

# FHIR 101

**March 6, 2024**

Diego Kaminker, HL7 DCSIO, [diego@hl7.org](mailto:diego@hl7.org)

With input and materials from:

- Viet Nguyen, HL7 CSIO
- Dan Vreeman, HL7 CSDO

*\*This session will be recorded.*



# Agenda

- Welcome from Civitas Networks for Health
- Purpose and Objective of Today's Training
- Part 1 – Introduction to HL7
- Part 2 – Introduction to FHIR
- Part 3 – The FHIR Toolbox

# Housekeeping Reminders

- This is a Zoom webinar.
- Please make sure you are muted.
- Please feel free to put questions or comments in the Q&A. These will be answered at the end – time permitting.
- This session is being recorded.

For questions following the meeting, reach out to [mvalu@civitasforhealth.org](mailto:mvalu@civitasforhealth.org)





# ABOUT CIVITAS

[Civitas Networks for Health](#) is a national collaborative comprised of over 170 member organizations working to use health information exchange, health data, and multi-stakeholder, cross-sector approaches to improve health.

Civitas educates, promotes, and influences both the private sector and policymakers on matters of interoperability, quality, coordination, health equity, and cost-effectiveness of health care. The network supports local health innovators by amplifying their voices at the national level and increasing the exchange of valuable resources, tools, and ideas.



[Civitas Networks for Health](#)



[@civitas4health](#)



# Demographic Data Standards Development

## Project Team

- This effort is a partnership between Civitas Networks for Health (Civitas), AHIP, and Health Level 7 (HL7) International.

## Objective/Scope

- AHIP has funded Civitas to launch a project in partnership with HL7 International to support refinement and development of improved demographic data questions and response choices for race, ethnicity, language, sexual orientation, gender, disability status, military experience, and spirituality.

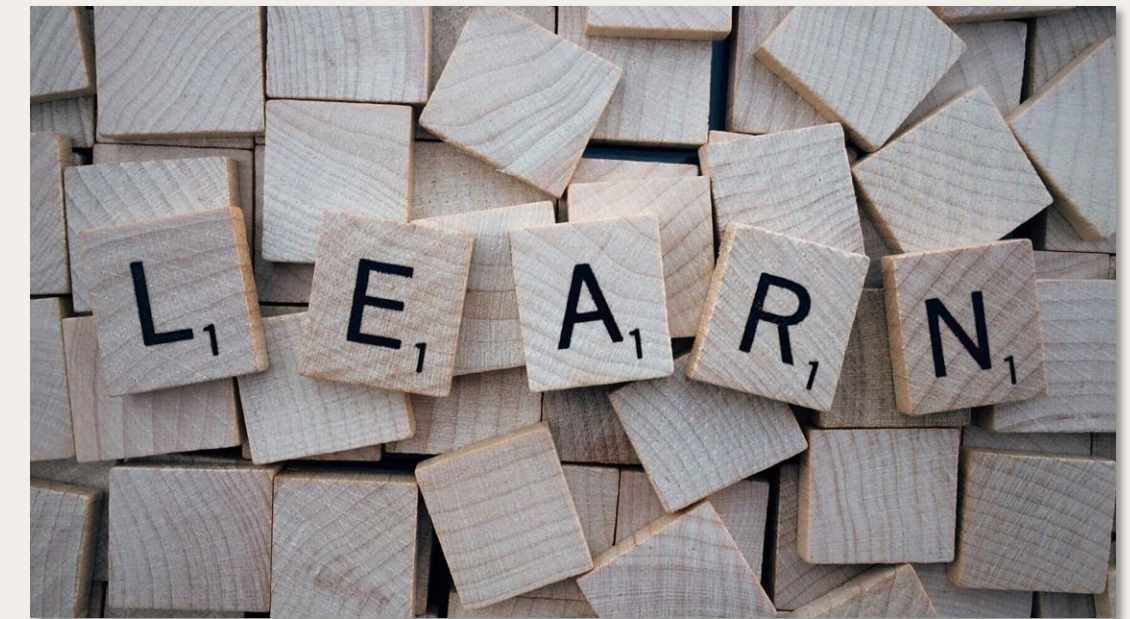
## Next Session

- Language and Spirituality | March 20 from 3pm-5pm ET



# Purpose & Objective

- Provide educational sessions for all interested stakeholders on core topics related to standards development and health information exchange.
- Introduce the concept of Fast Healthcare Information Resources (FHIR®).
- This 101-level presentation requires no prior knowledge or experience and is open to anyone who is interested in learning more about FHIR.



# PART 1 – INTRODUCTION TO HL7

- HL7's Global Reach
- What are healthcare data standards?
- What do we mean by interoperability?
- How does policy drive standards development and adoption?
- Coordination of Standards Development and Implementation
- Why Are Policies Important to implementers?
- FHIR Accelerators



## Health Level Seven® International (HL7®)

- Not-for-profit
- ANSI-accredited standards development organization (SDO)
- Dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services

### Vision

- A world in which everyone can securely access and use the right health data when and where they need it.

### Mission

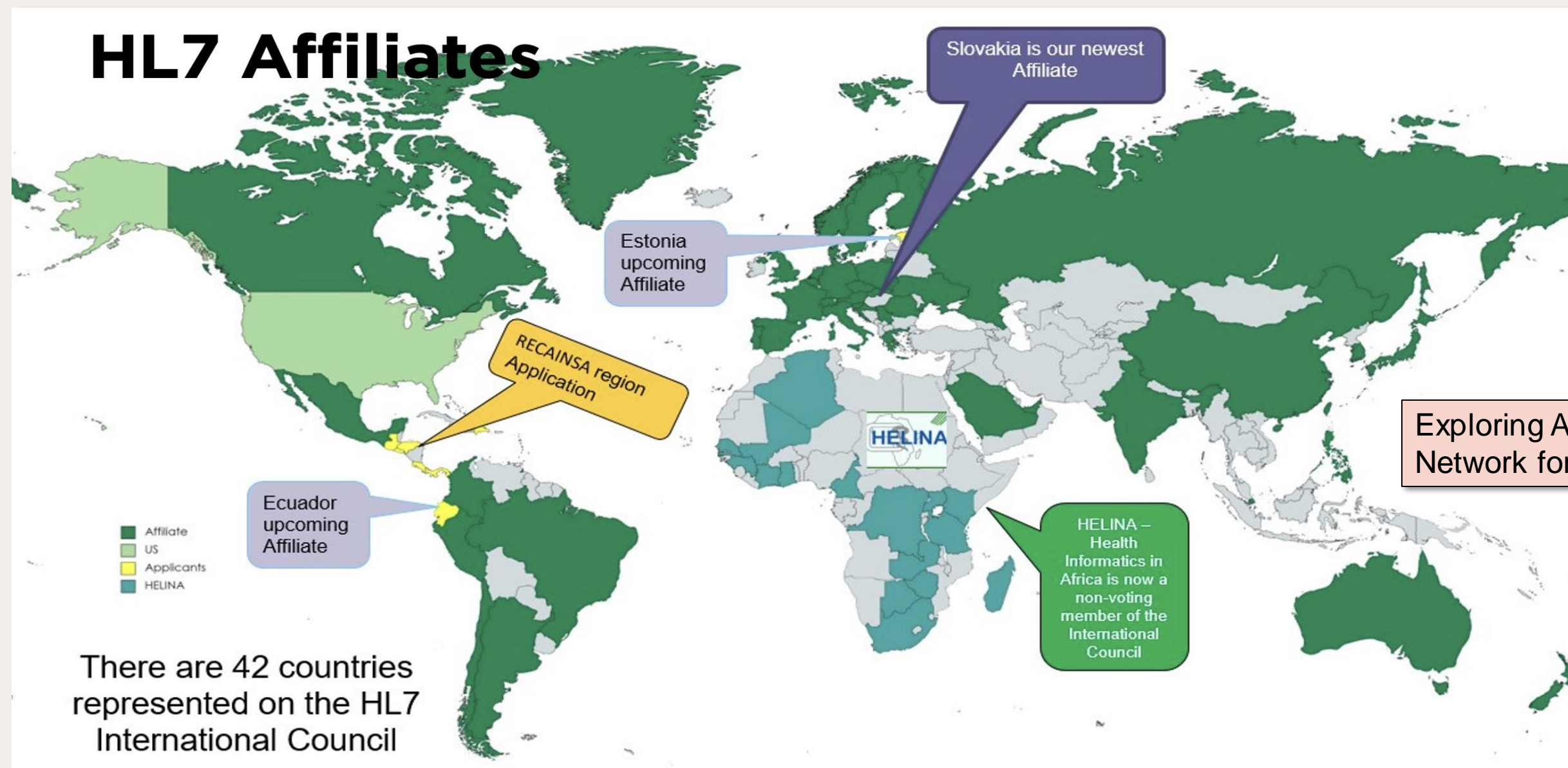
- To provide standards that empower global health data interoperability.

[Education on Demand](#): HL7® training Straight from the Source



# HL7 International's Global Reach

- **HL7 Mission:** To provide standards that empower global health data interoperability.

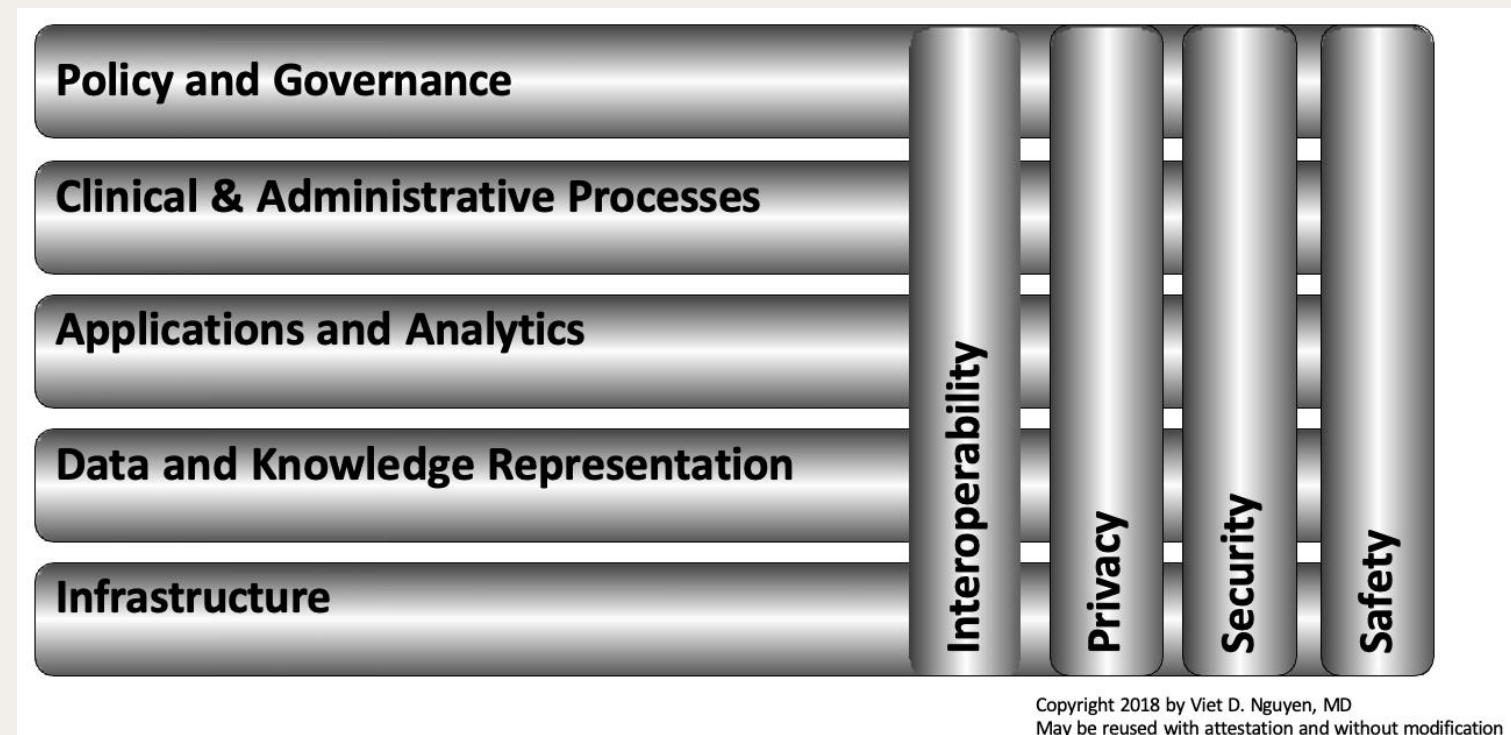


- 50+ Countries
- 500+ Corporate Members
- 1600+ Individual Members
- Thousands of contributors

# What are "Healthcare Data Standards"?

In the context of health care, the term data standards encompasses *methods, protocols, terminologies, and specifications* for the *collection, exchange, storage, and retrieval of information* associated with health care applications, including medical records, medications, radiological images, payment and reimbursement, medical devices and monitoring systems, and administrative processes (Washington Publishing Company, 1998).

