Digital Square Webinar: FHIR 101 & FHIR in Action

May 28, 2020

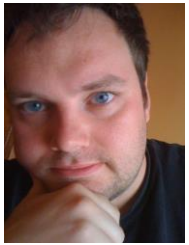
Agenda

- Welcome, Announcements, Introductions - Carl Fourie (5 min)
- FHIR 101: Overview of FHIR - Carl Leitner (20 min)
- FHIR in action: OpenELIS - OpenMRS lab data exchange use case; what we did, what we found, demo - Casey liams-Hauser & Christina White (20 min)
- Q&A (15 min)

Introductions

Carl Leitner, Technical Director, Digital Square at PATH. Carl Leitner, PhD, brings more than 15 years of experience in informatics, information technology, software development, and education, including more than eight years designing and adapting open-source interoperable digital health systems in low-and middle-income countries.

Christina White, MS, Senior Digital Health Specialist at Digital Initiatives Group (DIGI) at I-TECH, University of Washington. Technical project manager for Haiti healthcare information systems (HIS). 13+ years in design, development, and management of HIS implementations both global and domestic.



Casey liams-Hauser, Senior Digital Health Specialist at Digital Initiatives Group at I-TECH, University of Washington. Product owner for OpenELIS Global, 10+ years of experience leading open-source laboratory, medical records, and mobile health systems in resource limited settings. caseyi@uw.edu

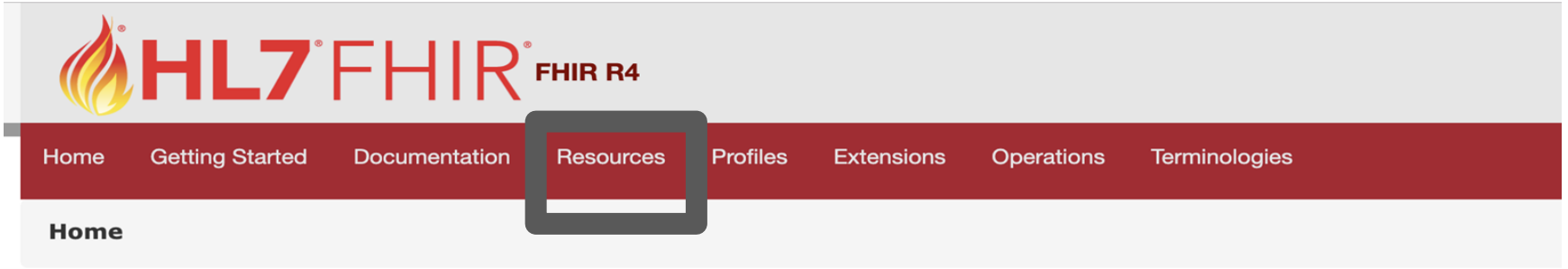
FHIR Overview

The Name

- F Fast (to model and to implement)
- H Health (why we're here)
- I Interoperability (ditto)
- R Resources (the core data models)

stolen from James A / cats added

Navigating FHIR http://hl7.org/fhir



FHIR Resources http://hl7.org/fhir/resourcelist.html

1.2 Resource Index

FHIR Infrastructure Work Group	Maturity Level: N/A	Standards Status: Informative

This page is provided to help find resources quickly. There is also a more detailed classification, ontology, and description. For background to the layout on the layers in this page, see the Architect's Overview. See also the abstract Base Resources Resource and DomainResource.

Categorized | Alphabetical | R2 Layout | By Maturity | Security Category | By Standards Status | By Committee

Foundation

Conformance	Terminology	Security	Documents	Other
• CapabilityStatement N	• CodeSystem N	• Provenance 3	• Composition 2	• Basic 1
• StructureDefinition N	• ValueSet N	• AuditEvent 3	• DocumentManifest 2	• Binary N
• ImplementationGuide 1	• ConceptMap 3	• Consent 2	• DocumentReference 3	• Bundle N
• SearchParameter 3	• NamingSystem 1		• CatalogEntry 0	• Linkage 0
• MessageDefinition 1	• TerminologyCapabilities 0			• MessageHeader 4
• OperationDefinition N				• OperationOutcome N
• CompartmentDefinition 1				• Parameters N
• StructureMap 2				• Subscription 3
• GraphDefinition 1				
• ExampleScenario 0				

Base

Individuals	Entities #1	Entities #2	Workflow	Management
• Patient N	• Organization 3	• Substance 2	• Task 2	• Encounter 2
• Practitioner 3	• OrganizationAffiliation 0	• BiologicallyDerivedProduct 0	• Appointment 3	• EpisodeOfCare 2
• PractitionerRole 2	• HealthcareService 2	• Device 2	• AppointmentResponse 3	• Flag 1
• RelatedPerson 2	• Endpoint 2	• DeviceMetric 1	• Schedule 3	• List 1
• Person 2	• Location 3		• Slot 3	• Library 2

