



Open**HIE**



Sharing Data to Improve Health Outcomes - OpenHIM, OpenHIE and FHIR for Health Financing

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The Challenge

Health professionals need **accurate, timely and complete information** for decision-making.

The Reality

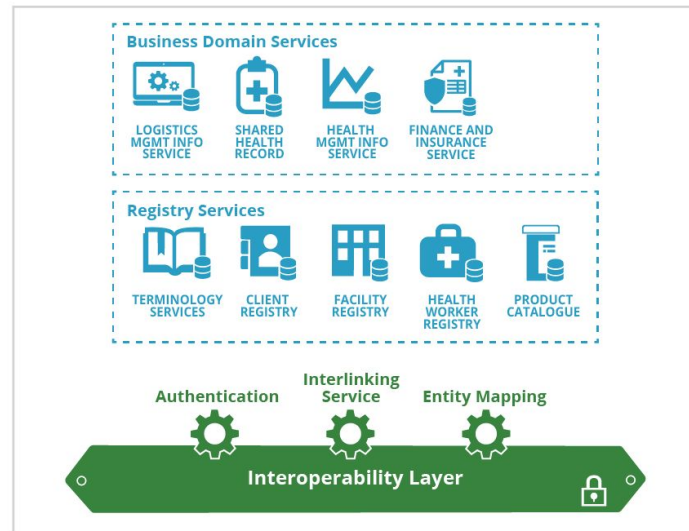
Healthcare information solutions are often **siloed**, making it **difficult to share information** across different systems, different facilities and different locations.

OpenHIE Overview

Global Mission-Driven Community of Practice dedicated to improving the health of the underserved through open and collaborative networks, and the development and support of country-driven health information sharing architectures.

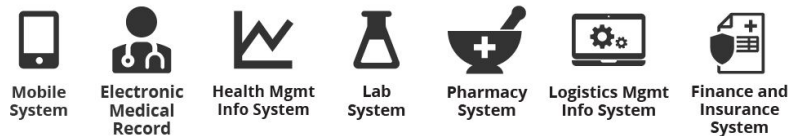


OpenHIE
Component Layer



Interoperability
Services Layer

Point of Service



Mobile System

Electronic Medical Record

Health Mgmt Info System

Lab System

Pharmacy System

Logistics Mgmt Info System

Finance and Insurance System

OpenHIE Value Proposition



Standards-based

Leverages international interoperability specifications that facilitate data sharing between systems to make relevant data accessible at point of care.



Implementable

Standard workflows can be extended to meet the contextual needs of specific health programs, and workflow extensions can be incorporated and used by others.