<https://www.ncbi.nlm.nih.gov/books/NBK216088>

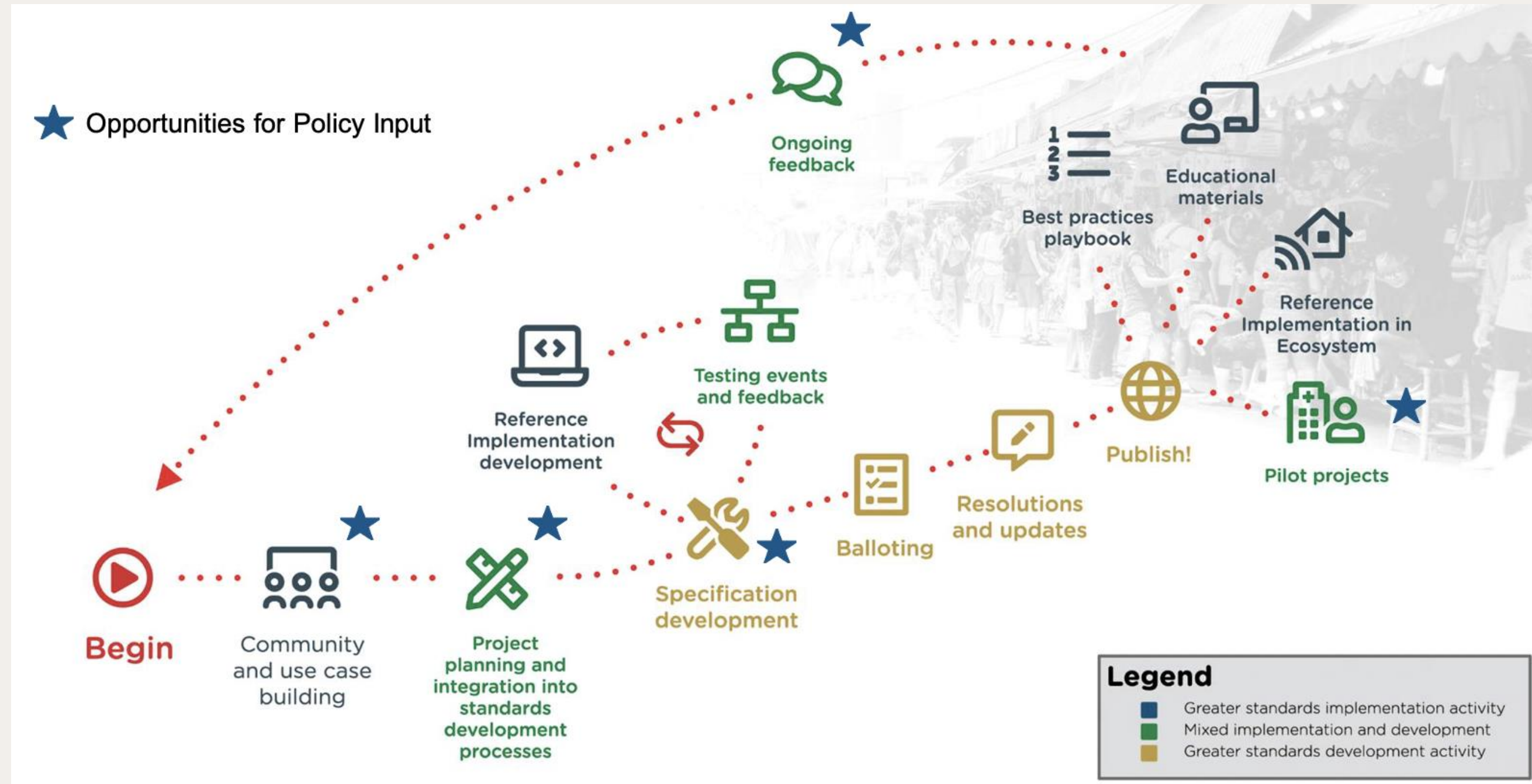


# How does policy drive standards development and adoption?



- Listening to stakeholder needs.
- Direct support of standards development and adoption.
- Setting of standards directly – e.g. HIPAA, ONC Cures Act.
- Adoption by agencies.

# Coordination of Standards Development and Implementation



# Why are policies important to implementers?

- Legal and regulatory requirements and compliance
- Standards and guidelines for implementation for certification
- Privacy and security
- Data governance
- Consent management
- Collaboration and partnerships
- Technological infrastructure
- Education and training
- Continuous improvement

**Interoperability must move from a compliance activity to a **strategic initiative.****

# The HL7 FHIR Accelerator Program

- Stakeholders with shared goal + policy radar + implementers + standard development



# PART 2 – INTRODUCTION TO FHIR

- What is an API and what is a healthcare API?
- Overview of FHIR
- Benefits of FHIR
- FHIR Versioning
- FHIR Essential Concepts
- Navigating the Specification
- Resources, Profiles, and Operations
- FHIR Extensions

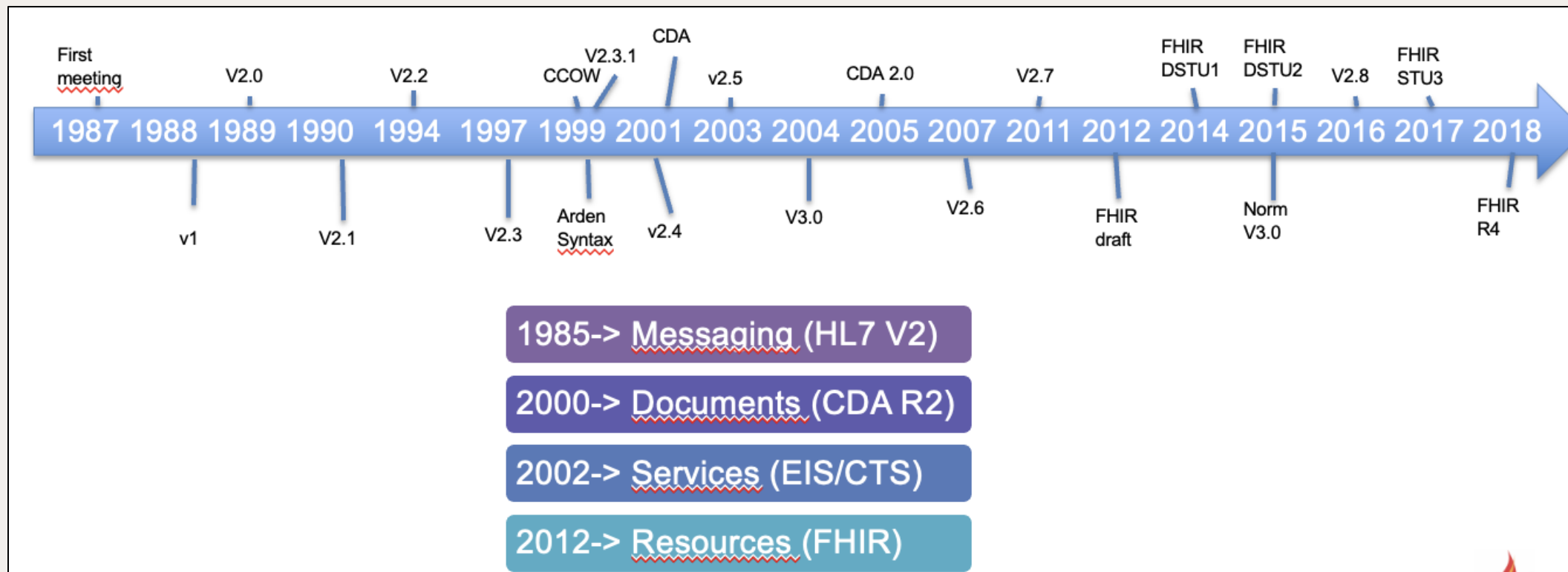
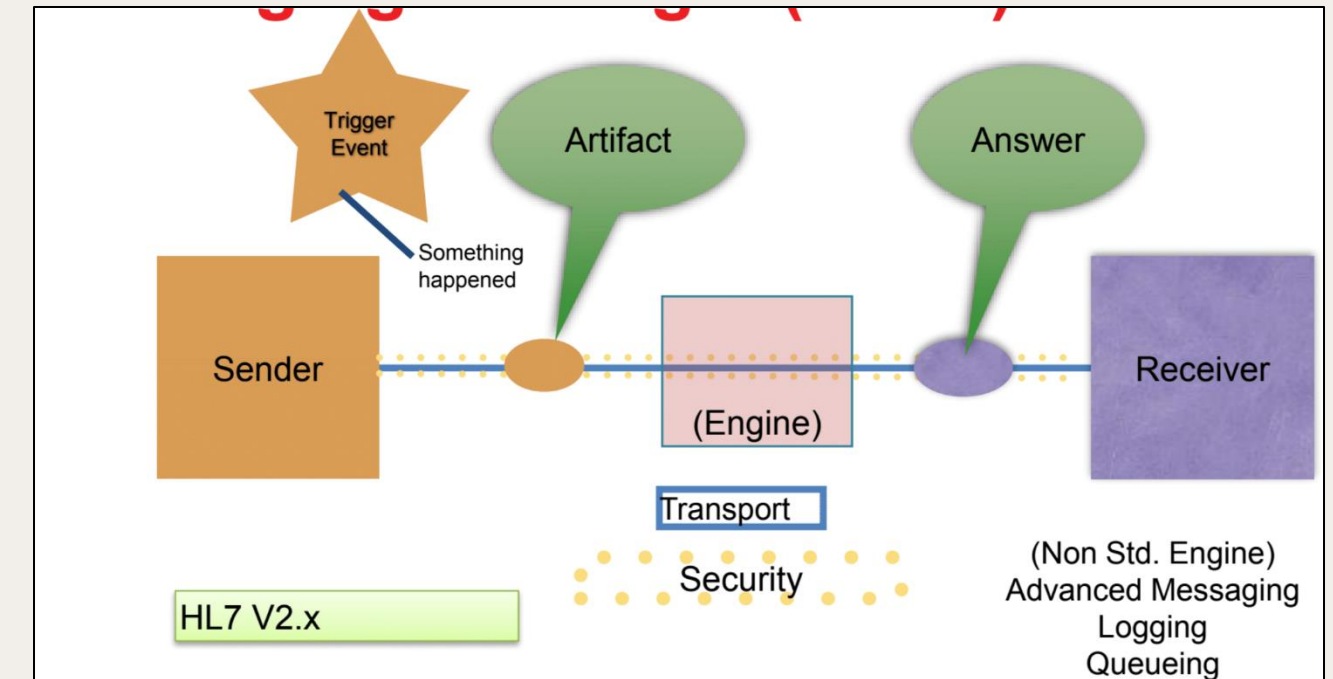


