

PointClickCare®

Leveraging Existing
Post-Acute and Acute Data
and Standards-Based
Extraction Capabilities for
Public Health

PointClickCare
February 28, 2023



Presenters



Benjamin Zaniello, MD

Chief Medical Officer



Keith Boone, MBI

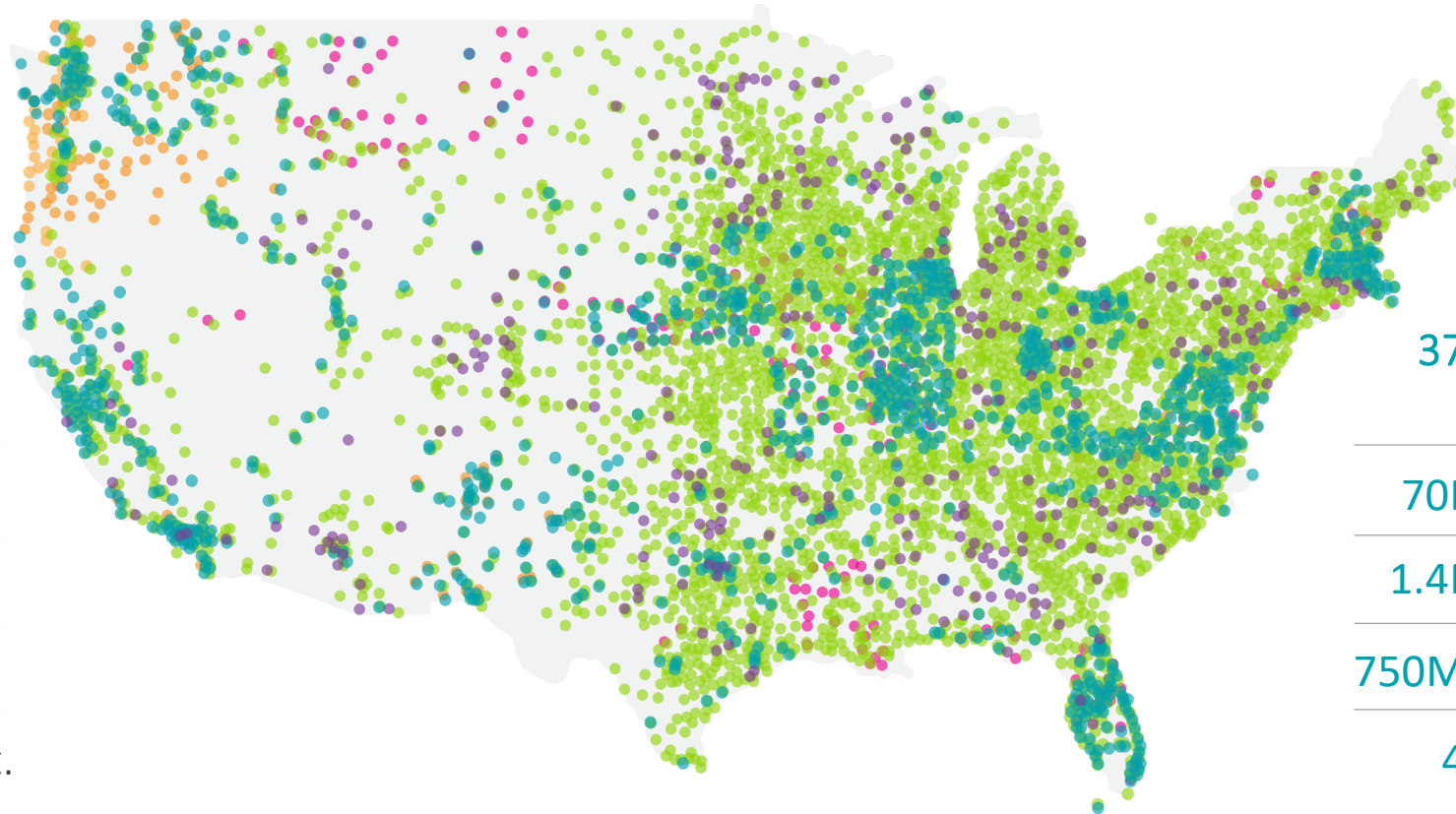
Standards Guru/Enterprise Architect

The PointClickCare Portfolio Now Powers one of the Largest Care Collaboration Networks in the U.S.

