

SHARP III Project
Harvard Medical School



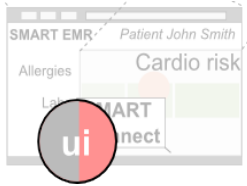
Substitutable Medical Apps Reusable Technologies

Josh C. Mandel, MD

Research Faculty, Harvard Medical School
Lead Architect, SMART Platforms Project

SemTechBiz SF, 2013

Substitutable Apps need



UI

Standards-based integration (HTML5)



Data

Context (container, user, patient)
Medical (Problems, Allergies, etc.)



API

Resource oriented, everything gets a **URL**



Authentication

Consistent delegation with Web standards (OAuth)

SMART Ecosystem

Apps



API (RDF)



Containers



Substitutable Apps need

Data

context, medical data



Substitutable Apps need

Data

information **exchange** (e.g. CCD)

vs.

discrete **normalized** data elements ✓



Substitutable Apps need

Data

“The best way to manage and store data for advanced data-analytical techniques is to break data down into the smallest individual pieces that make sense to exchange or aggregate.”

—*PCAST Report on Health IT*



Substitutable Apps need

Data

leveraging standard **terminology**

... simplifies our own models

(SNOMED CT, RxNorm, LOINC...)



SMART data models

80/20 approach

e.g., concentrate on common outpatient data

Specify payloads in standard **medical**
nomenclatures

e.g., SNOMED

Extensible semantic representations in RDF
Ideal for iterative construction over time

Three SMART examples

[Got Statins?](#)

Bioontology SPARQL [queries](#))

Pediatric [Growth Charts](#)

Backup slides...



Data principles

Translate **local** codes into **medical nomenclature**
(keeping provenance)

Medications: **RxNorm** (SCD, SBD, Packs)

Problems: **SNOMED CT**

Labs: **LOINC**



Clinical summary data models

Allergy

Allergy Exclusion

Demographics

Encounter

Fulfillment

Immunization

Lab Result

Medication

Problem

Vital Signs



SMART data model example

A **Problem** instance (SMART RDF)

```
<sp:Problem>
  <sp:problemName>
    <sp:CodedValue>
      <sp:code rdf:resource="http://purl.bioontology.
org/ontology/SNOMEDCT/161891005"/>
      <dcterms:title>Backache (finding)</dcterms:title>
    </sp:CodedValue>
  </sp:problemName>
  <sp:onset>2007-06-12</sp:onset>
  <sp:resolution>2007-08-01</sp:resolution>
</sp:Problem>
```







SMART data model example

A Lab Result instance (SMART RDF)

```
<sp:labName>
  <sp:CodedValue>
    <sp:code rdf:resource="http://purl.bioontology.org/ontology/LNC/2951-2" />
    <dcterms:title>Serum sodium</dcterms:title>
    <sp:codeProvenance>
      <sp:CodeProvenance>
        <sp:sourceCode rdf:resource="http://local-emr/labcodes/01234" />
        <dcterms:title>Random blood sodium level</dcterms:title>
        <sp:translationFidelity
          rdf:resource="http://smartplatforms.org/terms/code/fidelity#automated"
        />
      </sp:CodeProvenance>
    </sp:codeProvenance>
  </sp:CodedValue>
</sp:labName>
```

 LOINC

 Local