



FHIR IN GLOBAL HEALTH

ADDRESSING HEALTH INFORMATION WORKFLOW IN THE WORLD'S MOST CHALLENGED PLACES

W UNIVERSITY of
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CIRG
Clinical Informatics
Research Group



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GLOBAL HEALTH REALITIES

90% of **DEATHS** from disasters occur in LMIC

Internally **DISPLACED** **31 mil** Persons in 2019



National and Regional Infrastructures

- Travel on Roads and Bridges
- Power Issues
- Telecommunications

Effect access to Clean Water, Food, Sanitation...

...AND HEALTH SERVICES

**VULNERABLE POPULATIONS
COMPLEX CARE NEEDS PATIENTS**

- Refill medications
- Obtain critical lab testing
- Paper medical records and documented treatment plans
- Preventive services for identifying newly infected



1.7 mil Patients with HIV displaced



THE MANY CHALLENGES IN LMIC



Limited
developer
resources



Multiple
implementation
partners and
stakeholders



Complex
funding
environment



Training and
Education



Testing and
Validation



Change
Management,
Policy, and
Pacing Issues



Unreliable
Connectivity,
Infrastructure, &
Environment



Sustainability
and
Maintainability



Scalability



BACKGROUND

HAITI OVERVIEW



ABOUT HAITI

- Population: 11 million
- GNI (per capita): \$760 USD
- Life expectancy: 63.5 years
- Human Development Index (HDI) ranks Haiti as #169 out of 189 countries for quality of life

COMPLICATED HIV PUBLIC HEALTH

- 25 physicians/100k people – less in HIV C&T
- 149 HIV clinics
- 41 Reference and Clinical Laboratories
- Multiple funders, and care & treatment partners
- HIV epidemic high (2% prevalence)



BACKGROUND

HAITI HIS MODERNIZATION



*2008 Implementation, no major technological or pattern updates since
2020 iSante EMR updated to OpenMRS RefApp, called iSantePlus*

CURRENT NATIONAL ARCHITECTURE

EMR, LIS, Consolidated Server

- Tried and True Technologies
- Aging Technologies and Patterns
= Difficult to Upgrade, Extend,
Scale
- Gap in workforce to support