PointClickCare®

collectivemedical®
A PointClickCare Company

AUDACIOUS
INQUIRY
A PointClickCare Company



27,000 Senior Care Facilities

2,800 Hospitals

2,000+ Ambulatory

180 Health Plans

75 State & Govt. Agencies

370 ACOs & At-Risk Providers

70M Subscriber Lives

1.4M Residents/Day

750M+ Visits

47 States connected on the network

PointClickCare SNF EHR



Acute Care Connections



CCD Connections



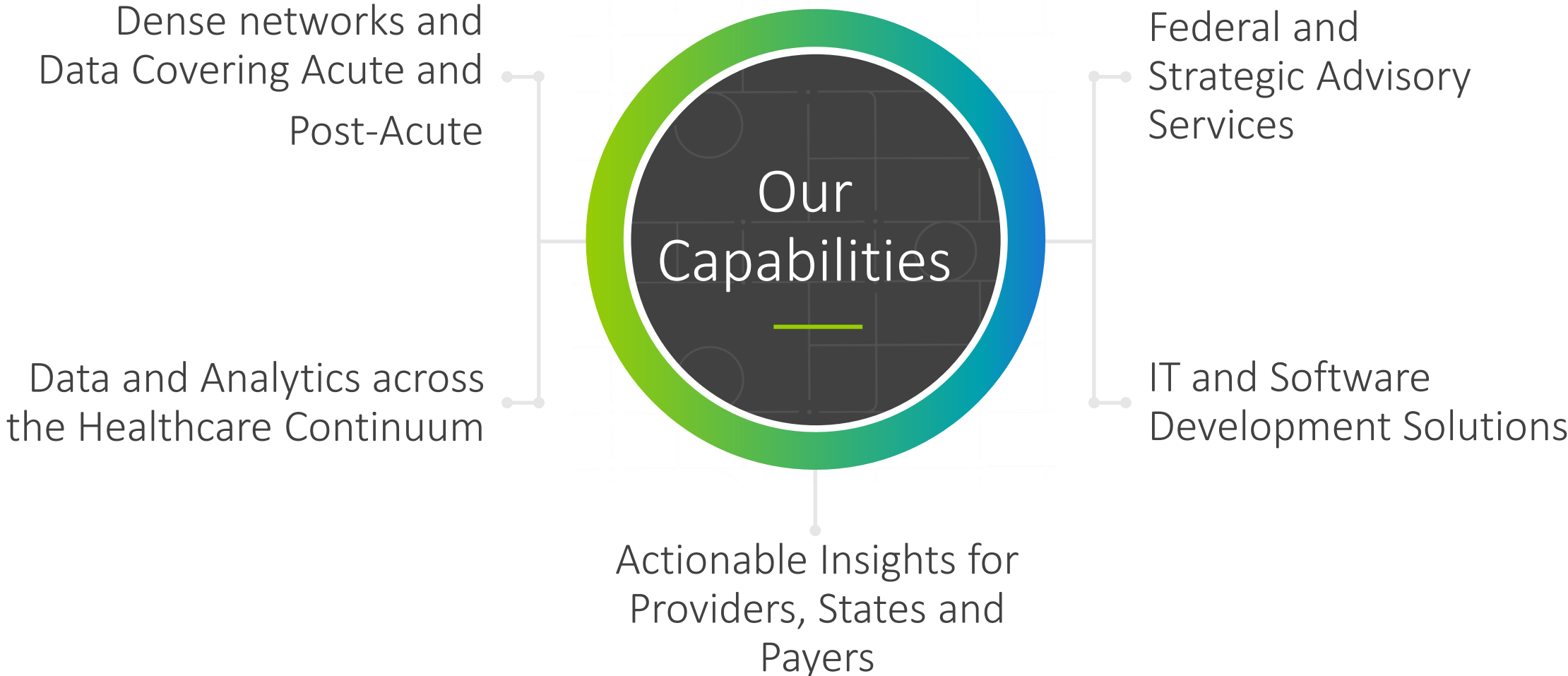
Connections via HIE



Other Integrations



PointClickCare brings on-the-ground experience bringing entities together around a common policy framework to support general healthcare data sharing and public health purpose-built networks



Utilizing Existing Real-Time Networks to Improve Access to Data and Break Down Silos

Real-time data sources can be a key resource for a variety of public health stakeholders, enabling STLTs and federal agencies to track specific, localized and emergent needs and measure interventions.