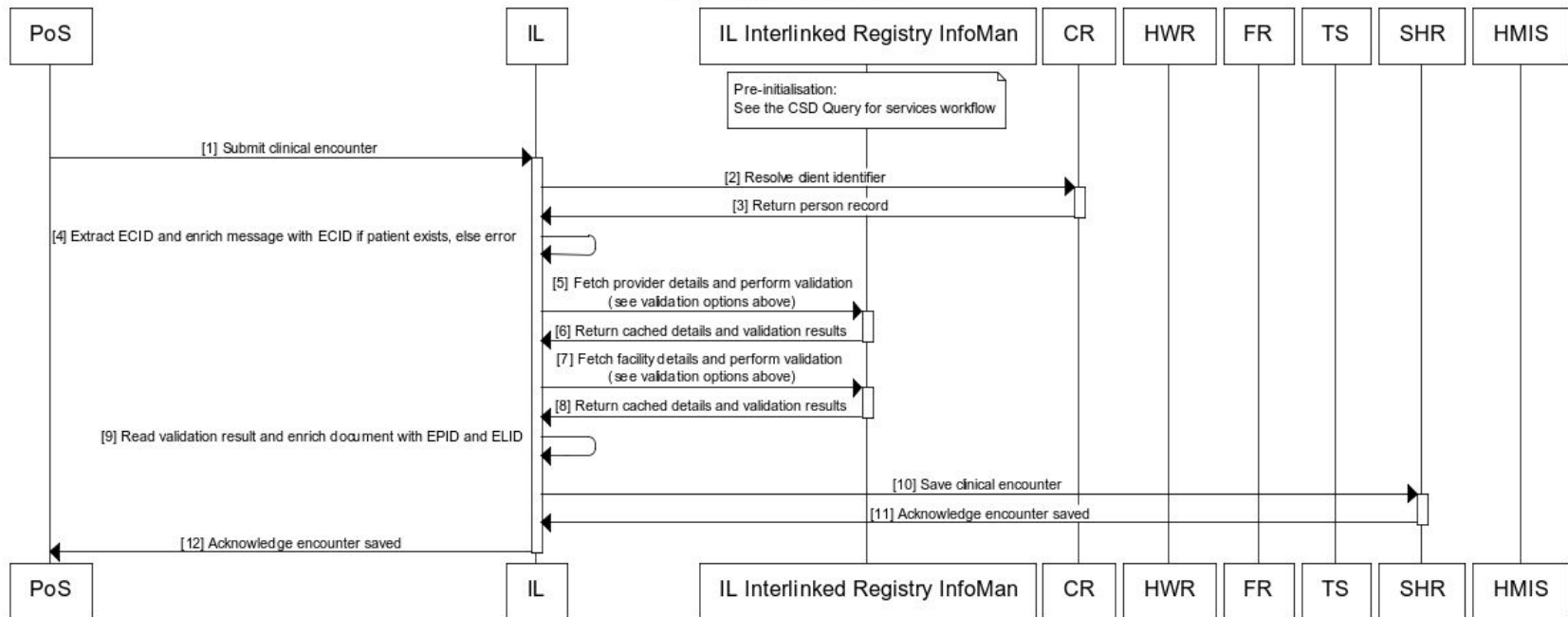


Interchangeable

Diverse software component ecosystem allows different software products to be selected and swapped out to best fit the needs of evolving health programs.

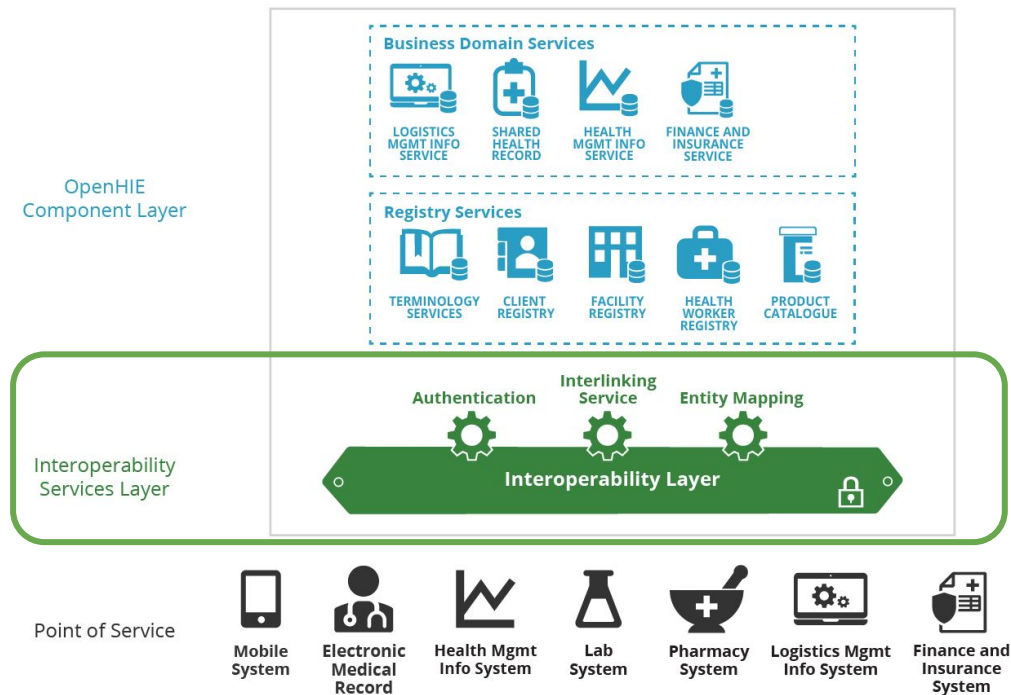
OpenHIE Workflows

Save Clinical Encounter



OpenHIE Interoperability Layer

- Single point of entry in a health information exchange (HIE).
- Manages security of the HIE.
- Routing of messages.
- Central logging mechanism.
- Rerunning of failed transactions at a central level.



