Scandinavian openEHR and ISO13606 workshop

The event is part of SHI2011 co-hosted with MIE2011. Welcome everybody!

- Agenda
  - Intro (5 min)
  - Briefings from Norway, Sweden & Denmark (40 min)
  - Open discussion (40+ min)

- Focus themes
  - Semantic challenges (clinical content)
  - Tooling & software challenges
  - Architectural challenges (system integration, national frameworks etc)
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What can and should be agreed upon? Standardized?

(EHR = Electronic Health Record)
Conversion problems 1

Same kind of information, but captured in different ways

- **Resolvable by computer** computer (non-changing patterns)
  - Weight at birth: 3300g
  - Weight: 3.3 kg

- **Resolvable by medically competent human** but not computer
  - Example: Medical history in two different systems
    - Chief Complaint
      - History of the present illness
      - Past medical history
      - Family diseases
      - Social history
      - Substance use (tobacco, alcohol, drugs)
      - Diet
      - Exercise
    - Chief Complaint
      - Medical History
      - Social History
Conversion problems 2

Same kind of information, but captured in different ways

- Not resolvable even by medically competent human
  (but maybe useful for a human anyway)
  - Example: Aggregations using different intervals (cigarettes/week)
    - 0, 1-5, 5-10, 11-15, 16-30, 31-50, 51-100, 101+
    - 0, 1-3, 4-7, 8-14, 15-28, 29-56, 57+

Different kinds of information or missing information

- Not resolvable even by medically competent human
  (not reusable for certain purposes)
  - Example:
    - Alcohol yes/no
    - Tobbaco yes/no
    - Cigarettes yes/no
    - Snuff (snus) yes/no
What is possible...

- For a computer system? For a human?
- For an organization? For multiple organizations?

Does it scale? Is it manageable? Man-hours? (Costs & competence)

Is data quality effected?
Domain Content Models
- Templates
- Information Representation
  - Reference model
  - Archetypes
- Domain Content Models
  - Templates

Layers of modeling
- Rather stable
- Storage, transactions etc.
- By IT system vendors etc.
- Implemented as software (in Java, .NET etc.)
- By Clinicians
- Medical (Informatics) knowledge
- Clinical needs arise
- Change when new

Computer Science knowledge?
Document - Traditions, clinical context, authorship etc. matter.

- EHR > Compositions > Sections > Entries > Data structures > Values

Tree - Paths are convenient for queries, processing etc.

- ehr://1234567/87284370-2D4B-4e3d-A3F3-F303D2F4F34B@latest_trunk_version/content/openEHR-EHR-SECTION.vital_signs.v1/items/openEHR-EHR-OBSERVATION.heart_rate-pulse.v1/data/events[at0006]/data/items[at0004]/value/magnitude

Objects - Easily implementable in IT systems (somewhat consistently)
SELECT e/data[@001]/items[@002.1]/value/defining_code/code_string
FROM EHR [uid = 121212-1212]
CONTAINS COMPOSITION c [openEHR-EHR-COMPOSITION.epicrisis.v1]
CONTAINS EVALUATION e [openEHR-EHR-EVALUATION.problem-diagnosis.v1]

SELECT c
FROM EHR [uid=$ehrUid]
CONTAINS COMPOSITION c
CONTAINS INSTRUCTION i [openEHR-EHR-INSTRUCTION.medication.v1]
CONTAINS ITEM_TREE it [openEHR-EHR-ITEM_TREE.medication.v1]
WHERE (it/items[@012]/value/defining_code/terminology_id = "SNOMED"
  AND it/items[@012]/value/defining_code/code_string
  matches {'350162003', '350162003'})

More info: http://www.openehr.org/wiki/display/spec/Archetype+Query+Language+Description
Briefings from Norway, Sweden & Denmark

40 minutes ≈ 10 quick reports
Norway

Archetypes for EHR information in Norway.
Johan Gustav Bellika

Master thesis topic: Enabling research on routinely collected EHR data by exporting data to an archetype based systems.
Johan Gustav Bellika & Leykun Gebeyehu

Archetype integration by DIPS (EHR vendor)
???
What is happening in Norway?

