

IHE based Interoperability – Benefits and Challenges

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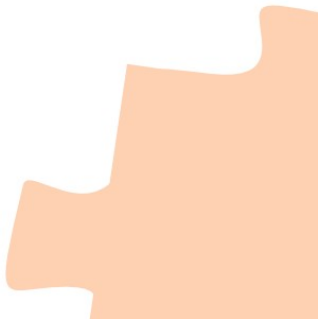


Outline

- Introduction
 - Why is interoperability important for trans-institutional Shared Electronic Health Records (SEHR)?

 - Methods
 - Literature analysis
 - Interviews with domain experts
 - Implementation and Connectathon experience

 - Results
 - Definition of criteria for interoperability assessment
 - Evaluation of IHE integration profiles according to those Criteria

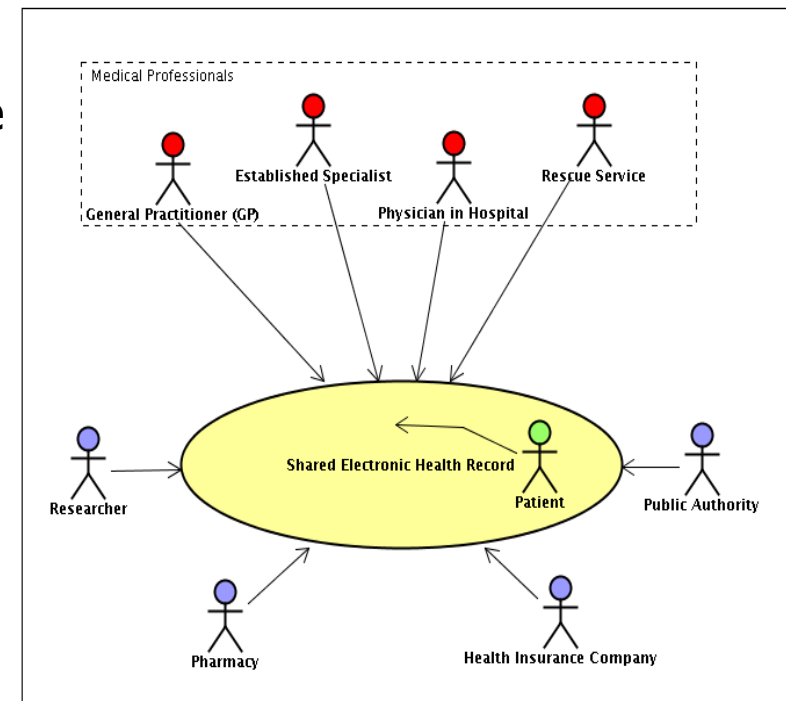
 - Discussion
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Subject and Motivation

- Cooperation and optimized work flows in health care institutions is expected to improve quality and efficiency while reducing costs.

[Collen, 1970]

- A Shared Electronic Health Record (SEHR) requires a variety of subsystems to collaborate
 - HIS / CIS in hospitals
 - GP's Praxis systems
 - Infrastructure components
 - Data Repository and Indices
 - Patient Identification Systems
 - etc...



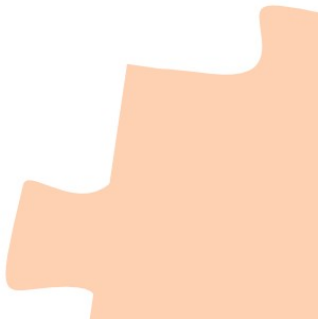
Interoperability should provide for medical data to be seamlessly transferred between and interpreted identically within involved Subsystems



Problem Context

- A clear definition of interoperability which covers the requirements for SEHRs is missing

 - It is unclear if existing IHE Integration Profiles fully support interoperability for Shared Electronic Health Records
 - What is covered by IHE?
 - Which issues are still open?

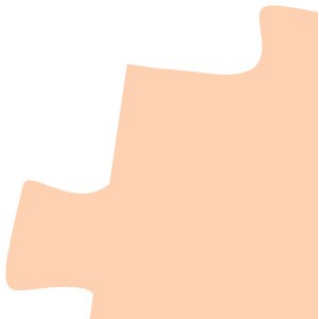
 - It is unclear which extensions have to be applied to IHE Profiles to support required interoperability
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Objectives

- Definition of interoperability with special emphasis on
 - SEHRs and
 - Healthcare services in general

 - Extraction of assessment criteria for interoperability evaluation

 - Evaluation of existing IHE Integration Profiles with regard to:
 - Coverage of extracted criteria
 - Modifications of IHE Integration Profiles required to support those criteria
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Methods

- Analysis of existing literature for identification of interoperability requirements
 - PubMed
 - IEEE
- Interviews with domain experts in the fields of:
 - Structured documents conversion of non-structured data (Innsbruck University Hospital)
 - Security, patient identification, accounting and billing (Sozialversicherungs-Chipkarten Betriebs- und Errichtungsgesellschaft m.b.H (SVC) e-card operating company)
 - Security, availability considerations (Österreichische Datenschutzkommission: Austrian data protection experts)
 - Data standards, user and domain requirements (Österreichische Ärztekammer: Austrian Medical Association)
- Experiences in implementing IHE Profiles and Connectathons

Results



Interoperability

IEEE defines interoperability as the:

**“Ability of a system or a product to work with other systems or products without special effort on the part of the customer”
[IEEE, 2007]**

- But what are the exact requirements for SEHRs?
- **--> Use the same requirements for interoperability consideration as for the design of SEHRs!**

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“Hello, Bob? It’s your father again. I have another question about my new computer. Can I tape a movie from cable TV then fax it from my VCR to my CD-ROM then E-mail it to my brother’s cellular phone so he can make a copy on his neighbor’s camcorder?”