The FHIR Standard: <https://hl7.org/fhir/>

FHIR Bibliography: <https://danielvreeman.com/project/fhir-bibliography/>

# Data Exchange with HL7 – Brief History

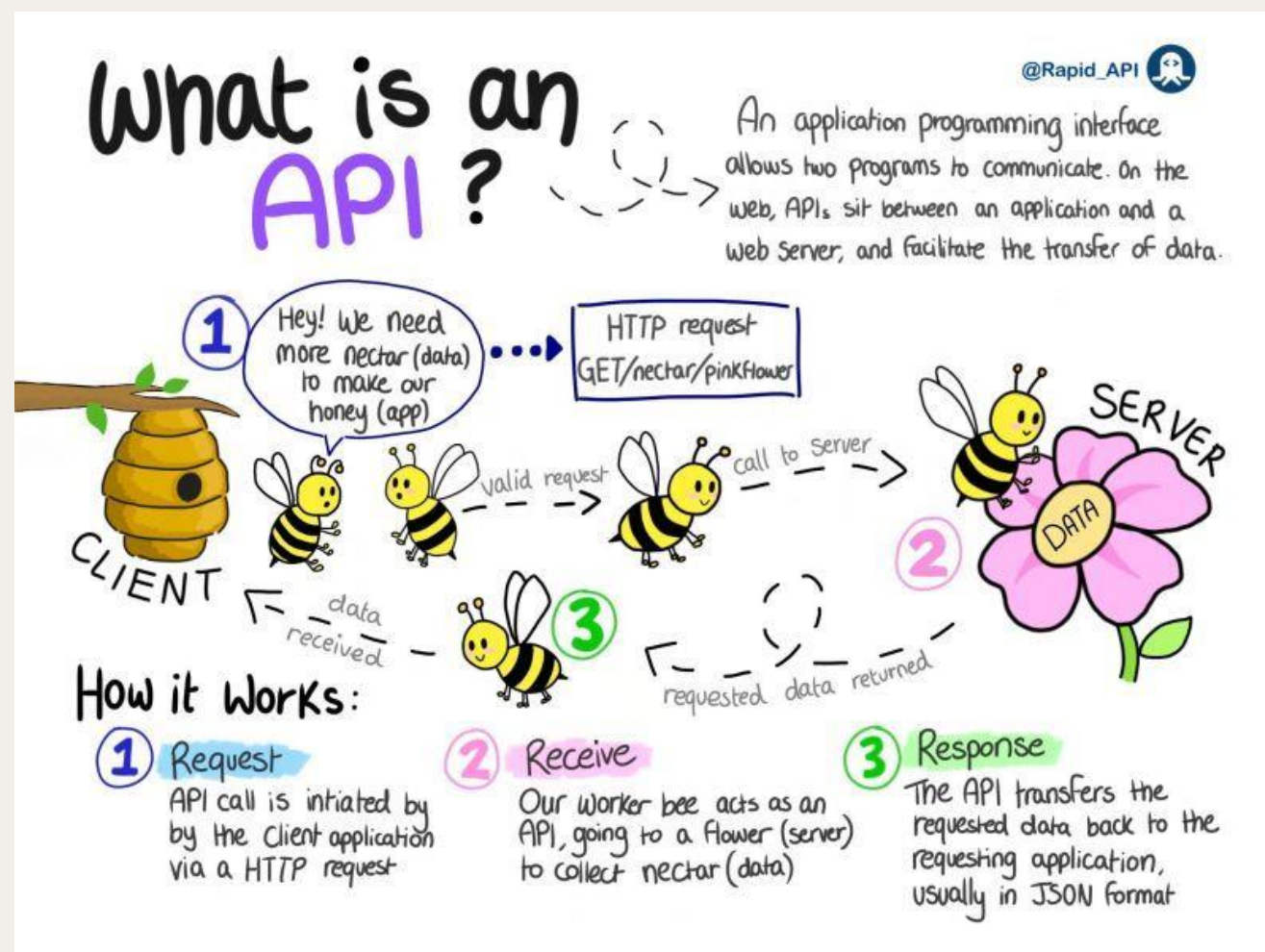
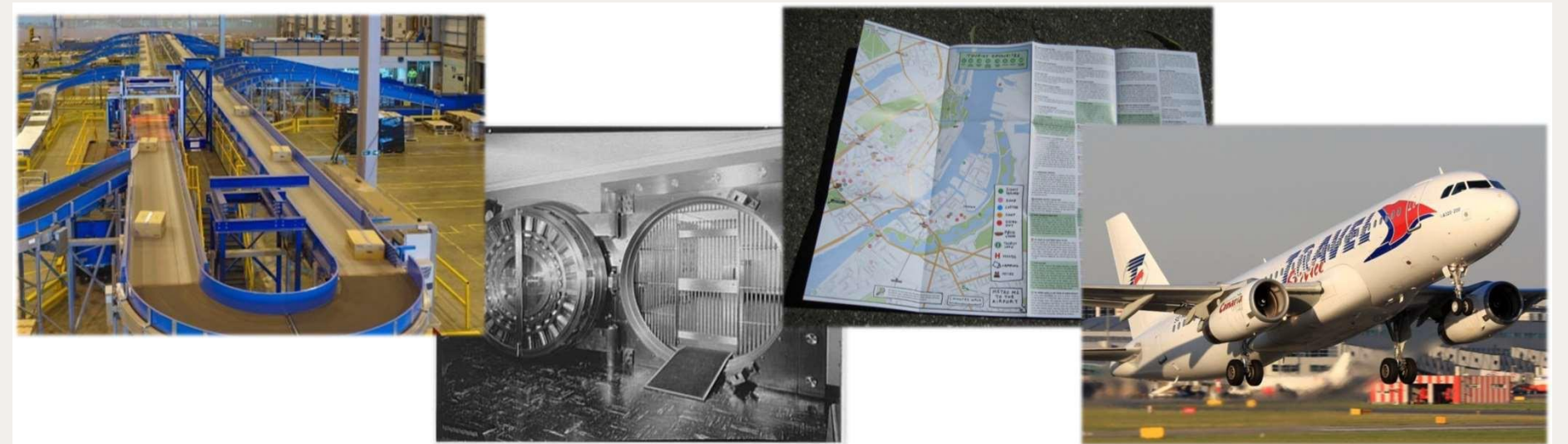
- **Messaging** - HL7 v2.x : 1987...
- **Clinical Document Architecture** - CDA R2 : 2000...
- **Services** – EIS/CTS: 2002...
- **Resource Based API** - FHIR: 2012...





# What is an API?

- The World Has Been Changed By Application Programming Interfaces (APIs)...
- "API": Application Program Interface : A way for one system to call another. A **CONTRACT**.
- Local vs Remote APIs vs RESTful APIs
- Proprietary (lock in) vs Open/Standard APIs



## APIs are good for:

- Access data from third parties
- Hide complexity
- Extend functionality
- Centralize security
- Standardize access to data

# Overview of FHIR

- **F**ast **H**ealthcare **I**nteroperability **R**esources

- RESTful APIs explain how 99% of the web and the clouds services works today.

- FHIR defines for Distributed Healthcare Data:

- the content "resources" and
- the methods "API"

- Consistent, simple to use content model resources / Supports all paradigms of exchange
- Designed with implementers in mind / Freely available
- Detailed on-line, hyperlinked specification / Freely available tooling, servers, libraries

**Transport:** HTTPs / other

**Security:** oAUTHx / other

**Syntax:** XML / JSON (preferred) / RDF

**Structure:** FHIR Resources/Datatypes

**Methods:** HTTP methods / other

**Terminology:** FHIR terminology + other

REST APIs explain how 99% of the web and the clouds services works today

FHIR is the web, for healthcare

Now...YOU try it: →

<https://tinyurl.com/tryfhir>

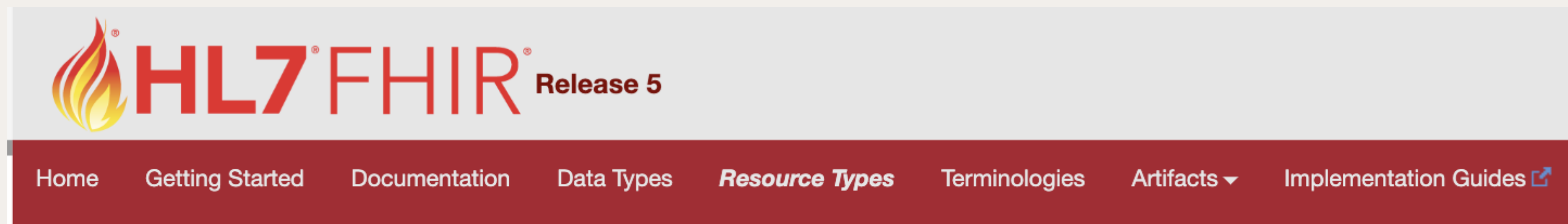


# Benefits of FHIR

- **For Patients**
  - Improved patient engagement, enabled through FHIR-enabled applications.
- **For Organizations**
  - Major vendor commitment, faster deployment.
  - Standards based API to support internal application development.
  - Data standards to support analytics and population management.
- **For Clinicians**
  - Access to a more complete patient record and improved decision-making tools.
- **For Implementers**
  - Familiar tooling and technologies, open-source code libraries, active community.
  - Validation services.

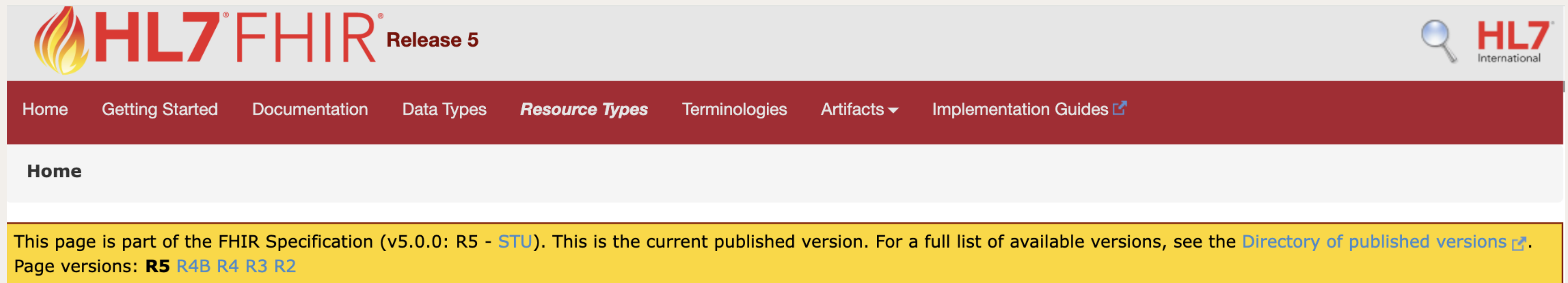
# Navigating the Specification

- **Getting Started:** "elevator" pitch for different roles in your organization: architect, policy maker, developer.
- **Documentation:** How everything works: API exchange, documents, messages, syntax.
- **Data Types:** Building Blocks for Resources.
- **Resource Types:** How the actual content is defined: patients, providers, organizations, problems, etc.
- **Terminologies:** Which codes to use in coded elements, or where to find them (external).



# FHIR Versions & Timeline

- **Current US regulations points to FHIR R4/R4B.** Last version: FHIR R5 (2023)  
DSTU2: 2015 STU3: 2016 R4: 2019 R5: 2023 (minor) R6: 2025? (major)



The screenshot shows the top portion of the HL7 FHIR website. At the top left is the HL7 FHIR logo with 'Release 5' next to it. At the top right is the HL7 International logo with a magnifying glass icon. Below the logo is a dark red navigation bar with the following links: Home, Getting Started, Documentation, Data Types, Resource Types (highlighted), Terminologies, Artifacts (with a dropdown arrow), and Implementation Guides (with an external link icon). Below the navigation bar is a white section with the word 'Home' in bold. At the bottom of the screenshot is a yellow banner with the text: 'This page is part of the FHIR Specification (v5.0.0: R5 - STU). This is the current published version. For a full list of available versions, see the [Directory of published versions](#). Page versions: **R5** R4B R4 R3 R2'.

R4B: R4+Subscriptions

# FHIR Essential Concepts: Resources

- Resource: **Minimum Artifact to Exchange**, sweet spot in size and granularity.
- Not a complete EHR for a patient, not a single type of result, not a single attribute for a patient.