Overview



- Functions as the Interoperability Layer in the OpenHIE architecture.
- **Open-source** application that **acts as an interface into the HIE** reference architecture.
- Allows other components to interoperate more easily:
 - Handles **common functions** (security, auditing, logging).
 - **Single point** of communication.
 - Message **transformation and orchestration** via mediators.

Key Features

Security

- Ensures transmission of data comes from valid sources, control over which health system data can be exchanged between entities.

Communication

- **Transformation** - Supports transformation of messages to broker communication between systems.
- **Orchestration** - Allows data to move between components of a health architecture.

Support

- Notification and resolution of issues - Configurable reports, email/SMS notifications.

Transactions Log (Filters Applied)

The screenshot displays the Transactions Log interface. At the top, there are tabs for 'Filter Settings' and 'List Settings'. Below this is a 'Toggle Advanced Filters' section. The 'Basic Filters' section includes dropdowns for 'Status' (set to 'Don't filter'), 'Channel' (set to 'Don't filter'), 'Date Range' (from 'start date' to 'end date'), 'Limit' (set to '100'), and 'Show Results' (set to 'Don't filter'). There are also buttons for 'Apply Defaults', 'Set As Default', and 'Clear Filters'. Below the filters is an 'Auto-Update Transaction List' section with 'Enabled' and 'Disabled' buttons. The main part of the interface is a table with columns: #, HTTP Method, Host, Port, Path, Request Params, Channel, Client, Status, and Request Time. The table contains 12 rows of transaction data. Below the table is an 'Edit a channel' dialog box with tabs for 'Basic Info', 'Request Matching', 'Routes', 'Data Control', 'User Access', 'Alerts', and 'Logs'. The 'Routes' tab is active, showing a 'Set Route' dialog box. The 'Set Route' dialog box has fields for 'Route Name' (HMIS), 'Route Type' (HTTP, TCP, MLP), 'Route Secured' (Yes, No), 'Host certificate authority' (Use default CA), 'Host' (hmis.dermo.org), 'Port' (443), 'Route Path' (app), and 'Route Path Transform' (sFromIdg). There are also fields for 'Basic Authentication Username' and 'Basic Authentication Password', and a 'Forward existing Authorization header' section with 'Yes' and 'No' buttons. The dialog box has 'Cancel' and 'Set Route' buttons.

#	HTTP Method	Host	Port	Path	Request Params	Channel	Client	Status	Request Time
1	GET	openhim_hsp		/api/rlt/Claim/1		IMISNeqal	imis	Failed	2019-12-05 09:22:40 +0200
2	POST	openhim_hsp		/api/rlt/Patient/1		IMISDemo	imis	Failed	2019-12-05 09:19:20 +0200
3	POST	openhim_hsp		/api/rlt/Claim/		IMISNeqal	imis	Completed	2019-12-04 10:06:57 +0200
4	POST	openhim_hsp		/api/rlt/Claim/		IMISNeqal	imis	Completed	2019-12-04 10:06:15 +0200
5	POST	openhim_hsp		/api/rlt/Claim/		IMISNeqal	imis	Completed	2019-12-04 10:06:07 +0200
6	POST	openhim_hsp		/api/rlt/Claim/		IMISNeqal	imis	Completed	2019-12-03 12:03:36 +0200
7	GET	openhim_hsp		/api/rlt/Claim/		IMISNeqal	imis	Failed	2019-12-03 11:45:06 +0200
8	GET	openhim_hsp		/api/rlt/Claim/					
9	GET	openhim_hsp		/api/rlt/Claim/					
10	GET	openhim_hsp		/api/rlt/Claim/					
11	GET	openhim_hsp		/api/rlt/Claim/					
12	GET	openhim_hsp		/api/rlt/Claim/					

A Lock for your HIE

The OpenHIM acts as a lock by supporting the IHE ATNA profile:

Audit Trail (AT)

Includes an Audit Repository which allows systems to audit their actions.

Node Authentication (NA)

Includes easy TLS certificate management capabilities to keep your HIE secure and even allows you to generate your own self-signed certificates.