Source: The World Wide Web Consortium (W3C) [lists.w3.org]

Interoperability Criteria

- **Interfaces:**
 - Has a common structure of interfaces been agreed on?
- **Semantics:**
 - Are data interpreted identically on systems of different vendors?
- **Legal and organizational aspects:**
 - Are local legal and organizational requirements correctly considered?
- **Security:**
 - Is the security level of a system to be decreased for the sake of interoperability?

--> Evaluate to which extent each requirement is covered by existing IHE Integration Profiles <--

Interoperability on Interface Level (1/2)

Implementation Experiences...

- Basic concept of IHE is successful
- Partly inconsistent standards (e.g. Optional fields in ebXML messages)
 - No specification whether optional fields should be completely absent or have empty elements in XML
- Vendors have their systems specially tuned for the Connectathon
 - Majority of vendors have validation turned off for the sake of passing tests
- XDS.a and XDS.b rely on ebXML (encapsulated in SOPAP via Web Services)
 - Much harder to implement than plain WS
 - WS* Security profiles can not be directly applied
 - XDS metadata can not be generated from WSDL

Interoperability on Interface Level (2/2)

- IHE defines clinical use cases to support interoperability
 - IHE specifies standardized actors and transactions
 - Systems compliant to IHE support basic interoperability of their technical interfaces

But...

- IHE leaves many details open for implementation
 - Supports the market, different vendors
 - Affects interoperability because of different interpretation of the standard
- Systems can be further developed after conformity has been attested
 - Systems can be further improved after the Connectathon
 - Side effects can break interoperability

Interoperability on Semantic Level

- IHE starts to cover semantic interoperability
 - Clinical Document Architecture (CDA) as common data standard
 - Content profiles to standardize medical contents based on clinical semantics
- CDA allows language independent sharing of medical content
 - Level 3 supports LOINC and other medical dictionaries

Challenges...

- A fine-grained structure of CDA level 3 is necessary
- Workflow of data capturing has to be changed
 - No free text entries
 - Organizational challenge
 - Medical staff must be motivated to use rigid form-based data input

Interoperability on Legal and Organizational Level

- IHE originates from mainly from US and English speaking countries
 - IHE covers “global” requirements for clinical workflows
 - IHE only slowly starts to care about regional requirements
 - IHE Europe is slowly gaining power

Challenges...

- It is important for IHE to support regional requirements
- Development of local extensions
- Integrate local extension to a holistic concept without braking interoperability
 - Local extensions should support local context, but
 - must remain interoperable with the international Integration Profiles
- To which extent may local extension be “localized”??

Interoperability on Security Level (1/2)

Implementation Experiences...

- IHE supports secure communication on network level (TLS)
- ATNA has a weak transport mechanism: Syslog via UDP
 - Lack of security and reliability for audit messages
- ATNA audit messages do not sufficiently cover Austrian legal requirements
 - ATNA messages are not reliable
 - ATNA messages are generated per Transaction,
 - But a “per Healthcare Professional” view is required
- Coverage of fine grained Patient-controlled access control policies with existing Integration Profiles is a mayor challenge for IHE

Interoperability on Security Level (2/2)

- IHE uses a modular approach (dedicated Integration Profiles) to solve Security issues
 - Audit Trail and Node Authentication (ATNA) for secure communication between nodes and meaningful logging messages
 - Cross Enterprise User Assertion (XUA) for secure identification of a user's or system's identity across institutional boundaries
 - Basic Patient Privacy Consents (BPPC) for enforcing access control policies based on the patient's consent
- Security can be plugged in at a later time
 - Simplifies implementation and testing

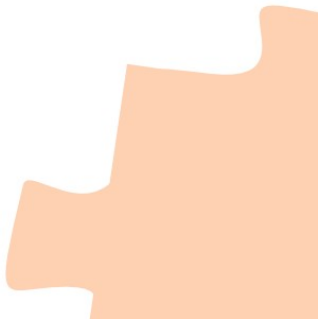
But...

- Security should be an integral part of each system by design
- Only by integrating security application level security (end-to-end security can be achieved)

Discussion

- IHE definitely improve interoperability
 - Standard clinical workflows are vastly covered by IHE Integration Profiles
- Integrated and consistent security for all IHE Profiles remains a major challenge
- Existing Integration Profiles could benefit from respecting local and regional requirements
 - Local extensions
 - without breaking interoperability
- Coordination of regional initiatives
 - To avoid uncoordinated groups with proprietary extensions / implementations
- Feedback of implementors can help profiles to improve

Thank you for
your attention!





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