Latest Findings regarding EHR System Functionality and Usability

-The Finnish update since 2021

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Professor of Health Information Systems;
Research Unit of Health Sciences and Technology;
University of Oulu;
Finland

HL7 EHR Work Group’s Reducing Clinician Burden Project, 13 March, 2023
CONTENTS OF THE PRESENTATION:

- **Finnish Healthcare system**
  - Wellbeing Service Counties reform in public services
  - National Health Information Exchange

- **Backoffice: EHR for professionals and Citizens**
  - How mature an EHR system or HI system is?
  - What are the services to citizens?
  - What are the implications to the reform?

- **Evaluation of usability and user experience**
  - Overall scope of the UX surveys
  - Latest results 2021 (physicians), also OPEN DATA
  - Extension to Digital Therapies (DTx)
Facts: the Finnish health care system, part 1

1. Finland has a population of **5.5 million** inhabitants, average population density is **18 persons / km²**.

2. **All citizen are covered by Public health care services**, and **public sector** provision is **75%** of expenditure and financed by taxes.

3. **Private sector** and **occupational health care** provide supplementary services (**25%** of expenditure).

4. Total health expenditure was **EUR 21.1 billion** in 2018, which is **9.0%** of GDP.

5. Until 31.Dec 2022 there were **21 hospital districts** providing **secondary care services**, 5 of them include a university hospital for **tertiary care services**.

6. Until 31.Dec 2022 there were **137 health care centers** organized by municipality organizations providing comprehensive **primary health care services**.

© Jarmo Reponen, Twitter: @reponenjarmo
1. The largest reform in health care and social welfare services since 50 years!

2. Since 1\textsuperscript{st} of Jan, 2023, 22 Wellbeing Service Counties + City of Helsinki + Helsinki University Hospital are in charge of Public health care and social welfare services = total 24 new actors.

3. All funding is coming from the state taxes, the municipalities have not a role anymore.

4. Those Service Counties will join Primary care, Secondary care and Social welfare services under one administration.

5. The information systems will be joined together in each of the counties, many megaprojects that will take years.

6. 9/24 had a joint information systems for primary care and secondary care already in 2022, the rest 15 have a lot to do!

7. 7/24 had at least partly social care systems combined in 2022, the 17 have work in progress.
National Health Information Exchange (HIE) in Finland - 13 years of ePrescription and Citizen access, - 10 years of national EHR archive,

Source: www.kanta.fi
The Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on Europe’s digital performance and tracks the evolution of EU member states in digital competitiveness.

#DESIEu #DigitalEU
The availability of EHR services

Last 10 years monitoring of the national development
Results summarizing the national eHealth maturity

Finland’s summary eHealth profile: primary and secondary care 2020

- 16 summary indicators from availability studies:
- Development needs in decision-making support, utilization of information produced by the patient, appointment services, regional data transfer and user support.
National Development and Regional Differences in eHealth Maturity in Finnish Public Health Care: Survey Study

Jari Haverinen, MSc, MHSc; Niina Keränen, MSc, MD; Timo Tuovinen, MD; Ronja Ruotanen, MHSc; Jarmo Reponen, MD, PhD

Figure 1. The national development in the maturity level of eHealth in the years 2011, 2014, 2017, and 2020 (modified from the studies by Reponen et al 2013). EPR: electronic patient record.

Figure 2. The status of the eHealth profiles of different types of health care organizations. EPR: electronic patient record.

https://doi.org/10.2196/35612
Twitter: @reponenjarmo
Availability of services offered to citizens:

- In 2020, public specialized medical care had the widest range of direct services available to citizens.

- In the private sector, more protected communication was available, as well as the possibility to view one's own data directly from the service provider's own system.

Regional differences in digital services for citizens:

- The differences between hospital districts in the scope of digital healthcare services available to citizens are considerable.

- >>Welfare service counties start from very different starting points regarding the "maturity" of available services.


Twitter: @reponenjarmo
Evaluation of User Experience

Updates of physician surveys and according to the national criterias in 2021

Indicators developed in Finland: Used in Iceland, Denmark, Germany, Australia

Newest material collection 2020-21
1. Compatibility between clinical ICT systems and physician’s tasks

2. ICT support for information exchange, communication and collaboration in clinical work

3. Interoperability and reliability

Table 4 - Summary of questionnaire items (usability statements) and clinical physicians' responses.

