How does FHIR® fit in?
A Picture from the Pieces

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Acronym Soup
This is today....

Tomorrow: Plug and Play Interoperability
Imagine....

Semantically Interoperable Healthcare focused Apps

Healthcare App Store
What needs to happen to make this work?

• Data elements consistently defined
• Standardized data exchange
• Standardized knowledge representation and (content) exchange
What needs to happen to make this work?

• Data elements consistently defined – CIMI

• Standardized data exchange - FHIR, SMART on FHIR, HSPC SOA Platform

• Standardized knowledge representation and (content) exchange – HSPC, BPMN, etc.
Data Comes in Different Shapes and Colors

Finding – Suspected Lung Cancer

Finding – Suspected Cancer
Location – Lung

Finding – Cancer
Location – Lung
Certainty – Suspected

(Let’s say this is the preferred color and shape)
IsoSemantic Models – Example of Problem

*(based on example from Dr. Linda Bird)*

**e.g. “Suspected Lung Cancer”**

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**General Practice**

- **Prob/Dx**: Cancer
- **Body Site**: Lung
- **Status**: Suspected

**Polyclinic**

- **Prob/Dx Name**: Suspected cancer
- **Body Site**: Lung

**Restructured Hospital**

- **Diagnosis**: Suspected lung cancer

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EHR Vendor ABC

EHR Vendor 123

EHR Vendor XYZ
Data Standardized in the Service

Application

Data in preferred shape and color

Shape and color translation

Shape and color of data in the local database

Application and User
Partial Interoperability

Application

Application and User

Standard Terms
(Non-standard Structure)

Term Translators

Local databases, CDA, HL7 V.2, etc.
Preferred Strategy – Full Interoperability

- Full Interoperability

Local databases, CDA, HL7 V.2, etc.

Application and User

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

Term and Structure Translators

Application and User Requirements
What does it mean to be **SMART** on FHIR

- Open, standards based platform
- Defines a some initial profiles of FHIR resources and other web technologies
- Specifically (well adopted in healthcare)
  - Open ID connect
  - OAuth2
- Manages identity concerns, security, authentication concerns – **consistently**.
- Also has
  - CDS Hooks – consistent support for CDS (clinical decision support) alert delivery. Limited use case for one type of alert that fits a specific pattern.
  - SMART Genomics
- SMART is just an entry point – it is what is available today
Progress

• FHIR is easy to implement
• FHIR has unprecedented support from EHR vendors
• SMART on FHIR enables quick development
The Danger

• No true interoperability because
  • Vendors use different models/profiles
  • Government agencies use different models/profiles
  • Provider organizations use different models/profiles
  • Professional organizations use different models/profiles
Development Strategy

Rather than have FHIR implementers start with a base FHIR resource and “fill in the blanks”, have them select a FHIR profile from a library of approved profiles.
MISSION

Improve health by creating a vibrant, open ecosystem of semantically interoperable applications

Provider Led Non-Profit Organization

• Consistent implementation and libraries for:
  • Terminology and Modeling
  • SMART on FHIR Profiling
  • SOA Platform Services
  • Knowledge Representation and Content Sharing
Previous Model....

Application

Interface Service

Local Service

Data

Update Medication Order
WHERE orderNumber = “4674” ...

Update PharmacyOrder
WHERE orderNumber = “4674” ...

Best for Pregnant Women Pain Management

Super Great Pain Management

EHR1 Order Services

SBS

FHIR

EHR1 Order Services

SBS

FHIR

Big IDN Database

Big IDN Database
Application

Interface

Data Transformation

Service

Data

Best for Pregnant Women Pain Management

Super Great Pain Management

SBS

FP System Order Services

EHR1 Order Services

EHR Vendor ABC

EHR Vendor 123

EHR Vendor XYZ
Best for Pregnant Women Pain Management

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Application

Interface

Data

Transformation

Service

Data

FP System Order Services

EHR1 Order Services

SBS

EHR Vendor ABC

EHR Vendor XYZ

EHR Vendor 123

Terminology and Model Libraries

Clinical Content Representation

Model Review

Repository of Shared Models in an approved Formalism

Model Review

Repository of Shared Models in an approved Formalism

Model Review

Repository of Shared Models in an approved Formalism

Repository of Shared Models in an approved Formalism

CIIC

EHR Vendor ABC

EHR Vendor XYZ

EHR Vendor 123
Today

- #1 Super Specialist
- Best DM Care APP
- Optimal Care Registry

EHR 1
EHR 2
EHR 3

The Future

- #1 Super Specialist
- Best DM Care APP
- Optimal Care Registry

EHR 1
EHR 2
EHR 3
Data is shared through standard services rather than through messages and data duplication.
Why do we care about all of this?

To help people live the healthiest lives possible
The Value of “Truly” Interoperable Systems
Decision Support Modules

- Antibiotic Assistant
- Ventilator weaning
- ARDS protocols
- Nosocomial infection monitoring
- MRSA monitoring and control
- Prevention of Deep Venous Thrombosis
- Infectious disease reporting to public health
- Patient worksheets

- Diabetic care
- Pre-op antibiotics
- ICU glucose protocols
- Ventilator disconnect
- Infusion pump errors
- Lab alerts
- Blood ordering
- Order sets
- Post MI discharge meds
We can’t keep up!

- 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+

- We have to fundamentally change the ecosystem
What Needs to Happen?

• All of what we just discussed technically.....

AND

• Governance and agreement on the consistent clinical models, profiles and services

• Implementation of the agreed upon truly semantically interoperable data models, profiles, and services.
Examples of on. FHIR® apps.

