How does ℹ️ FHIR® fit in?

A Picture from the Pieces

Laura Heermann Langford, PhD, RN
Why do we care about all of this?

To help people live the healthiest lives possible
More reason’s why!

• Improve the quality of care
• Decrease the cost of care
• Enable a Learning Health System
• Make patients happier
• Make providers happier and decrease their burden
• (there are more reasons, but this is all I have room for!)
Sir Cyril Chantler

Medicine used to be **simple**, **ineffective**, and relatively **safe**

Now it is **complex**, **effective**, and potentially **dangerous**.

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
Deaths during inpatient admissions: ~251,454

Table

<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>
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<td>—</td>
<td>0.71</td>
<td>251 454‡</td>
</tr>
</tbody>
</table>
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
This is today....

Point to point interface required

Tomorrow:
Plug and Play Interoperability

Seamlessly exchange knowledge and workflow without extra effort
Imagine....

Seamlessly Interoperable Healthcare focused Apps

Your Personal Health Record

Healthcare App Store

Allscripts®

Cerner®

Epic
What needs to happen to achieve national seamless interoperability?

**Syntactic interoperability = Same Language**
- Data elements consistently defined
- Standardized data exchange

**Semantic interoperability = Same Meaning**
- Standardized knowledge representation, (content) exchange and workflow

*Clinician engagement and commitment is essential*
Acronym Soup

HL7

SMART®

FHIR®

LOINC®

SNOMED International

The global language of healthcare

HSPC

THE HEALTHCARE INNOVATION ECOSYSTEM
What needs to happen to achieve national seamless interoperability?

- Data elements consistently defined
  - CIMI

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

- Standardized knowledge representation and (content) exchange
  - BPMN, etc.
• Data elements consistently defined
  – CIMI
Interoperability Today

Legend:
- shape = structure
- color = terminology
Interoperability in the Future

Real World → Digital World → Data Sharing and Re-use (no translation, just use it!)

Legend:
shape = structure
color = terminology
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”**

- **General Practice**
  - Problem/Dx: Cancer
  - Body Site: Lung
  - Status: Suspected

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

- **Restructured Hospital**
  - Diagnosis
    - Name: Suspected lung cancer
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
Partial Interoperability

Application

Application and User

Standard Terms
(Non-standard Structure)

Term Translators

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

Application

Application and User

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

Term and Structure Translators

Local databases, CDA, HL7 V.2, etc.
• Standardized data exchange
  - HSPC SOA Platform, FHIR, SMART on FHIR
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 (relatively) 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
Today

- Specialists across the country
- Diabetes Care App
- Patient Fitness Data
- My Doctors office
- My personal health record

Point to point interface required

The Future

- My Specialist
- My Care App
- My Data
- Any Hospital
- Any doctors office
- Anywhere

Seamlessly exchange knowledge and workflow without extra effort
Data is shared through standard services rather than through messages and data duplication.
Interoperability: What it will take

1. **CLINICAL ENGAGEMENT AND OWNERSHIP**
   - Expert clinicians must guide the content
   - Governance and agreement on the consistent clinical models, profiles and services

2. **TECHNICAL ADVANCES**
   - Data – common structure and language
   - Services – SOA, FHIR, behavior/functionality
   - Knowledge representation (Workflow, Decision support logic)
   - API adoption
   - Implementation

3. **POLICY & LEGAL FRAMEWORK TO ENABLE INFORMATION AND KNOWLEDGE SHARING**
   - TEFCA

4. **FINANCIAL INCENTIVES ALIGNMENT**
   - Value based payments, bundled payments, etc.
   - Implementation of the agreed upon truly semantically interoperable data models, profiles, and services.
Examples of SMART® 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
<table>
<thead>
<tr>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
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<tbody>
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</tr>
<tr>
<td>Reid, Ryan</td>
<td>Male</td>
<td>1 year</td>
</tr>
</tbody>
</table>
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 1oz — 54lb 13oz).
More Reasons for this level of Interoperability

• 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
To help people live the healthiest lives possible
How to Get Involved

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

• Healthcare Services Platform Consortium
  • www.hspconsortium.org
  • Clinical Information Interoperability Collaborative (CIIC)
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!