FHIR API

http://hl7.org/fhir/http.html

3.1.0 RESTful API

FHIR is described as a 'RESTful' specification based on common industry level use of the term REST. In practice, FHIR only supports Level 2 of the REST Maturity model as part of the core specification, though full Level 3 conformance is possible through the use of extensions. Because FHIR is a standard, it relies on the standardization of resource structures and interfaces. This may be considered a violation of REST principles but is key to ensuring consistent interoperability across diverse systems.

Each "resource type" has the same set of interactions defined that can be used to manage the resources in a highly granular fashion. Applications claiming conformance to this framework claim to be conformant to "RESTful FHIR" (see Conformance).

Instance Level Interactions	
read	Read the current state of the resource
vread	Read the state of a specific version of the resource
update	Update an existing resource by its id (or create it if it is new)
patch	Update an existing resource by posting a set of changes to it
delete	Delete a resource
history	Retrieve the change history for a particular resource
Type Level Interactions	
create	Create a new resource with a server assigned id
search	Search the resource type based on some filter criteria
history	Retrieve the change history for a particular resource type
Whole System Interactions	
capabilities	Get a capability statement for the system
batch/transaction	Update, create or delete a set of resources in a single interaction
history	Retrieve the change history for all resources
search	Search across all resource types based on some filter criteria

FHIR Patient Resource

Structure

Name	Flags	Card.	Type	Description & Constraints
Patient	N		DomainResource	Information about an individual or animal receiving Elements defined in Ancestors: id, meta, implicitRu
identifier	Σ	0..*	Identifier	An identifier for this patient
active	?! Σ	0..1	boolean	Whether this patient's record is in active use
name	Σ	0..*	HumanName	A name associated with the patient
telecom	Σ	0..*	ContactPoint	A contact detail for the individual
gender	Σ	0..1	code	male | female | other | unknown AdministrativeGender (Required)
birthDate	Σ	0..1	date	The date of birth for the individual
deceased[x]	?! Σ	0..1		Indicates if the individual is deceased or not
deceasedBoolean			boolean	
deceasedDateTime			dateTime	
address	Σ	0..*	Address	An address for the individual
maritalStatus		0..1	CodeableConcept	Marital (civil) status of a patient MaritalStatus (Extensible)
multipleBirth[x]		0..1		Whether patient is part of a multiple birth
multipleBirthBoolean			boolean	
multipleBirthInteger			integer	