- To establish a more connected system between public health and healthcare, there is an opportunity to:
 - Focus more on direct real-time connections and leveraging existing networks (including ADT networks)
 - Create deep analytical insights at the facility, population, regional, state or national level
 - Integrate actionable insights into provider workflows and reduce reporting burden
 - Enhance data utilized for the National Syndromic Surveillance Program to include LTPAC data
 - Support implementation of standards to improve data flow and ingestion
- What Leads to Better, Faster, Actionable Insights for Decision-Making?
 - Access to real-time data
 - Informative and available analytics
 - Actionable insights for intervening entities

Multi-Drug Resistant Organisms (MDRO) Use Case



MDRO flags auto-populated via HL7 and File Sources

1. **Public Health Agency** – MDRO flags from State Public Health Sources
2. **State Lab Results** – positive MDRO labs results from hospital and/or reference laboratory HL7 feeds
3. **Diagnosis** – HL7 ICD codes with MDRO diagnosis



MDRO Exposure Risk alerts to prevent and control MDRO transmission

- Understand the patient's infection, colonization status and antibiotics response history
- Prevent and control MDRO transmission, real-time MDRO alerts are delivered to ED providers upon patient registration
- Help SNF and hospital staff more quickly implement cleaning, PPE and isolation protocols
- Enable public health staff insights into confirmed case ED, IP, and SNF activity after MDRO confirmation



To date, there are over 1,300 active MDRO flags in our network



MDRO Workflow

- Scope reports for Virginia Dept. of Health Healthcare-Associated Infectious Program
- Outreach and onboarding of LTPAC facilities in Virginia
- Train public health surveillance staff on case follow up using our platform
- Enable real-time notifications for patients presenting with MDRO diagnosis

Olsen, Lane R [View More](#) CCO [Download PDF](#)

Address
2617 Dewy Goose Heath
Doty, VA 98946
[View More](#)

Phone
(755) 555-4723
[View More](#)

DOB
06/15/1999 (23)
[View More](#)

ID
65050417p
[View More](#)

Gender
Male

Tags + MDRO - Candida Auris - Virginia

Care Team

Care Team

Description: Pt. has a reported C. auris infection and/or is known to be colonized. Place on transmission-based precautions. Use an EPA registered disinfectant effective against C. auris(List P).See Infection prevention guidance here: tinyurl.com/5n7woxyn

Attributed on: 08/23/2022

Attributed by: Virginia Department of Health

[+ Add Provider](#)

COLLECTIVE NOTIFICATION 02/24/2021 11:51 CASE, JUSTIN MRN: 7777777

Criteria Met

Flags

- MDRO - MRSA Exposure - New Mexico - This patient has been identified in the state of New Mexico as experiencing exposure to Methicillin resistant Staphylococcus aureus by a licensed healthcare entity. | Attributed By: Collective Medical | Attributed On: 02/24/2021
- History of Sepsis - Patient has received a diagnosis of Sepsis from an acute or post-acute setting. Apply appropriate clinical planning practices; to learn more visit [cdc.gov/sepsis/clinicaltools](https://www.cdc.gov/sepsis/clinicaltools) | Attributed By: Collective Medical | Attributed On: 01/02/2020

E.D. Visit Count (12 mo.)

Facility	Visits
Lovelace Westside Hospital	2
Presbyterian Espanola Hospital	1
UNM Hospital - Adult & Peds ED	1
Presbyterian Hospital	1
Total	5

Note: Visits indicate total known visits.

Examples of Other Supported Public Health Use Cases

Candida Auris

- Serious emerging fungus threat that is difficult to identify, deadly, and persists in hospitals and LTPAC facilities
- Utilizing same Risk Alert technology and methodology as MDRO use case
- Reported cases confirmed by state Public Health

Infection Prevention and Control (IPC)

- Enables nursing facilities and senior living to identify, manage and report infections in real-time
- Clinical workflow and intelligence solution
- Increases awareness and understanding of infection cases and incorporates best practices for antibiotic stewardship
- Supports 837 organizations across 3,438 facilities

ADT Alerting and COVID-19

- Minnesota Encounter Alert Service expanded to support statewide situational awareness surveillance
- Rapidly expanded number of hospitals submitting ADT data for situational awareness by 100 hospitals in 60 days
- Message volume increased from ~50,000 per day to 350,000 per day

Opioid Use Disorder

- CA, NM and VA EDs refer patients for medication-assisted treatment (MAT)
- Bridge solution creates warm handoffs to providers in dedicated treatment settings or FQHCs
- Addicted patients given buprenorphine in ED were 2x more likely to remain in treatment after 30 days

Improved real-time data enhances our ability to have faster understandings of trends, outbreaks and key public health issues



Utilize Existing Vendor Networks

- Provide consistent and timely access to data across the healthcare continuum
- Inclusion of LTPAC and other previously siloed providers/facilities
- Alleviate reporting burden by including in provider workflows



Better Dissemination and Visualization of Data

- Improve real-time understanding of trends and impact of interventions
- Aggregated reporting at all levels
 - Facility
 - Region or County
 - State
 - National



Improve Standards and Policies through Existing Relationships

- Provide expertise on bringing together disparate groups around common policy and standards framework
- Support data collection and reporting across common, implemented standards and policies

