



Integrating RAPID Common Data Elements and Modeling with the Goals of HSPC

MDEpiNet RAPID

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Stanley M. Huff, MD

Why?

“To help people live the healthiest lives possible.”

Healthcare Services Platform Consortium

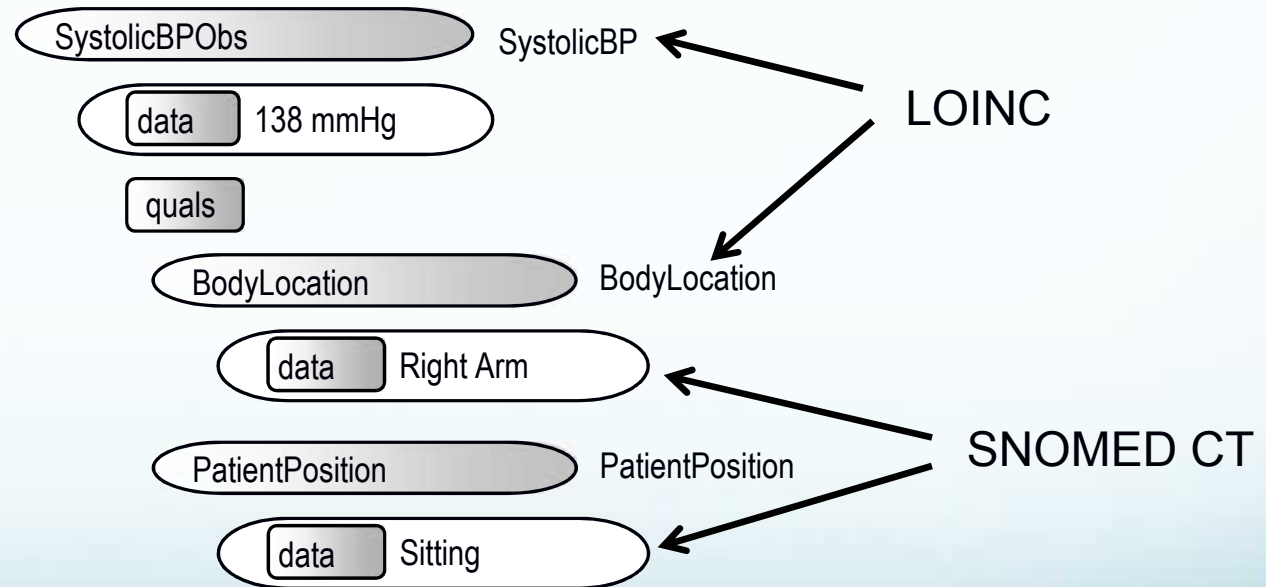
MISSION

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

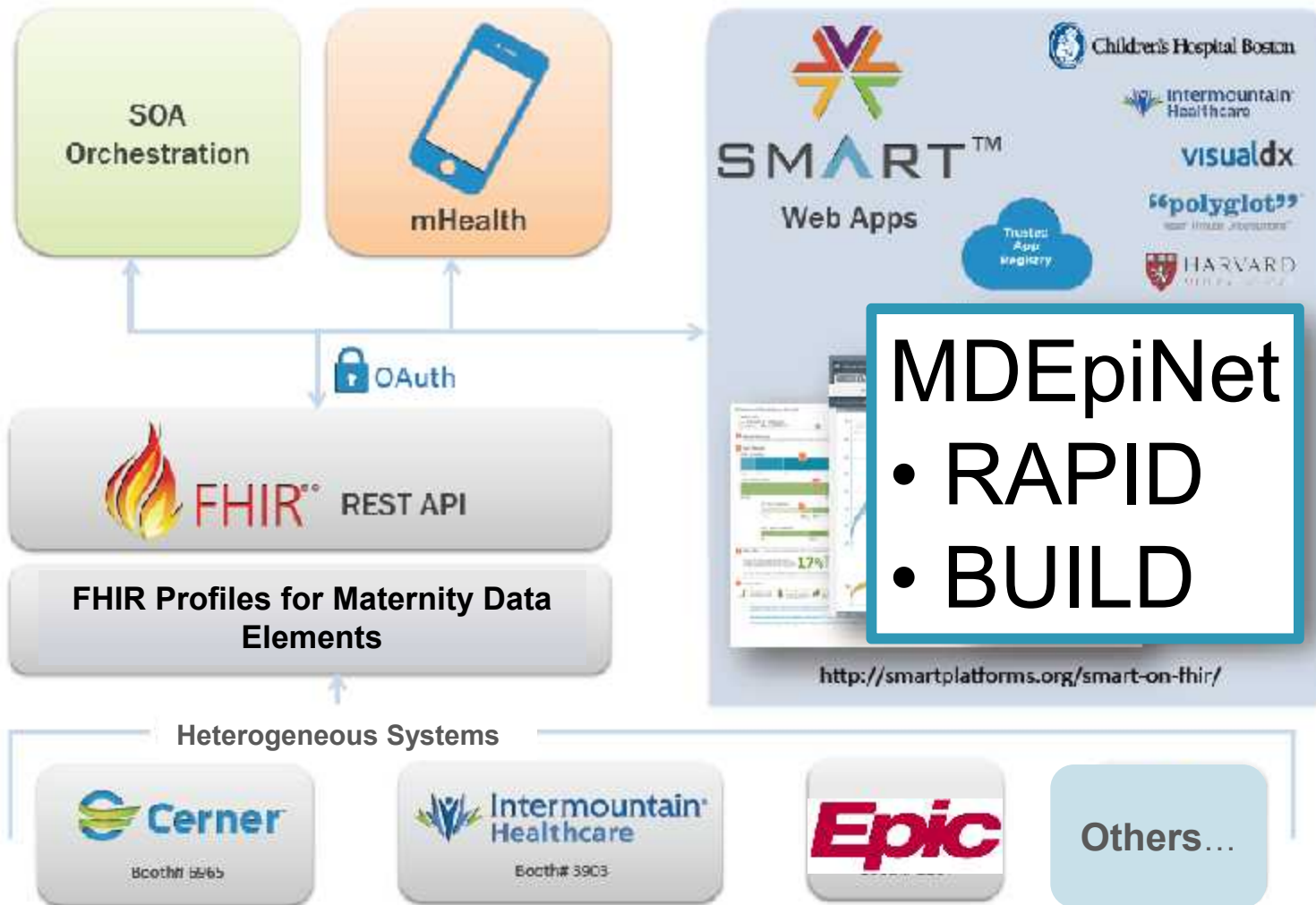
HSPC Initiatives

- Be a provider led collaboration agent
- Create a reference implementation of common SOA
- Develop terminology and information models for true semantic interoperability
- Support authoring and sharing of knowledge content
- Obtain implementation and adoption of approved standards
- Create a shared technical environment to enable simple and efficient development

Graphic Presentation of a Detailed Clinical Model



SMART on FHIR® – Open Platform Architecture



“True Interoperability”

- Data shared through standard messages
- Data accessed via standard services
- The data has a standard logical structure
 - Standard information models coupled (bound to) standard terminologies
- Sharing of applications, data, information, and knowledge

Proposed Shared Objective

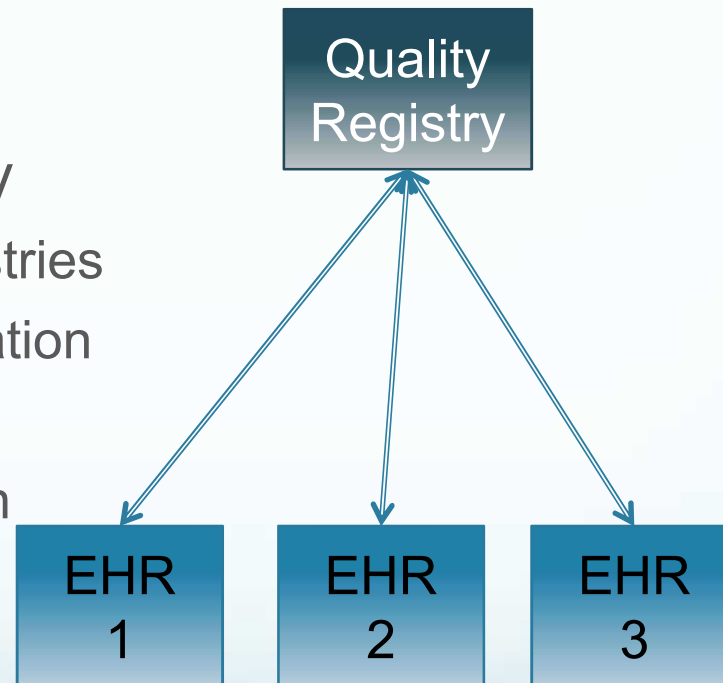
Create HSPC compliant terminology and models for RAPID data elements that can be used across the industry

Questions and Discussion

Appendix

Apps that enable data sharing...

- Next-gen Interoperability
 - Disease and quality registries
 - Population Health integration