**Categorized FHIR Resource Types**  
<https://hl7.org/fhir/resourcelist.html>

**Example Resource Definition ("Patient")**  
<https://hl7.org/fhir/patient.html>

	Categorized	Alphabetical	R2 Layout	By Maturity	Security Category	By Standards Status	By Work Group
Foundation	<b>Conformance</b> <ul style="list-style-type: none"> <li>CapabilityStatement <b>N</b></li> <li>StructureDefinition <b>N</b></li> <li>ImplementationGuide 4</li> <li>SearchParameter 5</li> <li>MessageDefinition 1</li> <li>OperationDefinition <b>N</b></li> <li>CompartmentDefinition 3</li> <li>StructureMap 4</li> <li>GraphDefinition 2</li> </ul>	<b>Terminology</b> <ul style="list-style-type: none"> <li>CodeSystem <b>N</b></li> <li>ValueSet <b>N</b></li> <li>ConceptMap 3</li> <li>NamingSystem 4</li> <li>TerminologyCapabilities 1</li> </ul>	<b>Security</b> <ul style="list-style-type: none"> <li>Provenance 4</li> <li>AuditEvent 4</li> <li>Permission 0</li> <li>Consent 2</li> </ul>	<b>Documents</b> <ul style="list-style-type: none"> <li>Composition 4</li> <li>DocumentReference 4</li> </ul>	<b>Other</b> <ul style="list-style-type: none"> <li>Basic 3</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> <li>SubscriptionStatus 2</li> <li>SubscriptionTopic 2</li> </ul>		
	<b>Individuals</b> <ul style="list-style-type: none"> <li>Patient <b>N</b></li> <li>Practitioner 5</li> <li>PractitionerRole 4</li> <li>RelatedPerson 5</li> <li>Person 4</li> <li>Group 3</li> </ul>	<b>Entities #1</b> <ul style="list-style-type: none"> <li>Organization 5</li> <li>OrganizationAffiliation 1</li> <li>HealthcareService 4</li> <li>Endpoint 2</li> <li>Location 5</li> </ul>	<b>Entities #2</b> <ul style="list-style-type: none"> <li>Substance 2</li> <li>BiologicallyDerivedProduct 2</li> <li>Device 2</li> <li>DeviceMetric 1</li> <li>NutritionProduct 1</li> </ul>	<b>Workflow</b> <ul style="list-style-type: none"> <li>Task 3</li> <li>Transport 1</li> <li>Appointment 3</li> <li>AppointmentResponse 3</li> <li>Schedule 3</li> <li>Slot 3</li> <li>VerificationResult 1</li> </ul>	<b>Management</b> <ul style="list-style-type: none"> <li>Encounter 4</li> <li>EncounterHistory 0</li> <li>EpisodeOfCare 2</li> <li>Flag 1</li> <li>List 4</li> <li>Library 4</li> </ul>		
Clinical	<b>Summary</b> <ul style="list-style-type: none"> <li>AllergyIntolerance 3</li> <li>AdverseEvent 2</li> <li>Condition (Problem) 5</li> <li>Procedure 4</li> <li>FamilyMemberHistory 2</li> <li>ClinicalImpression 1</li> <li>DetectedIssue 2</li> </ul>	<b>Diagnostics</b> <ul style="list-style-type: none"> <li>Observation <b>N</b></li> <li>DocumentReference 4</li> <li>DiagnosticReport 3</li> <li>Specimen 2</li> <li>BodyStructure 1</li> <li>ImagingSelection 1</li> <li>ImagingStudy 4</li> <li>QuestionnaireResponse 5</li> <li>MolecularSequence 1</li> <li>GenomicStudy 0</li> </ul>	<b>Medications</b> <ul style="list-style-type: none"> <li>MedicationRequest 4</li> <li>MedicationAdministration 2</li> <li>MedicationDispense 2</li> <li>MedicationStatement 4</li> <li>Medication 4</li> <li>MedicationKnowledge 1</li> <li>Immunization 5</li> <li>ImmunizationEvaluation 1</li> <li>ImmunizationRecommendation 1</li> <li>FormularyItem 0</li> </ul>	<b>Care Provision</b> <ul style="list-style-type: none"> <li>CarePlan 2</li> <li>CareTeam 2</li> <li>Goal 2</li> <li>ServiceRequest 4</li> <li>NutritionOrder 2</li> <li>NutritionIntake 1</li> <li>VisionPrescription 3</li> <li>RiskAssessment 2</li> <li>RequestOrchestration 4</li> </ul>	<b>Request &amp; Response</b> <ul style="list-style-type: none"> <li>Communication 2</li> <li>CommunicationRequest 2</li> <li>DeviceRequest 1</li> <li>DeviceDispense 0</li> <li>DeviceAssociation 0</li> <li>DeviceUsage 1</li> <li>BiologicallyDerivedProductDispense 0</li> <li>GuidanceResponse 2</li> <li>SupplyRequest 1</li> <li>SupplyDelivery 1</li> <li>InventoryItem 0</li> <li>InventoryReport 0</li> </ul>		
	<b>Support</b> <ul style="list-style-type: none"> <li>Coverage 4</li> <li>CoverageEligibilityRequest 4</li> <li>CoverageEligibilityResponse 4</li> <li>EnrollmentRequest 0</li> <li>EnrollmentResponse 0</li> </ul>	<b>Billing</b> <ul style="list-style-type: none"> <li>Claim 2</li> <li>ClaimResponse 2</li> <li>Invoice 0</li> </ul>	<b>Payment</b> <ul style="list-style-type: none"> <li>PaymentNotice 4</li> <li>PaymentReconciliation 4</li> </ul>	<b>General</b> <ul style="list-style-type: none"> <li>Account 2</li> <li>ChargeItem 1</li> <li>ChargeItemDefinition 1</li> <li>Contract 1</li> <li>ExplanationOfBenefit 2</li> <li>InsurancePlan 0</li> </ul>			
Financial							

8.1.3 Resource Content

Structure UML XML JSON Turtle R4 Diff All

Structure

Name	Flags	Card.	Type	Description & Constraints
Patient	<b>N</b>		DomainResource	Information about an individual or animal receiving health care services
id		0..*	Identifier	Elements defined in Ancestors: id, meta, implicitRules, language, text, contained, extension, modifierExtension An identifier for this patient.
active	<b>?</b>	0..1	boolean	Whether this patient's record is in active use
name		0..*	HumanName	A name associated with the patient.
telecom		0..*	ContactPoint	A contact detail for the individual
gender		0..1	code	male   female   other   unknown
birthDate		0..1	date	The date of birth for the individual
deceased[x]	<b>?</b>	0..1	boolean	Indicates if the individual is deceased or not
deceasedBoolean			boolean	
deceasedDateTime			dateTime	
address		0..*	Address	An address for the individual
maritalStatus		0..1	CodeableConcept	Marital (civil) status of a patient
multipleBirth[x]		0..1	boolean	Whether patient is part of a multiple birth
multipleBirthBoolean			boolean	
multipleBirthInteger			integer	
photo		0..*	Image	A photograph of the patient
contact		0..*	Reference(Patient)	act party (e.g. guardian, partner, friend) for the patient + Rule: SHALL at least contain a contact's details or a reference to an organization
relationship		0..*	CodeableConcept	The kind of relationship Binding: Patient-Contact Relationship (Extensible)
name		0..1	HumanName	A name associated with the contact person
telecom		0..*	ContactPoint	A contact detail for the person
address		0..1	Address	Address for the contact person
gender		0..1	code	male   female   other   unknown
organization		0..1	Reference(Organization)	Organization that is associated with the contact Binding: AdministrativeGender (Required)
period		0..1	Period	The period during which this contact person or organization is valid to be contacted relating to this patient
communication		0..*	BackboneElement	A language which may be used to communicate with the patient about his or her health
language		1..1	CodeableConcept	The language which can be used to communicate with the patient about his or her health Binding: All Languages (Required) Additional Bindings Purpose: Common Languages (Starter Set)
preferred		0..1	boolean	Language preference indicator
generalPractitioner		0..*	Reference(Organization   Practitioner   PractitionerRole)	Patient's nominated primary care provider
managingOrganization		0..1	Reference(Organization)	Organization that is the custodian of the patient record
link		0..*	BackboneElement	Link to a Patient or RelatedPerson resource that concerns the same actual individual
of		1..1	Reference(Patient   RelatedPerson)	The other patient or related person resource that the link refers to
type		1..1	code	replaced by   replaces   refer   sessio Binding: Link Type (Required)

Value of "true" or "false"

Documentation for this format: [See the Extensions for this resource.](#)

Additional definitions: Master Definition XML + JSON, XML Schema/Schematron + JSON Schema, SHEx (for Turtle) + see the extensions, the spreadsheet version & the dependency analysis

8.1.3.1 Terminology Bindings

Path	ValueSet	Type	Documentation
Patient.gender	AdministrativeGender	Required	The gender of a person used for administrative purposes.
Patient.maritalStatus	MaritalStatusCodes	Extensible	This value set defines the set of codes that can be used to indicate the marital status of a person.
Patient.contact.relationship	PatientContactRelationship	Extensible	The nature of the relationship between the patient and the contact person.
Patient.contact.gender	AdministrativeGender	Required	The gender of a person used for administrative purposes.
Patient.communication.language	AllLanguages (a valid code from Tags for the Identification of Languages)	Required	This value set includes all possible codes from BCP-47 (see <a href="http://tools.ietf.org/html/rfc4647">http://tools.ietf.org/html/rfc4647</a> )

# FHIR Essential Concepts: FHIR Resource Example

- Representing real life using FHIR Resources

55 y.o. AA male with hypertension and diabetes

## Encounter 1

History: Patient is seen at and afterhours urgent care for a **sore throat** for 3 days. He has had a mild **fever** up to 101 Fahrenheit. He denies any other respiratory or gastrointestinal symptoms.

Medications: **metoprolol and glipizide**. Allergies: **none**. Social History: **non-smoker**. Married. 3 adult children.

Vital signs: **temperature 100.5 F, BP 110/75, RR 12, HR 70, O2 Sat 97% on room air**

On exam he has **pus over his tonsils**. His **neck lymph nodes are enlarged**. The rest of the exam is normal

Lab: **Rapid strep test is positive**

Assessment and Plan: **Streptococcal sore throat**. Patient is **prescribed amoxicillin**

## Encounter 2

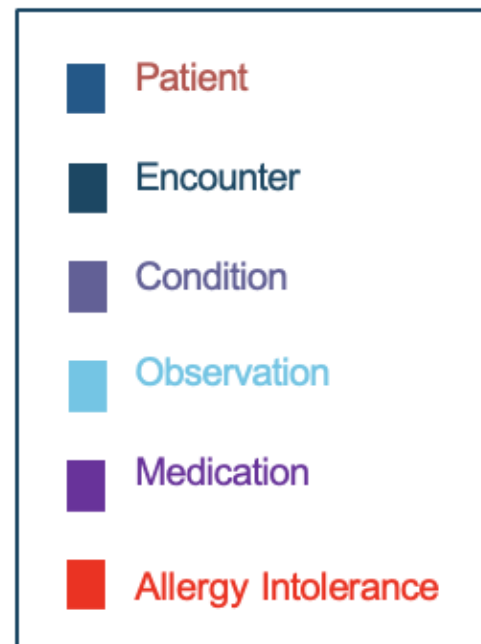
History: Patient returns with a **rash** over his chest that began after he started the **amoxicillin**. He admits that he has never taken amoxicillin before. He has no other respiratory symptoms. His fever and sore throat have resolved.

Vital signs are normal.

Exam shows a **raised rash** over patient's chest and arms

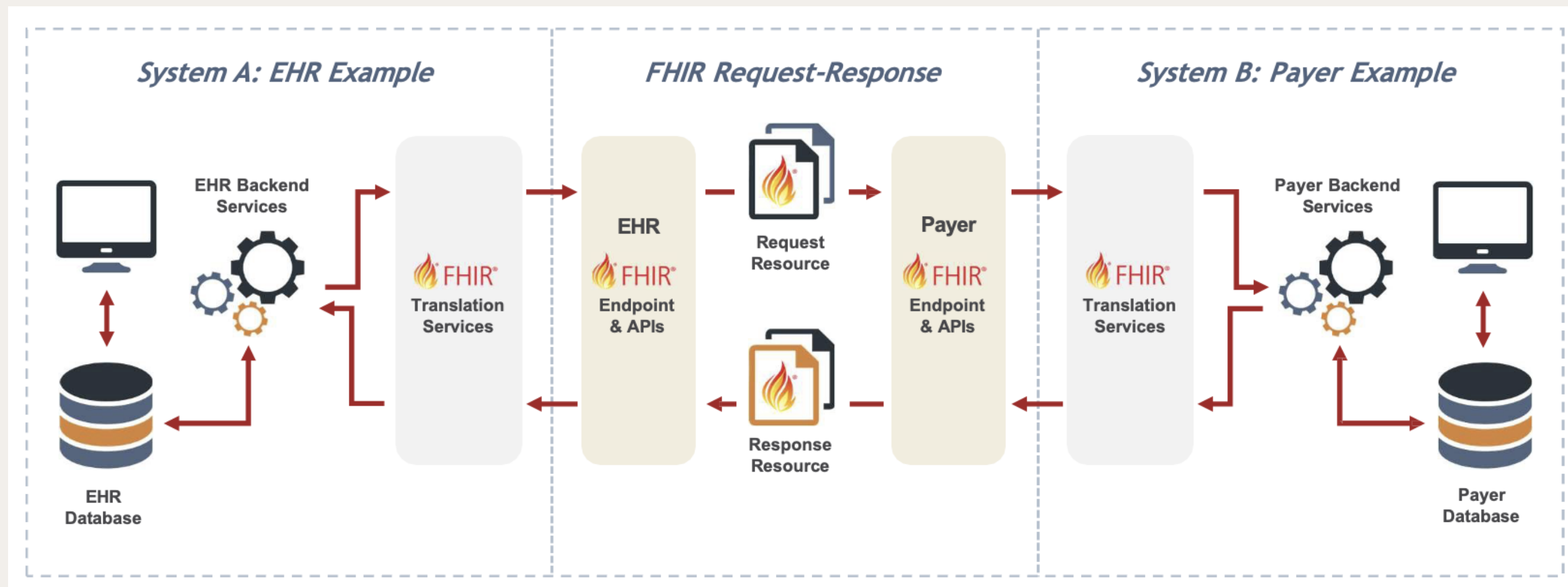
Assessment: **penicillin allergy**. Strep throat resolving

Plan: Patient was switched to **azithromycin**



# FHIR RESTful API

- Most common way to exchange resources...HTTP GET/PUT/POST to an Endpoint.
- The RESTful API defines a set of common interactions read, update, search, etc. performed on a repository of typed resources.






# FHIR Operations

- When FHIR RESTful is not enough, and you need the server to apply special algorithms before answering.

## 8.1.18 Resource Patient - Operations

[Patient Administration](#)  Work Group    [Maturity Level: N/A](#)    [Standards Status: Informative](#)

This resource has 3 operations associated with it:

<a href="#">\$match</a>	Find patient matches using MPI based logic	<b>Trial Use</b>
<a href="#">\$everything</a>	Fetch Patient Record	<b>Trial Use</b>
<a href="#">\$merge</a>	Patient Merge	<b>Trial Use</b>

In addition, there are operations that apply to all resource types:

<a href="#">\$validate</a>	Validate a resource	<b>Normative</b>
<a href="#">\$meta</a>	Access a list of profiles, tags, and security labels	<b>Trial Use</b>
<a href="#">\$meta-add</a>	Add profiles, tags, and security labels to a resource	<b>Trial Use</b>
<a href="#">\$meta-delete</a>	Delete profiles, tags, and security labels for a resource	<b>Trial Use</b>
<a href="#">\$convert</a>	Convert from one form to another	<b>Draft</b>
<a href="#">\$graphql</a>	Execute a graphql statement	<b>Trial Use</b>
<a href="#">\$graph</a>	Return a graph of resources	<b>Trial Use</b>
<a href="#">\$add</a>	Add to an array in a large resource	<b>Trial Use</b>
<a href="#">\$remove</a>	Remove from an array in a large resource	<b>Trial Use</b>
<a href="#">\$filter</a>	Filter an array in a large resource	<b>Trial Use</b>

For more information about operations, including how they are invoked, see [Operations](#).

