What is CIMI up to, and how does it fit in?

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CMIO Intermountain Healthcare
Chair of the Board HSPC
Chair of the Board FHIR Foundation
Why?

“To help people live the healthiest lives possible.”
Why Interoperability?

- Improve the quality and safety of care
- Decrease the cost of care
- Enable a Learning Health System
- Make providers happier and more effective
- Make patients happier and healthier
- There are many more reasons...
Core Assumptions

‘The complexity of modern medicine exceeds the inherent limitations of the unaided human mind.’
~ David M. Eddy, MD, Ph.D.

‘... man is not perfectible. There are limits to man’s capabilities as an information processor that assure the occurrence of random errors in his activities.’
~ Clement J. McDonald, MD
The Challenge at Intermountain

- We have ~150 decision support rules or modules
- We have picked the low hanging fruit
- There is a need to have 5,000+ decision support rules or modules
- There is no path from 150 to get to 5,000 unless we fundamentally change the ecosystem
- There is no scalable path from the leading institutions to community hospitals
Table

Table 1: Studies on US death rates from medical error since the 1999 IOM report and point estimate from pooled results

<table>
<thead>
<tr>
<th>Study</th>
<th>Dates covered</th>
<th>Source of information</th>
<th>Patient admissions</th>
<th>Adverse event rate (%)</th>
<th>Lethal adverse event rate (%)</th>
<th>% of events deemed preventable</th>
<th>No of deaths due to preventable adverse event</th>
<th>% of admissions with a preventable lethal adverse event</th>
<th>Extrapolation to 2013 US admissions†</th>
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</thead>
<tbody>
<tr>
<td>Health Grades</td>
<td>2000-02</td>
<td>Medicare patients</td>
<td>37 000 000</td>
<td>3.1</td>
<td>0.7*</td>
<td>NR</td>
<td>389 576</td>
<td>0.71</td>
<td>251 454</td>
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<td>Office of Inspector General</td>
<td>2008</td>
<td>Medicare patients</td>
<td>838</td>
<td>13.5</td>
<td>1.4</td>
<td>44</td>
<td>12</td>
<td>0.62</td>
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<td>Classen et al</td>
<td>2004</td>
<td>3 tertiary care hospitals</td>
<td>795</td>
<td>33.2</td>
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<td>9</td>
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<td>Landrigan et al</td>
<td>2002-07</td>
<td>10 hospitals in North Carolina</td>
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<td>18.1</td>
<td>0.6</td>
<td>63</td>
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<td>Point estimate from all data</td>
<td>2000-08</td>
<td>—</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.71</td>
<td>251 454‡</td>
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</table>

~251,454 deaths /year during inpatient admissions

BMJ May 2016
What is the vision for the future?
• HL7 WG Meeting Orlando
  • Fast Healthcare Interoperability Resources (FHIR) – (HL7 v4?)
  • Clinical Information Modeling Initiative (CIMI)
  • Improve the interoperability of healthcare systems through shared implementable clinical information models.
Heterogeneous Systems

SMART on FHIR®© – Open Platform Architecture

- SOA Orchestration
- mHealth
- OAuth
- FHIR®² REST API
- FHIR Profiles from CIMI detailed clinical models

Heterogeneous Systems

- Cerner
- Allscripts®
- Epic
- Others...

Real Impact
- Occult sepsis
- Community Acquired Pneumonia
- Pulmonary Embolus
- ICU Glucose
- Ventilator management

http://smartplatforms.org/smart-on-fhir/
Our end user is someone who makes this stuff work. ...

But what is this end-user looking for? We kind of made a gambit statement that we *could* define a world in which point to point mapping wouldn't be required. I think we showed that:

(a) that's not possible - all uses of V3 I've seen, ... have use case specific processing

(b) Users are increasingly telling us that they don't care. The price of this consistent semantics is higher than they'd pay *even if* we solved the consistent semantics problem. Instead, they want ad-hoc wire forms that are close to their domain use cases. ...

So. Is that right? Does it ring bells for anyone else?