 - HIE integration
 - Data capture for research
 - Clinical Trial recruiting



The path to interoperability

What is HL7 FHIR[®]?

- A set of modular components called “Resources”
- Resources refer to each other using URLs
 - Build a web to support healthcare process
- Exchange resources between systems
 - Using a RESTful API (e.g. web approach)
 - As a bundle of resources (messages, documents)

FHIR: Core Resources



AdverseReaction	Group	OrderResponse
Alert	ImagingStudy	Organization
AllergyIntolerance	Immunization	Other
CarePlan	ImmunizationRecommendation	Patient
Composition	List	Practitioner
ConceptMap	Location	Procedure
Condition	Media	Profile
Conformance	Medication	Provenance
Device	MedicationAdministration	Query
DeviceObservationReport	MedicationDispense	Questionnaire
DiagnosticOrder	MedicationPrescription	RelatedPerson
DiagnosticReport	MedicationStatement	SecurityEvent
DocumentReference	MessageHeader	Specimen
DocumentManifest	Observation	Substance
Encounter	OperationOutcome	Supply
FamilyHistory	Order	ValueSet

Observation Resource

Observation (DomainResource)

identifier : Identifier [0..*] status : code [1..1] « ObservationStatus! »

code : CodeableConcept [1..1] « LOINC ?? »

subject : Reference [0..1] « Patient | Group | Device | Location »

encounter : Reference [0..1] « Encounter »

effective[x] : Type [0..1] « dateTime | Period »

value[x] : Type [0..1]

« Quantity | CodeableConcept | string | Range | Ratio | SampledData |
Attachment | time | dateTime | Period »

