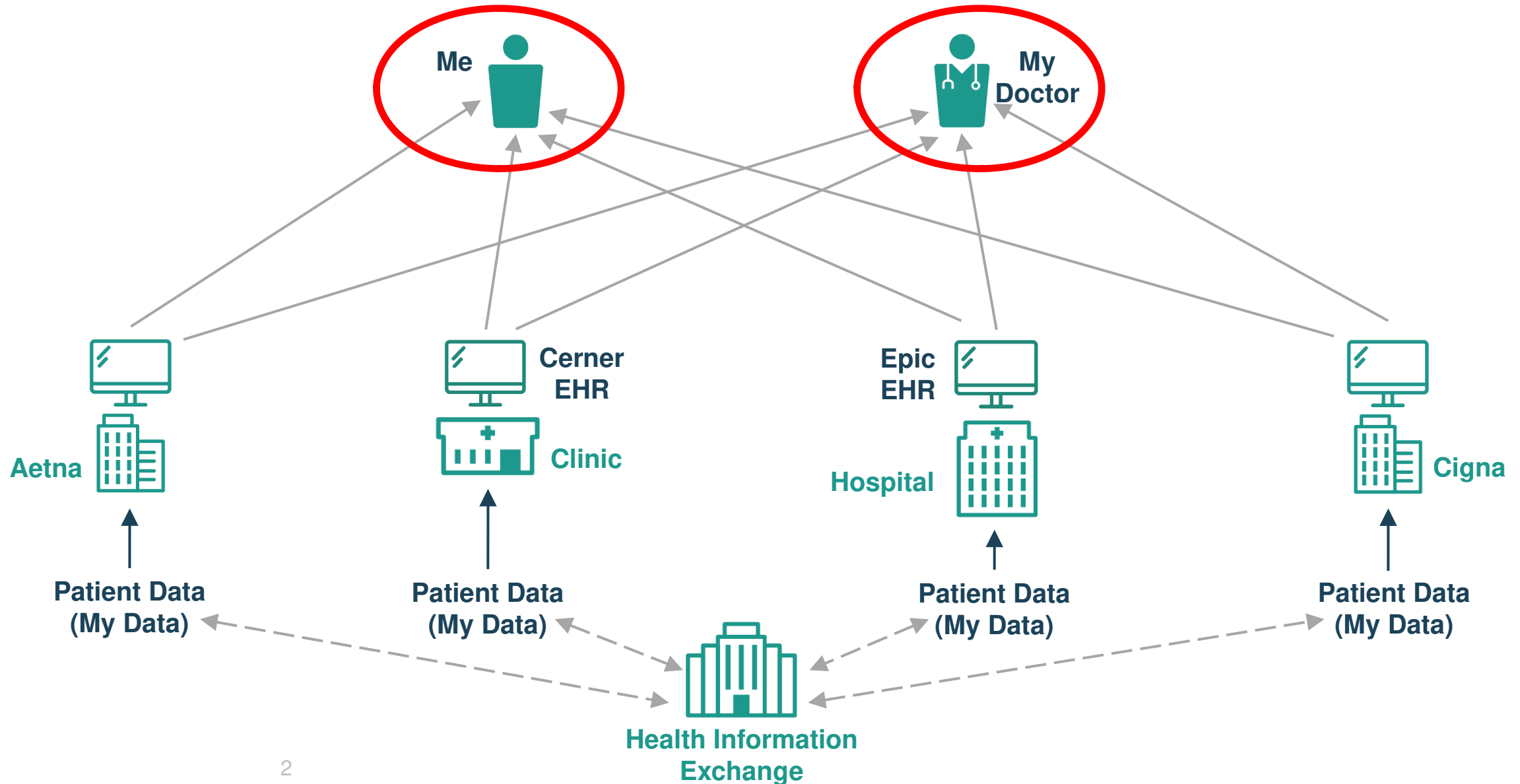


# FHIR: EHR Data Sharing

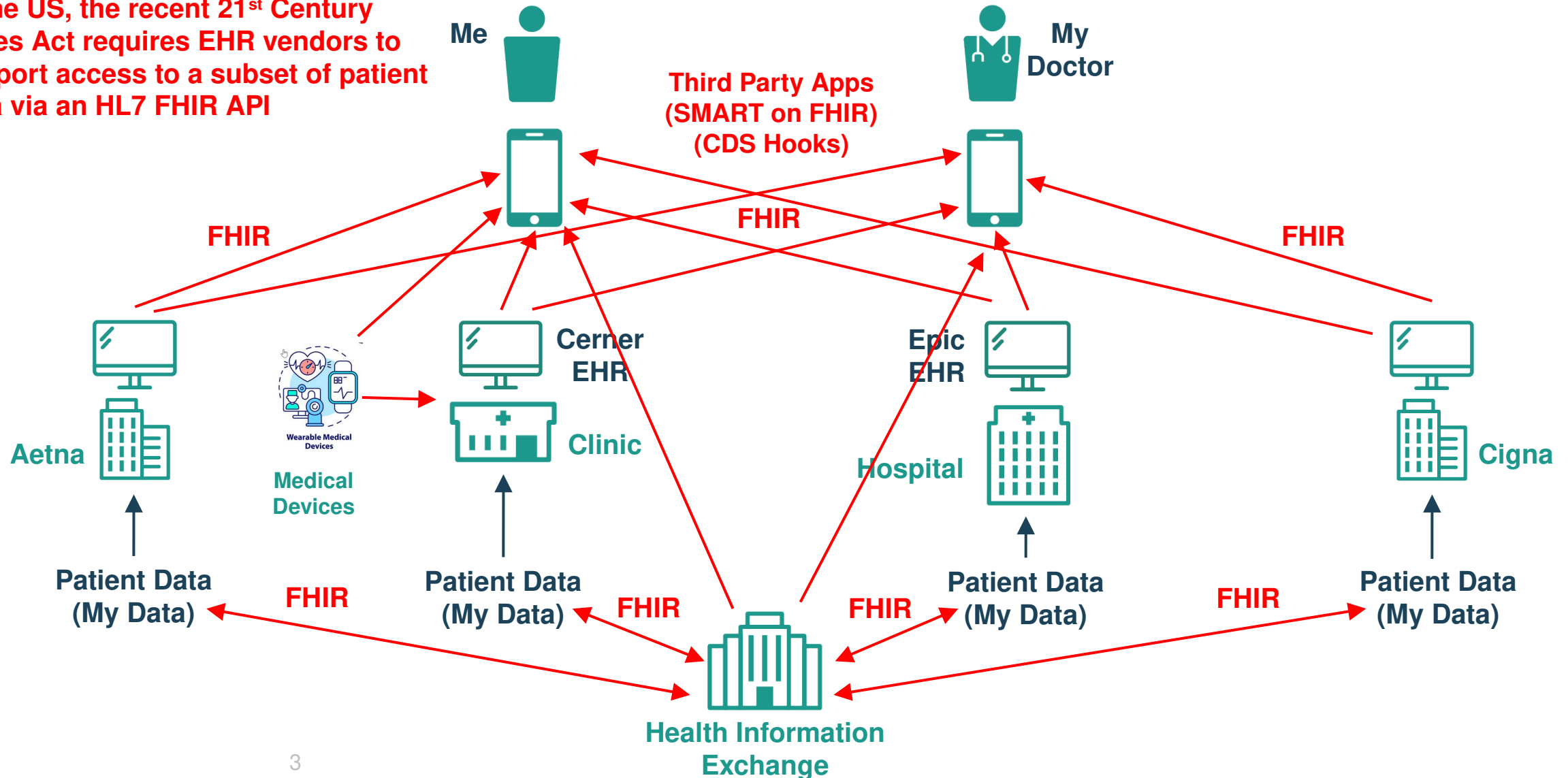
Courtesy: Dr. Darrell Woelk from Greenwood Technologies

# Problem: Limited Healthcare Data Interoperability

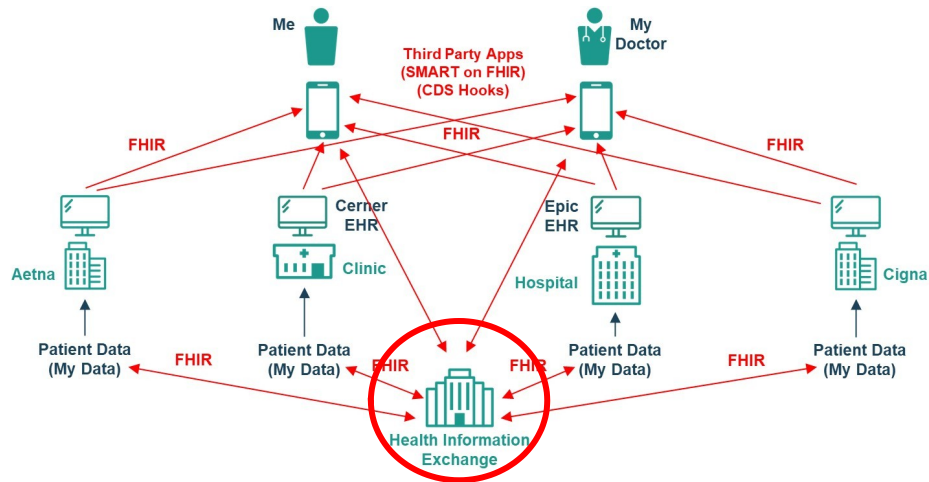


# Solution: FHIR Enabled Healthcare Data Interoperability

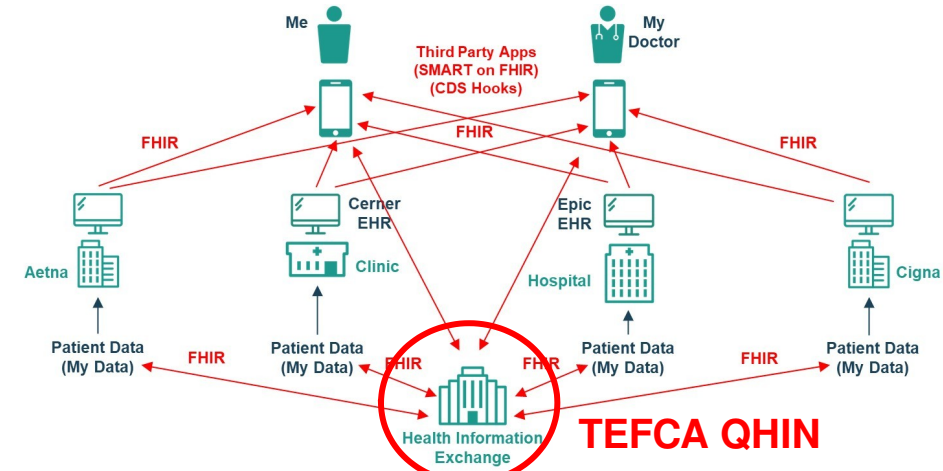
In the US, the recent 21<sup>st</sup> Century Cures Act requires EHR vendors to support access to a subset of patient data via an HL7 FHIR API



