

# Fuel Your Digital Health

# Innovation with HL7<sup>®</sup> FHIR<sup>®</sup>

HIMSS 2025

2025 03 05

**Daniel J. Vreeman, PT, DPT, MS, FACMI, FIAHSI, FHL7**

Chief Standards Development Officer

*HL7 International*

**HL7<sup>®</sup>**  
International



## Organizational Profile

Not-for-profit (501c6)

Standards Development Organization

Founded in 1987

ANSI-accredited

Globally trusted

## Product Families





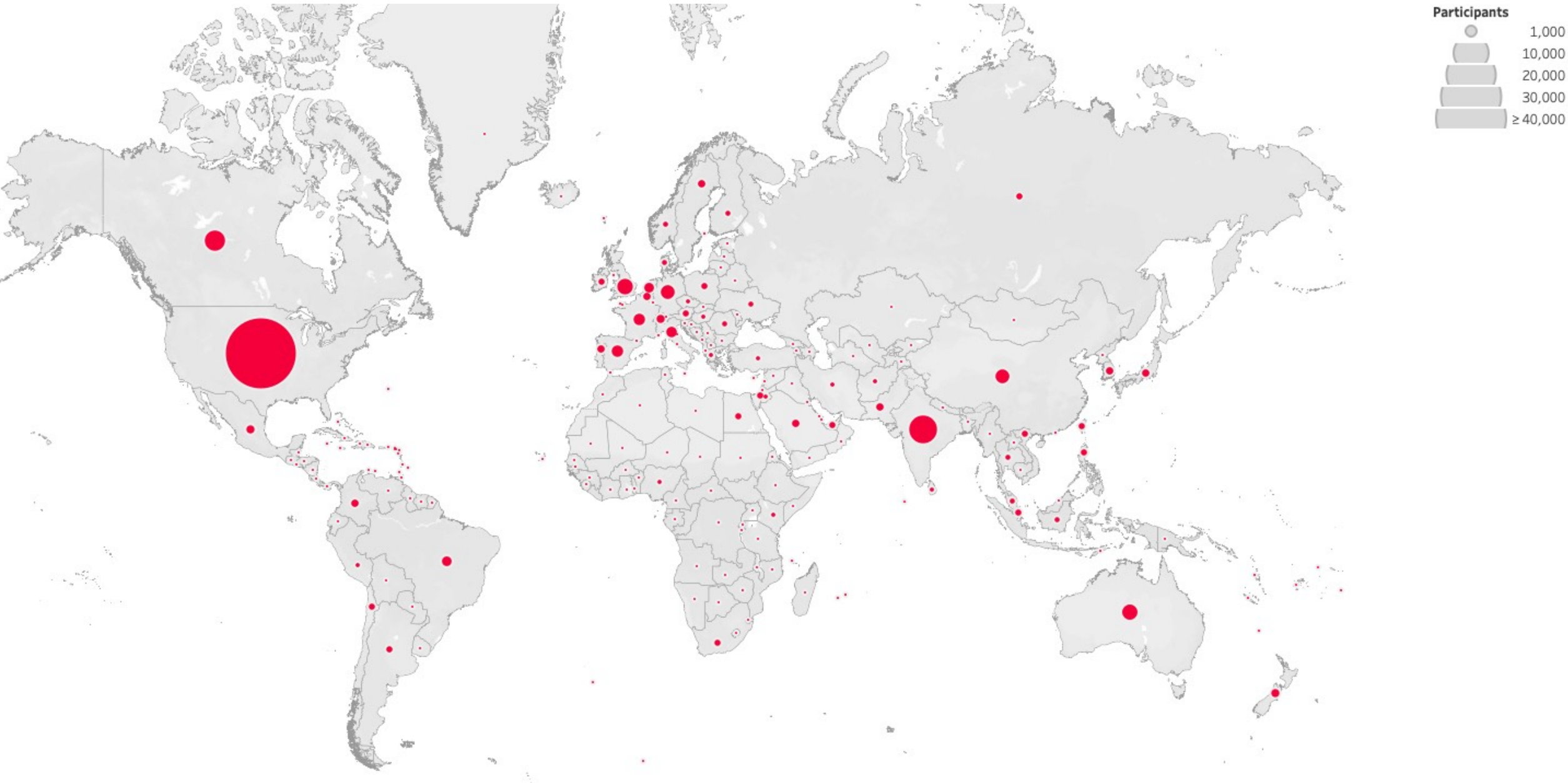
**F**ast **H**ealthcare **I**nteroperability **R**esources (**FHIR**)

A transformative *open API specification* and *data model* for health information.