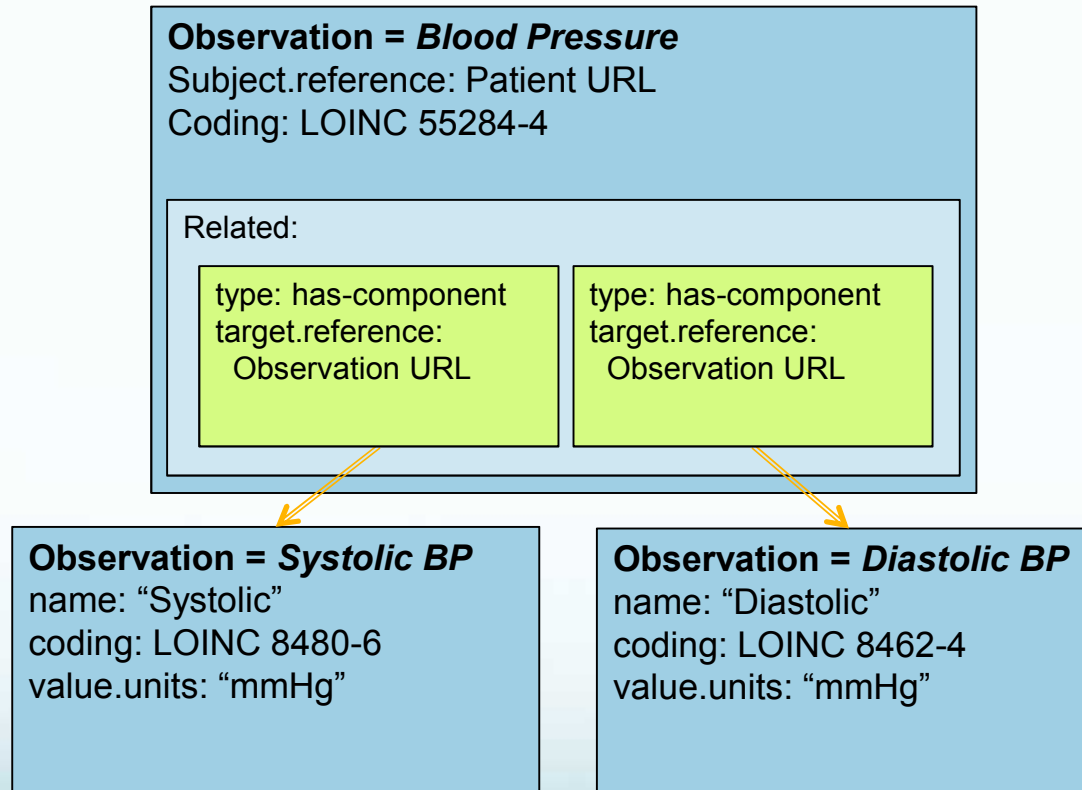
interpretation : CodeableConcept [0..1] « Observation Interpretation+ »

method : CodeableConcept [0..1] « Observation Methods?? »

specimen : Reference [0..1] « Specimen »

device : Reference [0..1] « Device | DeviceMetric »

Profile for “Blood pressure”



What if we use different models?

Site #1

Dry Weight:

Site #2

Weight:

- Dry**
- Wet**
- Ideal**

Too many ways to say the same thing

- A single name/code and value
 - **Dry Weight** is **70 kg**
- Combination of two names/codes and values
 - **Weight** is **70 kg**
 - **Weight type** is **dry**

Implications of different models

Patient Identifier	Date and Time	Observation Type	Observation Value	Units
123456789	7/4/2005	Dry Weight	70	kg
123456789	7/19/2005	Current Weight	73	kg

Patient Identifier	Date and Time	Observation Type	Weight type	Observation Value	Units
123456789	7/4/2005	Weight	Dry	70	kg
123456789	7/19/2005	Weight	Current	73	kg

How would you calculate the desired weight loss during the hospital stay?

LOINC Codes for Weight

The screenshot shows a web browser window with the LOINC search interface. The search query is 'body weight'. The results are displayed in a table with columns for LOINC, LongName, Component, Property, and Timing. A red circle highlights the text 'Search generated 135 hits in 0.142 secs.' at the bottom of the search results area.

LOINC	LongName	Component	Property	Timing
8335-2	Body weight Estimated	Body weight	Mass	Pt
3141-9	Body weight Measured	Body weight	Mass	Pt
3142-7	Body weight Stated	Body weight	Mass	Pt
8338-6	Body weight Measured --ante partum	Body weight^ante partum	Mass	Pt
69461-2	Mother's body weight --at delivery	Body weight^at delivery	Mass	Pt
8344-4	Body weight Measured --post dialysis	Body weight^post dialysis	Mass	Pt
8345-1	Body weight Measured --post partum	Body weight^post partum	Mass	Pt
8346-9	Body weight Measured --post surgery	Body weight^post surgery	Mass	Pt
8347-7	Body weight Measured --pre dialysis	Body weight^pre dialysis	Mass	Pt