Audit Repository



Admin Console

- Dashboard
- Transaction log
- Audit log**
- Clients
- Channels
- Tasks
- Visualizer
- Contact Lists
- Mediators
- Users
- Certificates
- Export/Import

Audit Log

Filter Settings List Settings

Toggle Advanced Filters

Filter by Patient:

Patient ID:

Assigning Authority:

Assigning Authority ID:

Basic Filters:

Date Range: to

#	Event Action / Outcome	Event Type	Event ID	Source ID
1	Read (R) / Success (0)	ITI-41 (IHE Transactions) - Provide and Register Document Set-b	110106 (DCM) - Export	openhim
2	Execute (E) / Success (0)	ITI-9 (IHE Transactions) - PIX Query	110112 (DCM) - Query	openhim
3	Execute (E) / Success (0)	ITI-9 (IHE Transactions) - PIX Query	110112 (DCM) - Query	openhim
4	Create (C) / Success (0)	ITI-8 (IHE Transactions) - Patient Identity Feed	110110 (DCM) - Patient Record	openhim
5	Execute (E) / Minor Failure (4)	ITI-9 (IHE Transactions) - PIX Query	110112 (DCM) - Query	openhim
6	Execute (E) / Minor Failure (4)	ITI-9 (IHE Transactions) - PIX Query	110112 (DCM) - Query	openhim
7	Create (C) / Success (0)	ITI-41 (IHE Transactions) - Provide and Register Document Set-b	110107 (DCM) - Import	openhim
8	Execute (E) / Minor Failure (4)	ITI-9 (IHE Transactions) - PIX Query	110112 (DCM) - Query	openhim
9	Execute (E) / Minor Failure (4)	ITI-9 (IHE Transactions) - PIX Query	110112 (DCM) - Query	openhim
10	Create (C) / Success (0)	ITI-41 (IHE Transactions) - Provide and Register Document Set-b	110107 (DCM) - Import	openhim

Load 10 more results



Admin Console

root@openhim.org

- Dashboard
- Transaction log
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Audit #5555ef0b9b9d892d17e28926

View Raw Audit Message

Event

Event Time: 2015-05-15 15:05:15 +0200

Event Action / Outcome: Create (C) / Success (0)

Event Type: ITI-8 (IHE Transactions) - Patient Identity Feed

Event ID: 110110 (Patient Record) - DCM

Audit Source

Audit Source ID: openhim

Active Participant

#1 User ID: openhim-mediator-ohie-xdsjopenhim, Alt. User ID: 8469, Is Requestor: true, Network Access Point: 127.0.1.1

Role ID: 110153 (DCM) - Source

#2 User ID: pix|pix, Alt. User ID: 2100, Is Requestor: false, Network Access Point: localhost, Role ID: 110152 (DCM) - Destination

Participant Object

#1 Object ID: 7612241234567***ZAF*NI, Object Type Code / Role: 1 / 1, Object ID Type Code: 2 (RFC-3881) - PatientNumber

#2 Object ID: 470a65e3-d9f5-420a-bafe-eaf3e2b9903d, Object Type Code / Role: 2 / 24, Object ID Type Code: ITI-9 (IHE Transactions) - PIX Query

Object Detail Type: MSH-10, Object Detail Value: NTFjYzBmNDctY2M2Zi00NDc5LWl1YVYwQmZldiY2MxOTNlMwVl, Object Query: [Click to view Object Query](#)

Mediators

OpenHIM mediators are **micro services** that run **independently** from the OpenHIM to perform additional tasks for a particular use case. They allow additional functionality and business logic to be added to the OpenHIM.

Mediators may be developed in **any language** and only talk to the OpenHIM via its RESTful API.

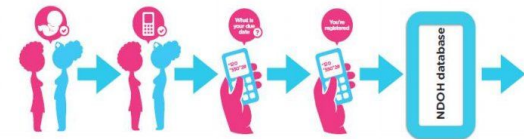
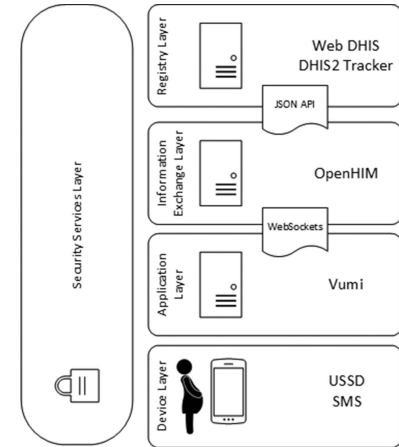
The common tasks within a mediator are:

- **Message format adaptation** - transformation of messages received in a certain format into another format (e.g. HL7 v2 to HL7 FHIR or MHD to XDS.b).
- **Message orchestration** - execution of a business function that may need to call out to other service endpoints on other systems. (e.g. Enriching a message with a client's unique identifier retrieved from a client registry).

