MODUL STANDARISASI DAN INTEROPERABILITAS

Modul 10

Universitas
Esa Unggul

Disusun Oleh

Tim Dosen

MODUL FHIR BAGIAN 2

The Case for Extensions

- Extensions are a problem
- Engineering – not handled by CASE
- Poorly described and carelessly done
- W3C rules: must interoperate without extensions
        - This is not possible in healthcare
- Choice – design for absolutely everything or allow extensions

What's the goal here?

- In most areas of healthcare standards, there is wide variability
    - Between systems, countries, institutions, clinicians
- Choices:
    - Specification only supports core – no one can use it
    - Specification adds everything – no one understands it
    - Specification picks winners – only they can use it
    - Allow extensions that people can use

Extensions tame the specification

No pain…

- Extensions are built into the wire format & handled by CASE tools
- All conformant systems can "handle" any possible extension - Just a bucket of "other stuff"
- Extensions rendered in human readable portion

Recipient must be able to know about these in the instance

Avoid modifier extensions -

Governing Extensions

- Extensions are not a silver bullet
- FHIR has a sliding scale governance for extensions

- **Local Projects**
- **Domain standards (e.g. Best Practice Cardiology)**
- **National Standards (e.g. Standard Finnish Extensions)**
- **HL7 published extensions (corner cases with international scope)**

Example Extension

Eye Colour to patient resource:

- **Need to pick a URL**
- **Need to choose a type**
- **Have to declare and publish the extension (at the URL)**

```
<Patient xmlns="http://hl7.org/fhir">
  <extension url="http://acme.org/fhir/patient#eyecolor">
    <valueCode value="brown"/>
  </extension>
  …
```

Example Extension

Eye Colour to patient resource:

- **Need to pick a URL**
- **Need to choose a type**
- **Have to declare and publish the extension (at the URL)**

```
<Patient xmlns="http://hl7.org/fhir">
  <extension url="http://acme.org/fhir/patient#eyecolor">
    <valueCode value="brown"/>
  </extension>
  …
```

Coding

```
<coding>
 <system value="http://hl7.org/fhir/sid/icd-10-vn"/>
 <version value="201710"/>
 <code value="C02.2"/>
 <display value="U ác mặt bụng của lưỡi"/>
</coding>
```

System	A uri that identifies the definition of the code. Must be unique Should refer to something useful. Good if it’s a code system resource
Version	Identifies the particular release of the code system (shouldn’t be necessary)
Code	As defined by the code system
Display	The string to display the concept defined by the code sytsem

CodeableConcept

```
<code>
 <coding>
  <system value="http://hl7.org/fhir/sid/icd-10-vn"/>
  <version value="201710"/>
  <code value="C02.2"/>
  <display value="U ác mặt bụng của lưỡi"/>
 </coding>
 <text value="[what user saw]"/>
</code>
```

- One or more codes and/or text - very common difficult pattern

Identifiers

- **dentifiers also appear throughout resources**
- **Similar to codes, but different**
  - **Assigned to a sequence of things that all have the same type**
- **Identifiers are assigned by some registry following a process**
- **Most important examples:**
  - **Patient Medical record Number**
  - **Encounter Admission Number**

National Health Identifier

```
<identifier>
 <system value="http://[hospital]/mrn"/>
 <value value="1234567"/>
</identifier>
```

System	**A uri that identifies the registry/process that issues the identifier. Typically, an institution based URL** **The combination of System + value must be globally unique**
Value	**Identifier issued under the process**

Identifiers + Ids

- **Resources have an id: http://test.fhir.org/r3/Patient/vietnam**
- **The id is unique on local system, and controlled by the server**
- **Can’t be the same on different systems (usually)**
- **The identifier in the resource is common across all systems**

- **Resource.identifier is a cross-system identifier**

Making FHIR work for you

- **International Specification defines overall framework**
- **Countries / Regions / Vendors / Institutions publish adaptations to local culture/regulations etc**
- **Individual projects use conformance resources to describe the project rules**
    - **Terminology usage rules**
    - **Rules about elements, usage, content flows**
    - **Extensions**
- **All of this can be published through http://registry.fhir.org**

