Up Close and Personal: Standards and Person-Centric Electronic Health Records

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PHRs & Standards

- Impetus for standards: Interoperability
  - RHIOs in a NHII

- EHR / PHR standards

- Improving Adoption
  - Functional standards
  - Harmonization
  - Certification
I. Interoperability: NHII

Fig. 2. Touch Points in NHII Architecture & Standards

- Clinical IT System: e.g., primary care physician, ambulatory clinic IT system
- Pharmacy IT System
- Clinical IT System: e.g., acute care in an IDN or in a community hospital
- Home Computer
- Patient Portals
- Patient at Home
- Public Health

Sharing and access to care records over patient’s lifetime enabling decision support

NHII

Collaborative services
Aggregation of data across appropriate populations

I. Interoperability: NHII
NHII ‘04: Architecture Recommendations

- **General principle:** NHII is not a collection of specific applications, but a definition of how data & knowledge are exchanged

- **Recommendations**
  - Unique identifiers (patients, providers, organizations)
  - Encode data at source using standards (LOINC, SNOMED CT, RxNorm, etc)
  - Define/standardize NHII transactions (data clearinghouses)
  - Conformance process to test compliance with NHII
  - Knowledge libraries + tools
  - Stakeholder consortium to guide NHII implementation
Impetus: NHII & Interoperability

- Office of the National Coordinator for Health Information Technology (ONCHIT): April, 2004
  - [http://www.hhs.gov/onchit/](http://www.hhs.gov/onchit/)

- President’s IT Advisory Committee (PITAC) Report: June, 2004
  - [http://www.nitrd.gov/pitac](http://www.nitrd.gov/pitac)

- Connecting for Health: July, 2004
  - [http://www.connectingforhealth.com](http://www.connectingforhealth.com)
Interoperability Impetus (Continued)

• eHealth Initiative: Focus on safety & quality of health care using IT
  – http://www.ehealthinitiative.org

• Systemic Interoperability Commission
NHII = Many RHIOs

- Facilitates interoperability: Mechanism for exchanging data between organizations
- Important elements
  - Standards: Messaging, data model, terminology
  - Mechanism: Clearinghouses
- Part of a federated NHIN
- Important driver: Public health
  - Integrate data from many HCOs
  - Syndromic surveillance (e.g., RODS, etc)
- Examples: Santa Barbara; Indiana; CalRHIO
II. Standards to Support NHII

• A. HL7 as a Standards Development Organization

• B. Standard terminologies

• C. Accessing knowledge: Decision support
  – Guideline formalism
  – Infobutton
A. SDO: Health Level Seven

- **Growing international organization**
  - 20+ international affiliates
  - participation by wide range of stakeholders: academia, vendors, government, consultants

- **Key characteristics**
  - All-volunteer organization
  - Refereed consensus process

- **Other organizations**: ASTM, CEN TC251, etc
HL7 Standards

- **Data standards**
  - Messaging (v2.x, v3)
  - Data model (RIM, possibly vMR)
  - Documentation (CDA)
  - Application integration (CCOW)
  - EHR Functional Model and Specification

- **Decision support**
  - Arden Syntax
  - Guideline formalism
  - Infobuttons
  - Order sets
B. Standard Terminologies: Why?

- **Comprehensive data dictionary**: Describe data collected electronically

- **Different names for the same thing**
  - Data stored using one coding scheme can be translated to another
  - Data from different sources can be stored using a consistent set of concepts

- **Uniform representation of data**
  - Queries for the CDR, data warehouse
  - Integration of data from systems from multiple vendors
Standard Vocabularies: Examples

- **Endorsed by CMS** (45 CFR 162 = HIPAA requirement, final rule adopted 20 Feb 2003)
  - ICD9-CM
  - NDC (retail pharmacies)
  - CPT-4
  - HCPCS
  - Code on Dental Procedures & Nomenclature
Importance of SNOMED CT