Standards-Based Extraction for Public Health

Utilizing FHIR to Modernize Public Health Data Collection and Analysis

- HL7 FHIR and related specification can be the foundation of modernized data infrastructure
- FHIR includes many capabilities that can enable data extraction, transformation, mapping, integration and record linking, supporting analysis including:
 - Querying for data in HL7 Version 2, CDA and FHIR by integrating with nationally recognized standards used by leading EHRs and HIEs across the country
 - Linking data across sources by integrating with master data management and privacy preserving record linking services
 - Mapping and extracting data from multiple standards into normalized data models for analysis
 - Enabling data sets to be defined that enable patient privacy and security
- These capabilities can enable public health to establish a modern architecture that can support current, future, and legacy data formats

Our Standards Experience

PointClickCare has extensive experience implementing HL7 and IHE Standards in production environments for our customers and federal partners.

Our staff has been involved in editing many of the specifications available in National Networks and Health Information Exchanges, including:

- QHIN Technical Framework
- HL7 FHIR Consent Resource
- HL7 Consolidated CDA (C-CDA)
- HL7 V2 to FHIR
- IHE Cross Enterprise Document Sharing (XDS), Cross Community Access (XCA), Patient Identifier Cross Referencing (PIX and PIX.m), Patient Demographic Query (PDQ and PDQ.m), Cross Community Patient Discovery (XCPD)
- HL7 Situational Awareness for Novel Epidemic Response (SANER) – which includes FluentQuery

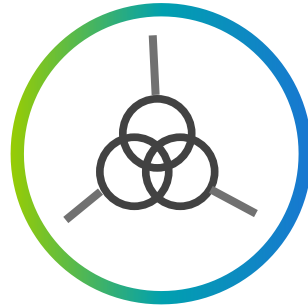
Problems to Surmount



Data Availability

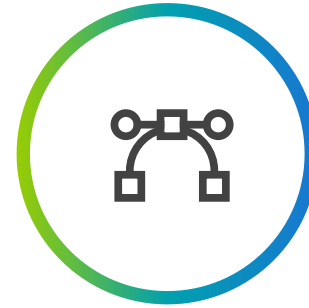
PCC's comprehensive care collaboration network covers:

- 27,000 senior care facilities,
- 2,800 hospitals,
- 2,000 ambulatory facilities
- 75 state & government agencies
- 195 million subscriber lives
- 1.4 million senior care residents
- 47 states connected



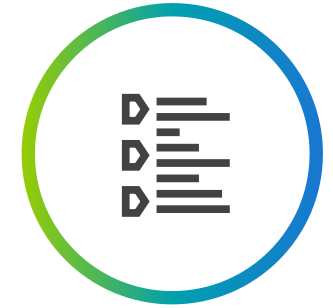
Searching via multiple APIs

Differing APIs enable access to HL7 Version 2, HL7 CDA, and FHIR® data sets, at differing levels of granularity. We can provide a fine-grained API based on HL7 FHIR® to support searching across multiple networks and formats.



Linking Records from Different Sources

Data linking (e.g., PPR) is essential for creating a longitudinal view. Multiple data linking solutions exist. We can illustrate how to link using internationally recognized standards based on HL7 FHIR®.



Mapping and Extraction

The data you need is in multiple formats. We can show how to map this data into data sets using analytics, again using capabilities and models in HL7 FHIR®

Variety in Data Access and Content

- National Networks
 - HL7 CDA and C-CDA Content
 - NWHIN / IHE XCA
 - QHIN Technical Framework
- Regional HIEs
 - HL7 CDA/C-CDA, V2 and FHIR Content
 - NWHIN / XCA
 - IHE XDS / XCA
 - SMART on FHIR
 - Other / Proprietary

eHealth Exchange

carequality



PointClickCare

Enabling Common Access using Standards



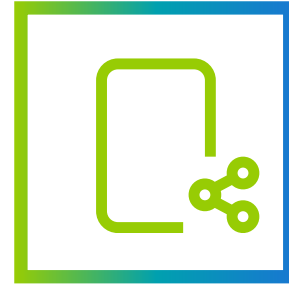
FHIR Path

- Data Selection API that works with any model that can be expressed in a FHIR StructureDefinition



Fluent Query

- Developed for HL7 Situational Awareness for Novel Epidemic Response
- FluentPath enables query via FHIR Path and works with any FHIR-based Query.



IHE Mobile Access to Health Documents (MHD)

- MHD provides a FHIR-based bridge from IHE XCA and XDS (and related specifications such as NHIN) to access documents.



HL7 FHIR®

- HL7 FHIR® provides search APIs for granular content, documents and messages that can be interfaced to different query clients.

