# Public Health on FHIR: Where Are We Today?

ASTHO Informatics Directors Peer Network
Quarterly Virtual Convening
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# Agenda

- Quick HL7 primer: Existing standards
- FHIR
- ONC NPRM (Feb 2019)
- Recommendations
- Resources

# Health Level Seven (HL7)

- Founded 1987
- ANSI-accredited
- International
- Named after the top level of the seven-layer International Organization for Standardization (ISO) seven-layer communications model
- Hundreds of organizations and individual members
- “Open” participation
- Several core standards, several ancillary

# Core Standard: Messages

- Version 2.x most pervasively deployed
- Meant for machine-to-machine interoperability
- Detailed specifications for use captured in Implementation Guides (IG)
- Data format specification *divorced* from data transport options
- Common messages: ADT, VXU, ORU
- Used for many PH measures in Meaningful Use

```
MSH|^~\&|||||||VXU^V04|19970522MA53|P|2.3.1|
PID|||221345671^^^^SS||KENNEDY^JOHN^FITZGERALD^JR|BOUVIER^^^^^^M|19900607|M|||~^^^^MA^^^BDL|
NK1|1|KENNEDY^JACQUELINE^LEE|MTH^MOTHER^HL70063|
RXA|0|1|19900607|19900607|08^HEPB-PEDIATRIC/ADOLESCENT^CVX|.5|ML^^ISO+||||||||
MRK12345||MSD^MERCK^MVX|
```

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# Core Standard: Documents

- Clinical Document Architecture (CDA)
- Philosophy: Capture a moment in time
- Data expressed in XML
- Machine readable *and* human readable
- Complex to properly create and consume
- Used for broader clinical data interoperability in Meaningful Use
- Challenging for EHR vendors to create

# Core Standard: Documents

CDAR2_IG_PHCASERPT_R2_STU1.1_SAMPLE.xml - Notepad

File Edit Format View Help


```xml
                </organizer>
            </entry>
            <entry typeCode="DRIV">
                <organizer classCode="BATTERY" moodCode="EVN">
                    <!-- [C-CDA R1.1] Result Organizer -->
                    <templateId root="2.16.840.1.113883.10.20.22.4.1" />
                    <!-- [C-CDA R2.1] Result Organizer (V3) -->
                    <templateId root="2.16.840.1.113883.10.20.22.4.1" extension="2015-08-01" />
                    <id root="a4307cb2-b3b4-4f42-be03-1d9077376f4a" />
                    <code code="11585-7" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"
                        displayName="Bordetella pertussis Ab [Units/volume] in Serum" />
                    <!-- statusCode must be set to completed because the statusCode of the observation is completed -->
                    <statusCode code="completed" />
                    <effectiveTime>
                        <low value="20161107" />
                        <high value="20161107" />
                    </effectiveTime>
                    <component>
                        <!-- This observation is a trigger code final result observation -
                             only the code is a trigger code and thus
                             only the code must contain @sdtc:valueSet and @sdtc:valueSetVersion.
                             Final result is indicated by statusCode="final"  -->
                        <observation classCode="OBS" moodCode="EVN">
                            <!-- [C-CDA R1.1] Result Observation -->
                            <templateId root="2.16.840.1.113883.10.20.22.4.2" />
                            <!-- [C-CDA R2.1] Result Observation (V3) -->
                            <templateId root="2.16.840.1.113883.10.20.22.4.2" extension="2015-08-01" />
                            <!-- [eICR R2 STU1.1] Initial Case Report Trigger Code Result Observation -->
                            <templateId root="2.16.840.1.113883.10.20.15.2.3.2" extension="2016-12-01" />
                            <id root="bf9c0a26-4524-4395-b3ce-100450b9c9ad" />
                            <!-- This code is a trigger code from RCTC subset: "Trigger code for laboratory test names"
                                 @sdtc:valueSet and @sdtc:valueSetVersion shall be present -->
                            <code code="11585-7" codeSystem="2.16.840.1.113883.6.1" codeSystemName="LOINC"
                                displayName="Bordetella pertussis Ab [Units/volume] in Serum" sdtc:valueSet="2.16.840.1.114222.4.11.7508"
                                sdtc:valueSetVersion="19/05/2016" />
```