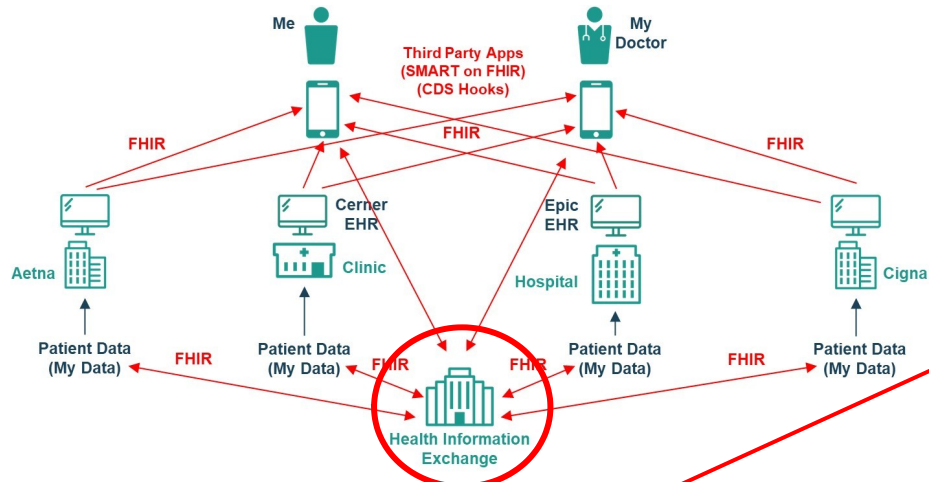
# TEFCA Data Exchange Using FHIR



TEFCA QHIN



TEFCA Broker



TEFCA QHIN

ONC Trusted Exchange Framework and Common Agreement (TEFCA) includes a FHIR® Roadmap for TEFCA Exchange that defines Stages for network-facilitated and network-brokered exchange of FHIR data  
[https://rce.sequoiaproject.org/wp-content/uploads/2022/01/FHIR-Roadmap-v1.0\\_updated.pdf](https://rce.sequoiaproject.org/wp-content/uploads/2022/01/FHIR-Roadmap-v1.0_updated.pdf)

# Sample EHR Screen

EHR  
Functions

**eClinicalWorks 7.0**

Admin Practice

Resource Sche... Willis, Sam Office Visits Progress Notes Telephone/We... Labs/Imaging Out of Office Vi... Recalls Referrals Messages Documents

**Progress Notes**

**Jane Doe, 48 Y, F** Sel Info Hub

112 Nashua dr  
Westborough, MA  
H: 508-976-5879  
M: 508-237-6419  
DOB: 01/01/1960

**Allergies**  
Billing Alert

Wt: **150 lbs.**  
Appt(L): **02/06/08**  
PCP: **Willis, Sam**  
Language: **English**  
Translator: **No**

Ins: **Medicare**  
Acc Bal: **\$0.00**  
Guar: **Jane Doe**  
Gr Bal: **\$0.00**  
Ref: **John, Smith**  
Ren: **Willis, Sam**

CLICK TO EDIT

SECURE NOTES

ADV DIRECTIVE

Medical Summary | CDSS | Labs | DI | Procedures | Growth Chart | Immunization | Encounters | Patient Docs | Flowsheets | Notes

Rel  Bulleted  Encounters << 02/06/2008 NP >>

**Objective:**

**Vitals:**  
BP 150/90, Ht 60, Wt 150, BMI 29.29

**Past Order(s):**  
**LIPID PROFILE**  
CHOLESTEROL 255  
TRIGLYCERIDES 100  
HDL CHOLESTEROL 82  
LDL-CHOL (CALC) 150  
CHOL/HDL RATIO 3.1

**Examination:**  
**General Examination**  
**GENERAL APPEARANCE:** NAD, pleasant. **HEENT:** unremarkable. **NECK:** supple, no lymphadenopathy. **HEART:** no murmurs, regular rate and rhythm. **LUNGS:** clear to auscultation bilaterally, no wheezes/rhonchi/rales. **ABDOMEN:** no masses palpated, no hepatosplenomegaly. **NEUROLOGIC EXAM:** non-focal exam. **SKIN:** normal, no rash. **EXTREMITIES:** no clubbing, no edema. **BREASTS:** normal.

**Assessment:**  
**Assessment:**  
• Diabetes mellitus type 2 - 250.00 (Primary)

**CDSS Alerts**  
+ BP control in DM (130/80) ?  
+ Influenza vaccine (high risk) ?  
- A1C testing ?  
GLYCO HGB A1-C Order  
+ LDL control (high risk) ?

Overview History CDSS Labs DI

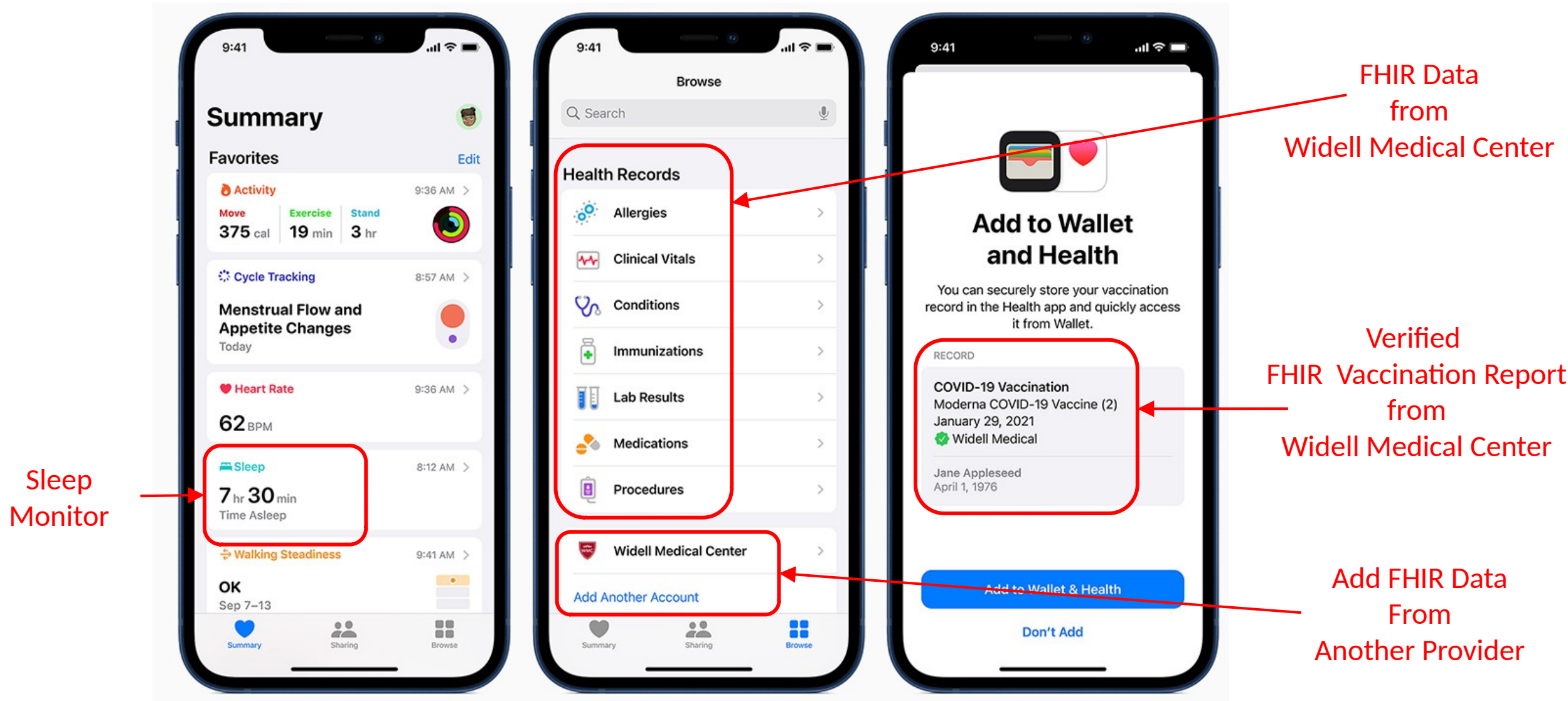
Print Fax Record Lock Details Scan Templates Claim Letters Ink