FHIRPath is a Graph Traversal Language

Features

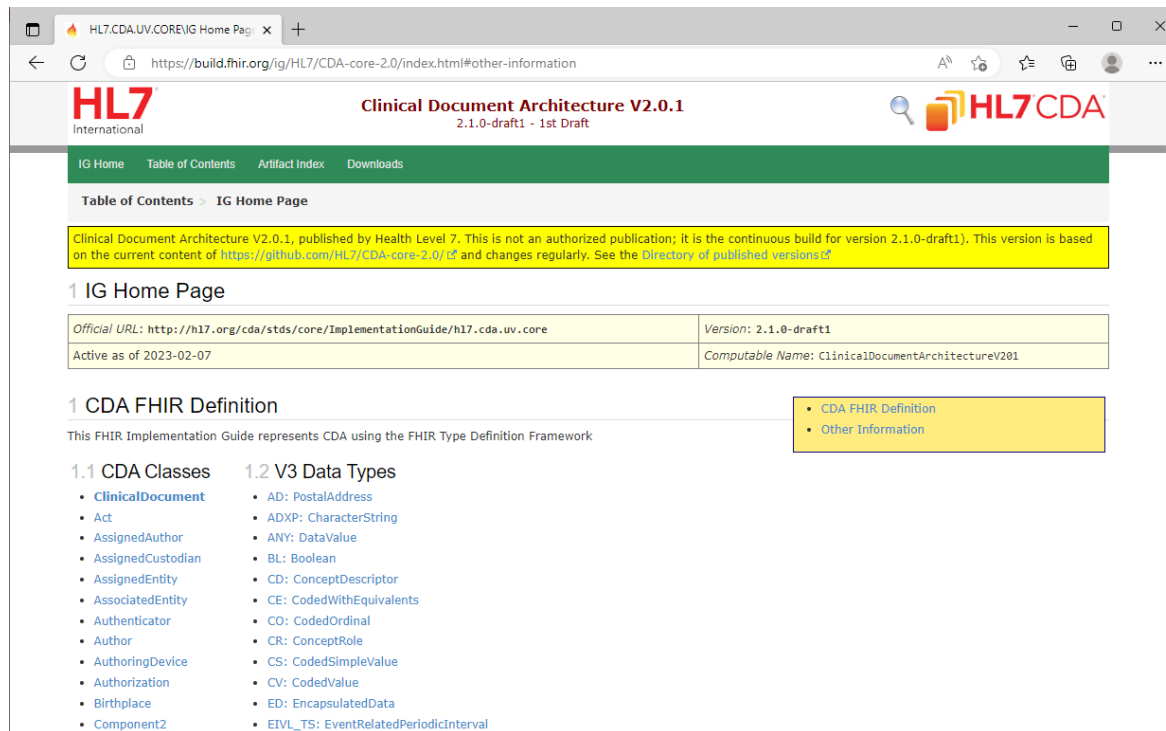
- **Graph-traversal:** FHIRPath is a graph-traversal language
- **Fluent:** FHIRPath has a syntax based on the [Fluent Interface](#) pattern
- **Collection-centric:** FHIRPath deals with all values as collections
- **Platform-independent:** FHIRPath can be implemented in any platform
- **Model-independent:** FHIRPath deals with data as an abstract model, allowing it to be used with any information model