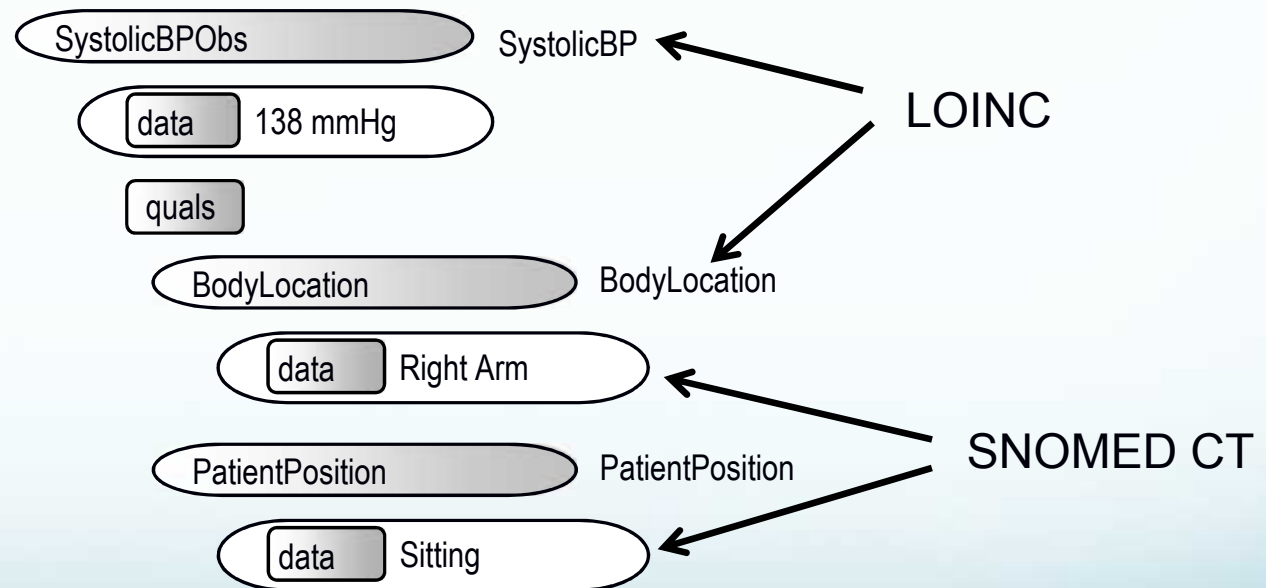
Search generated 135 hits in 0.142 secs.

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LOINC and SNOMED CT

- Logical Observation Identifiers Names and Codes
 - ~80,000 Observation codes
 - Regenstrief Institute
 - Licensed free-for-use
- Systematic Nomenclature of Medicine – Clinical Terms
 - International Health Terminology Standards Development Organization
 - Licensed by country, organization, or individual