Demographics  
& History

SMART  
on FHIR  
App  
Can Display  
Here

Today's  
Visit

# Sample iPhone Health Screens





# FHIR Interoperability Standards Ecosystem

## US Government Agencies

**ONC**  
Coordinate Exchange  
of Healthcare Data

**CMS**  
Administer Medicare, Medicaid  
CHIP, Insurance Marketplaces

Set Interoperability  
Rules

## FHIR Taskforces

ONC FHIR at Scale Taskforce

Investigate  
Scalability of FHIR  
Deployment

## FHIR Accelerator Projects

Argonaut

Da Vinci

CARIN

CodeX

Gravity

Vulcan

Helios

Create FHIR  
Implementation Guides  
for Use Cases

## Industry Standards Organizations

HL7

IHE

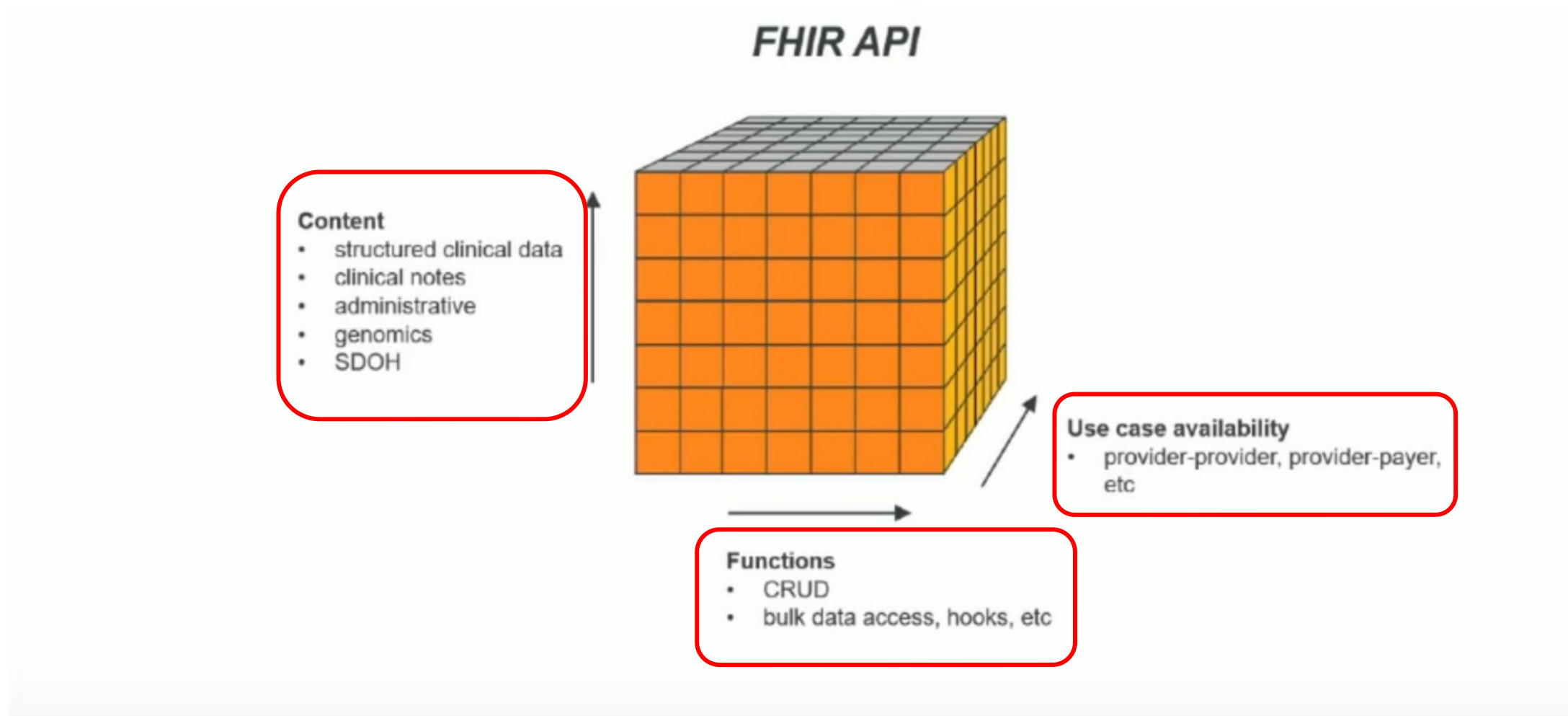
IEEE

DICOM

OMG

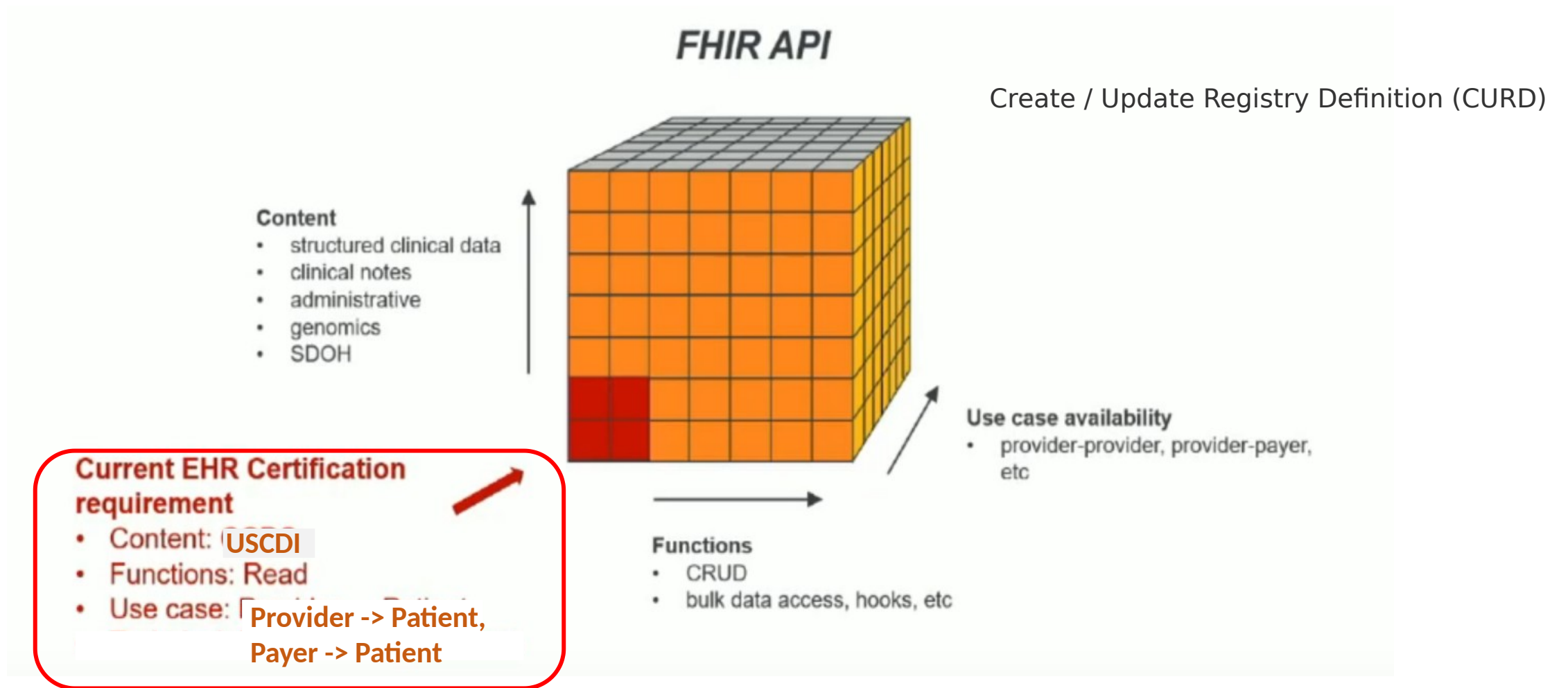
Create  
Base Standards

# Scope of the FHIR Standard



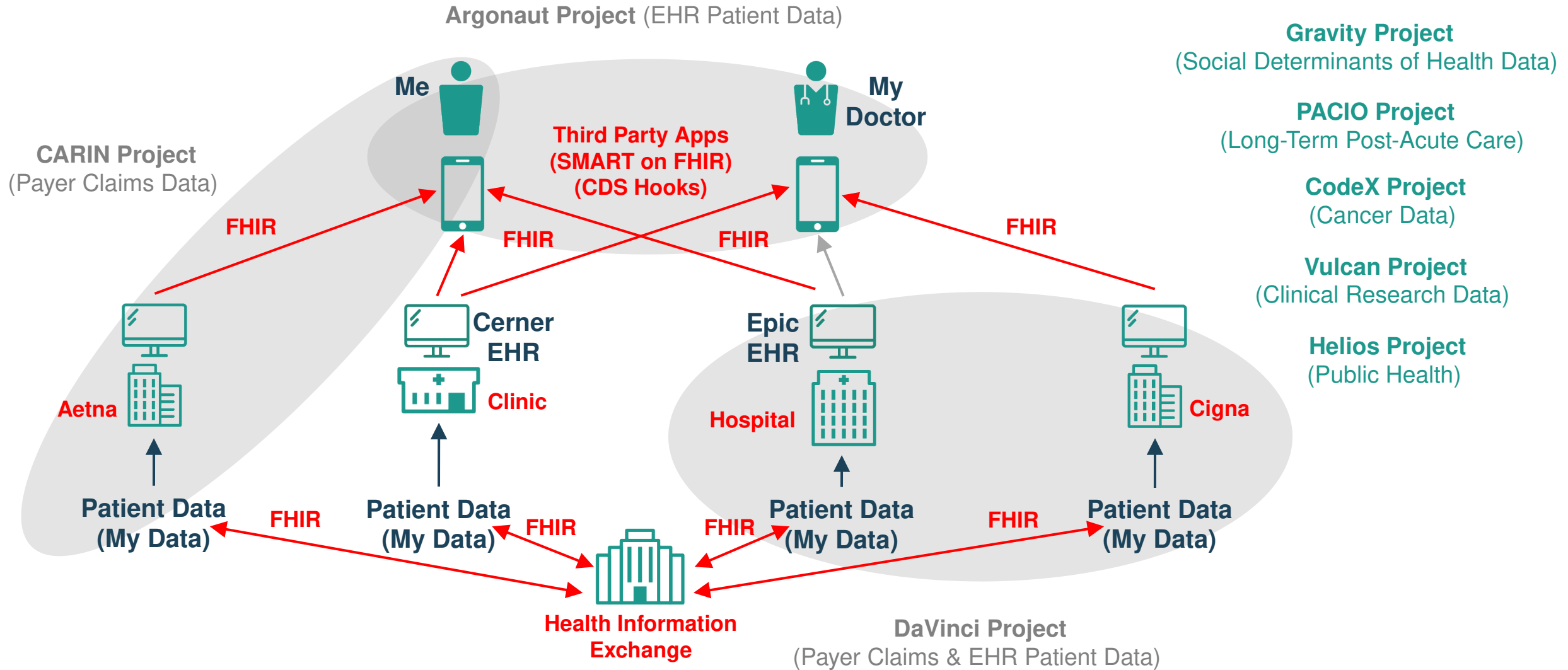


# Scope of the ONC/CMS Rules



Adapted from FHIR DevDays 2020 Keynote - Micky Tripathi: <https://www.youtube.com/watch?v=vcJ03RxE84U>