Case examples to apply FHIR (active discussion, planning)

Common Use cases for FHIR

- **EHR Plug-ins**
- **Application API (mobile)**
- **Clinical Data Repositories**
- **National Health Records**
- **Clinical Decision Support**
- **Terminology Services**
- **Data Analytics**

EHR Plug-ins

- **EHR (health record systems generally):**
    - **store and manage data**
    - **Myriad use cases for using the data exist**
    - **Need to built into clinical workflow without duplicating data**
    - **Well known problem in health IT**
- **Smart on FHIR:**

    - **FHIR + OAuth + context information**
    - **Include other applications inside the EHR program**
    - **Transparent to the user**
    - **EHR needs to include the applications**
- **Examples: Child Growth rating, Medications recommendations, clinical protocol determination**

Application API (mobile)

- **Existing Application (data store, business logic, user interface)**
- **Need lots of different clients / channels**
- **Don't write all of them yourself**
- **Application provides FHIR interface for external integration**

Clinical Data Repositories

- **Applications feed data into single data store**
- **FHIR interface for writing information in, reading it out**
- **Applications / workflow built around that**
- **Examples: UK renal repository, AllOfUs, Medic Alert NZ, Orion (NZ), HIE / XDS**

National Health Records

- **Single national health record**
- **Linked to**
    - **population identification**
    - **Individual citizen login**
    - **Health care systems**
- **Needs changes to clinical practice**
- **Do not need a central data store (Argonaut in USA)**
- **Examples: Lithuania (working), Argonaut + Australia**

Clinical Decision Support

- **Seek decisions / recommendations from specialist systems**
- **Process:**
  - **Package relevant clinical information**
  - **Send to specialist systems**
  - **Get one or more decisions/recommendations back**
  - **Pick one**
- **Can occur in user interface, or in the background when processing information**
- **Examples: Public health surveillance, Drug/Drug checking, dosage recommendations**

Terminology Support

- **Specialist system manages terminologies (SNOMED CT, LOINC, national billing codes etc)**
- **Clinical systems use common API:**
  - **Subsets of codes**
  - **Check codes**
  - **Reason from knowledge behind the code systems**
  - **Translate from one code system to another**
- **Examples: National programs for Australia + US, Canada, NZ**

Data Analytics

- **Gather huge amounts of data into big data repository**
- **Store the data as FHIR resources**
- **Run analysis (SQL, pattern learning, AI) on the data**
- **Examples: Google, IBM Watson, Microsoft, Cerner…**
- **https://bigquery.cloud.google.com/dataset/fhir-org-starter-project:synthea**

Argonaut Specification

- Rules for sharing / finding patient health information
- Implemented by EHR systems in USA, rolled out around the world
- Will be supported by consumer IT companies