• **Inclusion in NLM UMLS**
  – 5-y, $32.4M sole-source licensing agreement between HHS and CAP announced 1 July 2003
  – Makes SNOMED freely available to US users (January, 2004)

• **Use by major organizations:** VA
  – included in 4/2003 VA contract with Apelona

• **International effort:** Spanish version, etc
Standard Data Models

• **Candidates**
  – RIM = HL7 Reference Information Model
  – CCR = ASTM Continuity of Care Record

• **Purpose:** Standardize references to patient data
  – *Promote knowledge transfer:* Retrieve data for automated reasoning for decision support
  – *Goal:* Avoid manual rewriting of data references
Standard Data Models: HL7 RIM

- High-level, abstract model of all exchangeable data
  - Concepts are objects: Act (e.g., observations), Living Subject, etc
  - Object attributes
  - Relationship among objects

- Common reference for all HL7 v3 standards

Schadow G, Russler DC, Mead CN, McDonald CJ. Integrating medical information and knowledge in the HL7 RIM. Proc AMIA Symp 2000;:764-768.
Additional Standards: CHI

• **Consolidated Health Informatics initiative = health care portion of eGov**

• **Coalition of HHS (CMS, NLM, AHRQ, etc), DoD, VA, GSA, SSA, NIST + others**

• **Endorsed common standards (3/2003)**
  – HL7: messages
  – NCPDP SCRIPT: ordering from pharmacies
  – IEEE 1073: Medical Information Bus (devices)
  – DICOM: imaging
  – LOINC: laboratory, vital signs
CHI:
Endorsed Common Standards (May, 2004)

- **HL7**: Vocabulary (demographics, units of measure, immunizations, clinical encounters), CDA
- **SNOMED CT**: lab results contents, non-lab intervention/procedures, anatomy, dx/problems, nursing
- **LOINC**: lab test orders and drug label headers
- **HIPAA**: transactions/code sets for billing & admin
- **Federal med terminologies**: FDA (ingredients, manufactured forms, packages), NLM RxNorm (clinical drugs), VA NDF-RT (classification)
- **HUGN**: Genes in biomedical research
- **EPA Substance Registry System**: non-medicinal chemicals
C. Knowledge Access: Guidelines

• **Goal**: Facilitate decision support through shareable, computable knowledge

• **Candidate models**
  – Arden Syntax
  – GEM
  – GELLO: Expression language
Guideline Models: Arden Syntax


- **Formalism for procedural medical knowledge**

- **Unit of representation = Medical Logic Module (MLM)**
  - Enough logic + data to make a single decision
  - Generate alerts/reminders

- **Adopted by several major vendors**

Guideline Model: GEM

- Guideline Elements Model = ASTM standard E2210-02

- Mark up of a narrative guideline into structured, object-oriented format using XML
  - Not procedural programming
  - Tool = GEM Cutter

- Resulting structure might be used to translate to executable version


http://www.astm.org
Shareable Guideline Components: Expression Language

- **Purposes**
  - Query data (READ)
  - Logically manipulate data (IF-THEN, etc)

- **Current work:** Guideline Expression Language (GELLO)

- **Current status:** ANSI standard (4/2005)


http://cslxinfmtec.csmc.edu/hl7/arden/
Infobutton Standard

- **Infobutton**: Application that mediates queries of knowledge sources by clinical applications (EHRs, etc)

- **Process**
  - Clinical information system invokes infobutton manager (IM) with patient/user data
  - IM creates 1+ infobuttons, each = different kind of query
  - User chooses infobutton to execute query against a knowledge source, which displays response

Pharmacy Medication List as of 8/25/2004 02:00

PRN CONSTRITION
PRN SEVERE PAIN
PRN SEVERE NAUSEA
PRN NAUSEA/COMITING

PRN MODERATE PAIN

MICROMEDEX® Healthcare Series Integrated Index

Terms Matched(CYCLOBENZAPRINE;

- Summary Documents
  - Drug Summary Information [CYCLOBENZAPRINE HYDROCHLORIDE - Drug Summary Information]