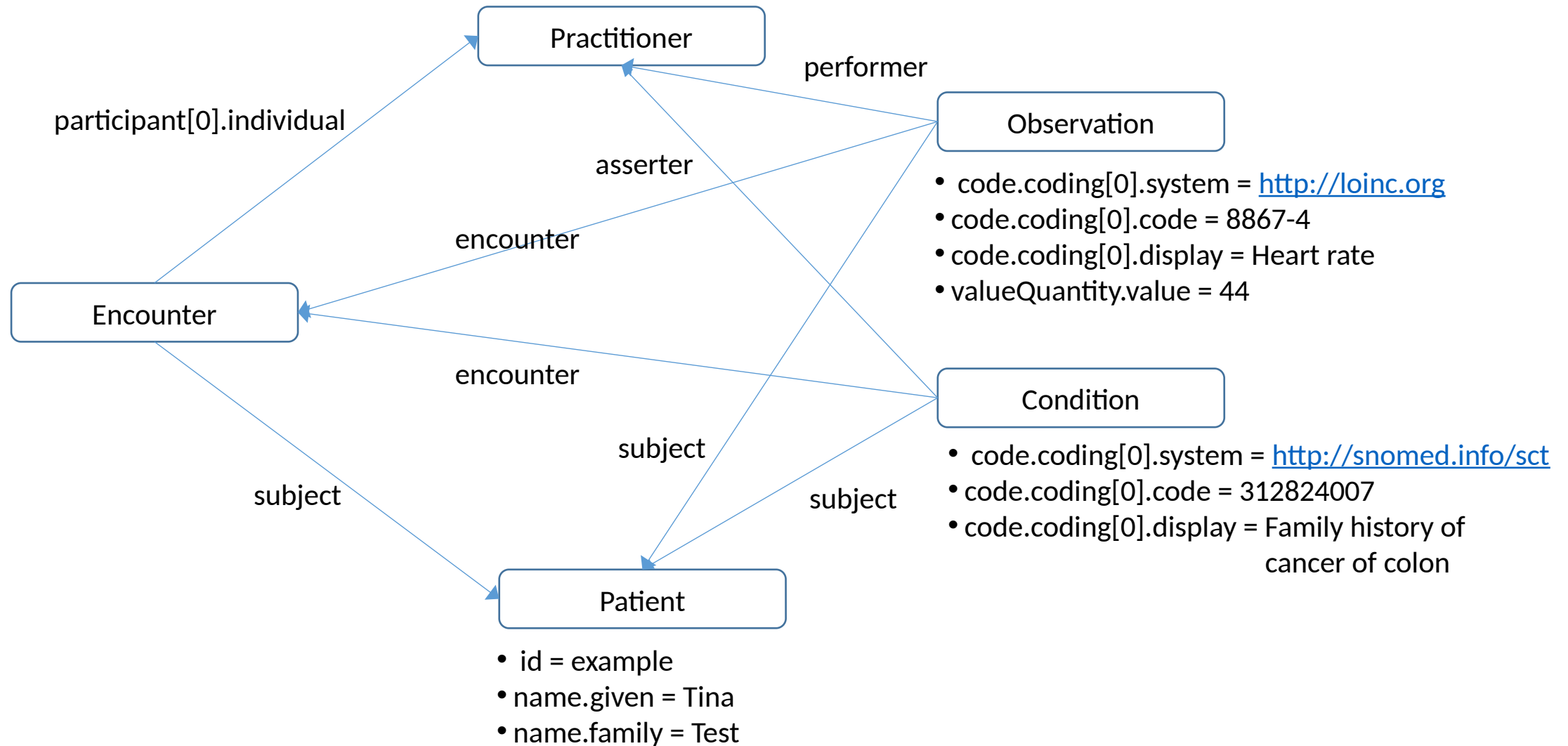
# HL7 FHIR Accelerator Projects



# So, What is FHIR?

- Fast Healthcare Interoperability Resources (FHIR) is an international standards framework for the exchange of healthcare data
- FHIR solutions are built from a set of modular components called "Resources".
- Resources can easily be assembled into working systems that solve real world clinical and administrative problems at a fraction of the price
- FHIR is suitable for use in a wide variety of contexts – mobile apps, cloud communications, HER data sharing, server communication in large institutional healthcare providers, and much more.
- Database servers have been developed that support creating, retrieving and searching for FHIR resources

# Use Case: FHIR Resources for Patient Visit



# FHIR Resources

	Categorized	Alphabetical	R2 Layout	By Maturity	Security Category	By Standards Status	By Committee
Foundation	<div> <div>Conformance</div> <ul style="list-style-type: none"> <li>CapabilityStatement <b>N</b></li> <li>StructureDefinition <b>N</b></li> <li>ImplementationGuide 1</li> <li>SearchParameter 3</li> <li>MessageDefinition 1</li> <li>OperationDefinition <b>N</b></li> <li>CompartmentDefinition 1</li> <li>StructureMap 2</li> <li>GraphDefinition 1</li> <li>ExampleScenario 0</li> </ul> </div>						
	<div> <div>Terminology</div> <ul style="list-style-type: none"> <li>CodeSystem <b>N</b></li> <li>ValueSet <b>N</b></li> <li>ConceptMap 3</li> <li>NamingSystem 1</li> <li>TerminologyCapabilities 0</li> </ul> </div>						
Base	<div> <div>Security</div> <ul style="list-style-type: none"> <li>Provenance 3</li> <li>AuditEvent 3</li> <li>Consent 2</li> </ul> </div>						
	<div> <div>Documents</div> <ul style="list-style-type: none"> <li>Composition 2</li> <li>DocumentManifest 2</li> <li>DocumentReference 3</li> <li>CatalogEntry 0</li> </ul> </div>						
Clinical	<div> <div>Other</div> <ul style="list-style-type: none"> <li>Basic 1</li> <li>Binary <b>N</b></li> <li>Bundle <b>N</b></li> <li>Linkage 0</li> <li>MessageHeader 4</li> <li>OperationOutcome <b>N</b></li> <li>Parameters <b>N</b></li> <li>Subscription 3</li> </ul> </div>						
	<div> <div>Individuals</div> <ul style="list-style-type: none"> <li>Patient <b>N</b></li> <li>Practitioner 3</li> <li>PractitionerRole 2</li> <li>RelatedPerson 2</li> <li>Person 2</li> <li>Group 1</li> </ul> </div>						
Financial	<div> <div>Entities #1</div> <ul style="list-style-type: none"> <li>Organization 3</li> <li>OrganizationAffiliation 0</li> <li>HealthcareService 2</li> <li>Endpoint 2</li> <li>Location 3</li> </ul> </div>						
	<div> <div>Entities #2</div> <ul style="list-style-type: none"> <li>Substance 2</li> <li>BiologicallyDerivedProduct 0</li> <li>Device 2</li> <li>DeviceMetric 1</li> </ul> </div>						
Specialized	<div> <div>Workflow</div> <ul style="list-style-type: none"> <li>Task 2</li> <li>Appointment 3</li> <li>AppointmentResponse 3</li> <li>Schedule 3</li> <li>Slot 3</li> <li>VerificationResult 0</li> </ul> </div>						
	<div> <div>Management</div> <ul style="list-style-type: none"> <li>Encounter 2</li> <li>EpisodeOfCare 2</li> <li>Flag 1</li> <li>List 1</li> <li>Library 2</li> </ul> </div>						
	<div> <div>Summary</div> <ul style="list-style-type: none"> <li>AllergyIntolerance 3</li> <li>AdverseEvent 0</li> <li>Condition (Problem) 3</li> <li>Procedure 3</li> <li>FamilyMemberHistory 2</li> <li>ClinicalImpression 0</li> <li>DetectedIssue 1</li> </ul> </div>						
	<div> <div>Diagnostics</div> <ul style="list-style-type: none"> <li>Media 1</li> <li>DiagnosticReport 3</li> <li>Specimen 2</li> <li>BodyStructure 1</li> <li>ImagingStudy 3</li> <li>QuestionnaireResponse 3</li> <li>MolecularSequence 1</li> </ul> </div>						
	<div> <div>Medications</div> <ul style="list-style-type: none"> <li>MedicationRequest 3</li> <li>MedicationAdministration 2</li> <li>MedicationDispense 2</li> <li>MedicationStatement 3</li> <li>Medication 3</li> <li>MedicationKnowledge 0</li> <li>Immunization 3</li> <li>ImmunizationEvaluation 0</li> <li>ImmunizationRecommendation 1</li> </ul> </div>						
	<div> <div>Care Provision</div> <ul style="list-style-type: none"> <li>CarePlan 2</li> <li>CareTeam 2</li> <li>Goal 2</li> <li>ServiceRequest 2</li> <li>NutritionOrder 2</li> <li>VisionPrescription 2</li> <li>RiskAssessment 1</li> <li>RequestGroup 2</li> </ul> </div>						
	<div> <div>Request &amp; Response</div> <ul style="list-style-type: none"> <li>Communication 2</li> <li>CommunicationRequest 2</li> <li>DeviceRequest 1</li> <li>DeviceUseStatement 0</li> <li>GuidanceResponse 2</li> <li>SupplyRequest 1</li> <li>SupplyDelivery 1</li> </ul> </div>						
	<div> <div>Support</div> <ul style="list-style-type: none"> <li>Coverage 2</li> <li>CoverageEligibilityRequest 2</li> <li>CoverageEligibilityResponse 2</li> <li>EnrollmentRequest 0</li> <li>EnrollmentResponse 0</li> </ul> </div>						
	<div> <div>Billing</div> <ul style="list-style-type: none"> <li>Claim 2</li> <li>ClaimResponse 2</li> <li>Invoice 0</li> </ul> </div>						
	<div> <div>Payment</div> <ul style="list-style-type: none"> <li>PaymentNotice 2</li> <li>PaymentReconciliation 2</li> </ul> </div>						
	<div> <div>General</div> <ul style="list-style-type: none"> <li>Account 2</li> <li>ChargeItem 0</li> <li>ChargeItemDefinition 0</li> <li>Contract 1</li> <li>ExplanationOfBenefit 2</li> <li>InsurancePlan 0</li> </ul> </div>						
	<div> <div>Public Health &amp; Research</div> <ul style="list-style-type: none"> <li>ResearchStudy 1</li> <li>ResearchSubject 1</li> </ul> </div>						
	<div> <div>Definitional Artifacts</div> <ul style="list-style-type: none"> <li>ActivityDefinition 2</li> <li>DeviceDefinition 0</li> <li>EventDefinition 0</li> <li>ObservationDefinition 0</li> <li>PlanDefinition 2</li> <li>Questionnaire 3</li> <li>SpecimenDefinition 0</li> </ul> </div>						
	<div> <div>Evidence-Based Medicine</div> <ul style="list-style-type: none"> <li>ResearchDefinition 0</li> <li>ResearchElementDefinition 0</li> <li>Evidence 0</li> <li>EvidenceVariable 0</li> <li>EffectEvidenceSynthesis 0</li> <li>RiskEvidenceSynthesis 0</li> </ul> </div>						
	<div> <div>Quality Reporting &amp; Testing</div> <ul style="list-style-type: none"> <li>Measure 2</li> <li>MeasureReport 2</li> <li>TestScript 2</li> <li>TestReport 0</li> </ul> </div>						
	<div> <div>Medication Definition</div> <ul style="list-style-type: none"> <li>MedicinalProduct 0</li> <li>MedicinalProductAuthorization 0</li> <li>MedicinalProductContraindication 0</li> <li>MedicinalProductIndication 0</li> <li>MedicinalProductIngredient 0</li> <li>MedicinalProductInteraction 0</li> <li>MedicinalProductManufactured 0</li> <li>MedicinalProductPackaged 0</li> <li>MedicinalProductPharmaceutical 0</li> <li>MedicinalProductUndesirableEffect 0</li> <li>SubstanceNucleicAcid 0</li> <li>SubstancePolymer 0</li> <li>SubstanceProtein 0</li> <li>SubstanceReferenceInformation 0</li> <li>SubstanceSpecification 0</li> <li>SubstanceSourceMaterial 0</li> </ul> </div>						