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Statements</th>
<th>Strongly agree %</th>
<th>Agree %</th>
<th>Neutral opinion %</th>
<th>Disagree %</th>
<th>Strongly disagree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Systems provide support for decision making (N = 3877)</td>
<td>4</td>
<td>18</td>
<td>27</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>Systems help to prevent medical errors (N = 3812)</td>
<td>3</td>
<td>25</td>
<td>29</td>
<td>29</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>EHR provides a proper summary view (daily treatment chart about the situation of the patient (N = 2153))</td>
<td>1</td>
<td>7</td>
<td>9</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Systems help to improve health outcomes (N = 3848)</td>
<td>1</td>
<td>7</td>
<td>9</td>
<td>19</td>
<td>12</td>
</tr>
</tbody>
</table>

Dimensions in 2010, published in 2011


In this article we argued that the focus of usability studies in health informatics field should be broadened and deepened not only to cover user-interface issues but also the practices and procedures of healthcare work as well as contexts of numerous ICT systems.
The Finnish National Usability-Focused HIS-Scale with dimension reliability validated (Hyppönen et al 2019 based on 2014 and 2017)*

- **Technical quality** (alpha=.82/.80)
  - Stability
  - System errors
  - Reaction speed
  - Unexpected actions
  - Missing info

- **Information quality** (alpha=.61/.62)
  - Medic list quality
  - Summary view
  - Patient-provided info
  - B2C collaboration

- **Ease of use** (alpha=.87/.86)
  - Logic
  - Terminology
  - Documenting
  - Operating info
  - Straightforward tasks
  - Needed patient data
  - Nursing record

- **Feedback** (alpha=.88/.88)
  - Suggestion implementation
  - Vendor interest
  - Implementation speed

- **Benefits** (alpha=.85/.81)
  - Care quality
  - Care continuity
  - Guideline adherence
  - Medication errors
  - Duplicate tests
  - Care needs and impacts

- **Cross-organizational collaboration** (alpha=.69/.64)
  - HIE medication
  - HIE speed
  - HIE data quality
  - HIE collaboration

- **Internal collaboration** (alpha=.70/.69)
  - Professionals collaboration
  - Physician collaboration

*Source:

Indicators developed in Finland: Used in Iceland, Denmark, Germany
UX Study: materials and methods

2010
2014
2017
2020/2021

- Survey questions based on OECD model survey, Nordic research collaboration, literature searches and consulting information of other relevant indicators in this area (e.g. Canada Infoway 2012 versio).
- Web-based questionnaires launched through professional organizations.
- Respondents: physicians 4000 – 4700 each yr; 3600-4000 nurses each yr.
- The distribution of respondents corresponds the known distribution of target population in terms of demographics, professional distribution and geographical distribution.
- UX Statements (32 or more) with a five point Likert scale.
- One multiple choice question about the overall EHR rating with a “school grade” from 4 to 10.
- Year 2021 survey for physicians performed during the first quarter.
School grades comparison 2017 and 2021, scale 4 to 10

- Ratings for almost all systems have improved compared to 2017, but the Overall Rating has slightly decreased due to Epic's (Apotti) poor rating.

* First hospital installations of Apotti (Epic) were made in 10.11.2018 and major installations only few months before this study.
The system is **technically stable** (no crashes, no interruptions), % agree
- Technical functionality by system and sector, Year 2021, 1st quarter

<table>
<thead>
<tr>
<th>Sector</th>
<th>% Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary care hospitals</td>
<td></td>
</tr>
<tr>
<td>Apotti (Epic)</td>
<td>74</td>
</tr>
<tr>
<td>ESKO</td>
<td>92</td>
</tr>
<tr>
<td>Lifecare (Effica)</td>
<td>35</td>
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<tr>
<td>Mediatri</td>
<td>76</td>
</tr>
<tr>
<td>Pegasos</td>
<td>66</td>
</tr>
<tr>
<td>Radiologien PACS/RIS</td>
<td>42</td>
</tr>
<tr>
<td>Uranus</td>
<td>67</td>
</tr>
<tr>
<td>All together</td>
<td>67</td>
</tr>
<tr>
<td>Primary care centres</td>
<td></td>
</tr>
<tr>
<td>Apotti (Epic)</td>
<td>80</td>
</tr>
<tr>
<td>GFS (Graafinen Finstar)</td>
<td>92</td>
</tr>
<tr>
<td>Lifecare (Effica)</td>
<td>46</td>
</tr>
<tr>
<td>Mediatri</td>
<td>43</td>
</tr>
<tr>
<td>Pegasos</td>
<td>63</td>
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<tr>
<td>All together</td>
<td>56</td>
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<tr>
<td>Private sector / Other</td>
<td></td>
</tr>
<tr>
<td>Acute</td>
<td>74</td>
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<tr>
<td>DynamicHealth</td>
<td>68</td>
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<tr>
<td>Softmed</td>
<td>57</td>
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<tr>
<td>All together</td>
<td>66</td>
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</tbody>
</table>