KEY CLINICAL CHALLENGE

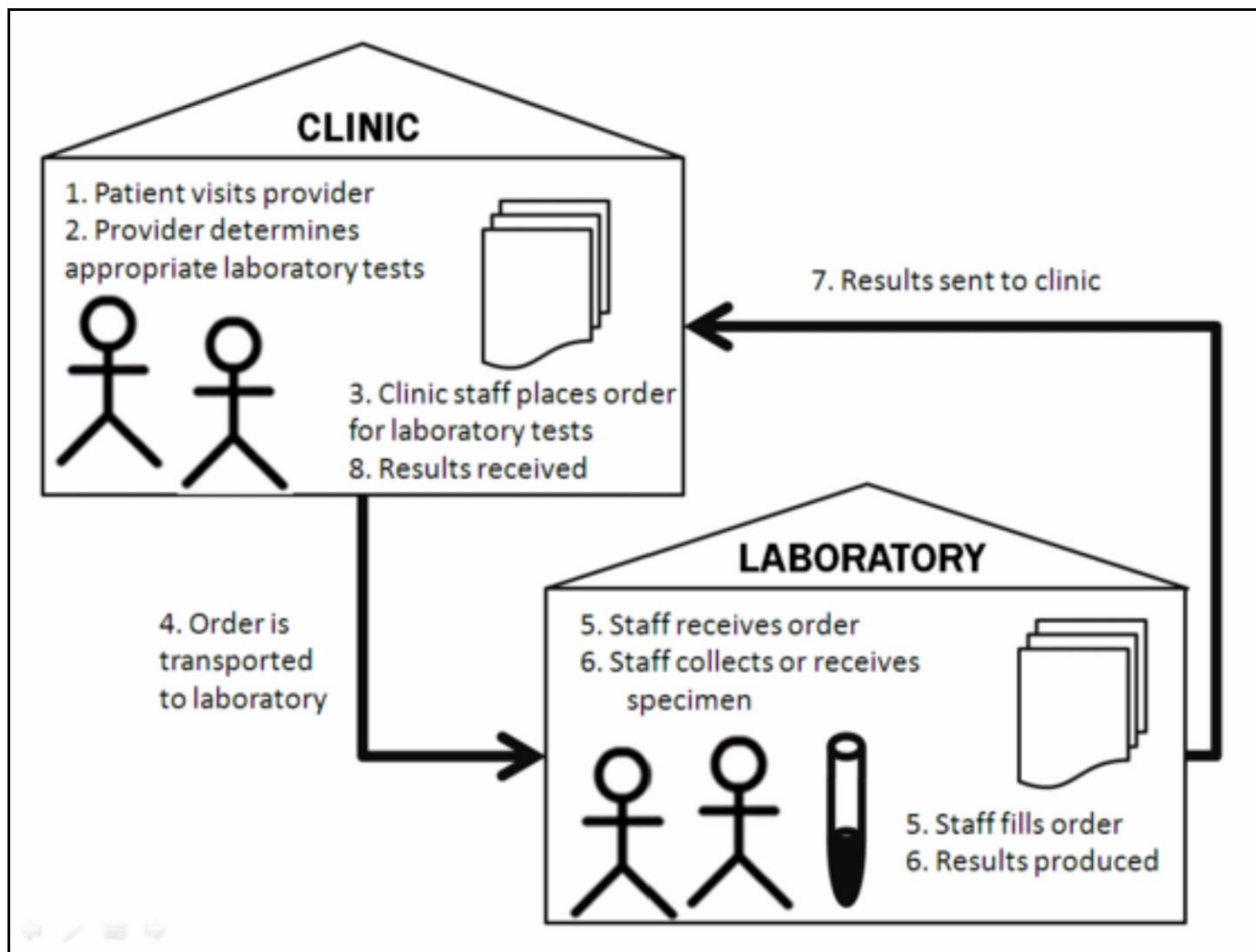
Continuity of Care & Viral Load Results

- Gap specifically in LIS to EMR workflow for lab results
- Newer standards used in newer additional technologies added to architecture



CLINICAL APPROACH

HAITI USE CASE: EMR TO LIS



Profile Options for LMIC

1. Results Transmission Only
2. Order Transmission and Results Transmission
3. Identification of Patients in EMR, Order Transmission and Results Transmission



SOCIAL APPROACH COMMUNITY DRIVEN



OPENELIS
GLOBAL



OpenMRS
MEDICAL RECORD SYSTEM

Why this approach?

- Go Further Together, Alignment
- Replicability + Reusability

What is the Implementation approach?

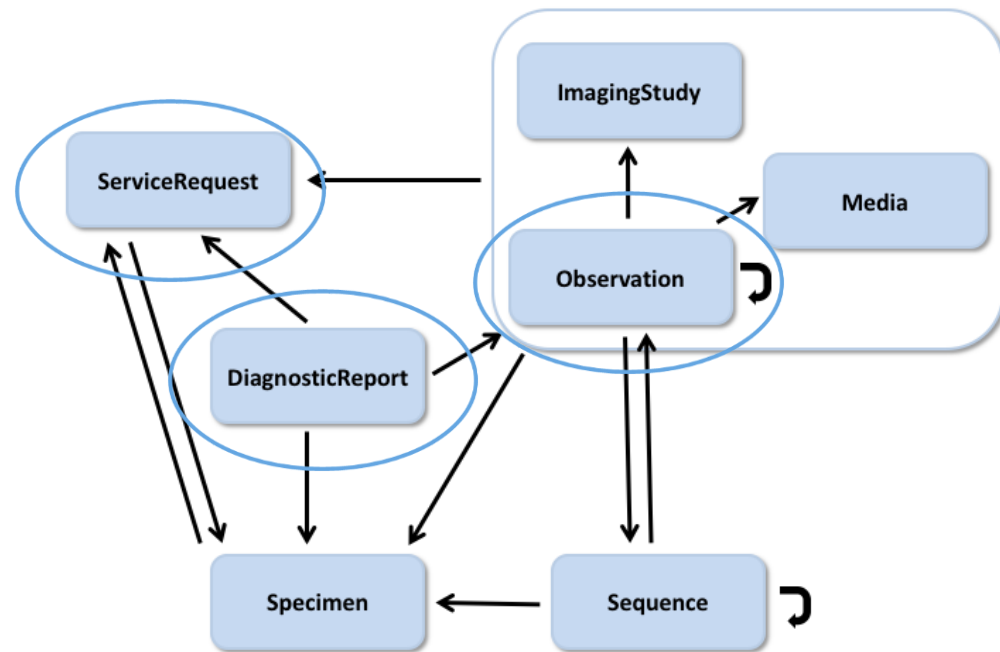
- Community engagement and decision-making
- Reuse and improve
- Standardised and community approved processes

What is the transition thought process?