Observation  
Resource

## Categories of FHIR Resources

### Foundation

- Conformance
- Terminology
- Security
- Documents
- Other

### Base

- Individuals
- Entities #1
- Entities #2
- Workflow
- Management

### Clinical

- Summary
- Diagnostics
- Medications
- Care Provision
- Request & Response

### Financial

- Support
- Billing
- Payment
- General

### Specialized

- Public Health & Research
- Definitional Artifacts
- Evidence-Based Medicine
- Quality Reporting & Testing
- Medication Definition

<https://www.hl7.org/FHIR/resourcelist.html>

# What's a Resource?

## Examples

- **Administrative**
  - Patient, Practitioner, Organization, Location, Coverage, Invoice
- **Clinical Concepts**
  - Allergy, Condition, Family History, Care Plan
- **Infrastructure**
  - Document, Message, Profile, Conformance

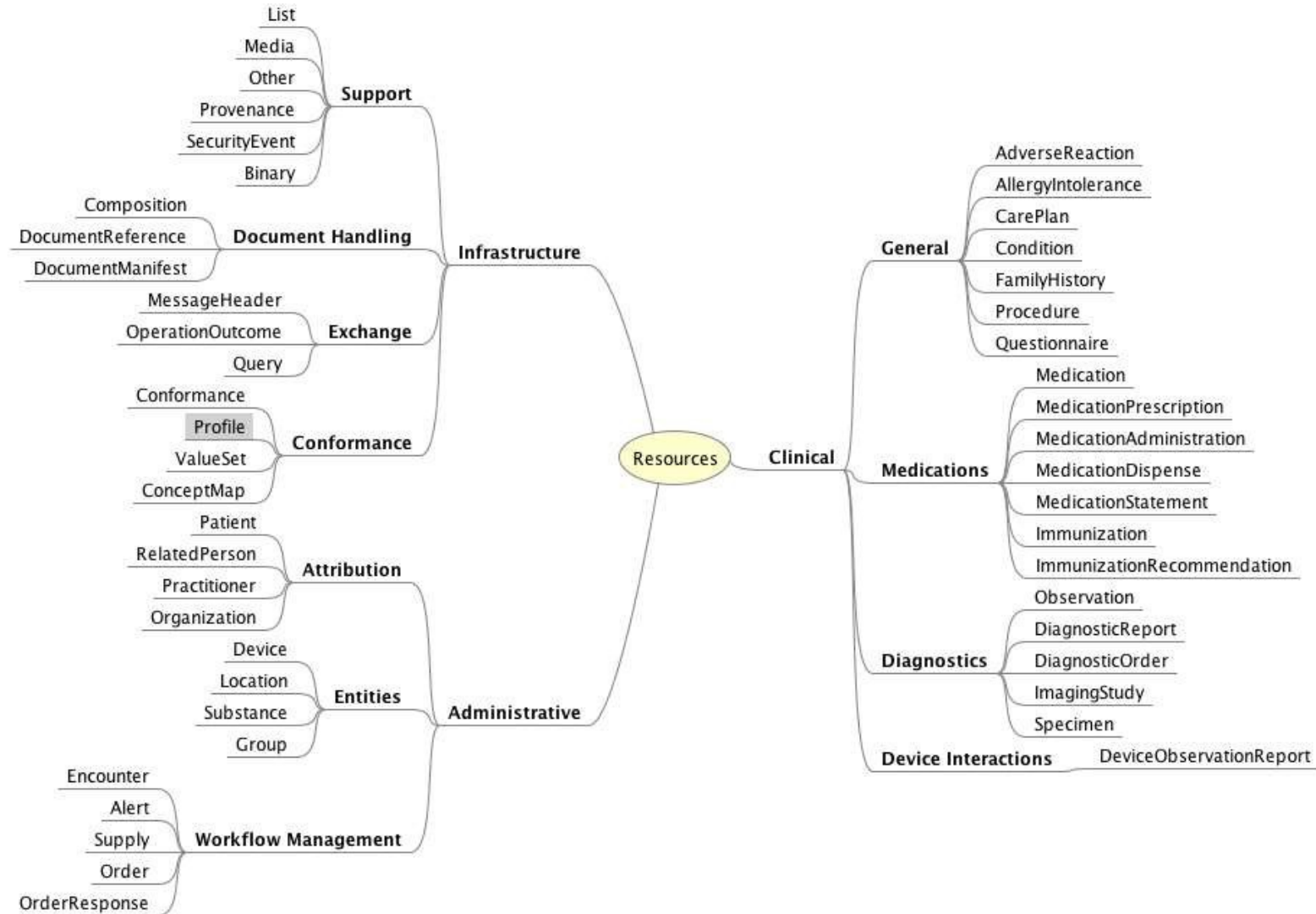
## Non-examples

- **Gender**
  - Too small
- **Electronic Health Record**
  - Too big
- **Blood Pressure**
  - Too specific
- **Intervention**
  - Too broad

---



















**100-150 total - ever**

# Resource List





# Structure of the FHIR Observation Resource

Structure	UML	XML	JSON	Turtle	R4 Diff	All
Structure						
Name	Flags	Card.	Type	Description & Constraints		
 Observation			DomainResource	Measurements and simple assertions + Rule: <i>dataAbsentReason</i> SHALL only be present if <i>Observation.value[x]</i> is not present + Rule: If <i>Observation.code</i> is the same as an <i>Observation.component.code</i> then the value element associated with the code SHALL NOT be present Elements defined in Ancestors: <a href="#">id</a> , <a href="#">meta</a> , <a href="#">implicitRules</a> , <a href="#">language</a> , <a href="#">text</a> , <a href="#">contained</a> , <a href="#">extension</a> , <a href="#">modifierExtension</a>		
 identifier	$\Sigma$	0..*	Identifier	Business Identifier for observation		
 basedOn	$\Sigma$	0..*	Reference(CarePlan   DeviceRequest   ImmunizationRecommendation   MedicationRequest   NutritionOrder   ServiceRequest)	Fulfills plan, proposal or order		
 partOf	$\Sigma$	0..*	Reference(MedicationAdministration   MedicationDispense   MedicationStatement   Procedure   Immunization   ImagingStudy)	Part of referenced event		
 status	?! $\Sigma$	1..1	code	registered   preliminary   final   amended + <a href="#">ObservationStatus</a> (Required)		
 category		0..*	CodeableConcept	Classification of type of observation <a href="#">Observation Category Codes</a> (Preferred)		
 code	$\Sigma$	1..1	CodeableConcept	Type of observation (code / type) <a href="#">LOINC Codes</a> (Example)		
 subject	$\Sigma$	0..1	Reference(Patient   Group   Device   Location   Organization   Procedure   Practitioner   Medication   Substance)	Who and/or what the observation is about		
 focus	$\Sigma$ 	0..*	Reference(Any)	What the observation is about, when it is not about the subject of record		
 encounter	$\Sigma$	0..1	Reference(Encounter)	Healthcare event during which this observation is made		
 effective[x]	$\Sigma$	0..1		Clinically relevant time/time-period for observation		
 effectiveDateTime			dateTime			
 effectivePeriod			Period			
 effectiveTiming			Timing			
 effectiveInstant			instant			
 issued	$\Sigma$	0..1	instant	Date/Time this version was made available		