- Drug Information
  - TRADINGDEX DRUG EVALUATIONS [15 Related Occurrences]
  - Ingredients from TRADINGDEX Tradename Products [CYCLOBENZAPRINE - Drug Evaluation]
  - PHYSICIAN'S DESK REFERENCE [2 Related Occurrences]
  - MARTINDALE - The Complete Drug Reference [6 Related Occurrences]
  - MSDS [CYCLOBENZAPRINE HYDROCHLORIDE]
  - List of TRADINGDEX Tradename Products
  - List of MARTINDALE Tradename Products

- Disease Information
  - DISEASEDEX(TM) Emergency Medical Abstracts: Rick, P. et al., MD, Terry Hoffman, MD [3 Related Occurrences]
  - DISEASEDEX(TM) Emergency Medicine Clinical Reviews [LOW BACK PAIN - therapy of]

- Toxicology Information
  - TOXICITY/TOXIC MANAGEMENTS [CYCLOBENZAPRINE - Poisoning]
III. Improving (EHR/PHR) Adoption

- No advantage if not used!
- **Varying prevalence in USA**
  - 20% (MGMA, January, 2005)
  - 17% (CDC ambulatory medical care survey 2001-3, published March, 2005)
- **Higher prevalence elsewhere**
  - Netherlands = 90%, Australia = 65%
  - Reasons: Single-payer system, certification, cost-sharing
Improving Adoption: CCR

- ASTM E31 WK4363 (2004). Coalition = AAP, AAFP, HIMSS, ACP, AMA, etc
- Defines the core data elements & content of the patient record in XML
  - Read/write standard data elements: Snapshot of the record
  - Therefore increases interoperability
- Uses: Record sharing, eRx (allergies, medications), certification
- Components: standard content; elements spreadsheet; implementation guide; XML schema
<xml version="1.0" encoding="UTF-8"?>
  <ContinuityOfCareRecord xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="urn:astm-org:CCR CCR9.xsd" xmlns="urn:astm-org:CCR">
    <CRID>632485590297343750</CRID>
    <DateTime>2005-04-08T12:10:29Z</DateTime>
    <Patient>
      <ActorID>AA0001</ActorID>
    </Patient>
    <From>
      <ActorLink>
        <ActorID>AA0002</ActorID>
        <ActorRole>
          <Text>Primary Care Provider</Text>
        </ActorRole>
      </ActorLink>
    </From>
    <Purpose>
      <Description>
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      </Description>
    </Purpose>
    <Body>
      <Problem>
        <CRID>BB0001</CRID>
        <DateTime>
          <Type>Onset</Type>
          <ExactDateTime>1999-04-01T05:00:00Z</ExactDateTime>
        </DateTime>
      </Problem>
    </Body>
  </ContinuityOfCareRecord>
Improving Adoption:
EHR Functional Model & Specification

- **HL7 2004**: Funded by US Government
- Identifies key functions of the EHR
- **Purpose**
  - Guide development by vendors
  - Facilitate certification
  - Facilitate interoperability
- **Certification governance**: CCHIT
Harmonization of Standards

- **ANSI HITSB**
  - Recently funded by HHS to identify key standards

- **HIPAA: NCVHS**

- **CHI: US Federal Government agency collaborative**

- **AHIC: Advise HHS re standards, certification, etc**

- **SDO collaborations: HL7 & CDISC, HL7 & SNOMED, etc**
Compliance with Standards: Certification

• Individual adopters have limited resources
  – Lack of IT expertise
  – Inability to judge compliance with standards

• Certification: Seal of approval

• Process: CCHIT
Summary: PHRs and Standards

- **Interoperability is key**
  - Substantial accomplishments already
  - Further work underway

- **Standards are essential**
  - Data & functional standards
  - Decision support standards
    - Guideline formalism
    - Infobutton

- **Putting it all together:** Harmonization & certification
Thank you!

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