Now a decade+ old and a global phenomenon and public good

# FHIR: the Web for health data

# Propelled by an Active Community Worldwide





# Lessons learned the hard way with health data



# Lesson 1:

You're almost certainly **not seeing**  
**the full picture.**

Manufactured  
Distributed by  
OPTICAL COMPANY, INC.  
Norwalk, CT  
oweropticalco.com

1.50¢

A grayscale background image showing an ambulance with 'MEDIC 05' and 'WISHARD Emergency Medical Services' on its side, and a motorcycle parked in front of a modern building with large windows and trees.

# 41%

of ED visits are for patients **with data at another institution**

A blurred image of an ambulance in motion, likely on a road, serving as the background for the text.

Nearly **every ED** in  
Indiana shares  
patients with **every**  
**other ED** in the state





**Fixed with FHIR**

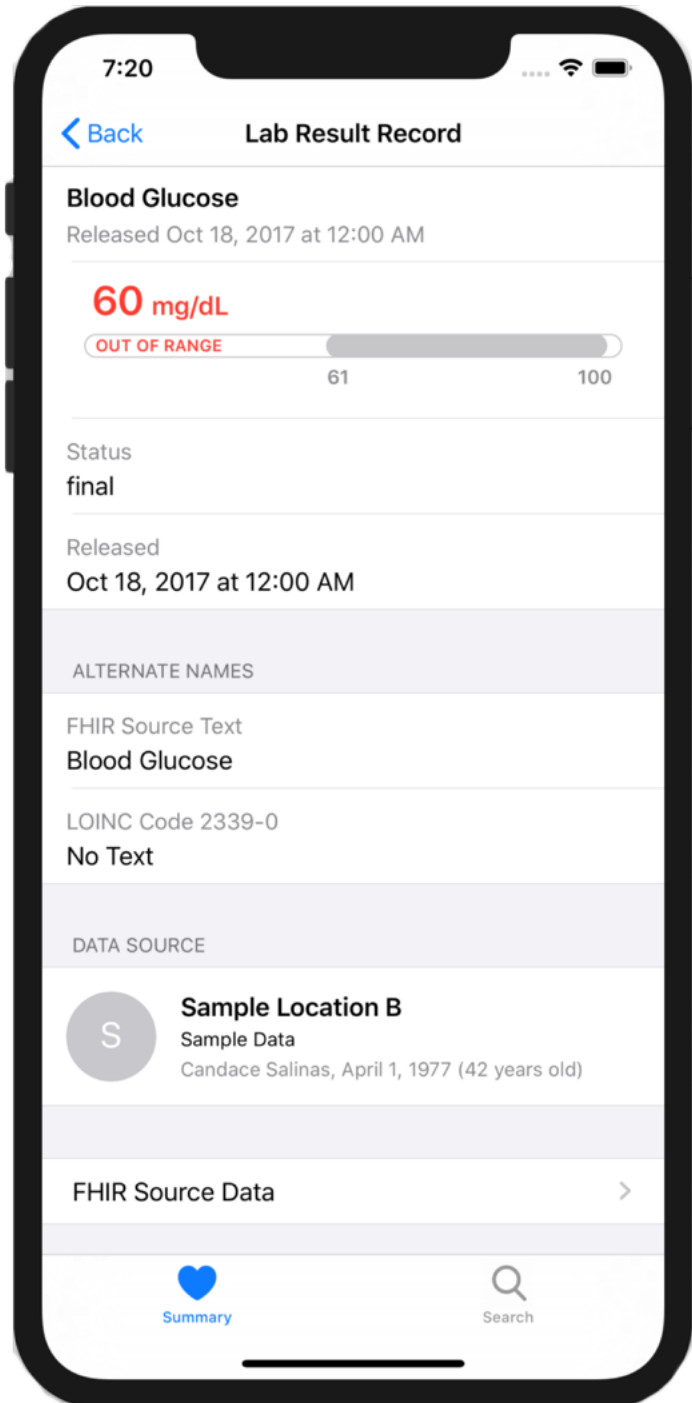


# Building a foundation for FHIR-based exchange in the United States

- ONC Cures Act Rule (2020)
- CMS Interop and Patient Access Final Rule (2020)
- ONC HTI-1 Final Rule (2023)
- CMS Interop and Prior Authorization Final Rule (2024)
- Common Agreement 2.0 (2024)