Graphic Presentation of a Detailed Clinical Model



The General Pattern

LOINC is the question, and
SNOMED CT is the answer

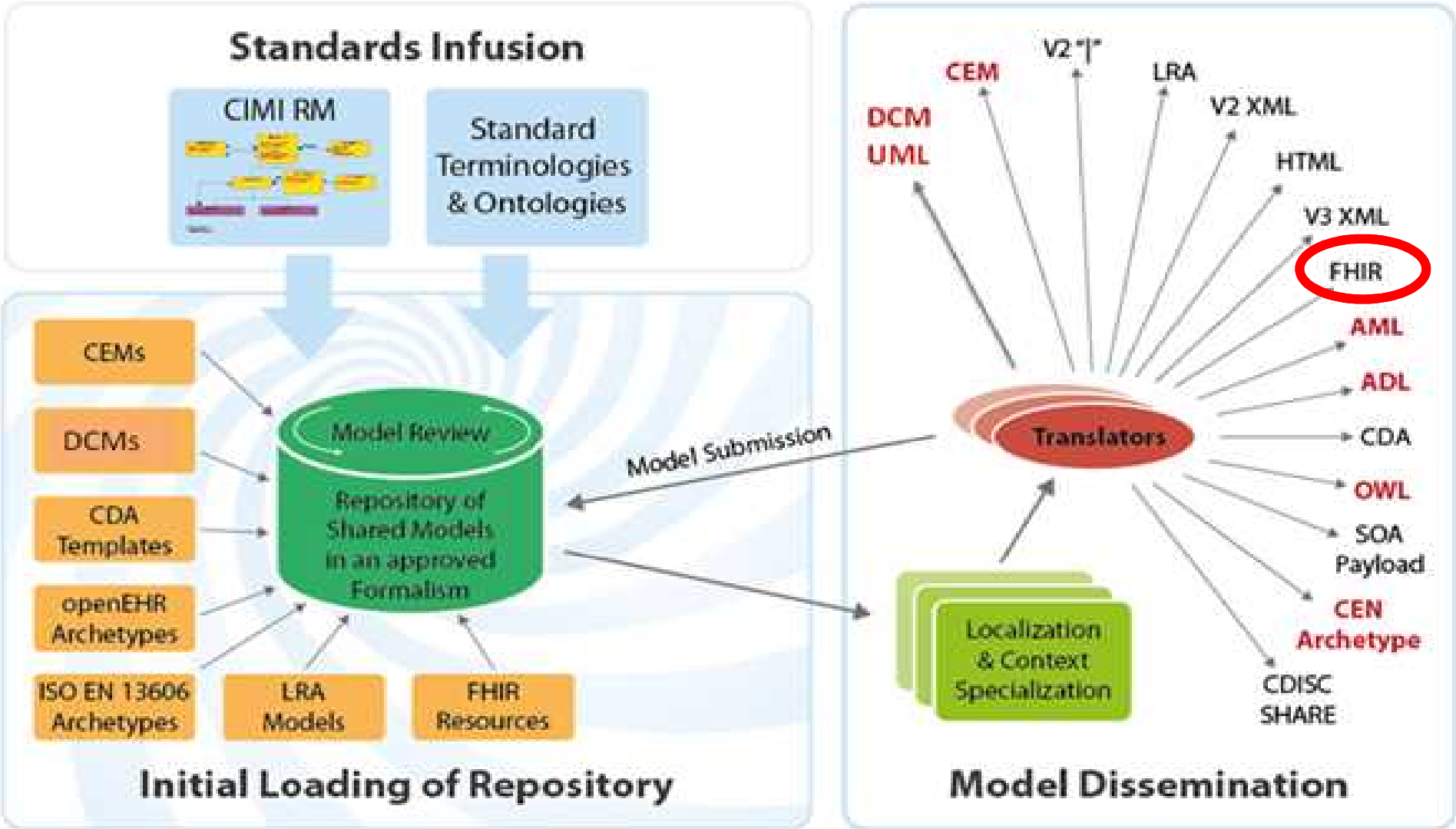
CIMI

- The Clinical Information Modeling Initiative (CIMI) is an HL7 Work Group that is producing detailed clinical information models to enable interoperability of health care information systems
- CIMI was initiated during a “Fresh Look” session at an HL7 meeting in 2011
- CIMI models are free for use for all purposes
- See <http://www.opencimi.org/> for more details

CIMI Goals

- Create a shared repository of detailed clinical information models
- Repository is open to everyone and models are licensed free for use at no cost
- Where the models:
 - Are expressed in an approved formalism
 - Archetype Definition Language (ADL)
 - Archetype Modeling Language (AML)
 - Are based on a core reference model, including a set of base data types
 - Have formal bindings to standard coded terminologies

CIMI Model Development Lifecycle



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

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Healthcare Services Platform Consortium

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Membership

- 3 Benefactor members
 - Veterans Administration
 - Louisiana State University Health
 - Intermountain Healthcare
- Key alliances
 - Center for Medical Interoperability (C4MI)
 - OSEHRA
- 3 Associate (organizational) members
 - Regenstrief
 - Motive
 - Allscripts
- 11 Individual members
- Society Members: AMA, MHII and ACOG

Plans for this Meeting

- Agree to a process for creating models which we use to create FHIR profiles
- We should be driven by the needs of real world implementations
- Discuss common modeling challenges and opportunities by working on examples

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!

- 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

The cost of medical software

- **Becker's Health IT & CIO Review**

- **Partners HealthCare: \$1.2 billion**

Boston-based Partners HealthCare is one of more recent implementations, [going live](#) the first week of June to the tune of \$1.2 billion. This is the health system's biggest investment to date. The implementation process took approximately three years, and in that time, the initial price tag of \$600 million doubled.

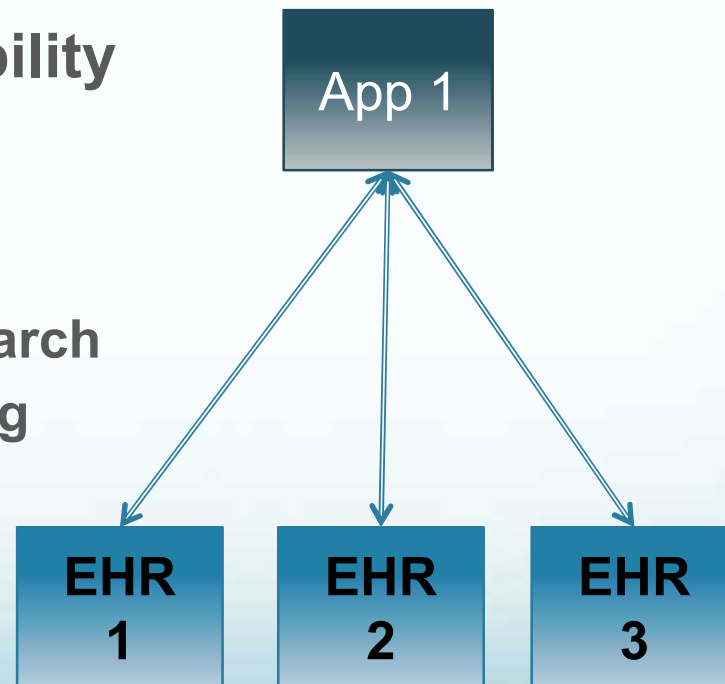
- **Intermountain Medical Center \$550 million**