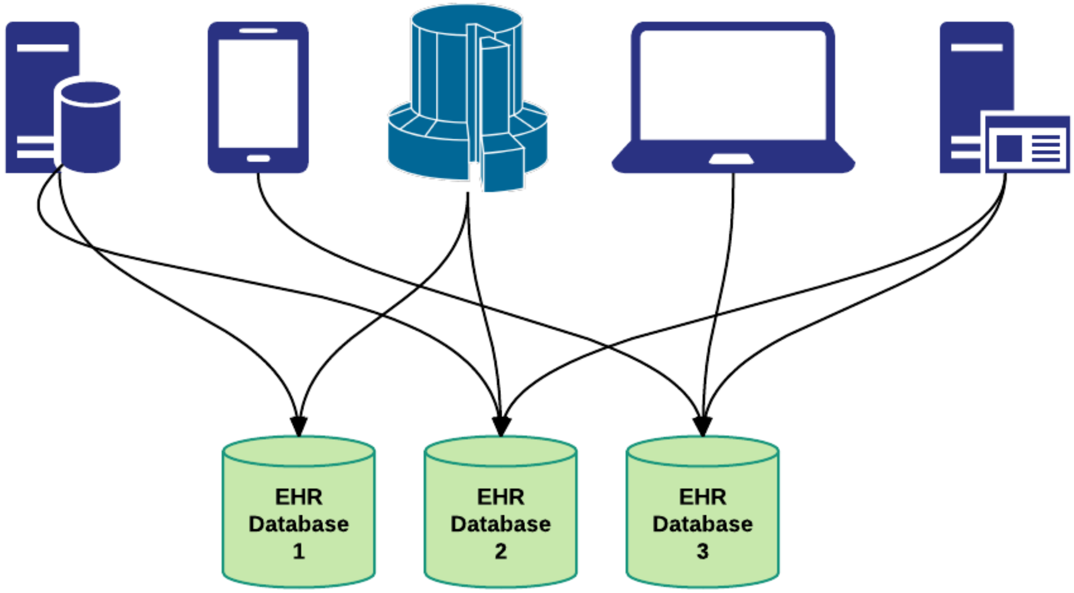
Use of FHIR in Vietnam

- Need to define Vietnamese use
  - Vietnamese identifiers, code systems (billing codes)
  - Specific Vietnamese extensions (regulatory compliance)
  - National implementation guide
- Building the national health record (e.g. Argonaut specification)
- Other use cases?