Gustav Bellika, Leykun Melkamu Gebeyehu
Department of Computer Science,
University of Tromsø
Something is finally happening! 😊

• Government level:
  – Action 41: Terminology binding of Archetypes with existing terminologies and SNOMED CT

• Academic: A master thesis project at CS dept at University of Tromsø

• Industry: DIPS, a Norwegian EMR vendor, will use OpenEHR archetypes in their new version
Government initiated activity

• “National ICT” (NIKT)
  – The medical specialist service arena for integrated care using ICT.
  – Funded by Dept. of Health

• Objectives:
  – Develop a catalog of clinical information models (archetypes) with corresponding terminology for medical chart systems (curve) and clinical quality registries based on archetypes.
Potential information contents

1 year
- Only project participants
- Smoking, Hart disease in family
- BP, pulse, weight
- Chemical lab
- ECG
- Diagnosis
- Medication?
- Physiological data, incl. respiratory/ventilator equipment
- Procedures and results
- GCS, MMS, MADRS
- Adverse reaction?
- Treatment goals (lab values)
- Translate 20, adapt 10, develop 5 archetypes.

2-3 year
- Registry owners and health personnel in hospital / outpatient clinics
- PAS-data. Demographics, contact details (persons)
- Information from anamnesis (ethnicity, heredity, food, physical activity)
- Clinical, non quantifiable findings, example: vibration sensing
- Infusjon, cytostatika, transfusjon
- Xray picture interpretation, other reports
- More treatment goals/effect/result
- Organ donation status
- Scoring systems
- Other critical information

3-5 year
- Norwegian intensive care registry
- Norwegian diabetes registry for adults
- Norwegian cardiac arrest registry (should be considered)
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- Norwegian diabetes registry for adults
- Norwegian cardiac arrest registry (should be considered)

Archetypes and terminology in EMR and registries
- ICD-10, NCMP, NCSP, ATC, FEST, SNOMED CT, DATAMS, NORAKO, national contents standards
- ICF, NEKLAB, radiology classifications
- Pilot with EPR-vendors and registries
- Library with archetypes
- Guide for implementation of archetypes and templates
- Inform Hospitals and developers

User scenarios
- Only project participants
- Smoking, Hart disease in family
- BP, pulse, weight
- Chemical lab
- ECG
- Diagnosis
- Medication?
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Contents in archetypes/templates
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Registries

Terminology binding

Deployment
Academic

• A master thesis project: Extracting and extending EMR data from the gastro surgical department at UNN using archetypes.

• Objective: Enable research/secondary use of 15 years production of clinically data
Industry

- DIPS ASA has announced that they will use archetypes in their next version of the DIPS EMR system.
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Sweden

Commercial projects by Cambio Healthcare Systems.
Rong Chen

National openEHR/13606-related eHealth projects, current situation, challenges
Daniel Karlsson

Using openEHR to exchange data between an overview application for intensive care and an EHR application (Cambio Cosmic).
Nadim's PhD project, which just started and looks at possibilities of EBM practice support and clinical process support through openEHR.
The first results of Nadim's PhD, in which European stroke guidelines are formally represented with consideration of openEHR concepts
Nadim Anani

Archetype based prototyping projects by academy and healthcare: AIV & EEE
Erik Sundvall

Archetype based decision support systems for dental care & openEHR experiences by Chalmers (Hajar Kashfi et al in Gothenburg)
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Work on reference archetypes

- Based on openEHR RM and a model of a generic clinical process
- Adds classes corresponding to steps in the generic process model
- Borrows attributes from SNOMED CT concept model
- http://sloocean.karolinska.se/ckm/
Work on reference archetypes

- Process model is used to elicit recording requirements
- Reference archetypes used for representing Heart Failure clinical documenting requirements
  - Ongoing project, three more domains will follow this fall
- Quality registry data items will be inferred from clinical data
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An **Educational EHR Environment** or **Extendable EHR Ecosystem**?

REST = "representational state transfer"

design principles presented in 2000 in the doctoral dissertation of Roy Fielding, one of the principal authors of the Hypertext Transfer Protocol (HTTP) specification.