- Despite the name, is *not* strictly limited to use within FHIR

HL7 CDA and HL7 Version 2 have FHIR-based models

CDA Model

<https://build.fhir.org/ig/HL7/CDA-core-2.0/>



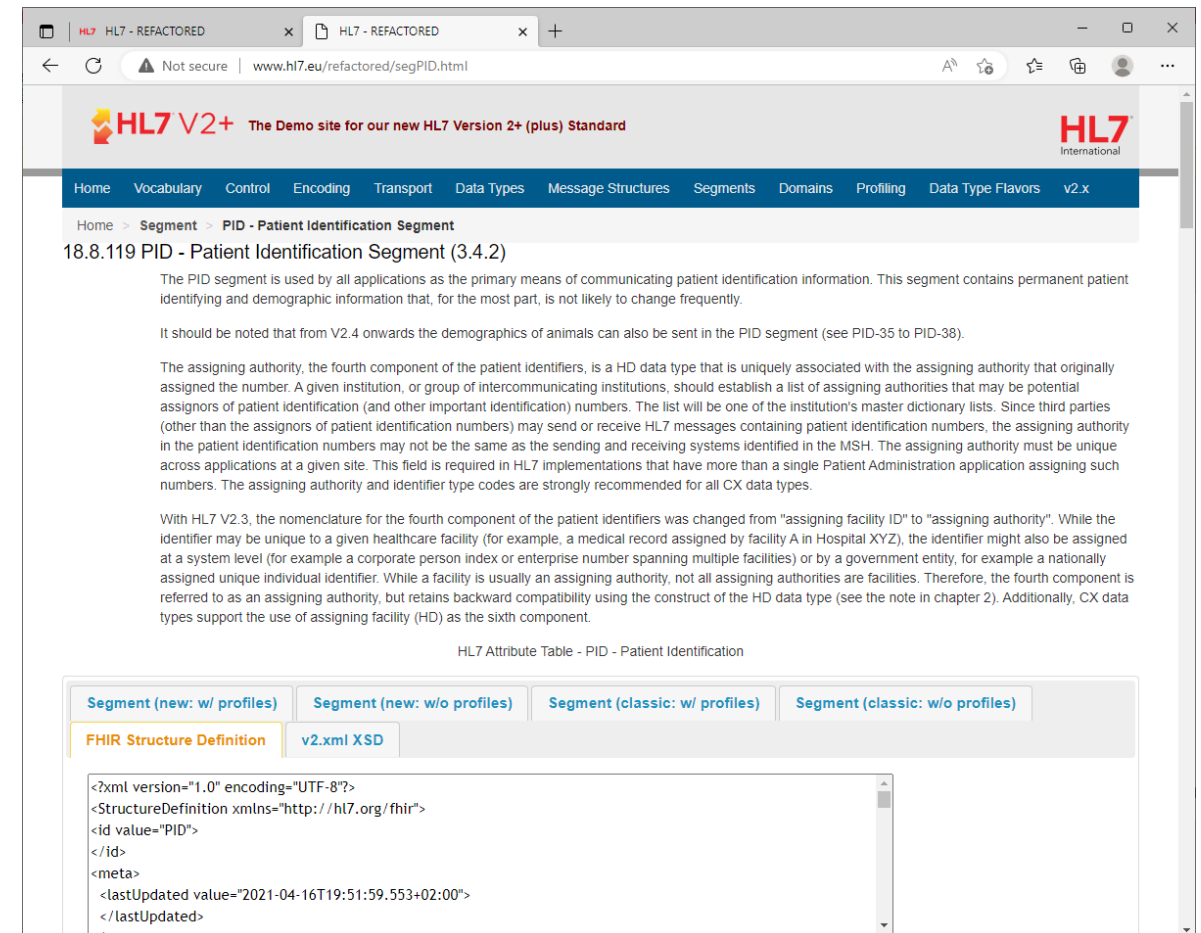
The screenshot shows the HL7 CDA Core 2.0 website. The header includes the HL7 International logo and the title "Clinical Document Architecture V2.0.1 2.1.0-draft1 - 1st Draft". A navigation menu contains "IG Home", "Table of Contents", "Artifact Index", and "Downloads". Below the menu, a "Table of Contents > IG Home Page" link is visible. A yellow highlighted box contains the text: "Clinical Document Architecture V2.0.1, published by Health Level 7. This is not an authorized publication; it is the continuous build for version 2.1.0-draft1). This version is based on the current content of <https://github.com/HL7/CDA-core-2.0/> and changes regularly. See the [Directory of published versions](#)." Below this, the "1 IG Home Page" section is displayed, featuring a table with the following information:

Official URL: http://hl7.org/cda/stds/core/ImplementationGuide/hl7.cda.uv.core	Version: 2.1.0-draft1
Active as of 2023-02-07	Computable Name: ClinicalDocumentArchitectureV201

Below the table, the "1 CDA FHIR Definition" section is shown, with a note: "This FHIR Implementation Guide represents CDA using the FHIR Type Definition Framework". A yellow highlighted box contains two links: "CDA FHIR Definition" and "Other Information". The page also lists "1.1 CDA Classes" and "1.2 V3 Data Types" with their respective sub-items.

HL7 V2 Model

<http://www.hl7.eu/refactored/segPID.html>



The screenshot shows the HL7 V2+ website. The header includes the HL7 V2+ logo and the title "The Demo site for our new HL7 Version 2+ (plus) Standard". A navigation menu contains "Home", "Vocabulary", "Control", "Encoding", "Transport", "Data Types", "Message Structures", "Segments", "Domains", "Profiling", "Data Type Flavors", and "v2.x". Below the menu, the "Home > Segment > PID - Patient Identification Segment" path is shown. The main content area displays "18.8.119 PID - Patient Identification Segment (3.4.2)". The text describes the PID segment as the primary means of communicating patient identification information, containing permanent patient identifying and demographic information. It notes that from V2.4 onwards, demographics of animals can also be sent in the PID segment. The text also discusses the assigning authority, the fourth component of the patient identifiers, and its role in patient identification. A yellow highlighted box contains two links: "CDA FHIR Definition" and "Other Information". Below the text, the "HL7 Attribute Table - PID - Patient Identification" is shown, with a table containing the following information:

Segment (new: w/ profiles)	Segment (new: w/o profiles)	Segment (classic: w/ profiles)	Segment (classic: w/o profiles)
FHIR Structure Definition	v2.xml XSD		

Below the table, the XML structure definition for the PID segment is shown:

```
<?xml version="1.0" encoding="UTF-8"?>
<StructureDefinition xmlns="http://hl7.org/fhir">
  <id value="PID">
  </id>
  <meta>
    <lastUpdated value="2021-04-16T19:51:59.553+02:00">
    </lastUpdated>
  </meta>
```

StructureDefinition Maps Between Models Using FHIRPath



- Mapping can be expressed in multiple languages:
 - FHIRPath
 - Xpath
 - HL7 V2

The screenshot shows a web browser displaying the FHIR StructureDefinition viewer for 'HL7.CDA.UV.CORE\IG Home Page'. The URL is 'hl7.org/fhir/R4/elementdefinition.html#ElementDefinition'. The page title is 'ElementDefinition' and it is noted that this definition is used in 'StructureDefinition'. The 'Content' section has tabs for 'UML', 'XML', 'JSON', 'Turtle', 'R3 Diff', and 'All', with 'UML' selected. Below the tabs is a 'Legend' section with a diagram showing the relationships between various FHIR classes. The 'ElementDefinition' class is the central focus, with relationships to 'Discriminator', 'Base', 'Example', 'ElementDefinitionBinding', and 'Mapping'. The 'ElementDefinition' class has attributes: path (string [1..1]), representation (code [0..*] = PropertyRepresentation), sliceName (string [0..1]), sliceSlicing (boolean [0..1]), label (string [0..1]), code (Coding [0..*] = LOINCCode?), short (string [0..1]), definition (markdown [0..*]), comment (markdown [0..1]), requirements (markdown [0..1]), alias (string [0..*]), and slicing (Slicing [0..*]). The 'Discriminator' class has attributes: type (code [1..1] = DiscriminatorType) and path (string [1..1]). The 'Base' class has attributes: path (string [1..1]), min (unsignedInt [1..1]), and max (string [1..1]). The 'Example' class has attributes: label (string [1..1]) and value[x] (string [1..1]). The 'ElementDefinitionBinding' class has attributes: strength (code [1..1] = BindingStrength), description (string [0..1]), and valueSet (canonical [0..1] = ValueSet). The 'Mapping' class has attributes: identity (id [1..1]), language (code [0..1] = Mime Type), map (string [1..1]), and comment (string [0..1]).

Mappings in FHIR already exist for CDA & Version 2

- Mappings can be transformed via automated processes to FHIRPath from the XPath and V2 syntax used for CDA Documents and Version 2 Messages

8.1.16.4 CDA (R2) (<http://hl7.org/v3/cda>)

Patient	ClinicalDocument.recordTarget.patientRole
identifier	.id
active	n/a
name	.patient.name
telecom	.telecom
gender	.patient.administrativeGenderCode
birthDate	.patient.birthTime
deceased[x]	n/a
address	.addr
maritalStatus	.patient.maritalStatusCode
multipleBirth[x]	n/a
photo	n/a
contact	n/a
relationship	n/a
name	n/a
telecom	n/a
address	n/a
gender	n/a
organization	n/a
period	n/a
communication	patient.languageCommunication
language	.languageCode
preferred	.preferenceInd
generalPractitioner	n/a
managingOrganization	.providerOrganization
link	n/a
other	n/a
type	n/a