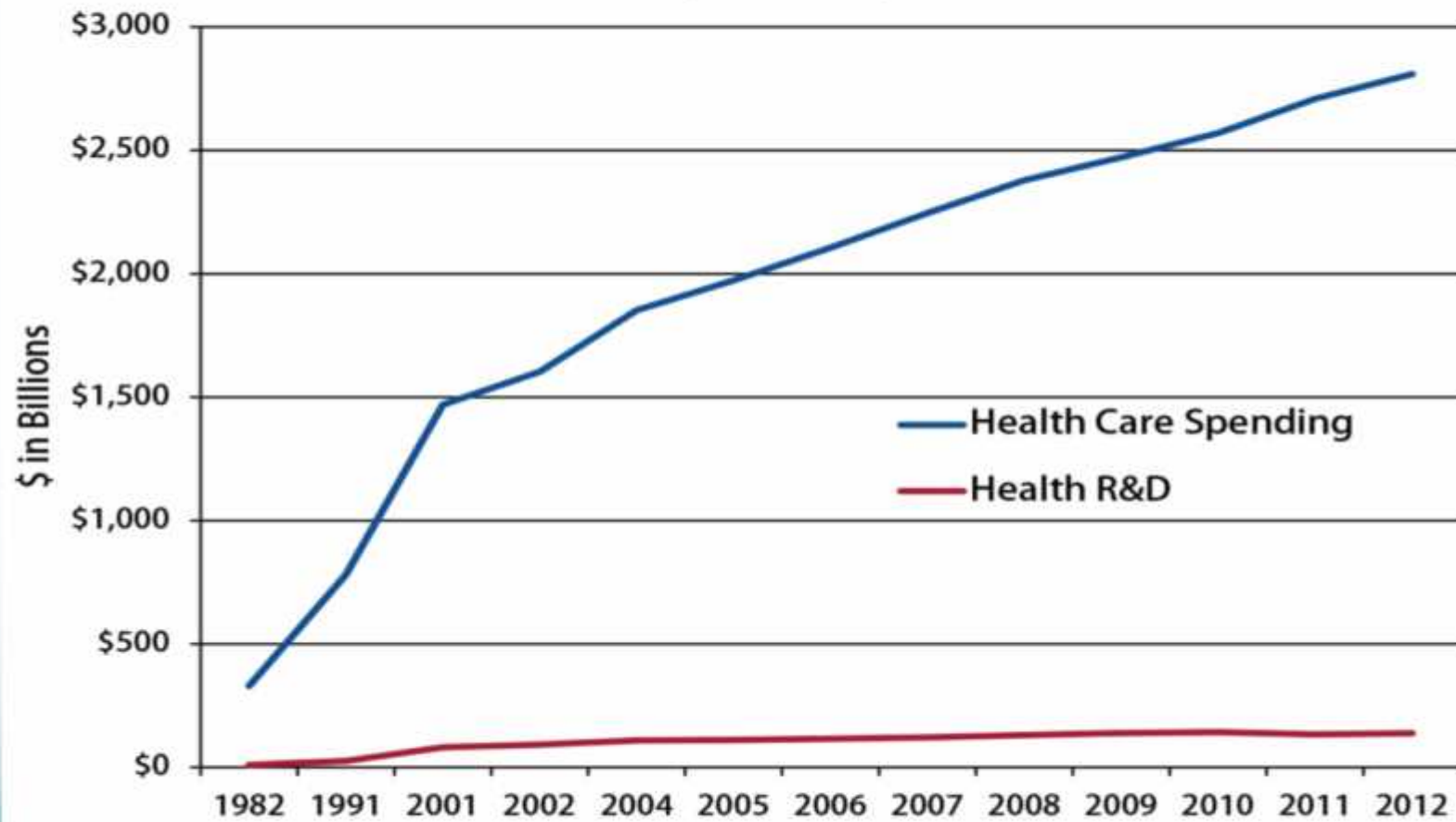
ACOs and Registries

Apps that enable data sharing...

- **Next-gen Interoperability**
 - Population Health integration
 - HIE integration
 - Data capture for research
 - Clinical Trial recruiting
 - Quality Repositories



Medical and Health Research vs. Health Care Spending in the U.S.



(from Research America)

The start of a Learning
Healthcare System is accurate,
computable, data.

More Reasons

- Agile 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

Pre and Post Coordination

IsoSemantic Models – Example of Problem

(from Dr. Linda Bird)

e.g. "Suspected Lung Cancer"

General Practice [X]

Problem/Dx

Prob/Dx: Cancer [v]

Body Site: Lung [v]

Status:

Suspected

Confirmed

Not found

OK Cancel

Polyclinic [X]

Problem/Diagnosis

Prob/Dx Name:

Suspected cancer [v]

Body Site:

Lung [v]

OK Cancel

Restructured Hospital [X]

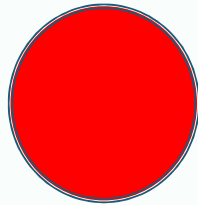
Diagnosis

Name:

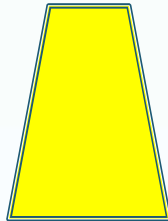
Suspected lung cancer [v]

OK Cancel

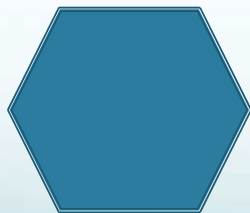
Data Comes in Different Shapes and Colors