- Community-led = Community adoption
- Iteration + Sustainability

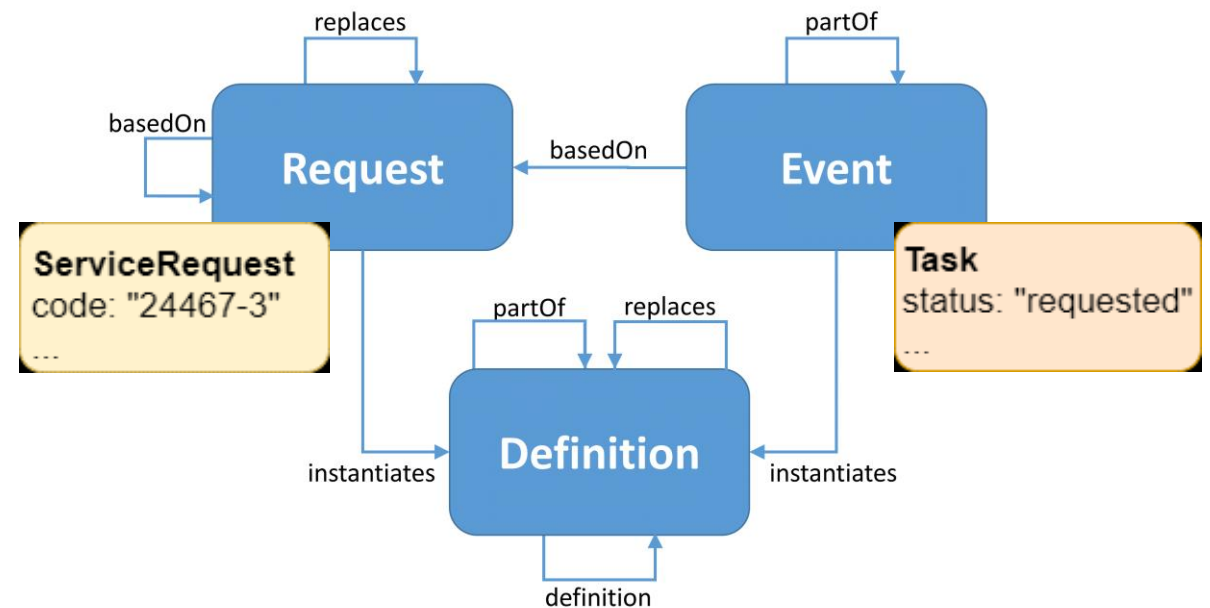
HL7 FHIR, PROFILES, IMPLEMENTATION GUIDE

DIAGNOSTIC MODULE



<https://www.hl7.org/fhir/diagnostics-module.html>

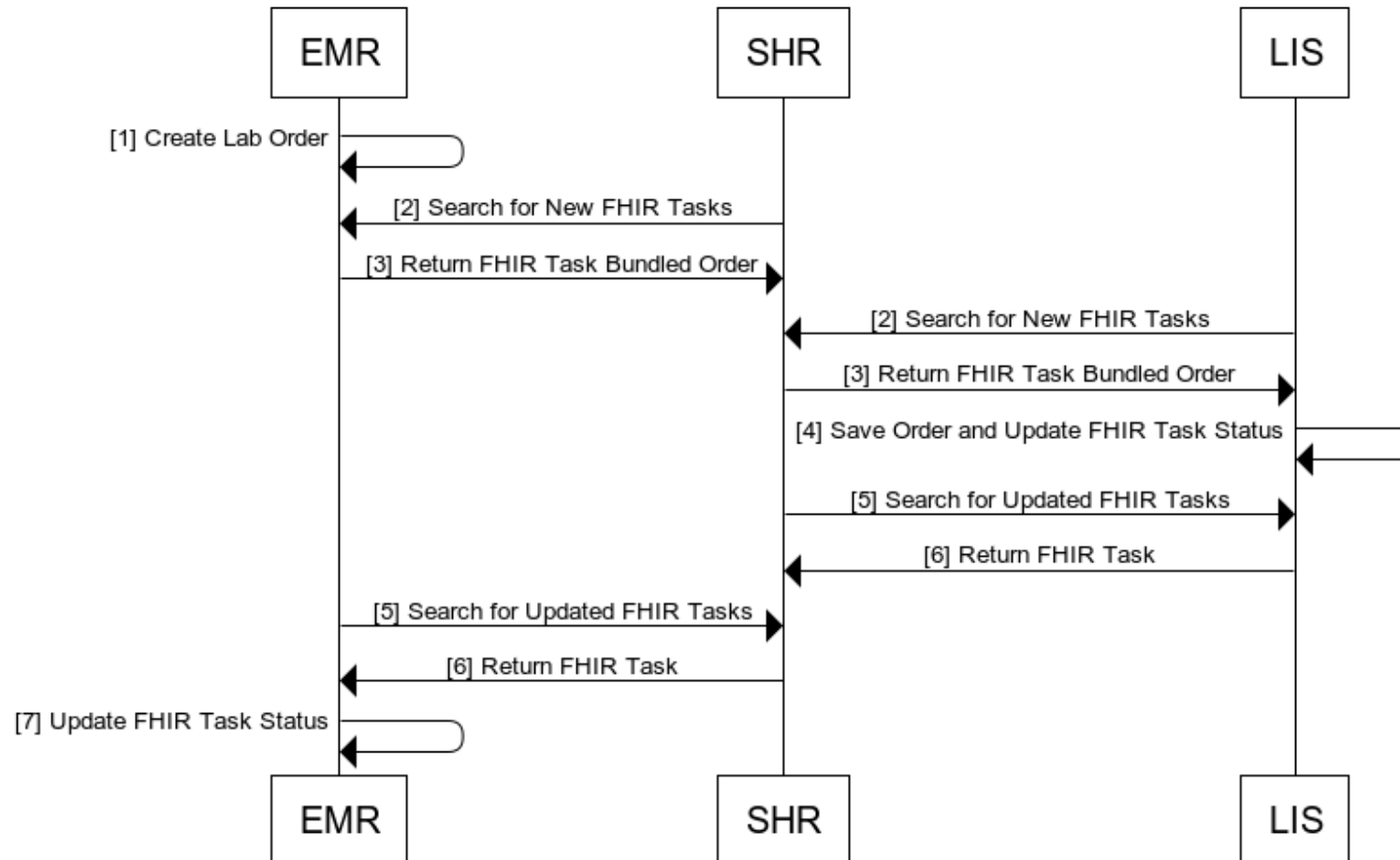
WORKFLOW MODULE



<https://www.hl7.org/fhir/workflow-module.html>

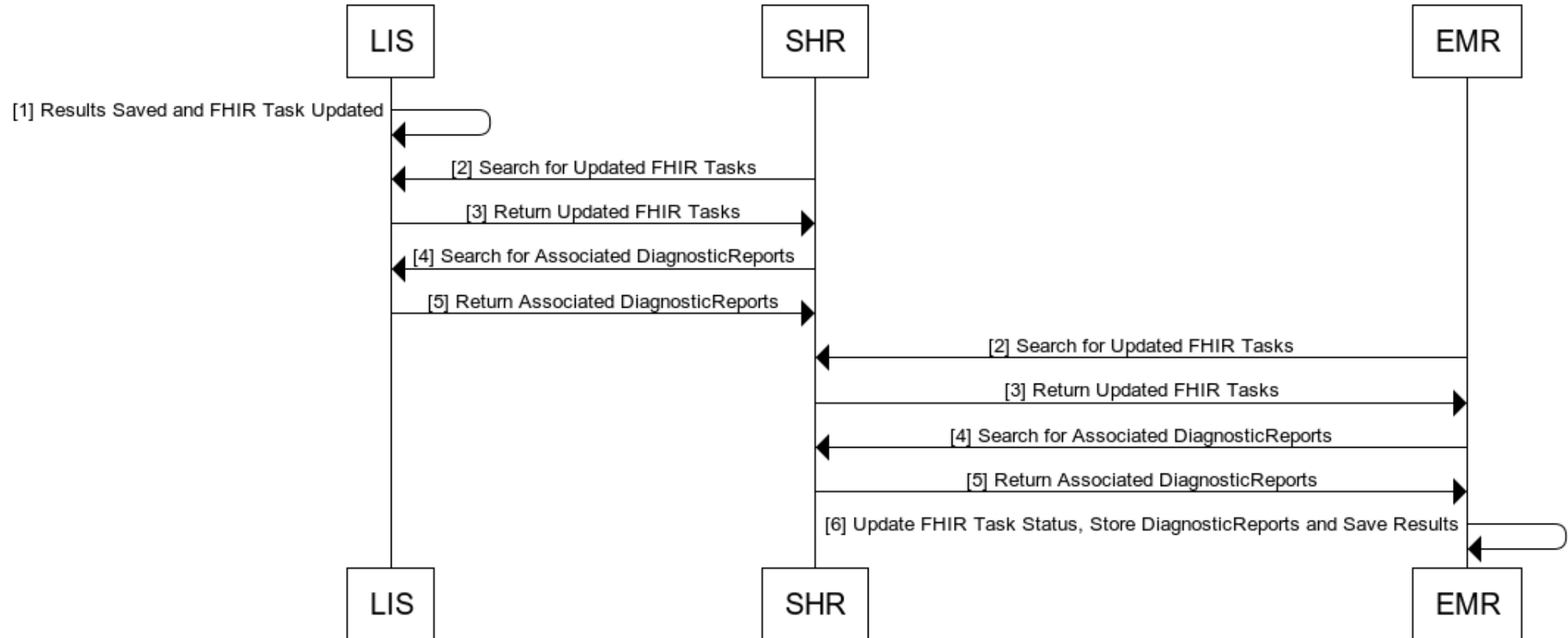
HL7 FHIR, PROFILES, IMPLEMENTATION GUIDE