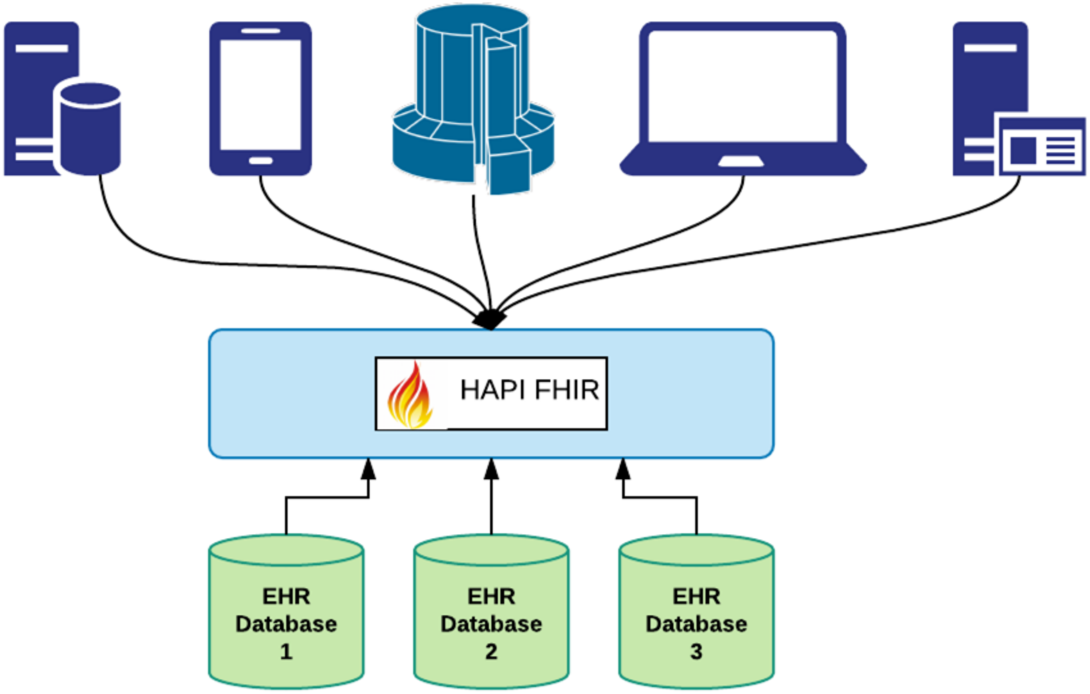
FHIR Implementation Examples

Unified Hospital Data Layer

Problem: Fragile connections between many systems



Solution: One consistent FHIR interface on all systems



Remote Monitoring for Heart Failure

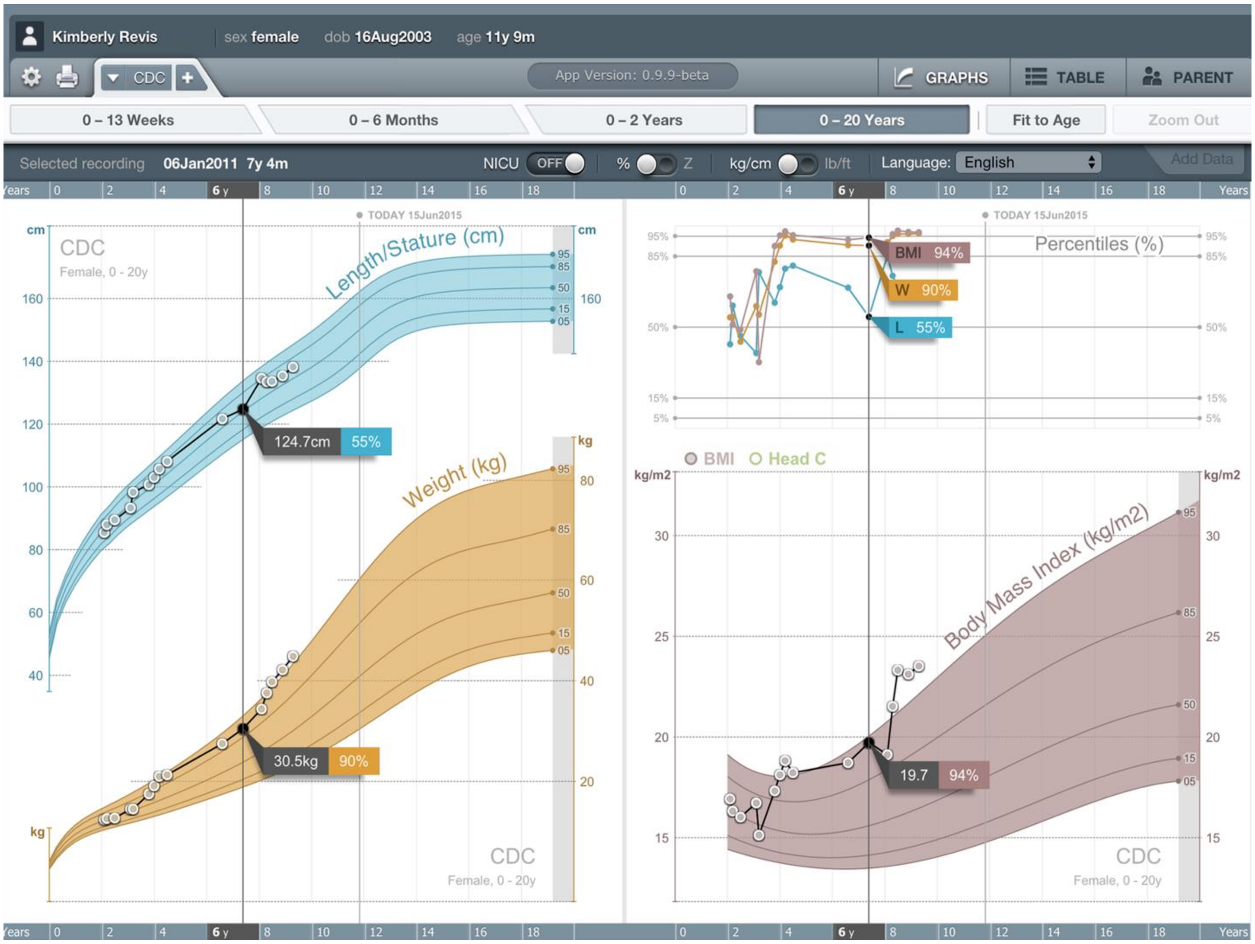
- **Heart Failure patients require very close monitoring to prevent readmission**
- **A custom monitoring application was developed to provide this monitoring**

Government Data Access Layers

- In Canada, government databases for Laboratory, Immunization, Prescriptions and other domains are getting unified FHIR interfaces now
- This is intended to trigger more innovation in health delivery