Am I saying that we shouldn't try for plug-and-play?
“We have definite goals to enable plug and play globally for some kinds of uses in some kinds of contexts - mostly infrastructure/exchange, and read-only access to summary information. But we remain true to the [previous] vision you quote when it comes to actual workflow; adaptation will always be required.”
Partial Interoperability

Application

Application and User

Standard Structure
(Non-standard codes)

Structure Translators

Local databases,
Cerner, Epic, Allscripts, etc.
Preferred Strategy – Full Interoperability

Application and User

Standard Structure AND Standard Terms (As defined by CIMI Models)

Requirements

Term and Structure Translators

Local databases, Cerner, Epic, Allscripts, etc.
What does CIMI do?
CIMI Logical Model Development Lifecycle

Standards Infusion

Core Reference Model

SNOMED CT
LOINC
RxNorm

LOINC or SNOMED Observable

BodyLocation

Model Review

Repository of Shared Models in an approved Formalism

Initial Loading of Repository

Translations

HL7 FHIR Profiles

CDISC

HL7 CDA

X12

NCPDP

HL7 V2

FPAR Application Development

FPAR Application

CEMs

DCMs

CDA Templates

openEHR Archetypes

ISO EN 13606 Archetypes

FHIM Models

FHIM Resources

Model Dissemination
How does CIMI fit in?
Healthcare Services Platform Consortium

*Improve health by creating a vibrant, open ecosystem of interoperable applications, content, and services*

HSPC is wholly dependent on CIMI for models

Clinical Information Interoperability Council

*Improve health by creating a vibrant, open ecosystem of interoperable applications, content, and services*

CIIC supplies detailed clinical knowledge to CIMI
August 2018 CIIC meeting at NLM

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<th>Providers</th>
<th>Government</th>
<th>Standards</th>
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HSPC/CIIC
Tasks for Clinical Experts

• What data should be collected? (part of domain analysis)
  • It will be different for different situations
  • Sherlock Holmes, “Data! Data! Data!” he cried impatiently. “I can’t make bricks without clay.”

• How should the data be modelled? (CIMI)
  • Two fields or one (the degree of pre and post coordination)

• What does the data mean?
  • How do we make computable definitions for diabetes mellitus, myocardial infarction, heart failure, chronic renal failure, etc.
Coordinating CIMI work at HL7

- CIMI works with HL7 Domain WGs to establish high level classes, patterns

- CIMI works with professional societies and clinical experts to define detailed model content

- CIMI works with FHIR Infrastructure to determine that the FHIR profiles created from CIMI models are technically correct
How do CIMI/HSPC/CIIC relate to other interoperability activities?

- **Argonauts**
  - We build on the HL7 FHIR profiles that the Argonauts create

- **Sequoia**
  - We depend on Sequoia to create the network, trust agreements, and data exchange infrastructure

- **SMART**
  - We depend on SMART for integration into EHRs

- **HL7**
  - FHIR – the approved API for sharing patient data
  - CIMI – provides the detailed information models that are essential for interoperability

- **Federal Health Information Model (FHIM)**
  - We use FHIM classes as the pattern for CIMI models

- **SOLOR**
  - SOLOR is the source of coded concepts used in CIMI models

- **NLM Value Set Authority Center (VSAC)**
  - We are aligning and placing SOLOR refsets in VSAC

- **SDOs (OMG, NCPDP, X12, ISO, CEN)**
  - We use their standards whenever possible

- **Commonwell, Center for Medical Interoperability, AMA Integrated Health Model Initiative, CDEs, openEHR, OMOP (OHDSI)**
  - We want to work together as partners with all groups with whom we have overlapping interests
Argonaut profiles and CIMI profiles

FHIR Resource
- Observation
  - Lab Obs
    - Qn Lab Obs
      - Hematocrit
    - Qual Lab Obs
      - Serum Glucose
    - Titer Lab Obs
      - Urine Sodium
  - Patient Obs
  - Family Hx Obs

CIMI Models and Profiles
- Argonaut profiles

Invariant Profile Structure – CIMI Leaf Node Content
Interoperability Pyramid

1. Preferred structure, standard extensions, explicit LOINC and SNOMED, units, magnitude, ...

Common resources, extensions and some specific LOINC and SNOMED

Structure(s), Generic LOINC

Structure, No terminology Constraints
Current and planned HSPC/CIIC projects that need CIMI models

- ACOG - OPA Family Planning
- FDA – Women’s Health Registry
- Cancer Interoperability
- Registries on FHIR
- Pain Assessment
- Occupational Health Data
- Common Data Elements (Pew Trust)
- Standard laboratory test results
- More …
Thank you

stan.huff@imail.org

@HSPConsortium

#HSPCIImplementersForum
• Clinical Information Interoperability Council
• Working specifically with professional organizations
  • American College of Surgeons
  • American College of Obstetricians and Gynecologists
  • American College of Cardiology
  • American Association of Family Physicians
  • Radiology
• Inviting others
  • American Nurses Association
  • Internal medicine
  • Anesthesiologists
  • Emergency Department
  • Etc.