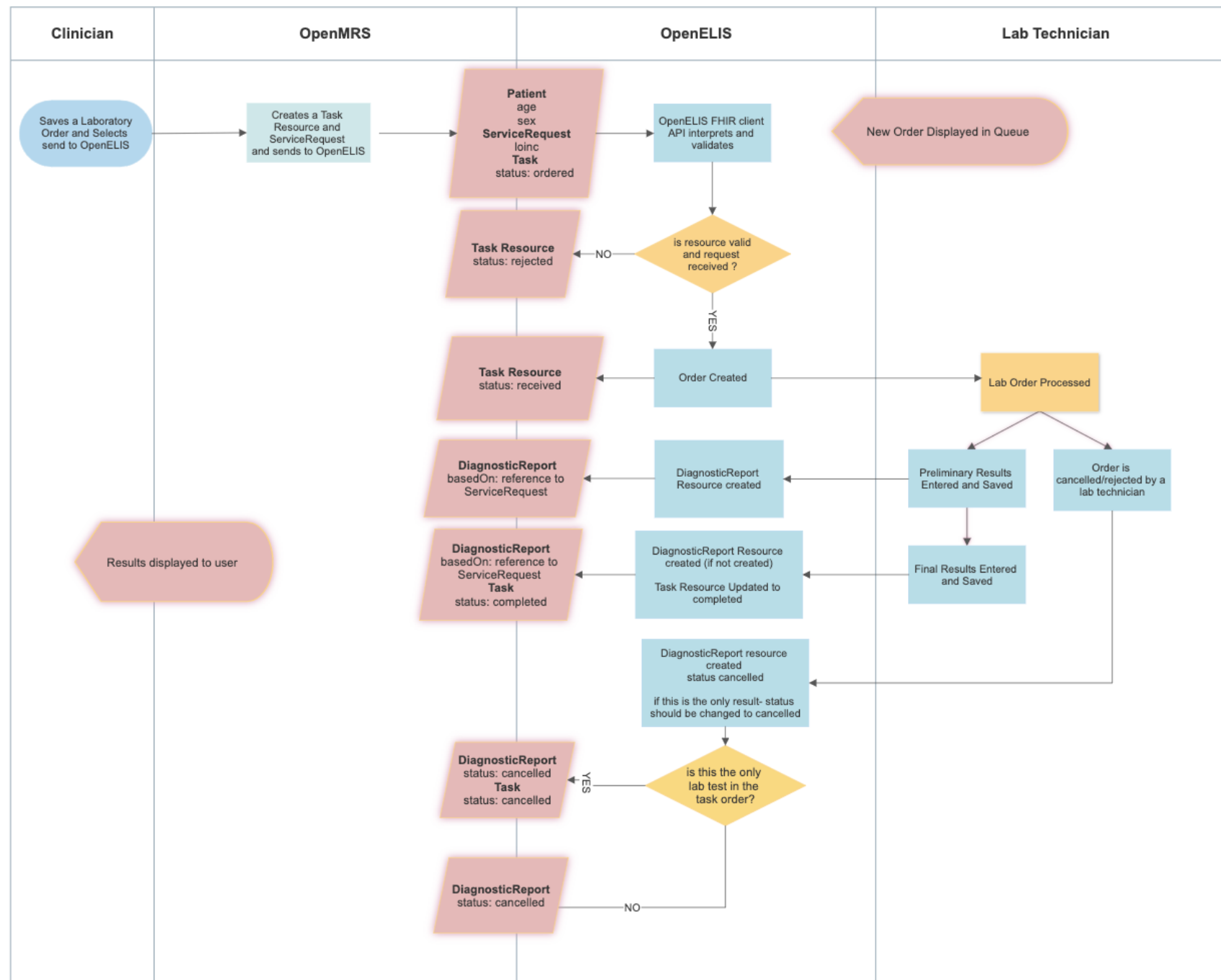
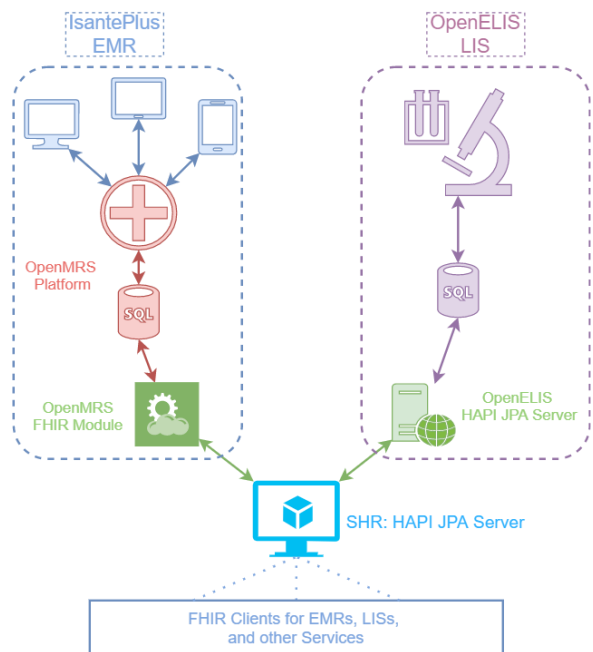
Lab Ordering



HL7 FHIR, PROFILES, IMPLEMENTATION GUIDE

Lab Results Reporting





iSantePlus (OpenMRS) - Patient Chart

iSantéPlus

admin

Unknown Location

Logout

> Piotr Mankowski

Piotr Mankowski

Male 33 year(s) (~01.Jan.1987)

Edit Show Contact Info

Patient recording date : 02/04/2020

Patient ID 10012R

Code ST Add

Code National 100000

iSante ID Add

Code PC Add

DIAGNOSES

None

Vitals

Height (cm) ____cm

Weight (kg) ____kg

(Calculated) ____kg/m²
BMI

Temperature ____°C
(C)

Pulse ____/min

Respiratory ____/min
rate

Blood ____mmHG
Pressure

Blood oxygen ____%
saturation

RECENT VISITS

20.May.2020

Analyses de Lab.

20.May.2020

Analyses de Lab.

19.May.2020

Analyses de Lab.