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# Core Standard: Documents

Initial Public Health Case Report

C:/Users/arzt/AppData/Local/Temp/CDAR2_IG_PHCASERPT_R2_STU1.1_SAMPLE.html

Patient: Jane Stinn    Document Type: Public Health Case Report

- BACK TO TOP
- DEMOGRAPHICS
- AUTHORING DETAILS
- **CLINICAL SECTIONS**
- PLAN OF TREATMENT
- ENCOUNTERS
- HISTORY OF PRESENT ILLNESS
- MEDICATIONS ADMINISTERED
- PROBLEMS
- REASON FOR VISIT
- RESULTS

| Encounter | Date(s) | Location |
|---|---|---|
| Office outpatient visit 15 minutes | NOV 7, 2016 | *Urgent Care Center* |

| Encounter Diagnosis Type |
|---|
| Diagnosis |

| Initial Case Report Trigger Code Problem Observation | Problem | Trigger Code | Trigger Code codeSystem | RCTC OID | RCTC Version | Date(s) |
|---|---|---|---|---|---|---|
| Diagnosis | Pertussis (disorder) | 27836007 | SNOMED CT | 2.16.840.1.114222.4.11.7508 | 19/05/2016 | NOV 7, 2016 |

| Encounter Diagnosis Type |
|---|
| Diagnosis |

| Problem Type | Problem | Date(s) |
|---|---|---|



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# New Standard: FHIR

- Fast Healthcare Interoperability Resources
- Key concepts:
  - Data “bundled” into Resources
  - Resources can be assembled either into “message-like” or “document-like” packages
  - Uses REST for transport
  - Relies on a set of “services” to pass FHIR resources from one system to another
- Data encoded in XML or JSON formats
- Human readable visualization
- 80/20 Rule, but extensible

# New Standard: FHIR Sample

```xml
<Patient xmlns="http://hl7.org/fhir">
  <id value="glossy"/>
  <meta>
    <lastUpdated value="2014-11-13T11:41:00+11:00"/>
  </meta>
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <p>Henry Levin the 7th</p>
      <p>MRN: 123456. Male, 24-Sept 1932</p>
    </div>
  </text>
  <extension url="http://example.org/StructureDefinition/trials">
    <valueCode value="renal"/>
  </extension>
  <identifier>
    <use value="usual"/>
    <type>
      <coding>
        <system value="http://hl7.org/fhir/v2/0203"/>
        <code value="MR"/>
      </coding>
    </type>
    <system value="http://www.goodhealth.org/identifiers/mrn"/>
    <value value="123456"/>
  </identifier>
  <active value="true"/>
  <name>
    <family value="Levin"/>
    <given value="Henry"/>
    <suffix value="The 7th"/>
  </name>
  <gender value="male"/>
  <birthDate value="1932-09-24"/>
  <careProvider>
    <reference value="Organization/2"/>
    <display value="Good Health Clinic"/>
  </careProvider>
</Patient>
```

Resource Identity & Metadata

Human Readable Summary

Extension with URL to definition

Standard Data:
- MRN
- Name
- Gender
- Birth Date
- Provider

http://hl7.org/implement/standards/fhir/summary.html



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# New Standard: FHIR Resources

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

| | Summary | Diagnostics | Medications | Care Provision | Request & Response |
|---|---|---|---|---|---|
| Clinical | • AllergyIntolerance 3<br>• AdverseEvent 0<br>• Condition (Problem) 3<br>• Procedure 3<br>• FamilyMemberHistory 2<br>• ClinicalImpression 0<br>• DetectedIssue 1 | • Observation N<br>• Media 1<br>• DiagnosticReport 3<br>• Specimen 2<br>• BodyStructure 1<br>• ImagingStudy 3<br>• QuestionnaireResponse 3<br>• MolecularSequence 1 | • MedicationRequest 3<br>• MedicationAdministration 2<br>• MedicationDispense 2<br>• MedicationStatement 3<br>• Medication 3<br>• MedicationKnowledge 0<br>• Immunization 3<br>• ImmunizationEvaluation 0<br>• ImmunizationRecommendation 1 | • CarePlan 2<br>• CareTeam 2<br>• Goal 2<br>• ServiceRequest 2<br>• NutritionOrder 2<br>• VisionPrescription 2<br>• RiskAssessment 1<br>• RequestGroup 2 | • Communication 2<br>• CommunicationRequest 2<br>• DeviceRequest 0<br>• DeviceUseStatement 0<br>• GuidanceResponse 2<br>• SupplyRequest 1<br>• SupplyDelivery 1 |

| | Support | Billing | Payment | General | |
|---|---|---|---|---|---|
| Financial | • Coverage 2<br>• CoverageEligibilityRequest 2<br>• CoverageEligibilityResponse 2<br>• EnrollmentRequest 0<br>• EnrollmentResponse 0 | • Claim 2<br>• ClaimResponse 2<br>• Invoice 0 | • PaymentNotice 2<br>• PaymentReconciliation 2 | • Account 2<br>• ChargeItem 0<br>• ChargeItemDefinition 0<br>• Contract 1<br>• ExplanationOfBenefit 2<br>• InsurancePlan 0 | |

http://hl7.org/implement/standards/fhir/resourcelist.html



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# New Standard: FHIR Interactions