* First hospital installations of Apotti (Epic) were made in 10.11.2018 and major installations only few months before this study

Incorrect operation of the system has caused or was close to causing a serious **adverse event** for the patient, % agree

- Technical functionality by system and by sector 3/3, year 2021, 1st quarter

### Secondary care hospitals

<table>
<thead>
<tr>
<th>System</th>
<th>% Agree</th>
</tr>
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<tbody>
<tr>
<td>Apotti (Epic)</td>
<td>4</td>
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<tr>
<td>ESKO</td>
<td>36</td>
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<tr>
<td>Lifecare (Effica)</td>
<td>20</td>
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<tr>
<td>Mediatri</td>
<td>21</td>
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<tr>
<td>Pegasos</td>
<td>22</td>
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<tr>
<td>Radiologien PACS/RIS</td>
<td>49</td>
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<tr>
<td>Uranus</td>
<td>43</td>
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### Primary care centres

<table>
<thead>
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<td>GFS (Graafinen Finstar)</td>
<td>31</td>
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<td>Lifecare (Effica)</td>
<td>29</td>
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<tr>
<td>Mediatri</td>
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<td>Pegasos</td>
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<tr>
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### Private sector / Other

<table>
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<tr>
<th>System</th>
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<tr>
<td>Acute</td>
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<td>Softmed</td>
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* First hospital installations of Apotti (Epic) were made in 10.11.2018 and major installations only few months before this study

Carrying out **routine tasks** is straightforward and can be done without additional choices, % agree
- Ease of use by system and sector, year 2021, 1st quarter

* First hospital installations of Apotti (Epic) were made in 10.11.2018 and major installations only few months before this study
Finnish Medical Association

How well do information systems support cooperation and information flow between doctors in your organization? “very supportive” respondents (%)
- Cooperation and information flow by system and sector 1/2, year 2021, 1st quarter

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<thead>
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<th>Private sector /Other</th>
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<td>Acute</td>
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<td>DynamicHealth</td>
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</tbody>
</table>

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Latest articles on Special topics:
User experience of ICU information systems

Overall satisfaction with the principally used ICU CIS was moderate.

Poor interface design, insufficient customizability, inefficiency, malfunctions, and difficulties in information retrieval all affect poor UX.

Table 4
Factors affecting poorer UX of the ICU Clinical Information Systems.

<table>
<thead>
<tr>
<th>Item no</th>
<th>Statement</th>
<th>OR (95% CIs)</th>
<th>P-value(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q44.4</td>
<td>The ICU’s Clinical Information System is sufficiently customizable to meet the needs of my unit</td>
<td>7.2 (1.7–30)</td>
<td>0.008(^a)</td>
</tr>
<tr>
<td>Q44.7</td>
<td>The ICU’s Clinical Information System makes it easy to retrieve the necessary information about the patient</td>
<td>3.0 (1.0–8.8)</td>
<td>0.044(^a)</td>
</tr>
<tr>
<td>Q48.1</td>
<td>In views (windows), fields and functions are arranged logically</td>
<td>7.8 (12.5–24.1)</td>
<td>0.001(^a)</td>
</tr>
<tr>
<td>Q48.2</td>
<td>Performing routine tasks is straightforward (succeeds without additional choices)</td>
<td>4.3 (1.0–18.2)</td>
<td>0.044(^a)</td>
</tr>
<tr>
<td>Q48.6</td>
<td>A system malfunction has caused or has been close to causing a serious adverse event for a patient</td>
<td>3.5 (1.2–9.6)</td>
<td>0.019(^a)</td>
</tr>
</tbody>
</table>

P-value < 0.05 was considered statistically significant.