# FHIR Profiles












- A profile is a set of constraints on a resource represented as a structure definition.
- "This not just a FHIR Patient Resource, it is a FHIR Patient for the US".

The screenshot displays the FHIR Patient resource structure definition. It lists various fields with their constraints (e.g., cardinality, data type, and flags like 'S' for mandatory or 'C' for cardinality) and their descriptions. Key fields include identifier, name, telecom, address, and communication. Below the structure definition, there is a section for Terminology Bindings (Differential) with a table listing specific paths, their conformance levels, and the value sets they reference.

Path	Conformance	ValueSet
Patient.telecom.system	required	ContactPointSystem
Patient.telecom.use	required	ContactPointUse
Patient.gender	required	AdministrativeGender
Patient.address.state	extensible	UspsTwoLetterAlphabeticCodes (a valid code from <a href="https://www.usps.com/">https://www.usps.com/</a> )
Patient.communication.language	extensible	LanguageCodesWithLanguageAndOptionallyARegionModifier

# FHIR Extensions

- An extension is the FHIR approach to adding valid data requirements to a resource.
- Example – US Core race extensions on Patient resource.

Name	Flags	Card.	Type	Description & Constraints
 Patient		0..*	Patient	Information about an individual or animal receiving health care services
 race		0..1	(Complex)	(USCDI) US Core Race Extension <b>URL:</b> <a href="http://hl7.org/fhir/us/core/StructureDefinition/us-core-race">http://hl7.org/fhir/us/core/StructureDefinition/us-core-race</a>
 ethnicity		0..1	(Complex)	(USCDI) US Core ethnicity Extension <b>URL:</b> <a href="http://hl7.org/fhir/us/core/StructureDefinition/us-core-ethnicity">http://hl7.org/fhir/us/core/StructureDefinition/us-core-ethnicity</a>
 tribalAffiliation		0..*	(Complex)	(USCDI) Tribal Affiliation Extension <b>URL:</b> <a href="http://hl7.org/fhir/us/core/StructureDefinition/us-core-tribal-affiliation">http://hl7.org/fhir/us/core/StructureDefinition/us-core-tribal-affiliation</a>
 birthsex		0..1	code	Birth Sex Extension <b>URL:</b> <a href="http://hl7.org/fhir/us/core/StructureDefinition/us-core-birthsex">http://hl7.org/fhir/us/core/StructureDefinition/us-core-birthsex</a> <b>Binding:</b> Birth Sex (required): Code for sex assigned at birth
 sex		0..1	code	(USCDI) Sex Extension <b>URL:</b> <a href="http://hl7.org/fhir/us/core/StructureDefinition/us-core-sex">http://hl7.org/fhir/us/core/StructureDefinition/us-core-sex</a> <b>Binding:</b> Sex (required): Concepts limited to Male, Female, Patient Sex Unknown, asked-declined.
 genderIdentity		0..*	CodeableConcept	(USCDI) The individual's gender identity <b>URL:</b> <a href="http://hl7.org/fhir/us/core/StructureDefinition/us-core-genderIdentity">http://hl7.org/fhir/us/core/StructureDefinition/us-core-genderIdentity</a> <b>Binding:</b> Gender Identity (extensible)
 Identifier	<b>S</b>	1..*	Identifier	(USCDI) An identifier for this patient
 system	<b>S</b>	1..1	uri	(USCDI) The namespace for the identifier value
 value	<b>S</b>	1..1	string	(USCDI) The value that is unique within the system.
 name	<b>S C</b>	1..*	HumanName	(USCDI) A name associated with the patient <b>us-core-6:</b> At least name.given and/or name.family are present or, if neither is available, the Data Abs present.

# FHIR Terminology

- Terminologies are the collections of codified concepts used in FHIR.

## 4.3.0.1 External Code systems

URI	Source	Use with HL7 Standards	OID (for non-FHIR systems)
<a href="http://snomed.info/sct">http://snomed.info/sct</a>	SNOMED CT (SNOMED International)	Using SNOMED CT with HL7 Standards See also the SNOMED CT Usage Summary which summarizes the use of SNOMED CT in the base FHIR Specification.	2.16.840.1.113883.6.96
<a href="http://www.nlm.nih.gov/research/umls/rxnorm">http://www.nlm.nih.gov/research/umls/rxnorm</a>	RxNorm (US NLM)	Using RxNorm with HL7 Standards	2.16.840.1.113883.6.88
<a href="http://loinc.org">http://loinc.org</a>	LOINC (LOINC.org)	Using LOINC with HL7 Standards	2.16.840.1.113883.6.1
<a href="https://fhir.infoway-inforoute.ca/CodeSystem/pCLOCD">https://fhir.infoway-inforoute.ca/CodeSystem/pCLOCD</a>	pCLOCD (pCLOCD)	Using pCLOCD with HL7 Standards	2.16.840.1.113883.2.20.5.1
<a href="http://unitsofmeasure.org">http://unitsofmeasure.org</a>	UCUM: (UnitsOfMeasure.org) Case Sensitive Codes	Using UCUM with HL7 Standards	2.16.840.1.113883.6.8
<a href="http://www.ama-assn.org/go/cpt">http://www.ama-assn.org/go/cpt</a>	AMA CPT codes	Using CPT with HL7 Standards	2.16.840.1.113883.6.12
<a href="http://va.gov/terminology/medrt">http://va.gov/terminology/medrt</a>	MED-RT (Medication Reference Terminology)	Using MED-RT with HL7 Standards	2.16.840.1.113883.6.345

## 8.1.3.1 Terminology Bindings

Path	ValueSet	Type	Documentation
Patient.gender	AdministrativeGender	Required	The gender of a person used for administrative purposes.
Patient.maritalStatus	MaritalStatusCodes	Extensible	This value set defines the set of codes that can be used to indicate the marital status of a person.
Patient.contact.relationship	PatientContactRelationship	Extensible	The nature of the relationship between the patient and the contact person.
Patient.contact.gender	AdministrativeGender	Required	The gender of a person used for administrative purposes.
Patient.communication.language	AllLanguages (a valid code from Tags for the Identification of Languages)	Required	This value set includes all possible codes from BCP-47 (see <a href="http://tools.ietf.org/html/bcp47">http://tools.ietf.org/html/bcp47</a> )
	Common Languages	starter	
Patient.link.type	LinkType	Required	The type of link between this Patient resource and another Patient/RelatedPerson resource.

This value set contains 4 concepts

Expansion based on [AdministrativeGender v5.0.0 \(CodeSystem\)](#)

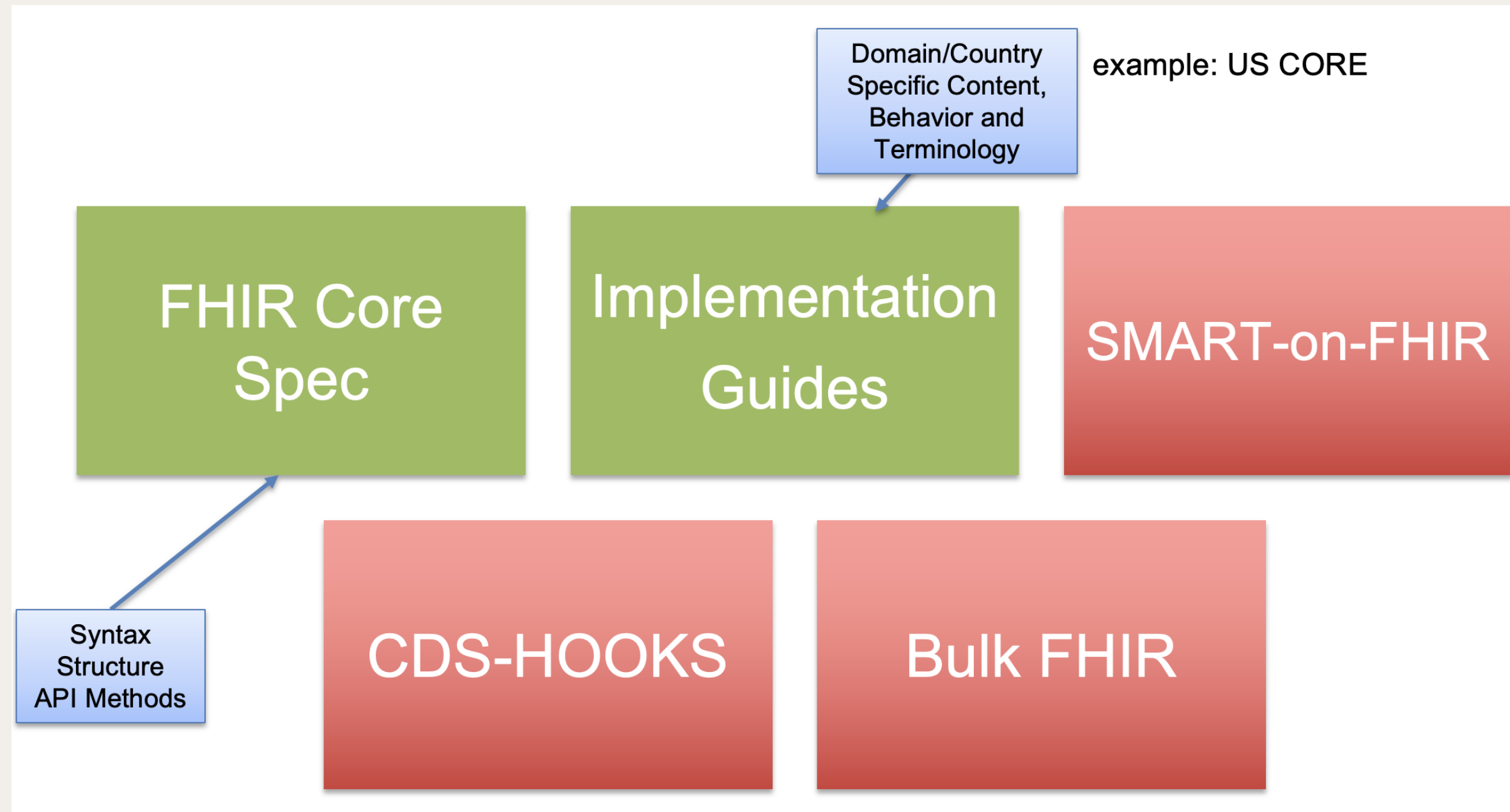
Code	System	Display	Definition	v2 map for AdministrativeGender
male	<a href="http://hl7.org/fhir/administrative-gender">http://hl7.org/fhir/administrative-gender</a>	Male	Male.	~M
female	<a href="http://hl7.org/fhir/administrative-gender">http://hl7.org/fhir/administrative-gender</a>	Female	Female.	~F
other	<a href="http://hl7.org/fhir/administrative-gender">http://hl7.org/fhir/administrative-gender</a>	Other	Other.	>A (Source concept 'other' is broader than target concept 'Ambiguous' because target concept does not include 'Other') >O (Source concept 'other' is broader than target concept 'Other' because target concept does not include 'Ambiguous')
unknown	<a href="http://hl7.org/fhir/administrative-gender">http://hl7.org/fhir/administrative-gender</a>	Unknown	Unknown.	~U

# PART 3 – THE FHIR TOOLBOX

- The FHIR Toolbox: SMART-On-FHIR, CDS-HOOKS, FHIR Bulk, CQL
- Implementation Guides
- US CORE vs US CDI
- Example Scenarios: Payer Data Exchange, Prior Authorization

# The FHIR Toolbox

- More than one standard (FHIR). A standard family, with several tools.