Use Case - MomConnect

National initiative of the South African National Department of Health (NDoH) that sends free **mobile phone text messages** in all eleven official languages **to pregnant women** who voluntarily register at any public healthcare facility in South Africa.

Allows for **health service planning** and health informative **targeted messaging** to expectant and new mothers.

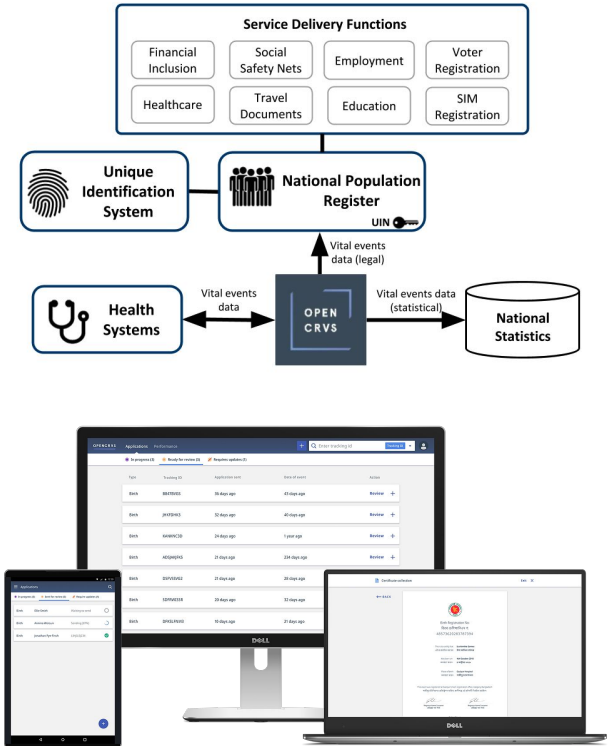


1. Nurse confirms pregnancy at clinic.
2. Nurse helps user register on their phone via USSD.
3. User answers questions about pregnancy.
4. User is registered.
5. Pregnancy is registered in the National Database
6. User receives weekly SMS messages to inform them of their pregnancy and baby health up to their child is 1 year old.

Use Case - OpenCRVS

A response to the need for an accessible and available **Civil Registration and Vital Statistics** (CRVS) system.

Designed to be **fully interoperable** with other government systems, and **data enabled** for fast decision-making.



OpenHIE and FHIR



FHIR is a standard describing data formats, elements and an API for exchanging electronic health records.

OpenHIE adopting IHE FHIR profiles:

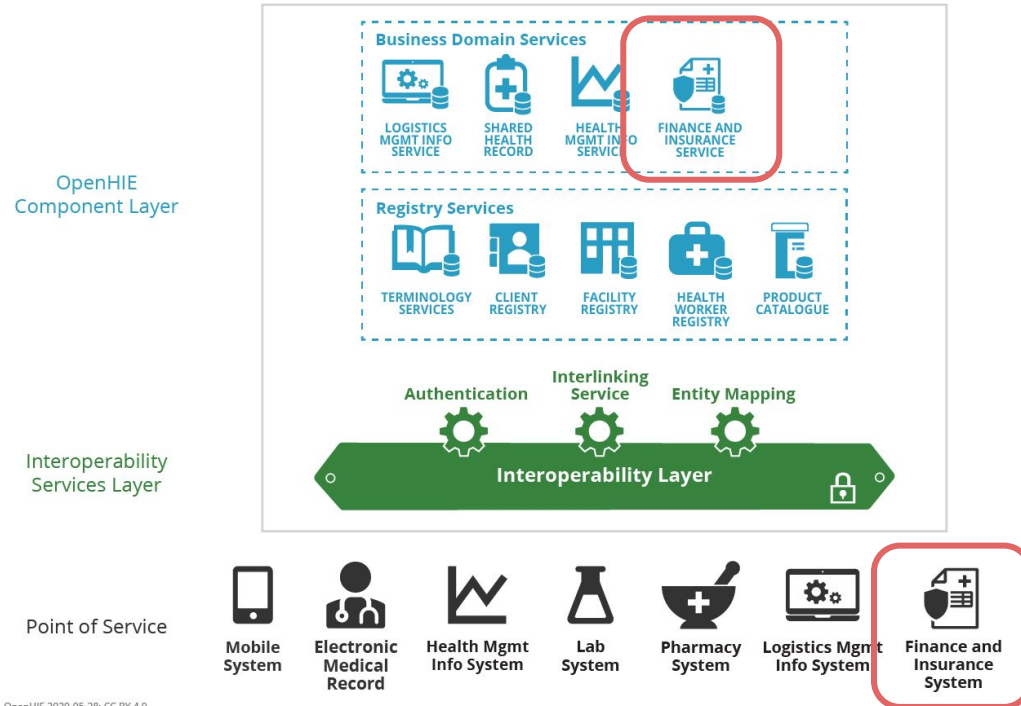
- PIXm, PDQm – client demographics
- mCSD – health and facility metadata
- mACM – client and health worker alerting

OpenHIE community exploring FHIR for:

- Shared Health Record (and FHIR Server)
- Terminology services for indicator management and mapping
- Laboratory Information System workflows
- **Health Financing workflows**
- Clinical Decision Support

OpenHIE Health Financing Community

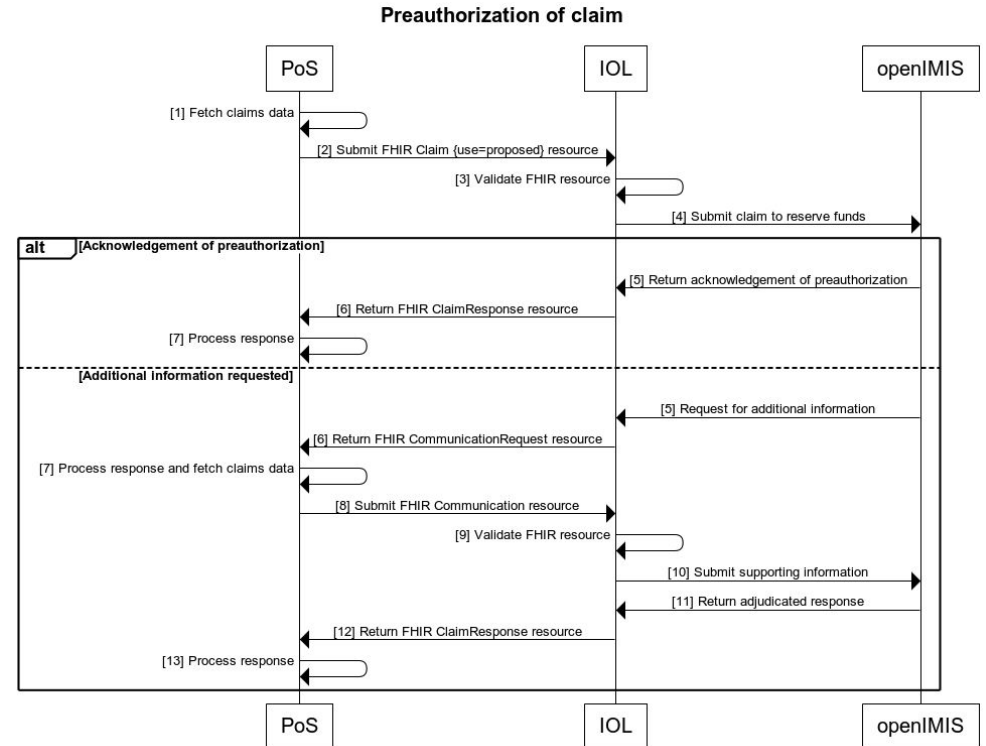
- Focused on identifying health financing data exchange needs.
- Work with the OpenHIE community to ensure that data exchange processes and requirements meet the needs of healthcare financing communities.
- Develop and adapt OpenHIE workflows to incorporate health finance data sharing use cases and country needs.