The negative impact of interface design, customizability, inefficiency, malfunctions, and information retrieval on user experience: A national usability survey of ICU clinical information systems in Finland

Miia Jansson\(^a\), Janne Liisanantti\(^b\), Tero Ala-Kokko\(^b\), Jarmo Reponen\(^a\),
International Journal of Medical Informatics 159 (2022) 104680
UX results as an open data

www.thl.fi/digikyselyt
The STePS projects consists of five nationwide surveys targeted at:

- social welfare management (SH eMap),
- health care management (TH eMap),
- physicians (PoLTe),
- nurses (PoSTe),
- citizens (additional module to the Adult health, wellbeing and service study [ATH]).

Two other sub-projects will also be implemented:

- develop and report indicators for Kanta services, obtained from Kanta log data; and
- implement the publishing of the materials as THL database reports.

Electronic health records as professionals’ tools

Electronic Patient Record systems as professional tools, USER EXPERIENCE AS OPEN DATA

Comparison between information systems by measure as column diagram, physicians


Measure: The EHR system is technically stable %
Year: 2021

Results are available as open data,
Provided by Finnish Institute of Health and Welfare

Measure: The EHR system is technically stable
### Measure: Routine tasks are straightforward to perform


**Results are available as open data,**

Provided by Finnish Institute of Health and Welfare

<table>
<thead>
<tr>
<th>Routine tasks are straightforward to perform %</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum variable: The EHR systems are easy to use</td>
<td>N</td>
</tr>
<tr>
<td>Sum variable: The EHR systems are easy to use %</td>
<td>The school grade of the EHR system N</td>
</tr>
<tr>
<td>The school grade of the EHR system at least an 8 %</td>
<td>The EHR systems do not require a lot of training</td>
</tr>
<tr>
<td>The EHR systems do not require a lot of training</td>
<td>The EHR systems’ screen views are logical</td>
</tr>
<tr>
<td>The EHR systems’ screen views are logical</td>
<td>Terminology of the EHR system is clear N</td>
</tr>
<tr>
<td>Terminology of the EHR system is clear</td>
<td>Terminology of the EHR system is clear</td>
</tr>
<tr>
<td>Documentation of patient care is smooth</td>
<td>The nursing record is in an easily readable format</td>
</tr>
<tr>
<td>The nursing record is in an easily readable format</td>
<td>Routine tasks are straightforward to perform</td>
</tr>
<tr>
<td>Routine tasks are straightforward to perform</td>
<td>The systems inform me about what they are doing</td>
</tr>
<tr>
<td>The systems inform me about what they are doing</td>
<td>Information on patient easy to obtain</td>
</tr>
<tr>
<td>Information on patient easy to obtain</td>
<td>All employers</td>
</tr>
</tbody>
</table>

**Experience with the EMR system**

- All users

**Measure:** Routine tasks are straightforward to perform

Electronic health records as professionals' tools

**Measure:** The EHR systems do not require a lot of training %

Year: 2021

EMR system: All information systems

Whole country: 38.9

Results are available as open data, provided by the Finnish Institute of Health and Welfare.

Available at: thl.fi/digikyselyt
OR
AVAILABILITY of Digital Services for Citizens

Results on a hospital district map, public health care organisations


Measure: Citizen: e-booking available %

Year: 2020

Sector: Public health centre

Whole country: 64.6 %

Results are available as open data,
Provided by Finnish Institute of Health and Welfare

Available at: thl.fi/digikyselyt
OR
https://sampo.thl.fi/pivot/prod/en/steps/thorg/summary_tilviste1?mittari_0=492354&mittari_1=492244&aika_0=456733&sektori_0=492254&jarjestelma_0=318854#
Beyond EHR systems

Towards assessment of Mobile Applications and Digital Therapies (DTx)
**Digi-HTA for Digital health**

- A new **health technology assessment (HTA)** method called **Digi-HTA** is in use in Finland to support HTA activities for new novel **digital** healthcare technologies of all kinds such as **Mobile apps**, **Artificial intelligence (AI)** and **Robotics**.

- **WHY, BECAUSE:** Conventional HTA does not discuss data security and usability aspects

- **FinCCHTA** (Finnish Coordinating Center for Health Technology Assessment) in collaboration with University of Oulu

- Published Digi-HTA assessments can be found from: www.digi-hta.fi

- European collaboration towards Digital Therapies (DTx).

Digi-HTA process in Finland

- Data security and protection is essential part of evaluation
- Assessment process has helped enterprises to refine their products


Bibliography, Finnish National EHR availability and user experience studies

https://doi.org/10.1016/j.ijmedinf.2021.104680
Thank you!

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