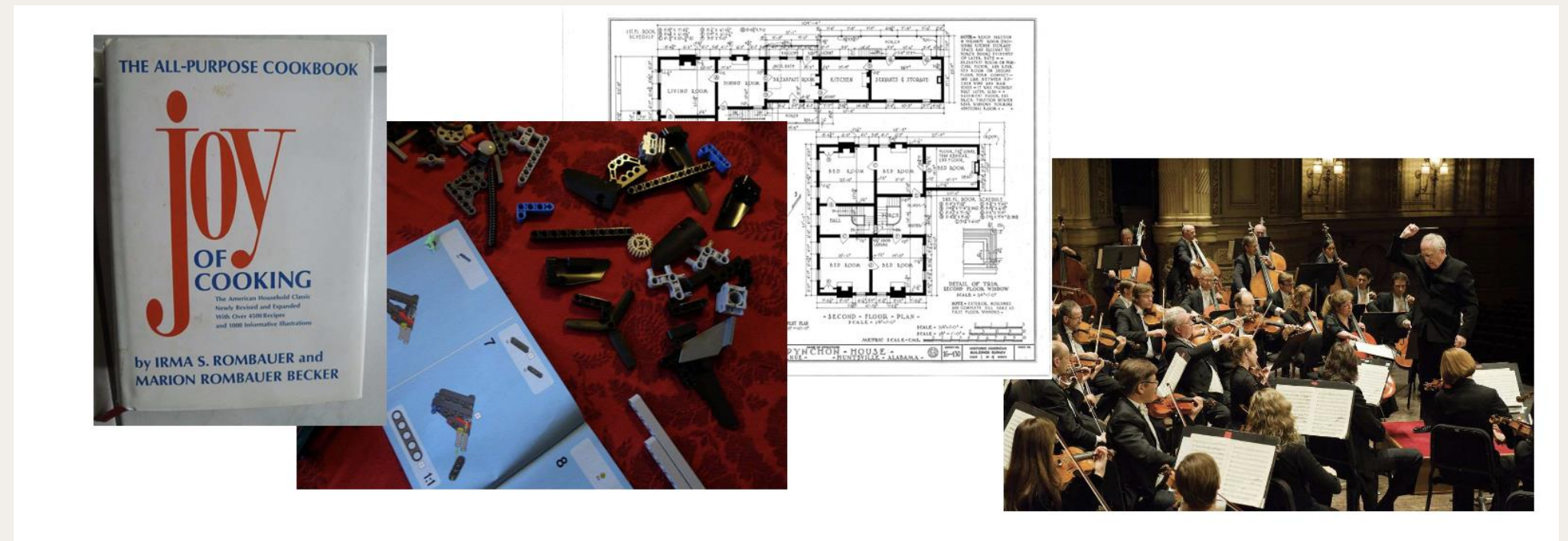


# Why do we need Implementation Guides?

- **What is it?** An implementation guide (IG) is a set of rules about **how FHIR resources are used (or should be used) to solve a particular problem**, with associated documentation to support and clarify the usage. Classically, FHIR implementation guides are published on the web after they are generated using the FHIR Implementation Guide Publisher.

- **Contents**

- Framework/Guidance
- Use Cases and Examples
- FHIR Artifacts
- Conformance Language
- Computable Capability Statement



# From US CDI to US CORE FHIR IG

- **US CDI:** Definitions from ONC on what should be shared
- **FHIR US CORE:** FHIR Implementation Guide defining precisely
  - **Content:** what is the MINIMAL content for the US
  - **Methods:** how can be patients, allergies, etc. searched

<https://hl7.org/fhir/us/core/STU6.1/>

**HL7 International** US Core Implementation Guide 6.1.0 - STU6

Home Conformance Guidance FHIR Artifacts Security Examples Downloads Change Log

Table of Contents > Home

This page is part of the US Core (v6.1.0: STU6 Update) based on FHIR R4. This is the current published version in its permanent home (it will always be available at this URL). For a full list of available versions, see the [Directory of published versions](#). Page versions: **STU6.1** STU6 STU5 STU4 STU3 STU2 STU1

**1 Home**

Official URL: <a href="http://hl7.org/fhir/us/core/ImplementationGuide/hl7.fhir.us.core">http://hl7.org/fhir/us/core/ImplementationGuide/hl7.fhir.us.core</a>	Version: 6.1.0
Active as of 2023-06-19	Computable Name: USCore
Copyright/Legal: Used by permission of HL7 International, all rights reserved Creative Commons License	

**STU Note**  
Key updates and detailed changes between this and prior versions are available on the US Core [Change Log](#) and [Changes Between Versions](#) pages.

**1.1 Introduction**

This guide and the US Core profiles have become the foundation for US Realm FHIR implementation guides. This annual release reflects changes to [U.S. Core Data for Interoperability \(USCDI\) v3](#) and comments and requests from the US Realm FHIR community. (The [Future of US Core](#) page outlines this approach to yearly updates.) US Core has benefitted from testing and guidance by the Argonaut Project Team. Their feedback continues to lay the groundwork for documenting the US Core Profile design, interactions, requirements, and guidelines for patient data access and ONC Certification testing. Under the guidance of HL7 and the HL7 US Realm Steering Committee, the content will expand in future versions to meet the needs specific to the US Realm.

- Introduction
- Background
- How to read this Guide
- US Core Actors
- US Core Profiles
- US Core FHIR RESTful Interactions

USCDI v3 Summary of Data Classes and Data Elements

<b>Allergies and Intolerances</b> <ul style="list-style-type: none"> <li>• Substance (Medication)</li> <li>• Substance (Drug Class)</li> <li>• Reaction</li> </ul>	<b>Health Status/Assessments</b> <ul style="list-style-type: none"> <li>• Health Concerns</li> <li>• Functional Status</li> <li>• Disability Status</li> <li>• Mental/Cognitive Status</li> <li>• Pregnancy Status</li> <li>• Smoking Status</li> </ul>	<b>Problems</b> <ul style="list-style-type: none"> <li>• Problems</li> <li>• SDOH Problems/Health Concerns</li> <li>• Date of Diagnosis</li> <li>• Date of Resolution</li> </ul>
<b>Assessment and Plan of Treatment</b> <ul style="list-style-type: none"> <li>• Assessment and Plan of Treatment</li> <li>• SDOH Assessment</li> </ul>	<b>Immunizations</b> <ul style="list-style-type: none"> <li>• Immunizations</li> </ul>	<b>Procedures</b> <ul style="list-style-type: none"> <li>• Procedures</li> <li>• SDOH Interventions</li> <li>• Reason for Referral</li> </ul>
<b>Care Team Member(s)</b> <ul style="list-style-type: none"> <li>• Care Team Member Name</li> <li>• Care Team Member Identifier</li> <li>• Care Team Member Role</li> <li>• Care Team Member Location</li> <li>• Care Team Member Telecom</li> </ul>	<b>Laboratory</b> <ul style="list-style-type: none"> <li>• Tests</li> <li>• Values/Results</li> <li>• Specimen Type</li> <li>• Result Status</li> </ul>	<b>Provenance</b> <ul style="list-style-type: none"> <li>• Author Organization</li> <li>• Author Time Stamp</li> </ul>
<b>Clinical Notes</b> <ul style="list-style-type: none"> <li>• Consultation Note</li> <li>• Discharge Summary Note</li> <li>• History &amp; Physical</li> <li>• Procedure Note</li> <li>• Progress Note</li> </ul>	<b>Medications</b> <ul style="list-style-type: none"> <li>• Medications</li> <li>• Dose</li> <li>• Dose Unit of Measure</li> <li>• Indication</li> <li>• Fill Status</li> </ul>	<b>Unique Device Identifier(s) for a Patient's Implantable Device(s)</b> <ul style="list-style-type: none"> <li>• Unique Device Identifier(s) for a patient's implantable device(s)</li> </ul>
<b>Clinical Tests</b> <ul style="list-style-type: none"> <li>• Clinical Test</li> <li>• Clinical Test Result/Report</li> </ul>	<b>Patient Demographics/Information</b> <ul style="list-style-type: none"> <li>• First Name</li> <li>• Last Name</li> <li>• Middle Name (Including middle initial)</li> <li>• Name Suffix</li> <li>• Previous Name</li> <li>• Date of Birth</li> <li>• Date of Death</li> <li>• Race</li> <li>• Ethnicity</li> <li>• Tribal Affiliation</li> <li>• Sex</li> <li>• Sexual Orientation</li> <li>• Gender Identity</li> <li>• Preferred Language</li> <li>• Current Address</li> <li>• Previous Address</li> <li>• Phone Number</li> <li>• Phone Number Type</li> <li>• Email Address</li> <li>• Related Person's Name</li> <li>• Related Person's Relationship</li> <li>• Occupation</li> <li>• Occupation Industry</li> </ul>	<b>Vital Signs</b> <ul style="list-style-type: none"> <li>• Systolic Blood Pressure</li> <li>• Diastolic Blood Pressure</li> <li>• Heart Rate</li> <li>• Respiratory Rate</li> <li>• Body Temperature</li> <li>• Body Height</li> <li>• Body Weight</li> <li>• Pulse Oximetry</li> <li>• Inhaled Oxygen Concentration</li> <li>• BMI Percentile (2 - 20 years)</li> <li>• Weight-for-length Percentile (Birth - 24 Months)</li> <li>• Head Occipital-frontal Circumference Percentile (Birth- 36 Months)</li> </ul>
<b>Diagnostic Imaging</b> <ul style="list-style-type: none"> <li>• Diagnostic Imaging Test</li> <li>• Diagnostic Imaging Report</li> </ul>		
<b>Encounter Information</b> <ul style="list-style-type: none"> <li>• Encounter Type</li> <li>• Encounter Diagnosis</li> <li>• Encounter Time</li> <li>• Encounter Location</li> <li>• Encounter Disposition</li> </ul>		
<b>Goals</b> <ul style="list-style-type: none"> <li>• Patient Goals</li> <li>• SDOH Goals</li> </ul>		
<b>Health Insurance Information</b> <ul style="list-style-type: none"> <li>• Coverage Status</li> <li>• Coverage Type</li> <li>• Relationship to Subscriber</li> <li>• Member Identifier</li> <li>• Subscriber Identifier</li> <li>• Group Number</li> <li>• Payer Identifier</li> </ul>		

US CDI V3: <https://www.healthit.gov/isa/sites/isa/files/2022-10/USCDI-Version-3-October-2022-Errata-Final.pdf>



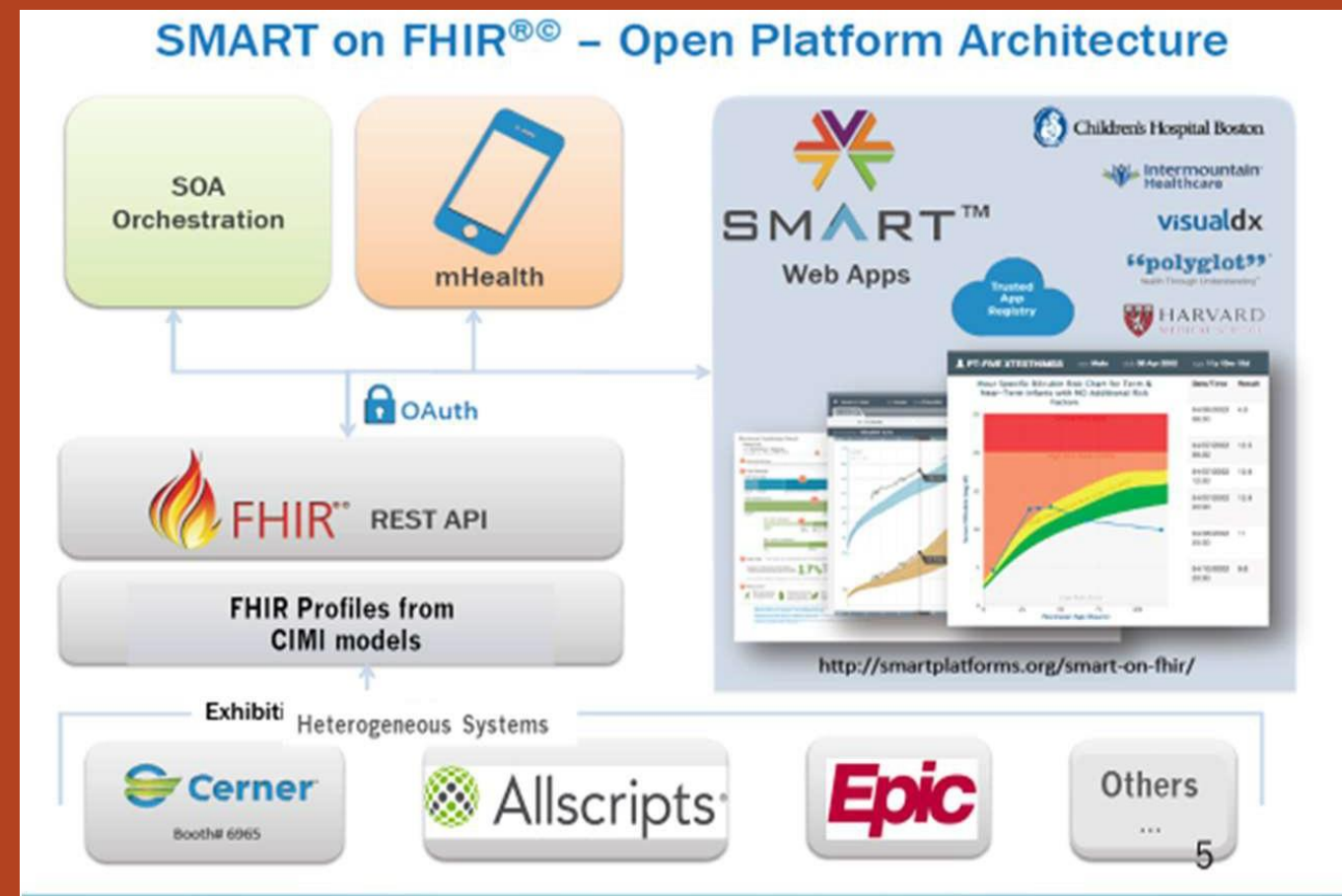


# SMART-on-FHIR

- Authorization/Authentication: Scopes: what can I read and/or write.
- Launch your special app 'inside' or 'outside' of the HER.
- For mobile apps, too.
- Patients and Practitioners apps have their own rules of engagement (user vs patient).