Structure

UML

XML

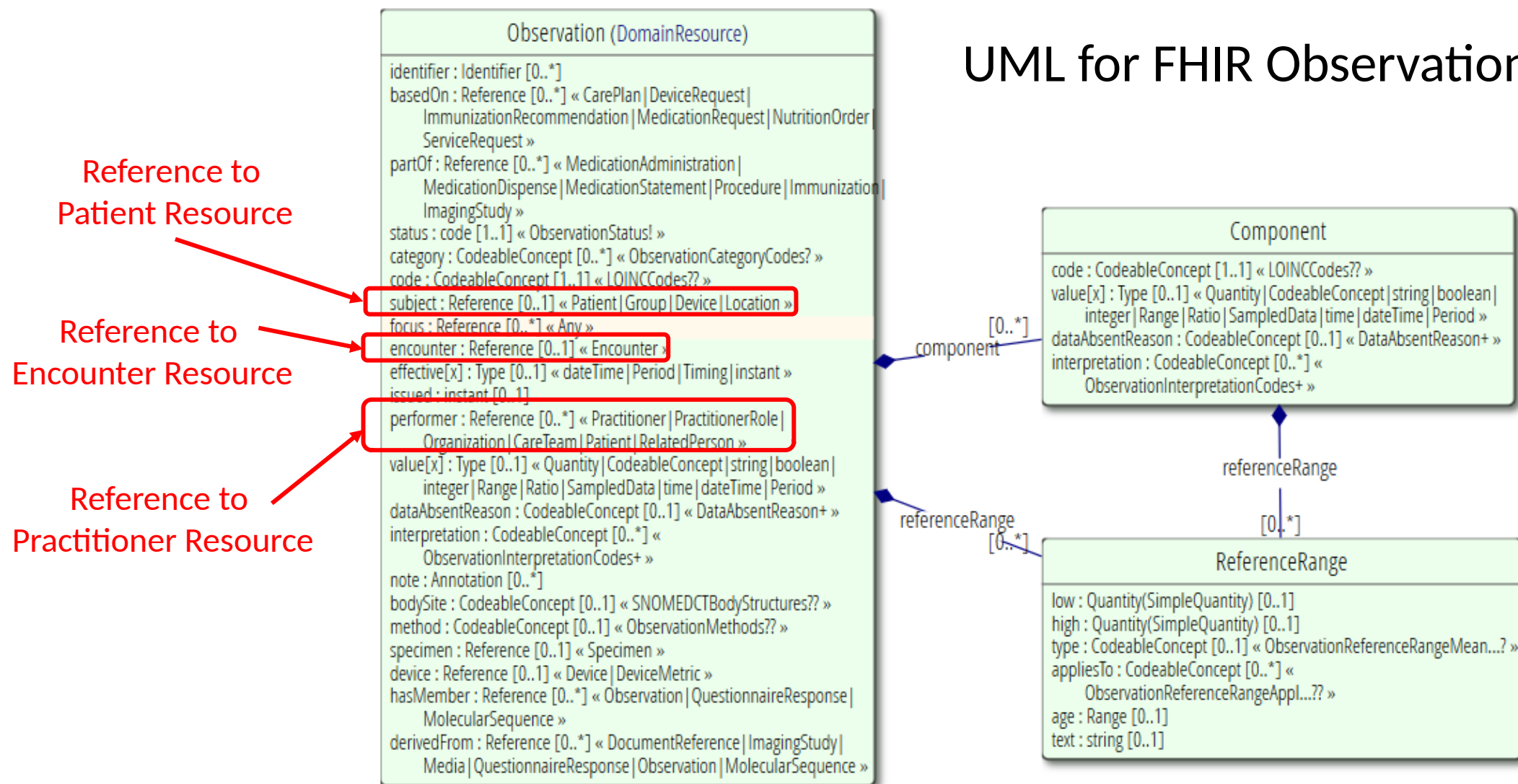
JSON

Turtle

R3 Diff

All

## UML Diagram (Legend)



## UML for FHIR Observation Resource

# Example of FHIR Observation Resource for Glucose (JSON Format)

```
{
  "resourceType": "Observation",
  "id": "f001",
  "identifier": [
    {
      "use": "official",
      "system": "http://www.bmc.nl/zorgportal/identifiers/observa",
      "value": "6323"
    }
  ],
  "status": "final",
  "code": {
    "coding": [
      {
        "system": "http://loinc.org",
        "code": "15074-8",
        "display": "Glucose [Moles/volume] in Blood"
      }
    ]
  },
  "subject": {
    "reference": "Patient/f001",
    "display": "P. van de Heuvel"
  },
  "effectivePeriod": {
    "start": "2013-04-02T09:30:10+01:00"
  },
  "issued": "2013-04-03T15:30:10+01:00",
  "performer": [
    {
      "reference": "Practitioner/f005",
      "display": "A. Langeveld"
    }
  ],
  "valueQuantity": {
    "value": 6.3,
    "unit": "mmol/l",
    "system": "http://unitsofmeasure.org",
    "code": "mmol/L"
  },
  "interpretation": [
    {
      "coding": [
        {
          "system": "http://terminology.hl7.org/CodeSystem/v3-ObservationInterpretation",
          "code": "H",
          "display": "High"
        }
      ]
    }
  ],
  "referenceRange": [
    {
      "low": {
        "value": 3.1,
        "unit": "mmol/l",
        "system": "http://unitsofmeasure.org",
        "code": "mmol/L"
      },
      "high": {
        "value": 6.2,
        "unit": "mmol/l",
        "system": "http://unitsofmeasure.org",
        "code": "mmol/L"
      }
    }
  ]
}
```

# FHIR Search Command

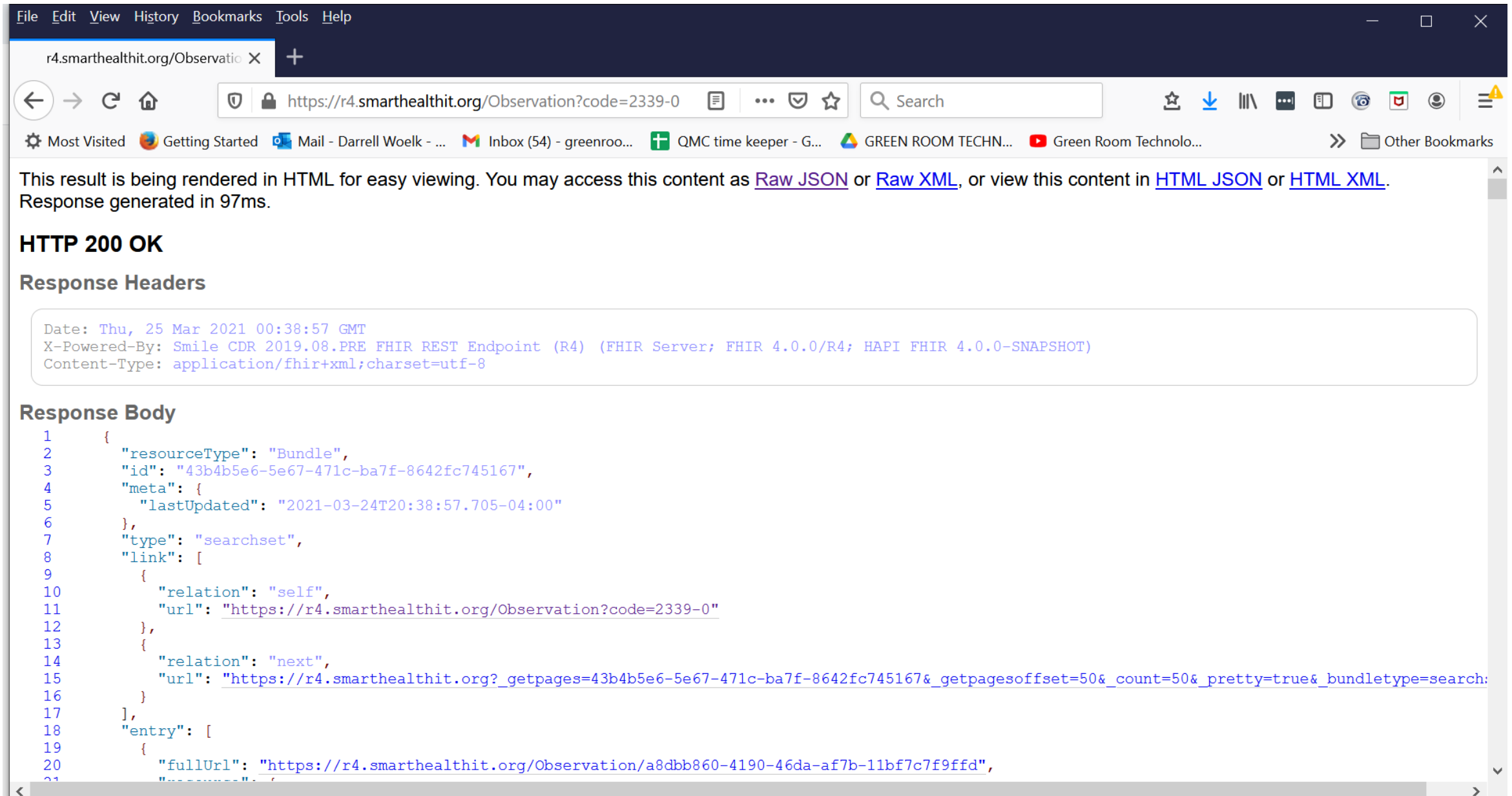
<https://www.hl7.org/fhir/search.html>

- Searching for resources is fundamental to the mechanics of FHIR. Search operations traverse through an existing set of resources filtering by parameters supplied to the search operation.
- FHIR Search Syntax
  - The client requests data using the following HTTP syntax:  
**GET [baseUrl]/[resourceType]?[optional parameters]**
  - The server then returns a FHIR Bundle resource, which is a container resource containing the matching search results
- Example:
  - <https://r4.smarthealthit.org/Observation?code=2339-0>

# Search Using a Reference Between Resources

- Get the Observation resources with Triglycerides values for the Patient with id = 0e61c3ad-d11e-4080-a6aa-cac89cae4e37
  - <https://r4.smarthealthit.org/Observation?subject=Patient/0e61c3ad-d11e-4080-a6aa-cac89cae4e37&code=2571-8>
  - <https://r4.smarthealthit.org/Observation?subject=Patient/0e61c3ad-d11e-4080-a6aa-cac89cae4e37&code=2571-8>

# Execute a FHIR API Call in a Browser: <https://r4.smarthealthit.org/Observation?code=2339-0>



File Edit View History Bookmarks Tools Help

r4.smarthealthit.org/Observation X +

← → ↻ 🏠 🔒 https://r4.smarthealthit.org/Observation?code=2339-0 📄 ⋮ 📌 ⭐ 🔍 Search

⚙️ Most Visited 🌐 Getting Started 📧 Mail - Darrell Woelk - ... 📧 Inbox (54) - greenroo... 🏥 QMC time keeper - G... 🟢 GREEN ROOM TECHN... 📺 Green Room Technolo...

➡️ 📁 Other Bookmarks

This result is being rendered in HTML for easy viewing. You may access this content as [Raw JSON](#) or [Raw XML](#), or view this content in [HTML JSON](#) or [HTML XML](#).  
Response generated in 97ms.