8.1.16.2 HL7 v2 Mapping (<http://hl7.org/v2>)

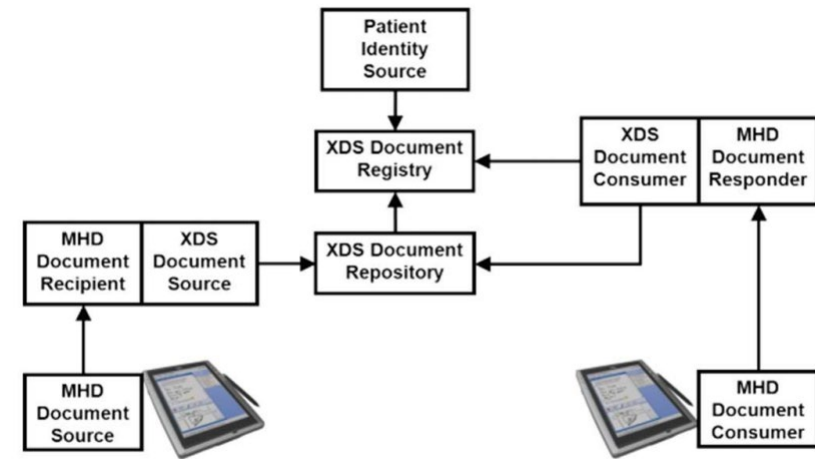
Patient	
identifier	PID-3
active	
name	PID-5, PID-9
telecom	PID-13, PID-14, PID-40
gender	PID-8
birthDate	PID-7
deceased[x]	PID-30 (bool) and PID-29 (datetime)
address	PID-11
maritalStatus	PID-16
multipleBirth[x]	PID-24 (bool), PID-25 (integer)
photo	OBX-5 - needs a profile
contact	
relationship	NK1-7, NK1-3
name	NK1-2
telecom	NK1-5, NK1-6, NK1-40
address	NK1-4
gender	NK1-15
organization	NK1-13, NK1-30, NK1-31, NK1-32, NK1-41
period	
communication	
language	PID-15, LAN-2
preferred	PID-15
generalPractitioner	PD1-4
managingOrganization	
link	
other	PID-3, MRG-1
type	

Searching for Documents

Native

- Base Specification is IHE XCA, used in:
 - CommonWell
 - Carequality
 - eHealth Exchange
- Or IHE XDS
 - Used in Regional HIEs
- SOAP Based

FHIR Based Query with MHD Bridge



Query using FHIR, bridged to IHE XDS or XCA, search by:

Patient, document type, date range, author, facility, event.

Messages can be handled similarly

Searching in FluentQuery

Native

- Limited Search Capabilities
 - Argonaut
 - USCDI
 - FHIR US Core
 - EHR Specific Implementations
- Pagination
 - Additional complexity in processing query results.
 - Naïve solutions simple retrieve all pages

FluentQuery

FluentQuery writes the search based on the back-end FHIR Capability statement.

Post query filters reduce selection to requested content, enabling granular selection.

Enables:

- Behind the scenes pagination for large result sets
- Optimized queries for endpoints supporting them.
- Caching of results for more efficient access.

FluentQuery Examples for FHIR, CDA and V2

FHIR Resource

```
findAll('Encounter',  
  including('subject', 'condition',  
    'reasonReference'),  
  with('subject').equalTo(%Patient%),  
  with('status').equalTo('in-  
progress' | 'finished'),  
  
  with('date').within(%ReportingPeriod)  
).onServers(%Base)
```

CDA content using MHD

```
findAll('DocumentReference',  
  including('subject', 'condition'),  
  with('subject').equalTo(%Patient),  
  with('status').equalTo('current'),  
  with('date').within(%ReportingPeriod)  
).onServers(%Base)
```

HL7 Version 2

```
findAll('MessageHeader',  
  with('subject').equalTo(%Patient),  
  with('status').equalTo('current'),  
  with('date').within(%ReportingPeriod)  
).onServers(%Base)
```



A Uniform API for Data Access Across Multiple Content Formats and Network

1. FHIR Search can be bridged to National Networks, V2 Message Repositories and native FHIR Endpoints
2. FHIRPath + CDA, V2 and FHIR Models enable common data access
3. FHIR Search and FluentQuery enable uniform query via FHIR[®], optimized for back-end FHIR server capabilities.

Integration with Record Linking Services

- Commonwell uses IHE Patient Identity Cross Referencing (PIX) using HL7 Version 2 or FHIR
- Carequality, eHealth Exchange, and the QHIN Technical Framework (QTF) use IHE Cross Gateway Patient Discovery (XCPD)
- XCPD can be integrated with using a FHIR façade with IHE PIX.m and PDQ.m, to enable patient identification in National Networks.
- The IHE PIX.m and PDQ.m profiles can also be used to enable uniform access to recording linking services or master patient indexes.
 - PPRL Services such as HealthVerity, DataVant or Senzing
 - MPI Services such as IBM, NextGate and Mirth Match

Beyond Record Linking, data exchange also needs to deal with anonymization or pseudonymization of data.

This is two separate problems:

1. Identifying the data to redact
2. Redacting it

If you can already identify (using StructureDefinition), data to extract, the same technology can be used to identify data to redact.

Open Source Tools

PointClickCare has decades of experience using the open-source tools in production environments for our customers. This is just a small sample of what we work with:

- HAPI FHIR
<https://hapifhir.io/>
- HAPI HL7 V2
<https://hapifhir.github.io/hapi-hl7v2/>
- Mirth Connect
<https://github.com/nextgenhealthcare/connect>
- NHIN Connect (XCA and XCPD)
<https://github.com/CONNECT-Solution>
- Model Driven Health Tools (MHDT)
<https://github.com/mdht>

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