vähemalt poolte meetri sügavuse.

22.01.2015 Sõidukite tehnilisegu on ennekõike
iliiklusohutuseks

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Sõiduki taustakontroll

Liiklusregistri
infotelefon 620 1200

Maanteeinfo
telefon 1510

Proovieksam info

Teeinfo kaardil

Peatus ee

Teekaamerad
CONCLUSIONS
Conclusions (1)

- Paradigm change in healthcare professional’s mindset
  - Data ownership change
  - Formalization of entered data
    - Structured descriptions and reports
    - Less assumptions/analysis
- Gradual change of data usage
  - Use of shared health, social and medical data
  - Acceptance of more extensive involvement of citizen/patient
- Change of workflows and pathways in healthcare
  - From linear to matrix
  - More pre-analyzed data – big data services
Conclusions (2)

- Improve the communication between different parties
  - To empower patients and motivate doctors to use the collected information and eHealth services
  - It is important to motivate physicians to tell patients about the possibilities to view and to be aware of their basic health data
  - It is important to inform patients about these possibilities and to support them actively inform their physicians that they know how to use their health data.
Thank you!
Peeter.Ross@ttu.ee
<table>
<thead>
<tr>
<th>Sustainability of healthcare systems</th>
<th>Chronic disease management</th>
<th>Efficient patient pathways</th>
<th>Innovation in health – innovative models of care</th>
</tr>
</thead>
</table>

**Benefits to achieve**
- Citizen
- Healthcare provider
- Society

**Challenges of healthcare**

**Business process development**
- Basic process
- Supportive processes
- Roles, stakeholders
- Data, materials

**Shared services**
- Case stories
- Standard contents
- Service levels
  - Owners
  - Service users
  - Service providers

**Application integration**
- Messages exchanges
- Users rights
- Sharing data
- Coordination of changes
  - Monitoring

**15 Years of e-health development**

- Reduced number of unused bookings
- Replacing doctors visits with nurses visits
- More efficient time management
- Receive medication on time
- Prevent complications
- Shorter visit times
- Improved self-management of disease
- Fewer hazardous examinations
- Better control of personal medical data
- Interactive prevention of disease for citizen
- Research of personalized healthcare/medication
- Patient can add personal self-monitoring data
- Improved self-management of disease
- Efficient patient pathways
- Innovation in health – innovative models of care

**Services**
- Diagnostic
- Care process
- Prescription
- Medical record
- Billing
- Patient portal
- Secure authentication
- Application integration
- Messages exchanges
- Users rights
- Sharing data
- Coordination of changes
  - Monitoring

**Application integration**
- Messages exchanges
- Users rights
- Sharing data
- Coordination of changes
  - Monitoring

**Ross&TiiK 2011®**