Patient Flags

ALLERGIES

Unknown

Last Viral Load Test

Weight's Graph

Viral Load Graph

BMI's Graph

General Actions

Start Visit

Add Past Visit

Registration Summary

Growth Charts

Forms

Lab History

Drugs History

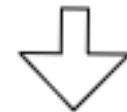
Merge Visits

Mark Patient Deceased

Delete Patient

Viral Load History

Patient summary



Patient
name: "Piotr M"

iSantePlus (OpenMRS) - Lab Order

iSantéPlus admin Unknown Location Logout

> [Piotr Mankowski](#) > **Analyse de Laboratoire**

Piotr Mankowski Male 33 year(s) (~01.Jan.1987) [Edit](#) [Show Contact Info](#)

Given Family Name

Patient recording date : 02/04/2020

Patient ID 10012R
Code ST Add
Code National 100000
iSante ID Add
Code PC Add

Active Visit - 20.May.2020, 23:11:36 Outpatient

Analyses de laboratoire

Date visite: 05/20/2020 (mm/dd/yyyy) Save

TYPE DE VISITE ☐ Clinique externe ☐ Visite initiale ☐ Visite de suivi ☐ Consultation

Hematologie | Biochimie | Cytobacteriologie | Bacteriologie | ECU | Parasitologie | Immuno-Virologie | Mycobacteriologie | Endocrinologie | Liquides Biologique | Serologie | CDV

Autres Tests | **Biologie Moleculaire**

☒ P : CD4
☐ P : Coagulation
☐ P : Groupe Sanguin
☐ P : Hemogramme - Auto
☐ P : Hemogramme - Manual
☐ P : TS / TC
☐ Anti-Thrombine III (Activite)
☐ Anti-Thrombine III (Dosage)
☐ Basophiles
☐ CCMH

☒ CD4 Compte Absolu
 RÉSULTAT ET DATE

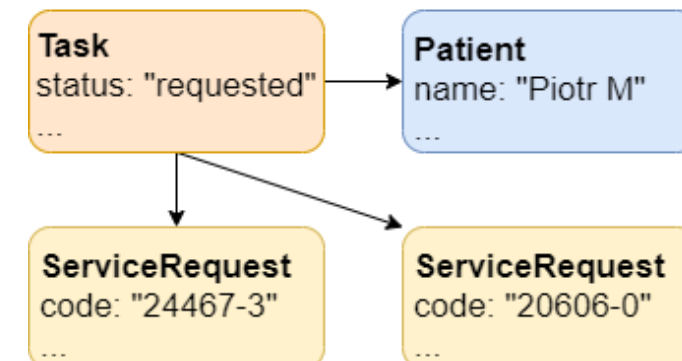
 Date

 (mm/dd/yyyy)
 Commentaire

☒ CD4 Compte en %
 RÉSULTAT ET DATE

☐ Groupe Sanguin - Rhesus
☐ Hematocrite
☐ Hemoglobine
☐ Heparinemie
☐ INR
☐ Lymphocytes
☐ Mixtes
☐ Monocytes
☐ Neutrophiles

☐ TCMH
☐ Temps de cephaline Activé(TCA)
☐ Temps de Coagulation
☐ Temps de Coagulation en tube
☐ Temps de Prothrombine
☐ Temps de saignement
☐ Test de comptabilite
☐ VGM
☐ Vitamine B12



OpenELIS – View Incoming Orders



View Electronic Orders

Sort Entries By: **Last Updated** ▼

Showing Results 1 - 8 of 8 [Previous](#) [Next](#)

External ID: 8f5dd01b-02ba-42df-ab30-015c347a9203

Timestamp: 2020-05-20 18:21:17.718

Patient:

Name: Mankowski, Piotr Gender: M

Birthdate: 01/01/1987 External ID: 5981a256-d60c-44b1-beae-9bdd2cf572f8

Status: Entered

Original Message:

{ "resourceType": "Task", "id": "ffd39301-3ed4-4a9d-81af-8496039d13da", "identifier": [{ "system": "http://isanteplus.org/ext/task/identifier", "value": "ffd39301-3ed4-4a9d-81af-849" }

External ID: d7d0e4c6-be6a-47b7-ade3-51215311ecbd

Timestamp: 2020-05-20 18:21:17.656

Patient:

Name: Mankowski, Piotr Gender: M

Birthdate: 01/01/1987 External ID: 5981a256-d60c-44b1-beae-9bdd2cf572f8

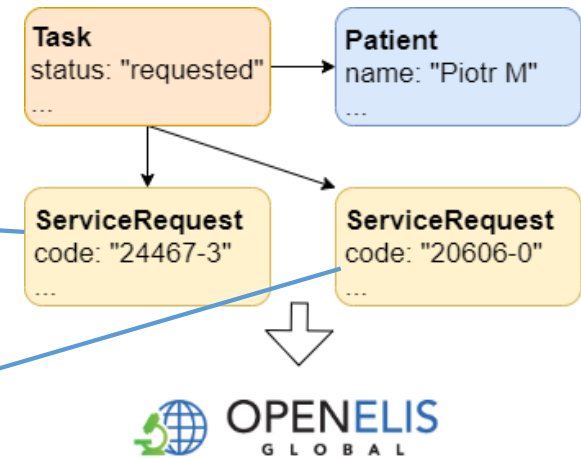
Status: Entered

Original Message:

{ "resourceType": "Task", "id": "ffd39301-3ed4-4a9d-81af-8496039d13da", "identifier": [{ "system": "http://isanteplus.org/ext/task/identifier", "value": "ffd39301-3ed4-4a9d-81af-849" }

External ID: eadab3d3-c2ef-49ce-8d38-0e82cedcc7bc

Timestamp: 2020-05-20 18:15:18.152



FUNCTIONAL DEMO

OpenELIS - Create Order

**Laboratory Information System**

Version: 9

Open ELIS - [Log out](#)

[Home](#) [Order](#) [Patient](#) [Non-Conforming Events](#) [Workplan](#) [Results](#) [Validation](#) [Reports](#) [Admin](#) [Help](#)

Test Request

Referring order number: If order number is not found, please fill in form manually:

+ Order *

- Sample *

ID	Sample Type	Condition	Collection Date (dd/mm/yyyy)	Collection Time (hh:mm)	Collector	* Tests	
☒ 1	Serum	Multiple				CD4 percentage count	Remove
							Remove All

Panels

	Name
☐	Bilan Biochimique
☐	Serologie VIH

Available Tests

	Name
☐	Creatinine
☐	Amylase
☐	Total cholesterol
☐	HDL cholesterol
☐	Triglycerides
☐	Créatininémie
☒	CD4 percentage count
☐	CD4 absolute count
☐	HIV rapid test HIV
☐	HBsAg (Hepatitis B surface antigen)

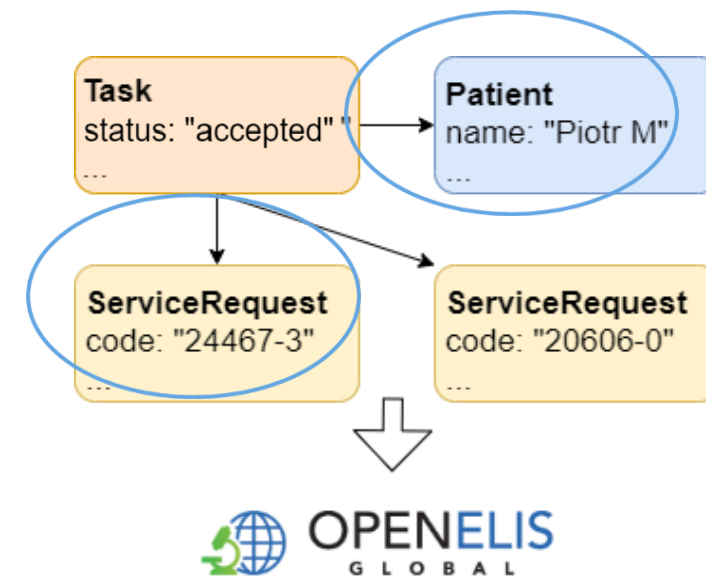
+ Patient: *

Piotr Mankowski

Date of Birth: 01/01/1987

National ID:

Gender: M



FUNCTIONAL DEMO

OpenELIS – Enter Results

Laboratory Information System Version: 9 Open ELIS - Log out

Order Patient Non-Conforming Events Workplan Results Validation Reports Admin Help

Immunology

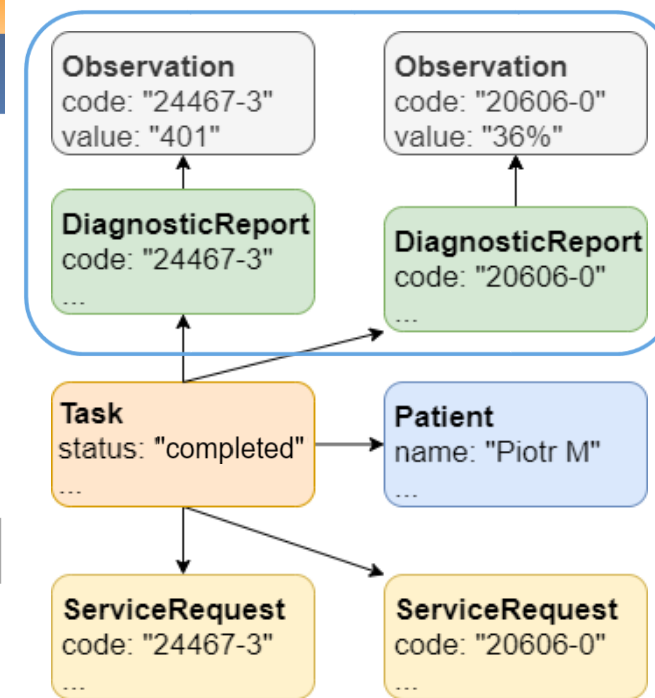
Search

Unit Type: Immunology

Previous Next 1 of 1 ⚠ = Sample or order is nonconforming OR test has been rejected ⚠ = Validation Failed Lab No.: Scan or Enter Manually Search

