Hot Trends in Digital Health: Using FHIR

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Aggregate Reporting with DHIS2, FHIR and IHE

DHIS2
- Org Unit
- Data Element
- Category Options

FHIR
- Organization
- Location
- Measure
- Measure Report
- Code System
- Value Set

IHE
- mCSD
- mADX
- mSVS
Aggregate Reporting Workflow

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{
    "resourceType": "MeasureReport",
    "measure": "http://ohie.org/Measure/hiv-indicators",
    "id": "12345-example",
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        "end": "2018-01-31"
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                                "value": {
                                    "coding": [{"code": "F"}]
                                }
                            }
                        ]
                    }
                ]
            }
        }
    ]
}```
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.

- **openIMIIS**: Transitioning to FHIR backend for health insurance claims which.

- **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 (mSVS) 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).
Computable Care through Secondary Data Usage

**Health Information Exchange**
- **Case Based Reporting**
  - generate de-identified case based reports after sentinel events
  - use CSD Hooks for triggering sentinel events and use CQL to generate CBR to send to ? according to ?

- **Clinical Decision Support Service**
  - trigger events based on patient care workflow
  - use CQL and CSD Hooks to trigger clinical support activities in Point of Service system according to CPG Implementation Guide. Activities may include a referral, order, alert, suggestion, or questionnaire

**Health System Monitoring**
- calculate indicators from anonymized data
  - use CQL to identify population cohort and define indicators and report to HMIS according to mADX and IHE White Paper

**HL7 FHIR profiles**
- **Indicators (mADX)**
- **Case Reports (?)**
- **Decision Support (CPG)**
- **Health Facility and Worker (mCSD)**
- **Aggregate Data Exchange (mADX)**
- **Terminologies (mSVS)**
- **Alerting (mACM)**
- **Client Demographics (PRIM)**
### Staged Maturity Model Scenarios

Three scenarios defined in terms of *Health Information Systems Interoperability Maturity Toolkit* and *HIS Stages of Continuous Improvement Toolkit*

**Standalone** - a standalone digital health system using a bespoke data model running on a low-powered and often disconnected device that wants.

*Requires precise definitions for native implementation of an indicator report, care guideline or case report.*

**Paired** - a digital health system that can share data using the HL7 FHIR data model and which offloads processing of FHIR resources to a locally available service using reusable software components.

*Requires profiled data models and computable assets.*

**Integrated** - a connected digital health system operating within a health information exchange that wants to contribute data to a longitudinal client record on which indicator calculations are performed, and case reports are generated.

*Requires profiled data models, computable assets and metadata registries.*

<table>
<thead>
<tr>
<th>Staged Maturity Model Scenarios</th>
<th>HIS Interoperability Maturity</th>
<th>HIS Stages of Continuous Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>National HIS enterprise architecture</td>
<td>HIS Subsystems</td>
</tr>
<tr>
<td>Standalone</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Paired</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Integrated</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
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Implementing Computable Care

Provide structured and computable assets for each maturity scenario to accelerate transition to a digital health
Computable Care Assets: HIV

**Guidance and Policy**
- [https://www.who.int/publications/guidelines/hiv_aids/en/](https://www.who.int/publications/guidelines/hiv_aids/en/)
- Consolidated strategic information guidelines for HIV in the health sector

**Accelerator Kit**
- Consolidated guidelines on person-centred HIV patient monitoring and case surveillance
- **Indicators**
  - ADX-HIV Content Profile
  - [http://fhir.who.int/computableCare/HIV (TBD)](http://fhir.who.int/computableCare/HIV (TBD))
- **Case Reports**
  - Submit Case Report when reported HIV+ / other triggers (TBD)
- **Decision Support**
  - Initiate ART when confirmed HIV+ (TBD)
Creating Computable Care Assets

**Guidance and Policy**

- SME, Health Program Manager, Policy Developer
- Business Analyst
- Digital Health Architect
- Business Analyst
- Digital Health Architect
- Software Developer

**L1 Narrative**: Guidelines and policies are developed by policy and health experts

**L2 Semi-structured**: Recommendations expressed in terms of HL7 FHIR model as structured business requirements using process flow diagrams, user stories, etc.

**L3 Structured**: Computable care guidelines expressed as HL7 FHIR and CQL artefacts

**L4 Executable**: Computable care guidelines implemented in a health jurisdiction

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Standards based data workflows in computable care

- **input streams**
  - PoS w/ sync
  - PoS w/ IHE-CDA
  - CSV
  - DB connection
  - mobile app
  - SMS, FLOIP, etc.

- **templating**
  - ingestion layer
  - templating engine

- **processing**
  - FHIR-data warehouse
  - FHIR-CQL Engine
  - FHIR Bundle
  - FHIR Library

- **secondary data use**
  - Decision Support
  - Case Reporting
  - HMIS
  - mADX: FHIR MeasureReport

- **standard**
  - FHIR implementation
  - FHIR Implementation Guide (CPG)

- **non-standard**
  - PoS w/ -sync
  - PoS w/ -CDA
  - FHIR Questionnaire

- **tools**
  - PLM POC Engine
  - DATIM POC
  - FHIR Bundle

- **examples**
  - SMS, FLOIP, etc.
  - DATIM POC
  - FHIR Questionnaire
  - FHIR Bundle

- **special cases**
  - mADX: FHIR MeasureReport