In addition to a number of General Considerations this page defines the following interactions:

| 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 |

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



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# New Standard: FHIR Operations

| Base Operations (All resource types) |
|---|
| Validate a resource |
| Access a list of profiles, tags, and security labels |
| Add profiles, tags, and security labels to a resource |
| Delete profiles, tags, and security labels for a resource |
| Convert from one form to another |
| Execute a graphql statement |
| Return a graph of resources |
| **Operations Defined by Resource Types** |
| Apply |
| Data Requirements |
| Fetch a subset of the CapabilityStatement resource |
| Test if a server implements a client's required operations |
| Test if a server implements a client's required operations |
| Discover what versions a server supports |
| Apply |
| Submit a Claim resource for adjudication |
| Concept Look Up & Decomposition |
| Code System based Validation |
| Subsumption Testing |
| Finding codes based on supplied properties |
| Generate a Document |
| Concept Translation |
| Closure Table Maintenance |
| Submit an EligibilityRequest resource for assessment |

| |
|---|
| Fetch Encounter Record |
| Fetch a group of Patient Records |
| Data Requirements |
| Find a functional list |
| Evaluate Measure |
| Data Requirements |
| Submit Data |
| Collect Data |
| Care Gaps |
| Fetch Product Record |
| Process Message |
| Fetch Preferred it |
| Observation Statistics |
| Last N Observations Query |
| Find patient matches using MPI based logic |
| Fetch Patient Record |
| Apply |
| Data Requirements |
| Build Questionnaire |
| Generate Snapshot |
| Model Instance Transformation |
| Value Set Expansion |
| Value Set based Validation |

http://hl7.org/implement/standards/fhir/operationslist.html



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**SMART**

- Method to embed FHIR app within an EHR (or other system)
- Defines a set of "profiles"
- Open standards
- Open source tools
- "Sandbox" for experimentation
- App "gallery"
- CDS Hooks extension

*https://smarthealthit.org/*

**Argonaut**

- "Implementation community" – closed
- Origins in JASON TF Report (2014)
- Develop set of FHIR IGs
  - Data Query IG
  - Provider Directory IG

*http://argonautwiki.hl7.org*



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# ONC NPRM: February 2019

- FHIR as a read-only method of implementing seamless and consistent interoperability.
- Both single patient and multiple patient queries would be supported.
- ONC seems uncertain of which version of FHIR to mandate, feedback is requested on several proposals including R2, both R2 and R3, both R2 and R4, or just R4.
- Proposes adopting a bundle of specific profiles to be referred to as "API Resource Collection in Health" ("the ARCH“) aligned with USCDI (US Core Data for Interoperability)
- Proposes use of Data Query IG specified by the Argonaut Project.
- Proposes use of OpenID/OAuth for authentication.
- Proposed use of SMART Standalone Launch and EHR Launch.
- Applies *only* to specifically-identified “API-focused” certification criteria (select a patient, respond to patient data request).
- FHIR endpoints must be published.
- Very complicated rules proposed for charging fees for these capabilities so as not to engage in data blocking.

# ONC NPRM: Public Health Impact

- Public health reporting transactions do not appear to be directly impacted.
- Most public health transactions are "push" transactions and the focus here seems to be on query/response.
- As FHIR becomes more pervasive in the clinical community, some public health registry activities (*e.g.*, IIS query/response) may come under pressure to support FHIR.
- Electronic case reporting (eCR) standards development *is* currently pursuing a parallel set of activities for the eICR using both C-CDA as well as FHIR (though no immediate FHIR implementation planned).
- It seems appropriate for this rule to require FHIR R4 which is the first normative release.
- Note that ONC is requesting an exemption from The National Technology Transfer and Advancement Act (NTTAA) requirements.

# Recommendations: Public Health

- Start learning!
  - Read up on FHIR
  - Participate in HL7 PH WG as it turns to FHIR
  - Attend HL7 events (WGM, Connect-a-thon, "FHIR Days")
- Look for potential applications in your agency
  - Especially ones with EHR data access like IIS query, clinical decision support
  - Focus nationally is on query/response but FHIR *can* also be used for "push" transactions
- Consider funding implication of using this newer technology



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# Resources

- https://corepointhealth.com/wp-content/uploads/hl7-fhir-primer.pdf
- http://hl7.org/fhir/
- https://www.fhir.org/
- https://www.hln.com/onc-releases-new-nprm-on-interoperability-how-might-it-affect-public-health/



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