Elements in the model

Structure

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Data Types

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Vocabulary Binding

ValueSet

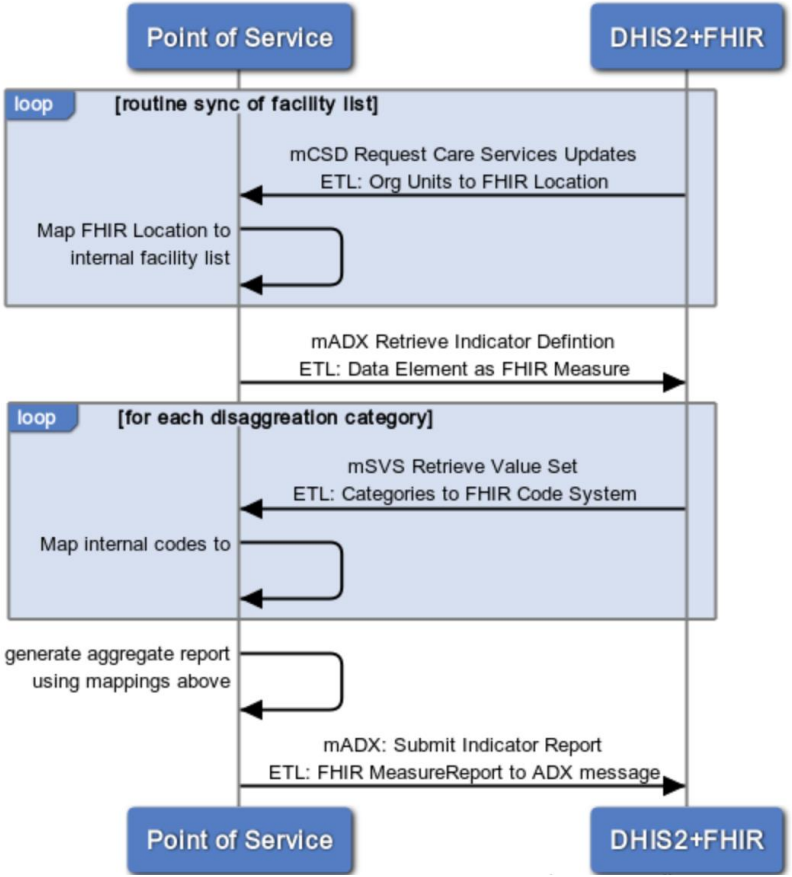
Strength

Some Key Resources: Clinical

- **Patient:** An individual receiving healthcare services
- **Practitioner:** An individual delivering healthcare services
- **Condition**: A statement about a condition for a patient
- **Observation**: An observed “thing” about a Patient, e.g. lab test, measurement, qualitative assessment
- **Immunization**: A statement about the administration or non-administration of an immunization
- **MedicationRequest**: An order for meds
- **MedicationStatement**: A statement (list) of current or discharge meds
- **Questionnaire / QuestionnaireResponse:** Electronic “forms”

HL7 FHIR Data Model and Clinical Care Workflow

Aggregate Reporting Workflow (mADX)

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    "id" : "12345-example"
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        "end": "2018-01-31"
    },
    "group": [
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                    {
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                            },
                            {
                                "code": {"coding": [{"code": "SEX"}]},
                                "value": {"coding": [{"code": "F"}]}
                            }
                        ]
                    }
                ]
            ]
        }
    ]
}
```

HL7 FHIR Adoption in Global Goods

- OpenMRS: Sync 2.0 module enables two-way synchronization between OpenMRS and FHIR Server for the key FHIR resources (e.g. Observation, Practitioner, Patient, Observation).
- DHIS2 Tracker: DHIS2 FHIR adapter has mapping rules to FHIR resources. Rules need to be defined for each Tracker Program implementation.
- openIMIS: Transitioning to FHIR backend for health insurance claims, beneficiary enrollment.
- OpenLMIS Support synchronization of facility lists with mCSD. Defining stock related indicators using mADX (planned).
- GOFR: Multiply facility lists can be cross-referenced reconciled, and mapped to each other. Uses mCSD.
- Instant OpenHIE: Reference implementation of OpenHIE components pre-configured for FHIR profile and with FHIR warehouses interoperability designed for multiple deployment scenarios (starting).
- iHRIS: Exports facility and health worker lists with mCSD. Moving to FHIR backend data store.
- DHIS2 Aggregate: OrgUnit hierarchy mapped to FHIR Location (mCSD), DataElements represented as FHIR Measure (mADX), CategoryOptions represented as FHIR ValueSets (SVCM) for disaggregation (in early planning phases)
- mHero: Two-way communication system with health workers. Supports mACM profile for one-way alerts and reporting data collected as FHIR Questionnaire. Updating to mCSD (starting).
- OCL: A terminology service that is currently working on adding support for SVCM profile.

FHIR with OpenELIS and OpenMRS

OpenELIS / OpenMRS FHIR-based workflow

- The Digital Initiatives Group (DIGI) at University of Washington has led a project working with the OpenHIE LIS Community of Practice, the OpenMRS FHIR Squad, and the HL7 FHIR Working Group to address the need for a standards-based protocol for lab test ordering and results reporting between EMRs and LIS in resource limited settings.
- DIGI used OpenELIS and OpenMRS to architect, specify, and build a FHIR-based workflow using a pull architecture designed for operating under limited infrastructure. The link was developed using FHIR R4 resources, and is implemented using HAPI-FHIR tooling and a newly developed OpenMRS FHIR2 module
- This work will be piloted in the Haiti national OpenMRS scale up and in the national OpenELIS implementation in Cote d'Ivoire.

Demo

Future of OE-OMRS Lab Integration

Next steps:

- Finalize 1.0 FHIR module
- More Testing Testing Testing and piloting in Haiti
- Default test catalog in OE
- Subscriptions support (OE/OMRS)
- Improve systems identification (for supporting multiple systems)

Other uses of our work:

- Microfrontends in OMRS is using the FHIR module for lab information visualizations (among others)
- OE code will be used as a basis for data warehouse for OE network of implementations in Cote d'Ivoire

Resources

- Demo: https://youtu.be/HiudYTi-JBg
- Tutorial: https://wiki.openmrs.org/display/projects/OpenMRS-OpenELIS+Lab+Communication+Tutorial
- Communication overview and implementation guide: https://wiki.openmrs.org/display/projects/Lab+Integration+Workflow
- OpenMRS FHIR Module wiki: https://wiki.openmrs.org/display/projects/OpenMRS+FHIR+Module

Q&A

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Thank you!