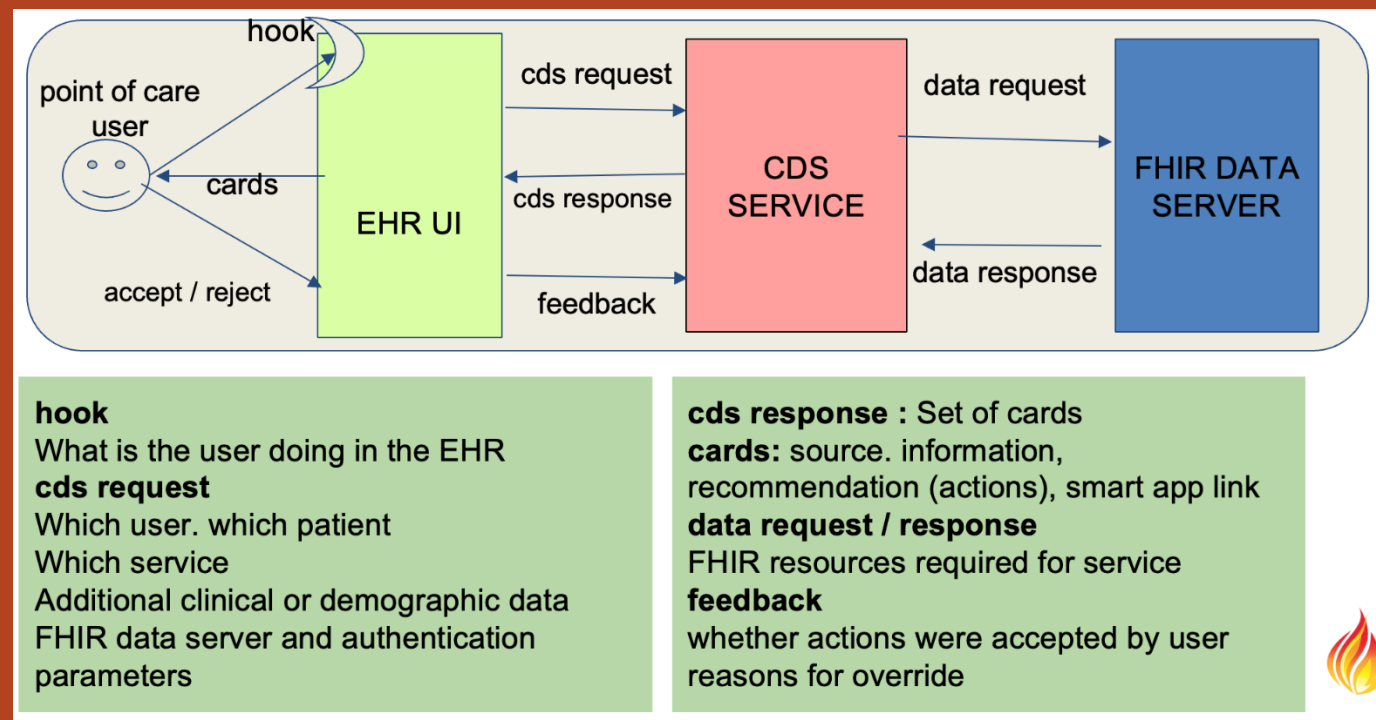
## Reference:

- <https://pubmed.ncbi.nlm.nih.gov/34486675/>



# CDS HOOKS

- Remote Clinical Decision Support.
- EHR asks for advice given the context (hook), patient demographics, other required data in the form of FHIR Resources/Access.
- CDS system answers with a series of advices represented by cards.
- EHR can give feedback on the cards.
- Cards may lead to open a link, or actions inside of an EHR (example: cancel, update an order).
- Security is handled.



# BULK-FHIR

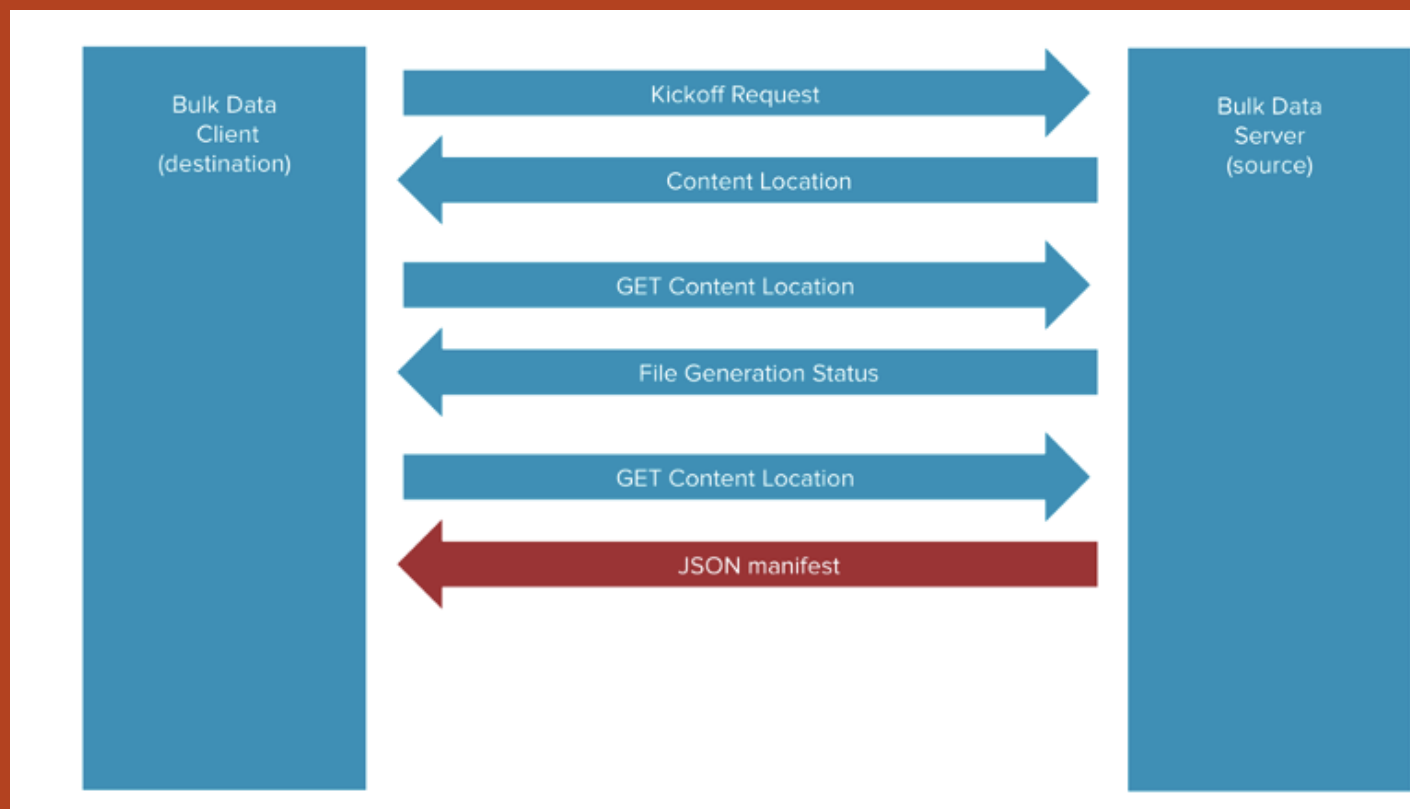
- When you need hundreds of thousands or several million resources for Public Health, Quality Reporting or Research.

- RESTful Synchronic API is too slow (it's prepared to work for a few hundreds resources at a time).

- Bulk FHIR provides an ASYNCHRONIC API and a lean format (ndjson).

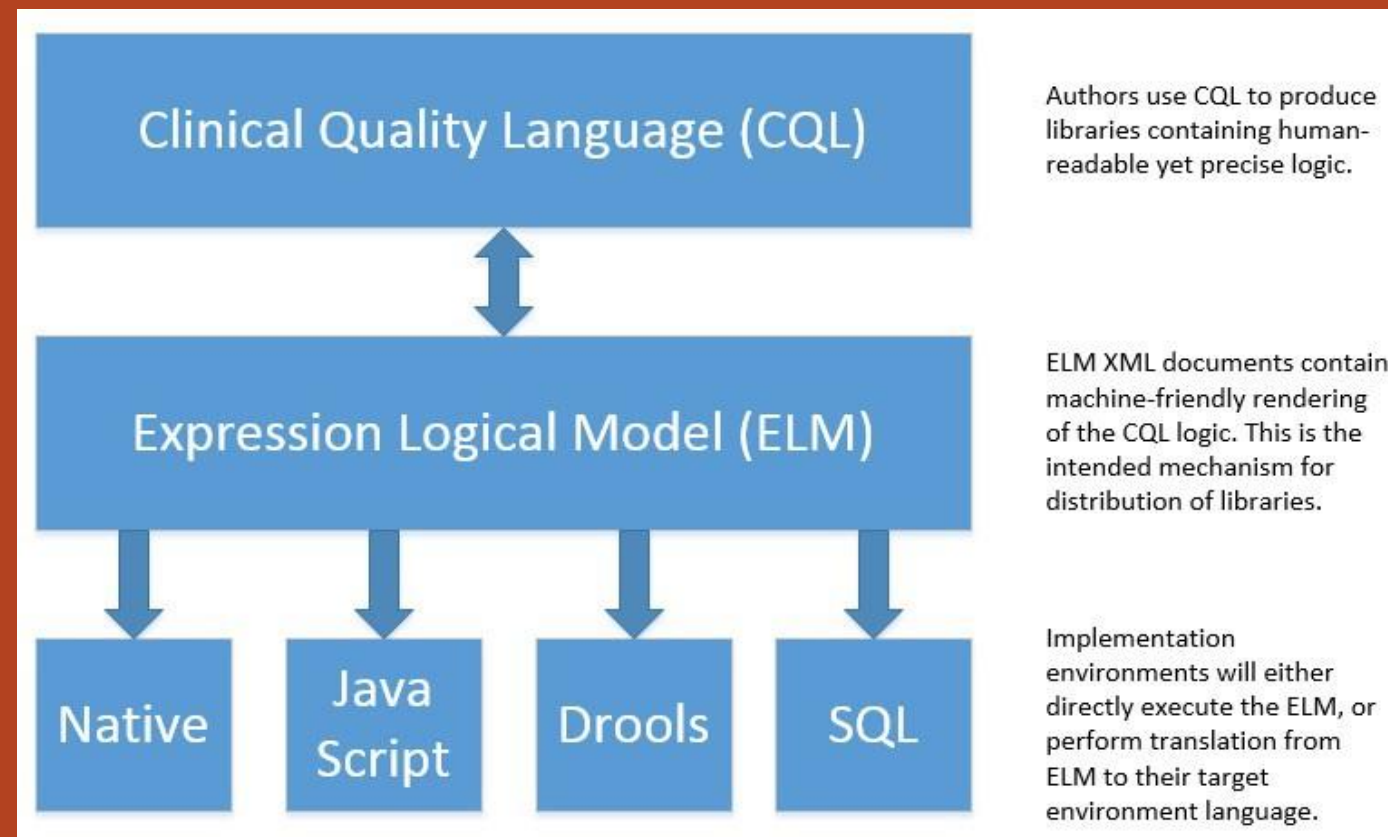
- Same resources, different goal and transport.

- Robust authentication/authorization.



# Clinical Quality Language

- High-level, domain-specific language focused on clinical quality and targeted at **measure and decision support** artifact authors.
- Good for representing the data needed from the EHR, and the logic to apply, to calculate numerator and denominator for population quality measures.
- Identify individual conditions or gaps in care.