Health Financing Workflows



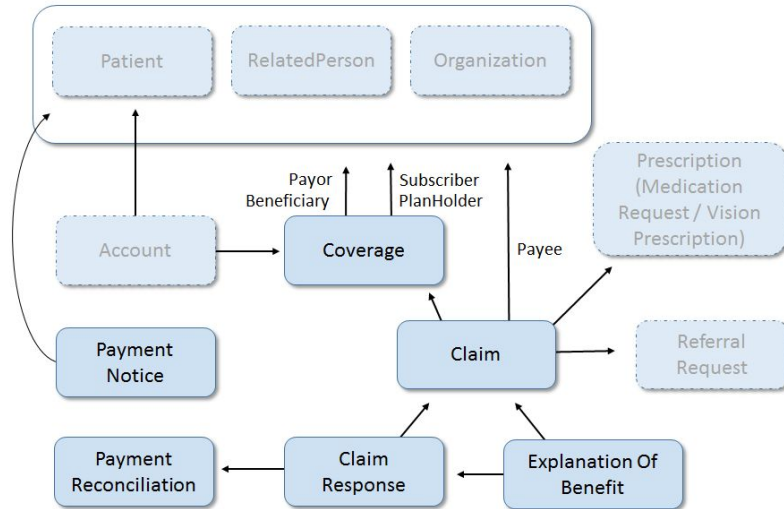
- Beneficiary enrollment
 - Check enrollment status
 - Enrol beneficiary
- Claim submission
 - Check beneficiary validity
 - Check beneficiary balance/treatment options
 - Preauthorization of claim
 - Track status of claim
 - Submit claim
- Indicator Reporting



Health Financing and FHIR

<http://hl7.org/fhir/financial-module.html>

Finance Interactions



Business Activity	Focal Resource
Patient visits Provider	
Provider checks for valid insurance coverage	EligibilityRequest
Insurer responds with coverage status and optional plan details	EligibilityResponse
Provider examines Patient and reviews treatment options	
Provider submits Pre-determination(s) for treatment options to determine potential reimbursement	Claim {use=exploratory}
Insurer responds with potential reimbursement	ClaimResponse
Provider and Patient determine treatment plan	
Treatment plan submitted to Insurer to reserve funds	Claim {use=proposed}
Insurer acknowledges receipt of pre-authorization	ClaimResponse
Insurer requests additional information	CommunicationRequest
Provider submits supporting information	Communication
Insurer provides adjudicated response to pre-authorization	ClaimResponse
Provider checks on status of pre-authorization processing	ProcessRequest {action=status}
Insurer responds indicating adjudication is ready	ProcessResponse
Provider retrieves pre-authorization adjudication	READ or ProcessRequest {action=poll}
Provider provides treatment	
Provider submits patient's claim for reimbursement	Claim {use=complete}
Insurer responds with claim adjudication	ClaimResponse
Patient leaves treatment setting	
Patient requests an Explanation of Benefit for their Personal Health Record application	READ or ProcessRequest {action=poll}
Insurer responds with Explanation of Benefit	ExplanationOfBenefit
Provider requests the payment details associated with a bulk payment	SEARCH or ProcessRequest {action=poll}
Insurer responds with a Payment Reconciliation	PaymentReconciliation
Insurer notifies provider that payment has been issued	PaymentNotice
Insurer notifies parties that payment funds have been received	PaymentNotice