Finding – Suspected Lung Cancer



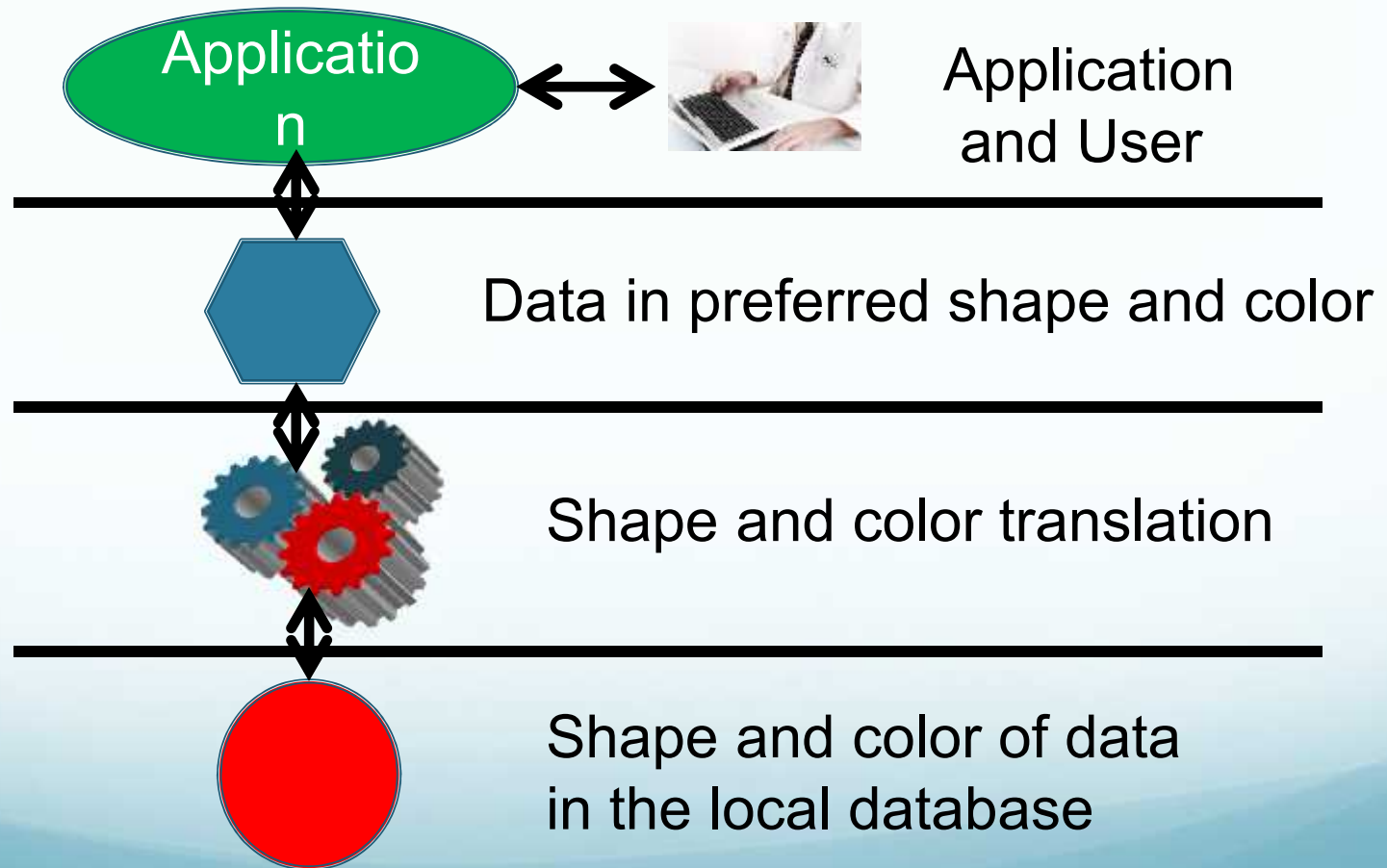
Finding – Suspected Cancer
Location – Lung



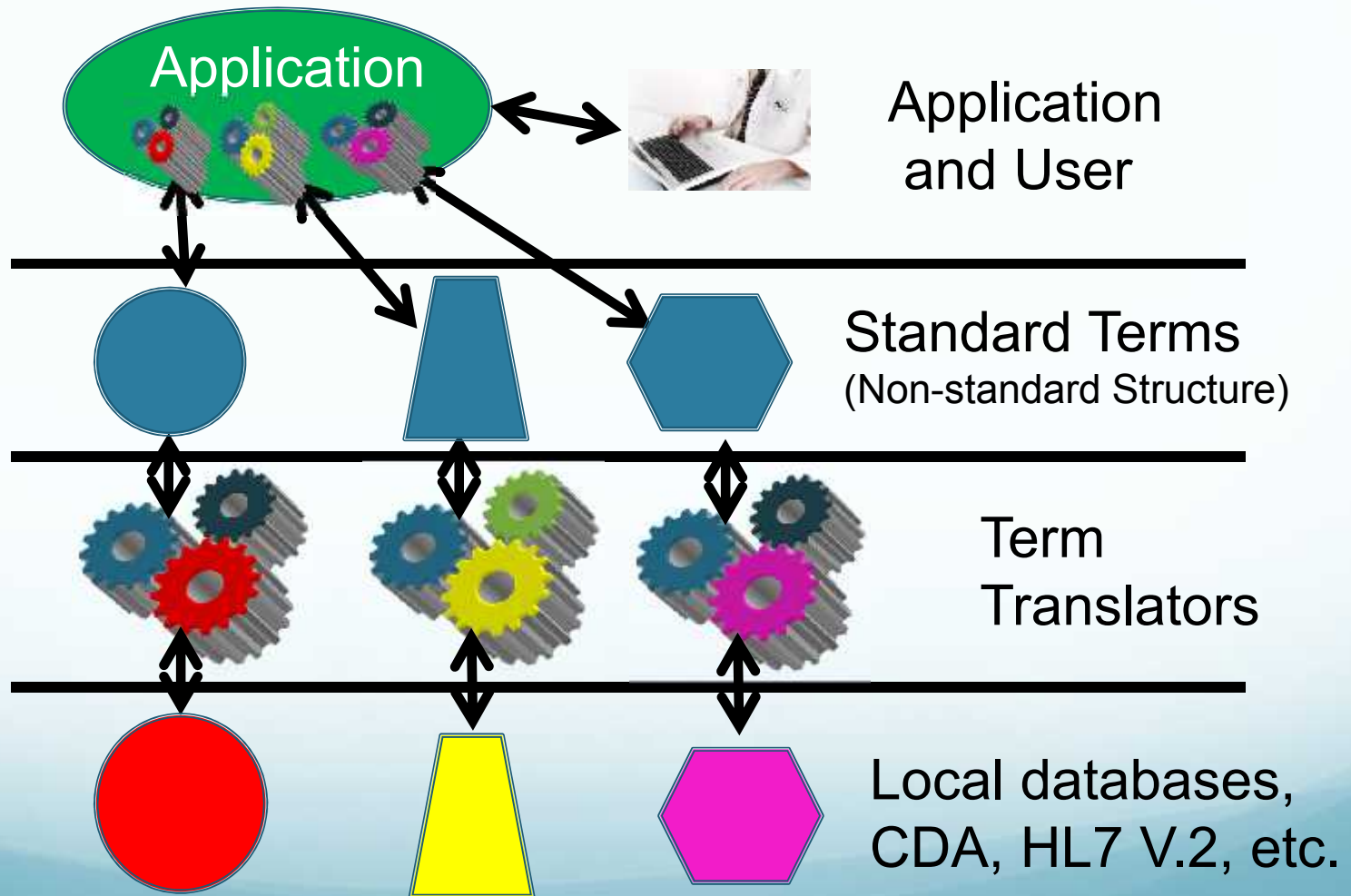
Finding – Cancer
Location – Lung
Certainty – Suspected