Terminology service

Argonaut



Kimberly Revis sex female dob 16Aug2003 age 11y 9m

Selected recording 06Jan2011 7y 4m

NICU OFF

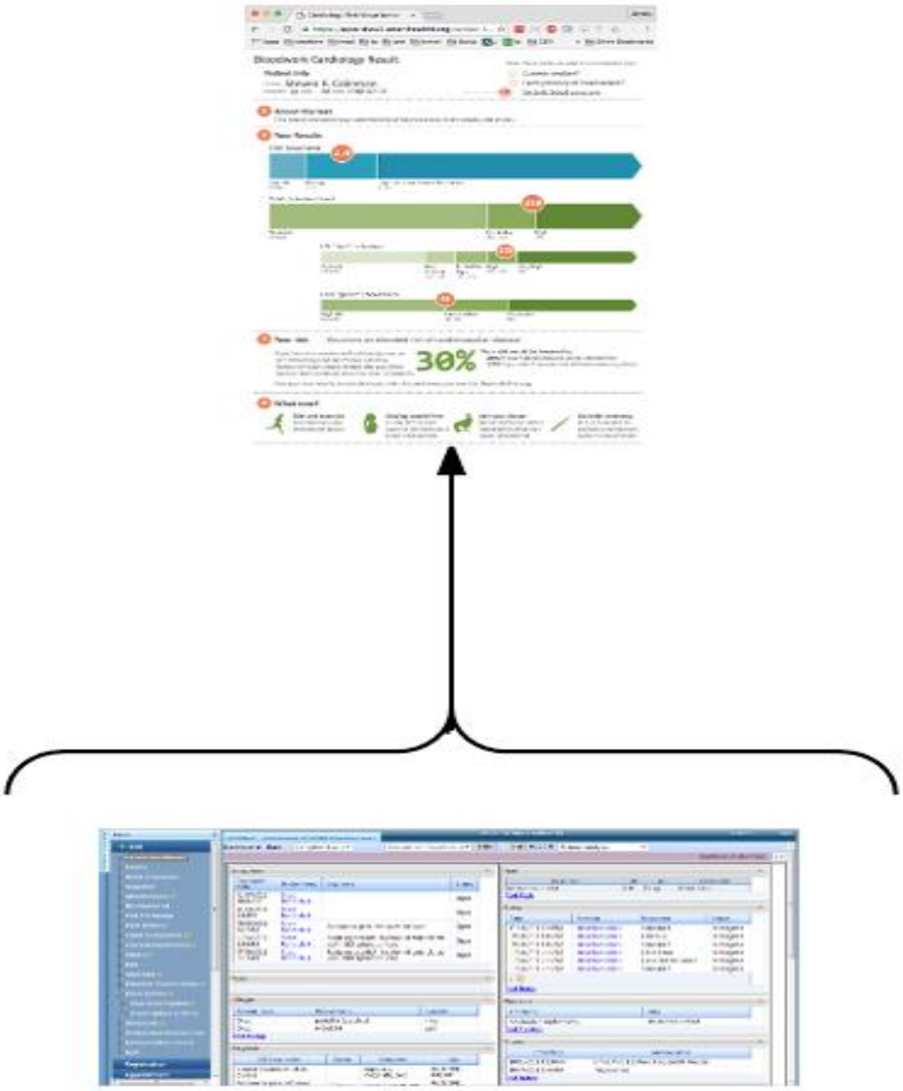
% Z

kg/cm lb/ft

Language: English

APIs for Health Data

- **Launching useful apps on top of an EHR requires 3 things:**
    - **User Context (Who is the user starting the application)**
    - **Patient Context (Which patient is selected)**
    - **Data (What do we know about the patient)**