FHIR Profiling

<https://bluebutton.cms.gov/developers/>

Structure UML XML JSON Turtle R3 Diff All

Structure

Name	Flags	Card.	Type	Description & Constraints
ExplanationOfBenefit	TU		DomainResource	Explanation of Benefit resource Elements defined in Ancestors: <code>id</code> , <code>meta</code> , <code>implicitRules</code> , <code>modifierExtension</code>
identifier		0..*	Identifier	Business Identifier for the resource
status	? Σ	1..1	code	active cancelled draft entered-in-error ExplanationOfBenefitStatus (Required)
type	Σ	1..1	CodeableConcept	Category or discipline Claim Type Codes (Extensible)
subType		0..1	CodeableConcept	More granular claim type Example Claim SubType Codes (Example)
use	Σ	1..1	code	claim preauthorization predetermination Use (Required)
patient	Σ	1..1	Reference(Patient)	The recipient of the products and services
billablePeriod	Σ	0..1	Period	Relevant time frame for the claim
created	Σ	1..1	dateTime	Response creation date
enterer		0..1	Reference(Practitioner PractitionerRole)	Author of the claim
insurer	Σ	1..1	Reference(Organization)	Party responsible for reimbursement
provider	Σ	1..1	Reference(Practitioner PractitionerRole Organization)	Party responsible for the claim
priority		0..1	CodeableConcept	Desired processing urgency ProcessPriority (Example)
fundsReserveRequested		0..1	CodeableConcept	For whom to reserve funds FundsReserve (Example)
fundsReserve		0..1	CodeableConcept	Funds reserved status FundsReserve (Example)
related		0..*	BackboneElement	Prior or corollary claims
claim		0..1	Reference(Claim)	Reference to the related claim
relationship		0..1	CodeableConcept	How the reference claim is related Example Related Claim Relationship Codes (Example)
reference		0..1	Identifier	File or case reference
prescription		0..1	Reference(MedicationRequest VisionPrescription)	Prescription authorizing services or products
originalPrescription		0..1	Reference(MedicationRequest)	Original prescription if superceded by fulfiller
payee		0..1	BackboneElement	Recipient of benefits payable
type		0..1	CodeableConcept	Category of recipient PayeeType (Example)
party		0..1	Reference(Practitioner PractitionerRole Organization Patient	Recipient reference

Text Summary Differential Table Snapshot Table All

Complete Summary of the Mandatory Requirements

- One or more ... in `ExplanationOfBenefit.identifier`
 - each `ExplanationOfBenefit.identifier` must have:
 - an `identifier.system`
 - an `identifier.value` that is unique within the system.
- One status in `ExplanationOfBenefit.status`
- One type in `ExplanationOfBenefit.type`
 - an `ExplanationOfBenefit.type` must have:
 - a `type.coding`, and each coding must have: - a `coding.system` - a `coding.code`
- One patient in `ExplanationOfBenefit.patient`
 - an `ExplanationOfBenefit.patient` must have:
 - a `patient.reference`
- One type in `ExplanationOfBenefit.billablePeriod`
 - an `ExplanationOfBenefit.billablePeriod` must have:
 - a `billablePeriod.start`
 - a `billablePeriod.end`
 - a `billablePeriod.outpatient-claim-query-cd-extension`
- One insurance in `ExplanationOfBenefit.insurance`
 - an `ExplanationOfBenefit.insurance` must have:
 - an `insurance.coverage`, and a coverage must have: - a `coverage.reference`
- One or more item in `ExplanationOfBenefit.item`
 - an `ExplanationOfBenefit.item` must have:
 - an `item.sequence`
 - an `item.careTeamLinkId`
 - a `item.revenue`, and each revenue must have:
 - a `revenue.coding`, and each coding must have: - a `coding.system` - a `coding.code`
 - a `revenue.outpatient-rev-cntr-stus-ind-cd-extension`
 - an `item.service`, and each service must have:
 - a `service.coding`, and each coding must have: - a `coding.system` - a `coding.code`
 - a `service.outpatient-rev-cntr-ide-ndc-upc-num-extension`
 - an `item.modifier`, and each modifier must have:
 - a `modifier.coding`, and each coding must have: - a `coding.system` - a `coding.code`
 - an `item.serviceDate`
 - an `item.locationAddress`, and each locationAddress must have:
 - a `locationAddress.state`

Future Workflows and Approach

Additional OpenHIE workflows:

- Patient leaves treatment setting workflows
- Explanation of benefit and payment reconciliation
- Client Registry (CR) interactions
 - Beneficiary enrolment
 - Beneficiary verification
 - Register dependant(s)
 - Death notifications
- Terminology Services (TS) and Product Registry (PR)
 - Terminology and product code sync

Approach:

- Community Approach
 - Serve as collaborative workspaces for sharing of best practices and novel solutions to health care financing data exchange.
 - Represent real world needs of countries, and engage with developers and implementers working with health insurance/finance solutions.
- Adherence to standards
 - Leverage FHIR and collate best practices.

Thank You

www.jembi.org