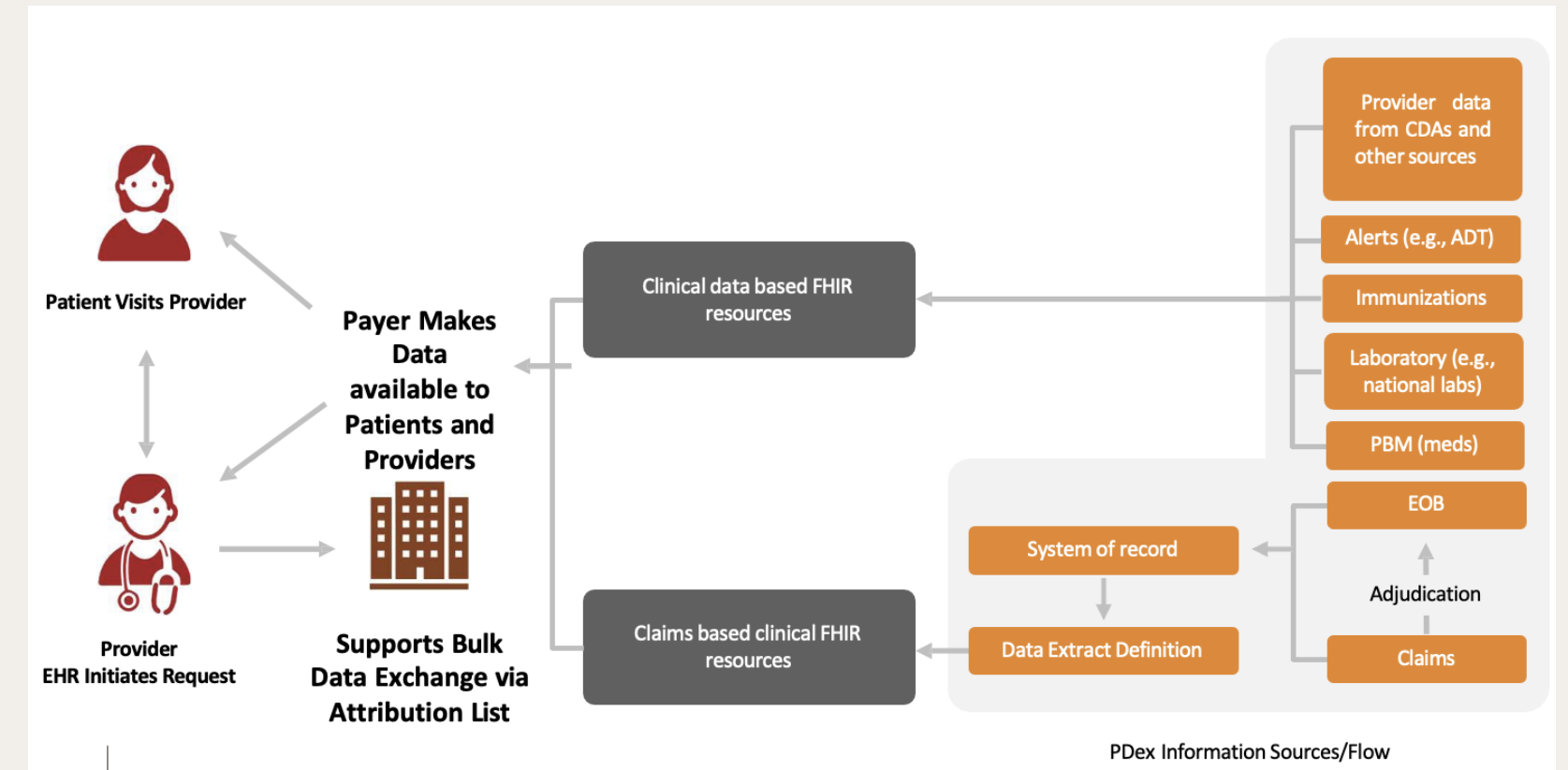
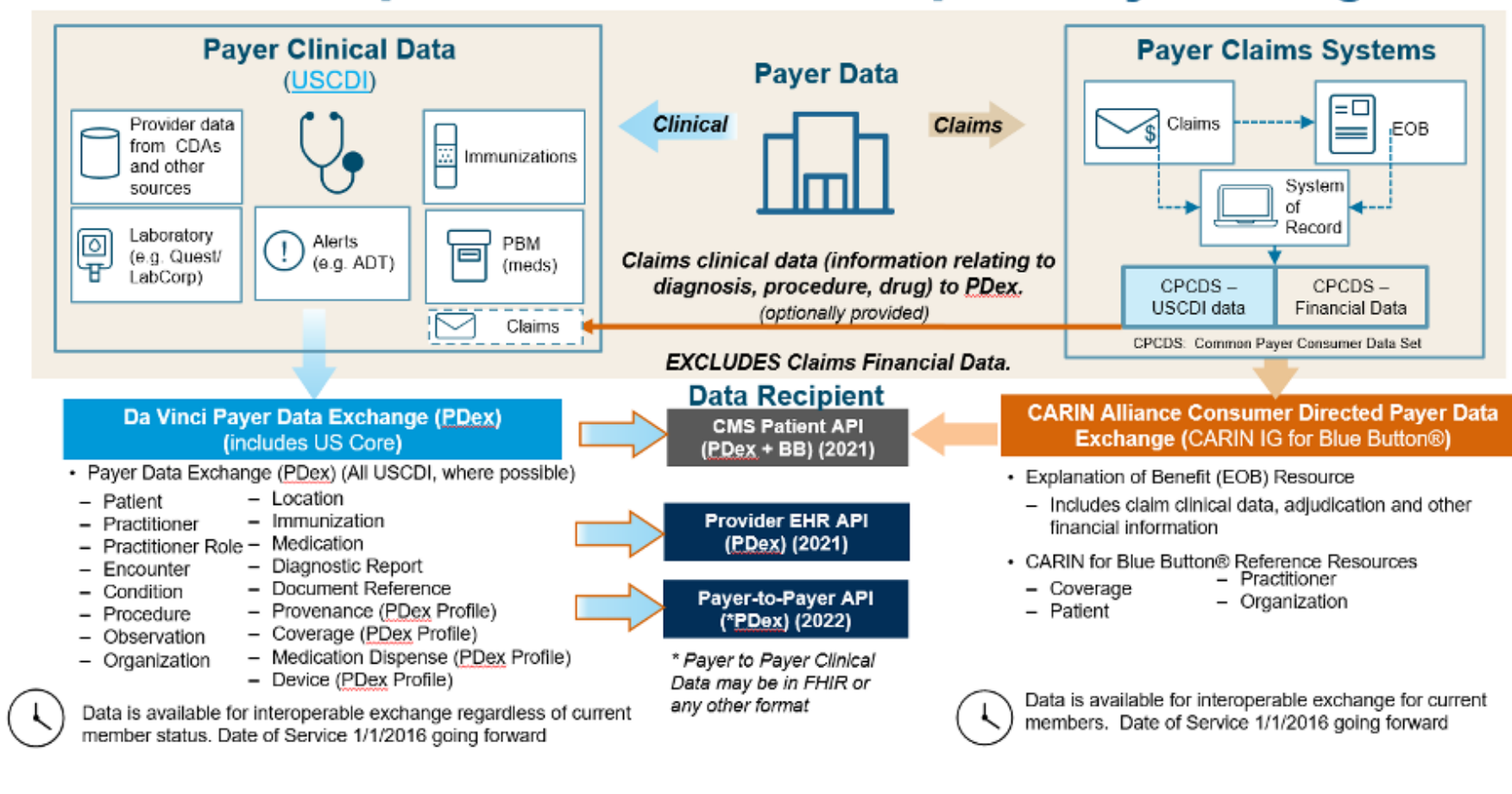
Reference:

<https://cql.hl7.org/index.html>

# Example Scenario (1): Da Vinci PDEX

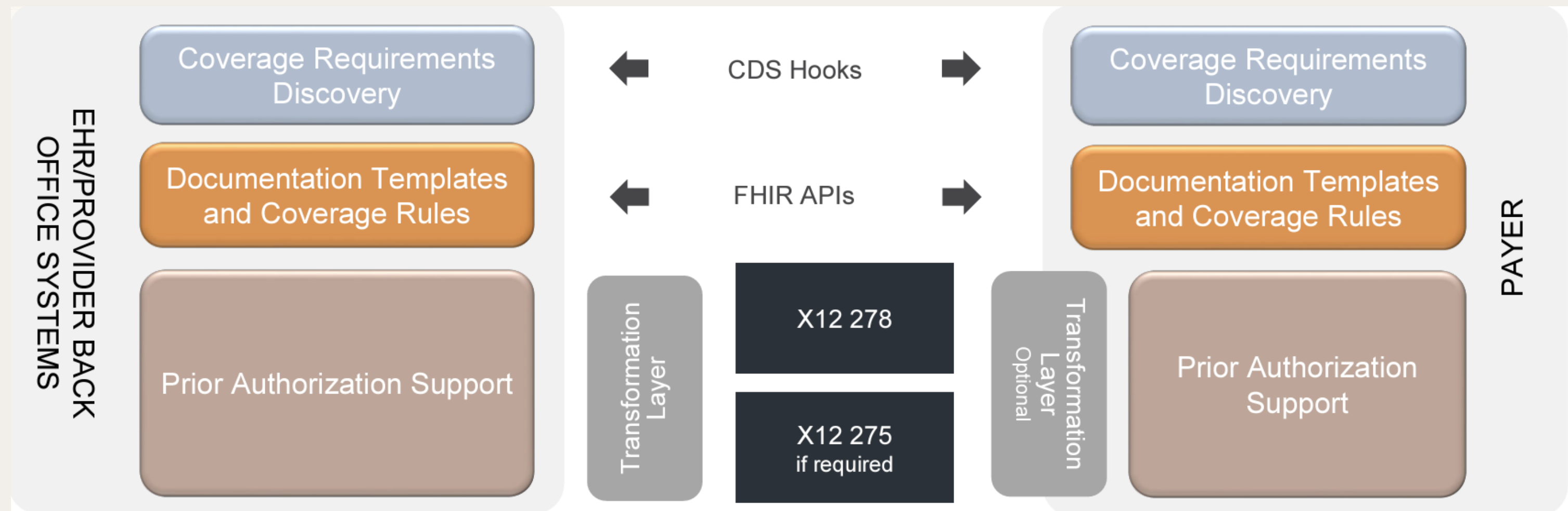
- Da Vinci PDEX (Payer Data Exchange)

## Data Associated with Payers Meeting the Administrative / Financial and Clinical Requirements of the Interoperability Exchange



# Example Scenario (2): Prior Authorization

- Uses all the FHIR Product Family: FHIR, US Core, CDS Hooks, Smart-on-FHIR, CQL!



# FHIR Timeline and Federal Regulations

## ***CMS Interoperability and Prior Authorization*** Final Rule.

- Released January 17, 2024.
- Demonstrates CMS' continued commitment to increasing efficiency by *ensuring that health information is readily available* to providers by leveraging Health Level 7® (HL7®) Fast Healthcare Interoperability Resources® (FHIR®) standards.
- **In response to stakeholder comments on the proposed rule, impacted payers have until at least January 1, 2027, to meet the application programming interface (API) development and enhancement requirements.**

The final rule will reduce patient, provider, and payer burden by *streamlining prior authorization processes and moving the industry toward electronic prior authorization.*

# FHIR Timeline and Federal Regulations

- Required APIs

Standards	Patient Access API	Provider Access API	Provider Directory API	Payer-To-Payer API	Prior Authorization API
USCDI, at 45 CFR 170.213	✓	✓	N/A	✓	N/A
FHIR Release 4.0.1	✓	✓	✓	✓	✓
HL7 FHIR US Core IG STU 3.1.1	✓	✓	✓	✓	✓
HL7 SMART App Launch Framework IG 1.0.0	✓	✓	✗	✗	✓
HL7 FHIR Bulk Data Access IG v 1.0.0 STU 1	✗	✓	✗	✓	✗
OpenID Connect Core 1.0	✓	✗	✗	✗	✗



# FHIR Timeline and Federal Regulations

- Recommended APIs

Implementation Guide	Patient Access API	Provider Access API	Provider Directory API	Payer-To-Payer API	Prior Authorization API
CARIN for Blue Button IG Version STU 2.0.0	✓	✓	✗	✓	✗
FHIR SMART App Launch IG Release 2.0.0 to support Backend Services Authorization	✗	✓	✗	✓	✗
Da Vinci PDex IG Version STU 2.0.0	✓	✓	✗	✓	✗
Da Vinci PDex U.S. Drug Formulary IG Version STU 2.0.1	✓	✗	✗	✗	✗
Da Vinci PDex Plan Net IG Version STU 1.1.0	✗	✗	✓	✗	✗
Da Vinci Coverage Requirements Discovery (CRD) IG Version STU 2.0.1	✗	✗	✗	✗	✓
Da Vinci Documentation Templates/Rules (DTR) IG Version STU 2.0.0	✗	✗	✗	✗	✓
Da Vinci Prior Authorization Support (PAS) IG Version STU 2.0.1	✗	✗	✗	✗	✓

Note: The Patient Access and Provider Directory API were finalized in the CMS *Interoperability and Patient Access* final rule.

# Questions?

# Thank You!

Join us for our next session:

**HL7 Standards Lifecycle | April 9 from 3-4pm ET**

Registration Link: [https://civitasforhealth-org.zoom.us/webinar/register/WN\\_LB5\\_Quw3RkaTxPF5N9JmkA](https://civitasforhealth-org.zoom.us/webinar/register/WN_LB5_Quw3RkaTxPF5N9JmkA)