(Let's say this is the preferred shape)

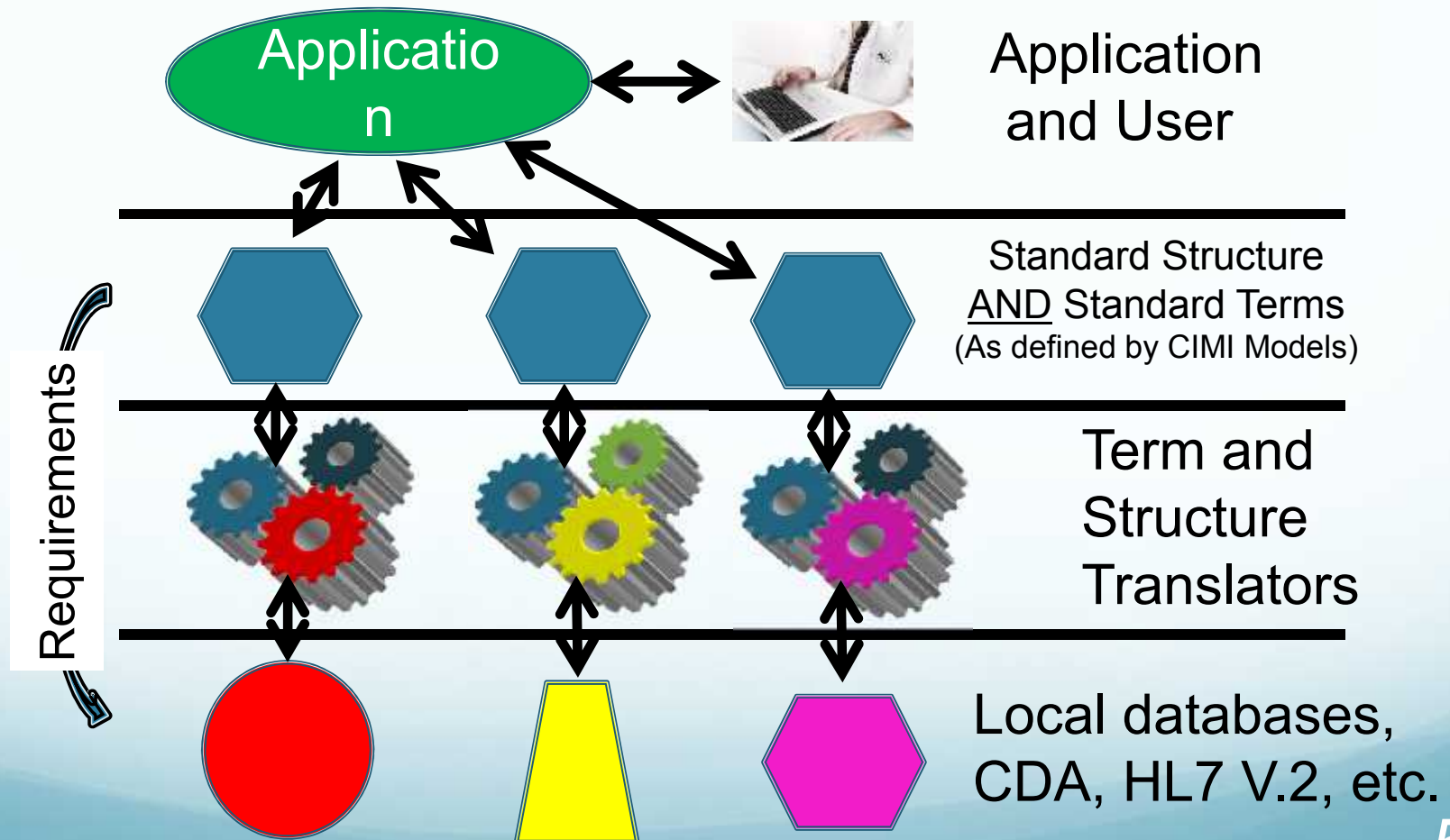
Data Standardized in the Service



Partial Interoperability



Preferred Strategy – Full Interoperability



Reasons to do it on the server side

- Person writing the translation is most likely to understand the meaning of the data in their own database.
- The person writing the translation only has to understand their own data and the preferred model.
 - They can optimize query execution for their own system
- The query for the data is simpler. If the application has to write a query that will work for all shapes, the query will be inefficient to process by every system.