## HTTP 200 OK

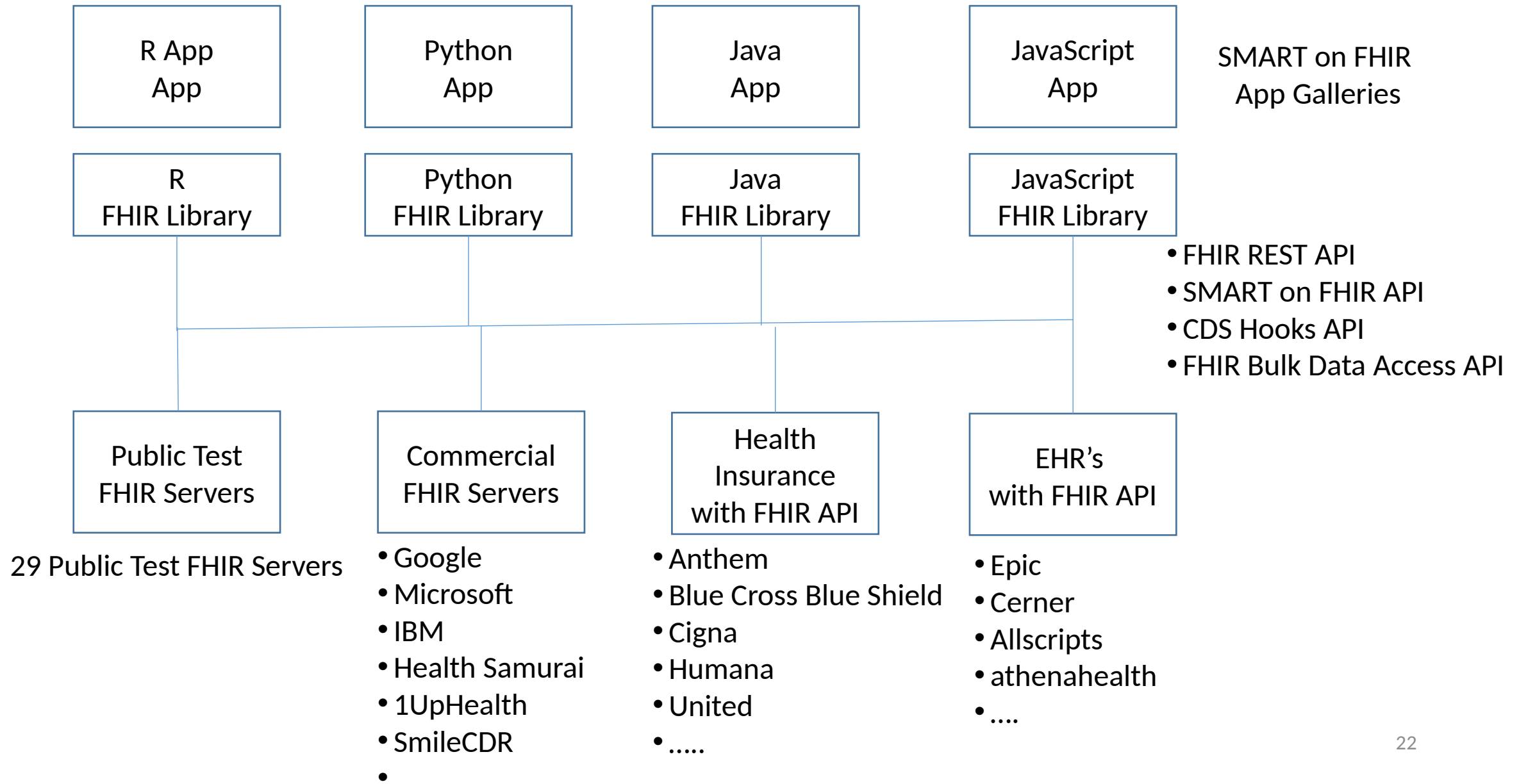
### Response Headers

```
Date: Thu, 25 Mar 2021 00:38:57 GMT
X-Powered-By: Smile CDR 2019.08.PRE FHIR REST Endpoint (R4) (FHIR Server; FHIR 4.0.0/R4; HAPI FHIR 4.0.0-SNAPSHOT)
Content-Type: application/fhir+xml;charset=utf-8
```

### Response Body

```
1  {
2    "resourceType": "Bundle",
3    "id": "43b4b5e6-5e67-471c-ba7f-8642fc745167",
4    "meta": {
5      "lastUpdated": "2021-03-24T20:38:57.705-04:00"
6    },
7    "type": "searchset",
8    "link": [
9      {
10       "relation": "self",
11       "url": "https://r4.smarthealthit.org/Observation?code=2339-0"
12     },
13     {
14       "relation": "next",
15       "url": "https://r4.smarthealthit.org/?_getpages=43b4b5e6-5e67-471c-ba7f-8642fc745167&_getpagesoffset=50&_count=50&_pretty=true&_bundletype=search:"
16     }
17   ],
18   "entry": [
19     {
20       "fullUrl": "https://r4.smarthealthit.org/Observation/a8dbb860-4190-46da-af7b-11bf7c7f9ffd",
21       "resource": {
```

# Architecture for FHIR Applications





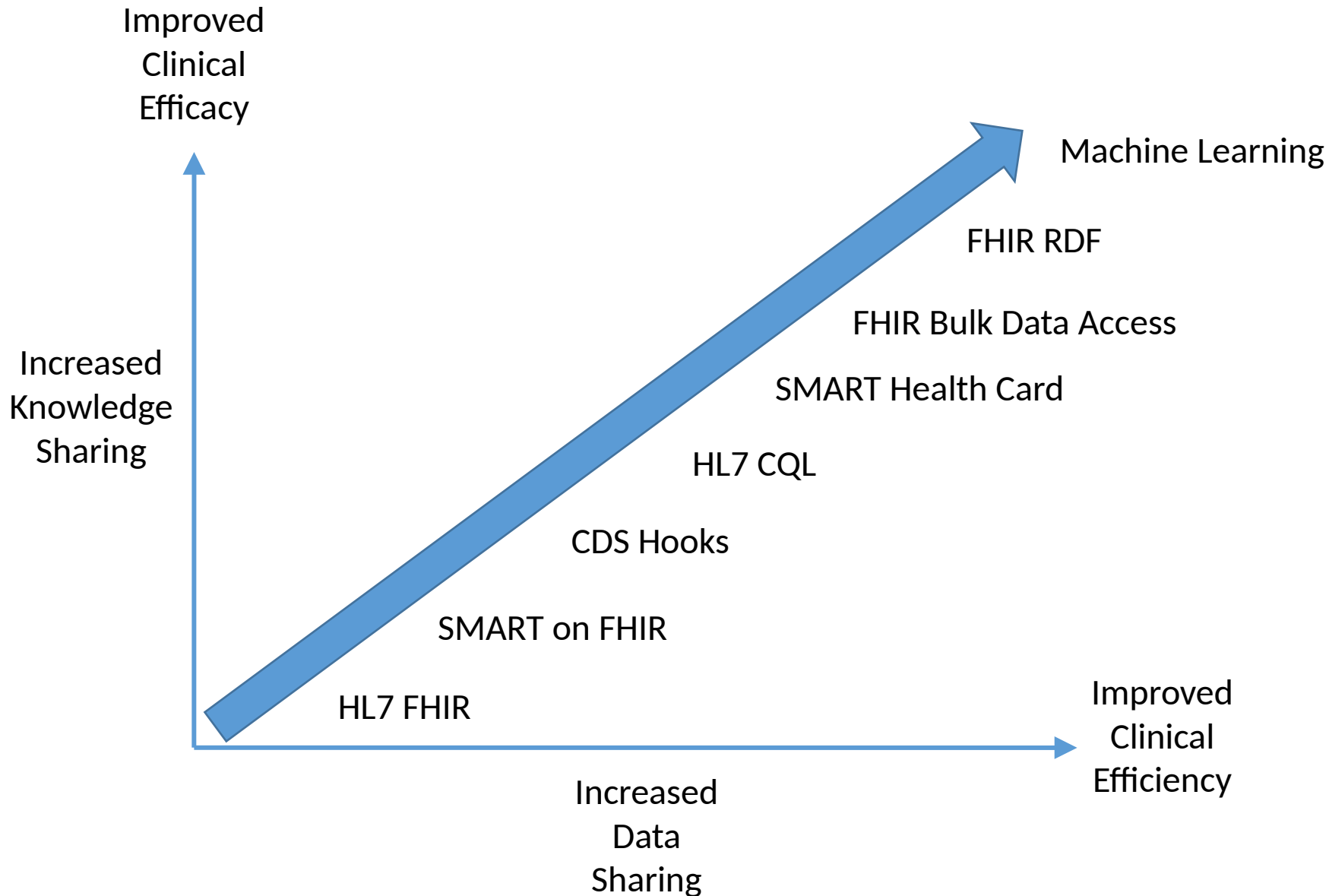
# Open Source and Commercial FHIR Servers

- There are 29 public FHIR Test Servers online for use in application development and for testing at FHIR Connectathons
  - <https://confluence.hl7.org/display/FHIR/Public+Test+Servers>
- Logica Health provides a personal instance of a FHIR Server for testing FHIR applications
  - <https://www.logicahealth.org/solutions/fhir-sandbox/>
- There are a number of commercially supported FHIR Servers from small companies along with software tools for application development
  - 1UpHealth (<https://1up.health/>)
  - Health Samurai (<https://www.health-samurai.io/>)
  - Smile CDR (<https://smilecdr.com/>)
  - Vonk FHIR Server (<https://vonk.fire.ly/>)
  - and others .....