Test Date (dd/mm/yyyy)	Result from analyzer	Test	Accept as is	Result	Referral Reason	Notes
Lab No.: DEV0120000007 - 1 Condition: Sample Type: Serum Patient: Mankowski, Piotr, M, 01/01/1987						
21/05/2020	☐	CD4 percentage count(Serum) 35.00 - 55.00 %	☒	36.00 %	☐	Note:
Lab No.: DEV0120000009 - 1 Condition: Sample Type: Serum Patient: Mankowski, Piotr, M, 01/01/1987						
21/05/2020	☐	CD4 absolute count(Serum) 400.00 - 750.00 Cell/µl	☒	401.00 Cell/µl	☐	Note:

Previous Next 1 of 1 Save Cancel



iSantePlus (OpenMRS) – View Results

iSantéPlus

admin Unknown Location Logout

> Piotr Mankowski > Lab History

Piotr Mankowski

Male 33 year(s) (~01.Jan.1987) Edit Show Contact Info

Given Family Name

Patient recording date : 02/04/2020

Patient ID 10012R

Code ST Add

Code National 100000

iSante ID Add

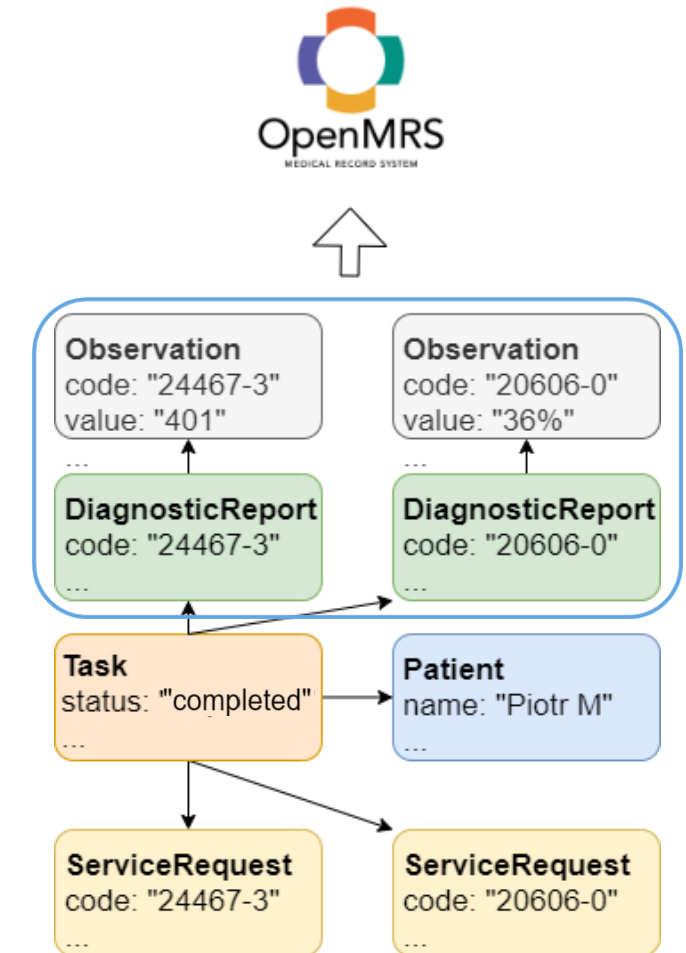
Code PC Add

Active Visit - 20.May.2020, 23:11:36

Outpatient

Lab History

Test name	Date	Test result	Normal minimum value	Normal maximum value
CD4 COUNT	20.May.2020, 18:15:16	401 cells/uL	445	1497
CD4%	20.May.2020, 18:15:16	36 %	30	60
LOW-DENSITY LIPOPROTEIN CHOLESTEROL	20.May.2020, 18:19:16	2 mmol/L		2.59
Serum creatinine (umol/L)	20.May.2020, 18:19:16	7 umol/L		





ADOPTION & SCALE

NEXT STEPS FOR HAITI

Infrastructure

Capacity Building

Change Management

Policy

Funding Sustainability



Interoperability Plans

Continuity of Care

- Patient Identification (Dedupe)
- Shared Longitudinal Record

Data Use

- Data Warehouse
- Data Pipeline (Report & Research)

Funder: Digital Square & Gates Foundation

Digital Square <https://digitalsquare.org/>

Team Members

UW Digital Initiatives Group at I-TECH (DIGI) <http://www.go2itech.org/digital-initiatives-group-at-i-tech/>

Jan Flowers, UW I-TECH DIGI Faculty Co-Lead

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Greg Rossum, UW I-TECH DIGI OpenELIS Sr. Developers

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Michelle Virgin, UW I-TECH DIGI Haiti Sr. PM

Nancy Puttkammer, UW I-TECH DIGI Faculty Co-Lead & Haiti PI

Resources

- Demo of Workflow: <https://www.youtube.com/watch?v=HiudYTi-JBg>
- OpenMRS-OpenELIS Tutorial: <https://wiki.openmrs.org/display/projects/OpenMRS-OpenELIS+Lab+Communication+Tutorial>
- OpenMRS-OpenELIS Technical Design: <https://wiki.openmrs.org/display/projects/Lab+Integration+Workflow>
- OpenHIE LIS-EMR Workflow Specification: <https://discourse.ohie.org/t/lis-emr-workflow-specification-draft-for-input/3267>

Thank You!

Jan Flowers, jflow2@uw.edu