- Bilirubin chart
- Growth Chart
https://apps.smarthealthit.org/apps/

Skip the screen prints...
Bilirubin Management

• Created at Intermountain Healthcare on legacy HELP2 enterprise system
• Monitors bilirubin [Mass/volume] results over a time-based risk chart
• Clinicians are presented with a visual representation of the results and associated criticality zones.
• Suggests recommended intervention for the criticality of the result.
• Focus is to reduce the incidence of severe hyperbilirubinemia and bilirubin encephalopathy while minimizing the risks of unintended harm such as maternal anxiety, decreased breastfeeding, and unnecessary costs or treatment.
• Current state: Application is being service enabled at the University of Utah for use in their EPIC system
## Patient Chooser

Search for patients by name: John Smith ...

<table>
<thead>
<tr>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bili, Baby</td>
<td>Male</td>
<td>1 year</td>
</tr>
<tr>
<td>Himston, Billie H.</td>
<td>Male</td>
<td>6 years</td>
</tr>
<tr>
<td>Langenheim, Ruby</td>
<td>Female</td>
<td>1 year</td>
</tr>
<tr>
<td>Reid, Ryan</td>
<td>Male</td>
<td>1 year</td>
</tr>
</tbody>
</table>
Hour Specific Bilirubin Risk Chart for Term & Near-Term Infants with NO Additional Risk Factors

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Result (mg/dL)</th>
<th>Age (Hrs)</th>
<th>Value/Test</th>
<th>Risk Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/04/2016 08:12</td>
<td>7</td>
<td>8.20</td>
<td>Transcutaneous Bilirubin</td>
<td>High Risk Zone (&gt;95%)</td>
</tr>
<tr>
<td>01/04/2016 14:00</td>
<td>9.7</td>
<td>14.00</td>
<td>Transcutaneous Bilirubin</td>
<td>High Risk Zone (&gt;95%)</td>
</tr>
<tr>
<td>01/04/2016 17:06</td>
<td>9</td>
<td>17.10</td>
<td>Transcutaneous Bilirubin</td>
<td>High Risk Zone (&gt;95%)</td>
</tr>
<tr>
<td>01/05/2016 21:30</td>
<td>10.7</td>
<td>21.50</td>
<td>Transcutaneous Bilirubin</td>
<td>High Risk Zone (&gt;95%)</td>
</tr>
<tr>
<td>01/05/2016 06:36</td>
<td>11.9</td>
<td>30.60</td>
<td>Transcutaneous Bilirubin</td>
<td>High Risk Zone (&gt;95%)</td>
</tr>
<tr>
<td>01/05/2016 12:48</td>
<td>11.6</td>
<td>36.80</td>
<td>Transcutaneous Bilirubin</td>
<td>High Intermediate Risk Zone (75-95%)</td>
</tr>
<tr>
<td>01/05/2016 20:18</td>
<td>11.4</td>
<td>44.30</td>
<td>Transcutaneous Bilirubin</td>
<td>High Intermediate Risk Zone (75-95%)</td>
</tr>
<tr>
<td>01/06/2016 08:06</td>
<td>12.9</td>
<td>56.10</td>
<td>Transcutaneous Bilirubin</td>
<td>High Intermediate Risk Zone (75-95%)</td>
</tr>
<tr>
<td>01/06/2016 20:18</td>
<td>11.5</td>
<td>68.30</td>
<td>Transcutaneous Bilirubin</td>
<td>Low Intermediate Risk Zone (40-74%)</td>
</tr>
<tr>
<td>01/07/2016 20:18</td>
<td>11</td>
<td>92.30</td>
<td>Transcutaneous Bilirubin</td>
<td>Low Risk Zone (&lt;40%)</td>
</tr>
</tbody>
</table>

Values from Hospital
Values from Home Health
Values from Outpatient Pediatrician
Growth Chart

• Concise, interactive view of a child’s growth over time
• Interactive Graphs, Data Table, Parent View
• Percentile/bone-age/mid-parental height estimates
• CDC/WHO/Fenton charts (expandable)
• Support for Ambulatory and NICU uses with:
  • Gestation corrections
  • Bone Age presentation
  • Growth point comparison with velocity
  • Print-out formats for Graphs, Data Table, and Parent View
Allen Vitalis has a healthy weight of 23kg (50lb 11oz).
The healthy weight for his age and height is 17.3kg — 24.9kg (38lb 1 oz — 54lb 13oz).
More Reasons

• Efficient software development
  • Widely distributed
  • Directed daily by front line clinicians
  • Increased usability of software, creativity, innovation

• Increased choice in software
  • Thousands of independent developers
  • Centrally planned economy vs free market
  • Think “app store for healthcare” or of innovations like Uber

• The start of a Learning Healthcare System is accurate, computable, data.
Why is this important for clinicians

• Communicate care across the care continuum
• Share knowledge
• Capture and share data and knowledge to have the visibility needed
• Interoperability at the application level in addition to interoperability at the data level
How to Get Involved

• HL7
  • www.HL7.org
  • CIMI
  • Clinicians on FHIR

• Clinical Information Interoperability Collaborative (CIIC)

• Healthcare Services Platform Consortium
  • www.hspconsortium.org
How to Get Involved

• Visit the web/wiki sites
• Call into calls of interest
• Introduce yourself
• Participate on the calls!
• Attend F2F meetings
• Participate in public comment opportunities
Questions?
Thank you!
So - How did it go?

• What did you like today?

• What did you find confusing, or not worth your time?

• Suggestions for next time?

• *Don’t forget the AMIA Evaluation and the learning exam – Take time to complete it now!*