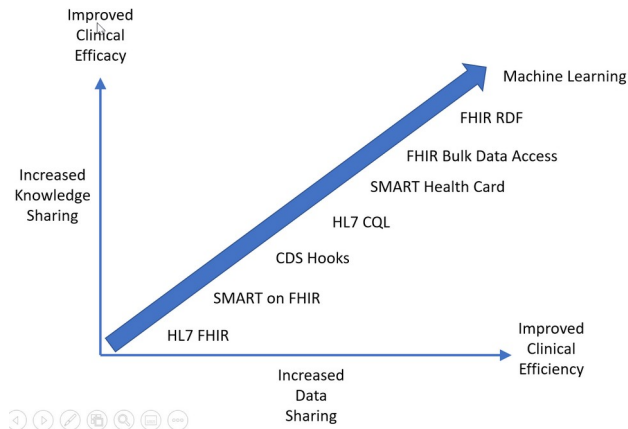
# FHIR and the Major Technology Companies

- The Argonaut Project was formed by the major EHR vendors in 2014 to set priorities and write Implementation Guides for using FHIR
  - <https://confluence.hl7.org/display/AP/Argonaut+Project+Home>
- Apple Health Records iPhone app is able to access a user's selected medical records from provider organizations using the FHIR API
  - <https://www.apple.com/healthcare/health-records/>
- Microsoft has announced the Azure API for FHIR product that is a managed Platform-as-a Service (PaaS) cloud offering that is built on an open source FHIR server based on the Azure Cosmos DB
  - <https://azure.microsoft.com/en-us/services/azure-api-for-fhir/>
- Google has announced the Cloud Healthcare API PaaS which includes a FHIR database
  - <https://cloud.google.com/healthcare/>
- The IBM Watson for Health GxP PaaS includes a FHIR database and is able to import healthcare data from other sources
  - <https://www.ibm.com/products/fhir-server>

# The Evolving FHIR Ecosystem

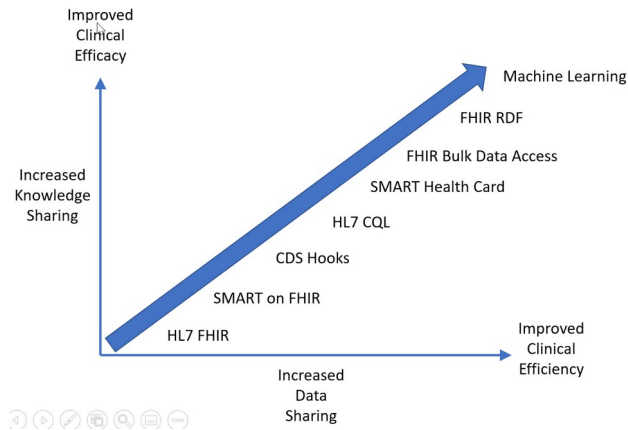


# Improving Clinical Efficacy with FHIR



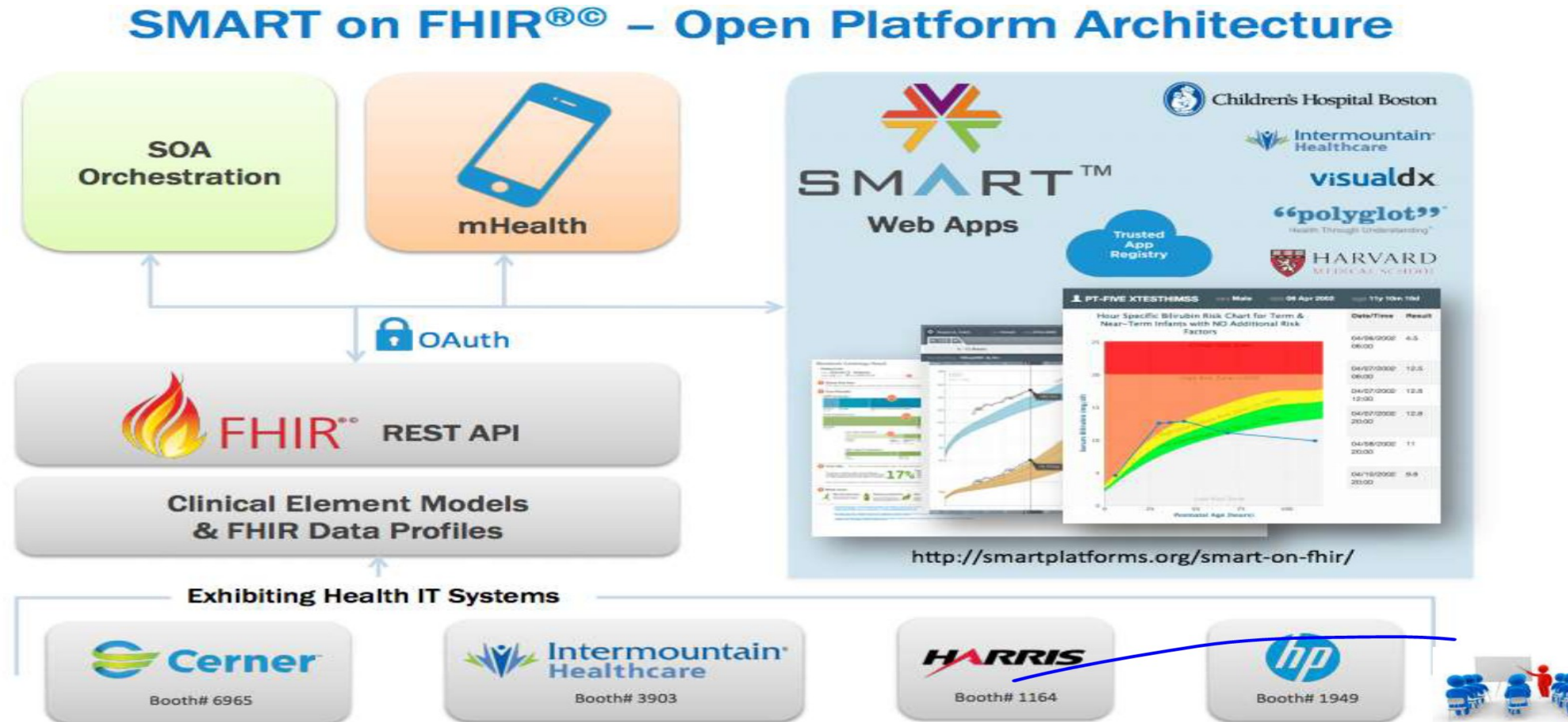
- The **HL7 FHIR** (Fast Healthcare Interoperability Resources) standard defines a set of Resources and a REST API for creating, retrieving, **searching**, and updating
  - <https://www.hl7.org/fhir/>
- The **SMART on FHIR** specification defines a framework for **launching FHIR-based apps from an EHR** that leverages OAuth2 and OpenID for authorization and authentication
  - <https://smarthealthit.org/>
- The **CDS Hooks** specification defines a framework for **registering and launching Clinical Decision Support apps** from an EHR at specific points in the **clinical workflow**
  - <https://cds-hooks.org/>
- **HL7 Clinical Quality Language (CQL)** is a high-level, domain-specific language focused on clinical quality and **targeted at quality measure and decision support artifact authors**
  - <https://ecqi.healthit.gov/cql>

# Improving Clinical Efficacy with FHIR



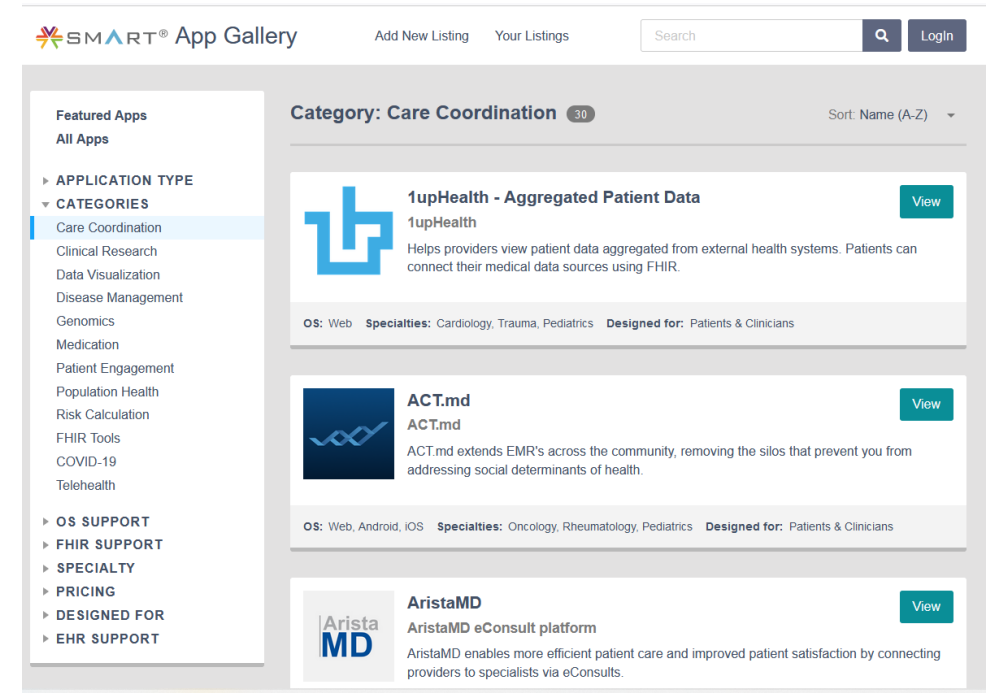
- **SMART Health Cards** are verifiable paper or digital versions of FHIR clinical data that implement the W3C Verifiable Credentials standard to **prove the authenticity of the data**
  - <https://smarthealth.cards/en/>
- **FHIR Bulk Data Access** provides an API for transferring **large amounts** of FHIR data
  - <https://hl7.org/fhir/uv/bulkdata/>
- **FHIR RDF** is an RDF representation of FHIR resources for **knowledge applications** that is an alternative to the XML and JSON representations
  - <https://www.hl7.org/fhir/rdf.html>
- **Machine Learning** can be used to train models that identify patterns in FHIR data that predict health outcomes

# SMART on FHIR



# SMART on FHIR App Marketplaces

- The SMART Health IT project maintains an App Gallery where developers can list their SMART on FHIR apps and others can try them out using a sandbox FHIR database
  - <https://apps.smarthealthit.org/apps>
- Many EHR vendors maintain their own App Galleries where third party developed SMART on FHIR apps are listed that have been tested and certified with the vendor's EHR system
  - Epic: <https://apporchard.epic.com/>
  - Cerner: <https://code.cerner.com/apps>
  - Allscripts: <https://expo.allscripts.com/>
  - and others .....





# Representation of Care Plans in FHIR

## Vision Today

### Care Plan Cornerstones

#### Dynamic Behavior:

Machine assisted care coordination



#### FHIR CarePlan Design:

FHIR CarePlan Resource

+

FHIR Goal Resource

+

Available extensions and resourceReferences

=

Machine assisted care coordination

Dynamic Care planning/coordination processes

#### Content:

- Health concern(s)
- Health goal(s)
- Activity/intervention(s)
- Progress/outcome and more ...





# Reference

- <https://smarthealthit.org/>
- <https://docs.smarthealthit.org/>
- <https://apps.smarthealthit.org/>