EEE = openEHR sliced to more digestable pieces using REST + ...
EEE main components

- Decision support
- Trigger handler (during entry)
- Validators & Converters
- Trigger handler (on commit)
- Export (e.g. replication)
- Decision support

EHR Database
- Basic DB write
- Versioned objects (compositions etc)
- Contributions
- EHR Access control settings

Basic DB read

Native DB calls
- Versioned object
- AQL-Query
- Query (DB native QLs)

Tools & utilities:
- Bulk loader
- Instance builder
- Log extractor
- Admin (users etc)
"Skapa en kreativ plattform med senaste tekniken för att praktiskt implementera tvärvetenskaplig forskning inom informationsvisualisering för vård och omsorg.”
County Council of Östergötland
Med Tech R&D Organisation

Research and development unit

R&D Coordinator
Magnus Stridsman

Research
Development
Innovation
Testning

http://www.advancedinfovis.org/
AIV + EEE

- EHR overviews
  - Medication history, review & perscription
    - http://www.nepi.net/110208-Foerstudie-ordinationsorsak.htm
  - General EHR overviews
Cooperative Prototyping, a form of participatory design

Let the user/domain expert have power over the prototyping tools and shared "ownership" of prototype.

a) idea-generation & exploration
b) "work-like evaluation"


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Denmark

National Patient Index and Shared Medication Record.
Louise Bilenberg Pape-Hauggaard

National archetype project – a cooperation between the national authorities, regions, and vendors
Knut Bernstein
Denmark

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Knut Bernstein
Danish research contribution and perspectives

Focus on Shared Medication Record

Presented by Louise Pape-Hauggaard
National Patient Index & Shared Medication Record

• In DK – several smaller ongoing projects
  – Conducted by vendors, researchers and governmental staff

• Research in eHealth conducted at AAU is:
  – Terminologies (SCT)
  – Architectures
  – Clinical content
  – Electronic Health Records (from different perspectives)

• Basically, Interoperability in eHealth
Shared Medication Record

- General Practitioner
- Citizens/Patients
- Specialist
- Emergency Center
- Politicians
- Hospitals
- Researchers
- Nursing Homes and Institutions
- Pharmacy
- District Nurse

SMR

WebService Communication:
Standardization used to support SMR

Webservice standards

Security standards

'The good web service'
Future ideas and collaboration

• Shared Medication Record is quick and dirty but....
  – Can we reuse the model in a different domain?
  – Can we internationalize the model?
  – Could such services be based on international profiles and standards?
  – Can we in any way create a collaboration?
Open Discussion
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Semantic challenges
clinical content

Tooling & software challenges

Architectural challenges
system integration, national frameworks etc

Questions in Scandinavian languages are also welcome and will be translated to English.
A. Using openEHR for quality registers? Will distributed queries in archetyped EHRs be able to replace registers in the future? Will the expert roles change?

B. How can Scandinavian cooperation in openEHR-related research and education be improved?

C. Can common semantic platform support Scandinavian participatory design of reusable parts for end user solutions?

D. Can different it-architectures and strategies across national borders make Scandinavian collaboration harder? Do Danish SOA approaches and archetype-based approaches address the same or different kinds of problems? Can experiences from one approach be reused in the other?

E. How can CDS applications and distributed care process support benefit from a common semantic platform and shared clinical content?

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The End?

Slides & contact info will be uploaded to http://www.imt.liu.se/~erisu/2011/MIE/
Bonus track...
Borders... Systems of Systems...

- Terminology systems
- Process & flow models
- Information models and structures
- Decision Support Systems (DSS)
Borders... Systems of Systems...

- Process & flow models
- Information models and structures
- Terminology systems
- Decision Support Systems (DSS)

- limits of decomposition based engineering (bandwidth in hierarchies)
- Instead, competitive parallel design - mimics complex biological and social systems or free market competition,

Some key concepts suggested:

- A focus on environment and process rather than a product. Allow component changes in situ.
- Continually build on what already exists and allow systems to include multiple (possibly overlapping) versions of functional components. View complex systems as populations rather than rigid assemblies of unique components.
- Allow multiple parallel development processes, experiment in situ and gradually increase the usage of potentially more efficient solutions – testing is never complete and the operation needs to be continuous.