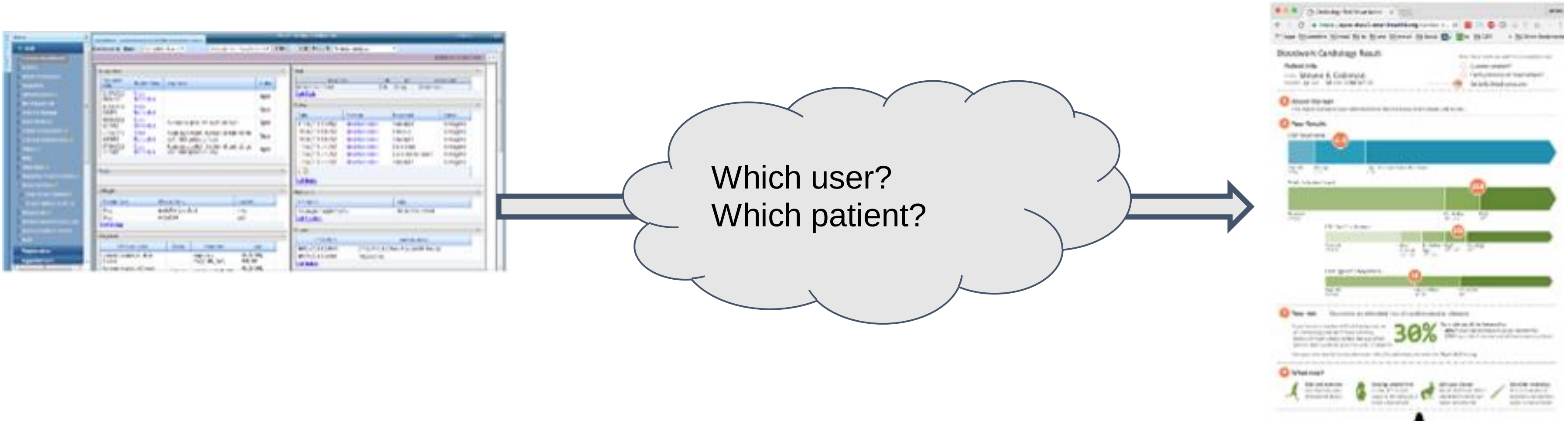


-

SMART on FHIR

SMART on FHIR is a specification for app developers which provides 3 things:

1. **Application Launch using predictable URLs to transfer Context**

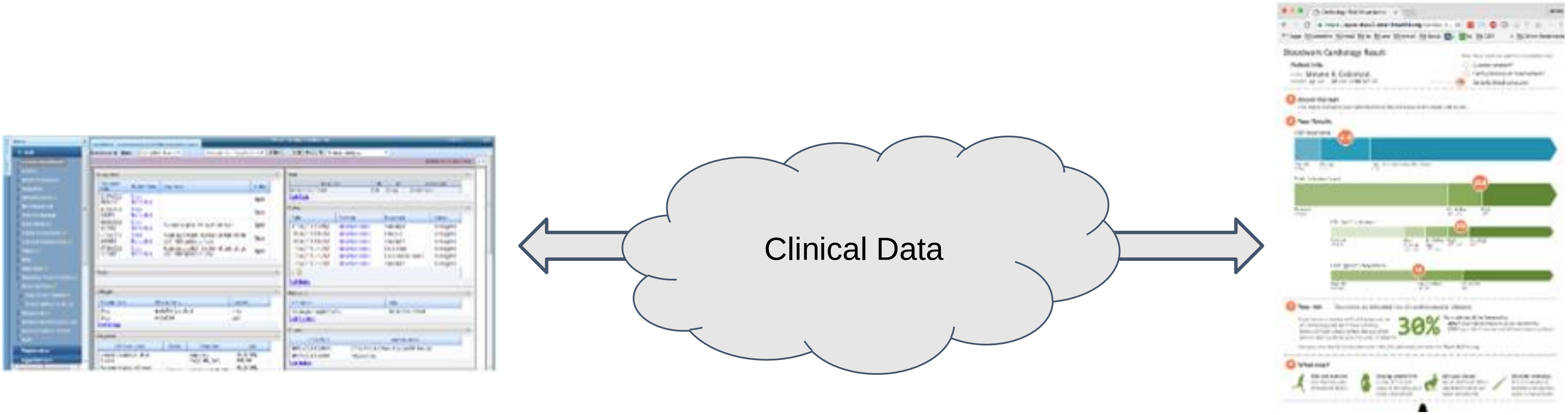


2. **Application Security using OpenID Connect and OAuth2**

- **SMART defines “Scopes” which an app may request**

SMART on FHIR is a specification for app developers which provides 3 things:

3. Data APIs using FHIR


Clinical Data