## Notice of Proposed Rule Making...

- ONC HTI-2 (2024)



## Current Endpoint Metrics



ENDPOINTS LAST QUERIED:  
**2024-10-07 14:07:27**



TOTAL ENDPOINTS  
**34700**



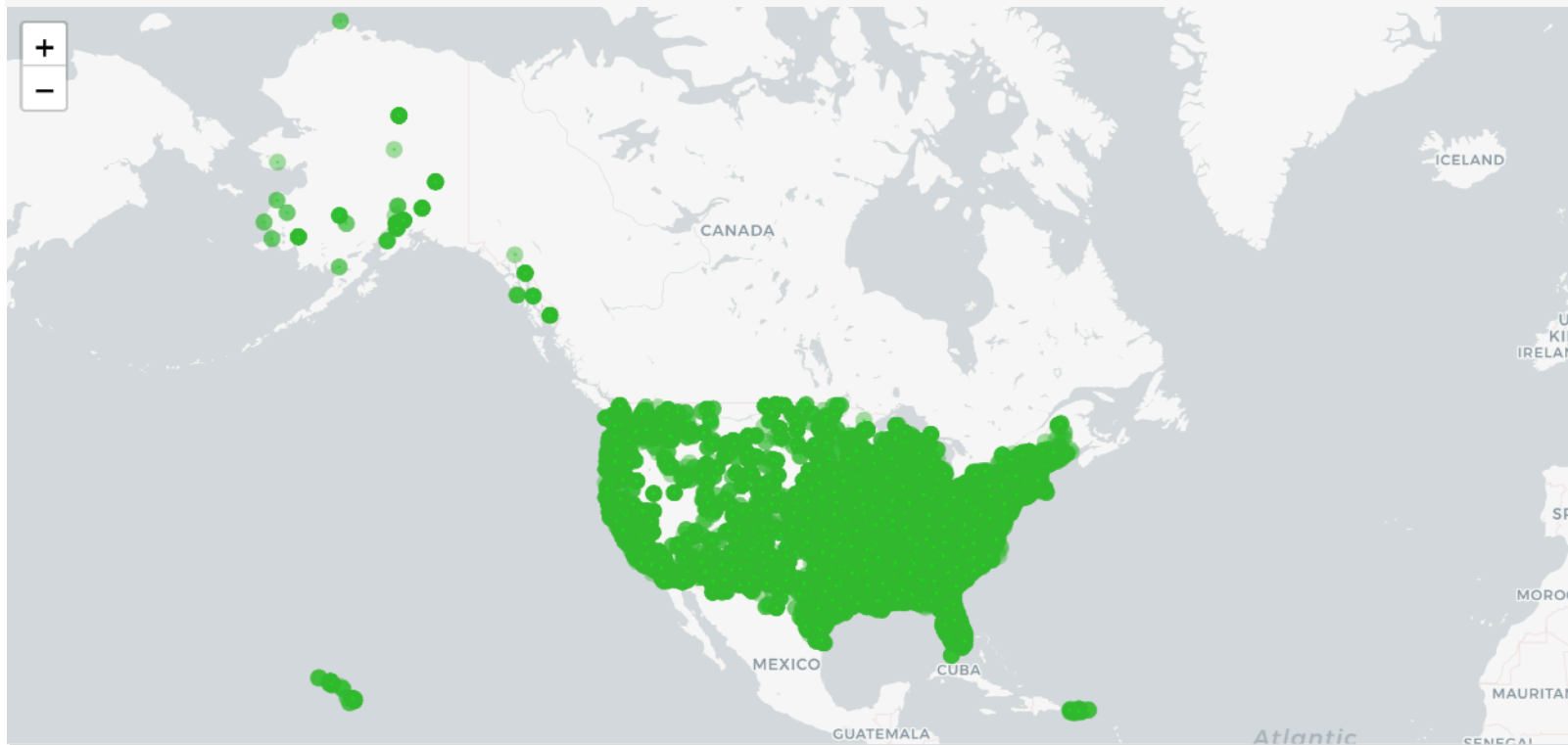
INDEXED ENDPOINTS\*  
**34700**

## Current endpoint responses:

**30743**  
200 (Success)

**353**  
404 (Not found)

**168**  
503 (Unavailable)



# Example Use Cases for FHIR in 2024

Patient Cost  
Transparency

Payer Data Exchange

Quality Improvement Core

Adverse Events in  
Clinical Research

Central Cancer Registry  
Reporting

Digital Insurance Card

Pharmaceutical Quality

Electronic Long-Term  
Services and Supports

Value-based Performance  
Reporting

Multiple Chronic  
Condition Care Plans

SDOH Data Exchange

Electronic Case  
Reporting

A woman with long hair is shown in profile, looking towards the right. She is holding a glowing, spherical object in her hands, which appears to be made of many small, shimmering particles. The background is dark with soft, out-of-focus light spots, creating a magical or ethereal atmosphere.

# Lesson 2:

AI's magic can sparkle, but insiders know it's **data work that powers the glow.**

# “Everyone wants to do the model work, not the data work”: Data Cascades in High-Stakes AI

Nithya Sambasivan, Shivani Kapania, Hannah Highfill, Diana Akrong, Praveen Paritosh, Lora Aroyo

[nithyasamba,kapania,hhighfill,dakrong,pkp,loraa]@google.com

Google Research  
Mountain View, CA

## ABSTRACT

AI models are increasingly applied in high-stakes domains like health and conservation. Data quality carries an elevated significance in high-stakes AI due to its heightened downstream impact, impacting predictions like cancer detection, wildlife poaching, and loan allocations. Paradoxically, data is the most under-valued and de-glamorised aspect of AI. In this paper, we report on data practices in high-stakes AI, from interviews with 53 AI practitioners in India, East and West African countries, and USA. We define, identify, and present empirical evidence on *Data Cascades*—compounding events causing negative, downstream effects from data issues—triggered by conventional AI/ML practices that undervalue data quality. Data cascades are pervasive (92% prevalence), invisible, delayed, but often avoidable. We discuss HCI opportunities in designing and incentivizing data excellence as a first-class citizen of AI, resulting in safer and more robust systems for all.

## CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI.**

lionized work of building novel models and algorithms [46, 125]. Intuitively, AI developers understand that data quality matters, often spending inordinate amounts of time on data tasks [60]. In practice, most organisations fail to create or meet any data quality standards [87], from under-valuing data work vis-a-vis model development.

Under-valuing of data work is common to all of AI development [125]<sup>1</sup>. We pay particular attention to undervaluing of data in *high-stakes domains*<sup>2</sup> that have safety impacts on living beings, due to a few reasons. One, developers are increasingly deploying AI models in complex, humanitarian domains, *e.g.*, in maternal health, road safety, and climate change. Two, poor data quality in high-stakes domains can have outsized effects on vulnerable communities and contexts. As Hiatt *et al.* argue, high-stakes efforts are distinct from serving customers; these projects work with and for populations at risk of a litany of horrors [47]. As an example, poor data practices reduced accuracy in IBM’s cancer treatment AI [115] and led to Google Flu Trends missing the flu peak by 140% [63, 73]). Three, high-stakes AI systems are typically deployed in low-resource contexts with a pronounced lack of readily available, high-quality datasets. Applications span into communities that

***“Everyone wants to do the model work, not the data work”:***  
**Data Cascades in High-Stakes AI**

Neil S. Davies, Shih-Wei Huang, Hilary J. Dineen, Albert R. Meyer, David J. ...

Paradoxically, data is the most under-valued and de-glamorised aspect of AI..

An overall lack of recognition for the invisible, arduous, and taken-for-granted data work in AI led to poor data practices, resulting in the data cascades (compounding events causing negative, downstream effects).

**CCS CONCEPTS**

- **Human-centered computing** → **Empirical studies in HCI.**

[65, 75]). Three, high-stakes AI systems are typically deployed in low-resource contexts with a pronounced lack of readily available, high-quality datasets. Applications span into communities that

Research and Applications

**An argument for reporting data standardization procedures in multi-site predictive modeling: case study on the impact of LOINC standardization on model performance**

Amie J. Barda,<sup>1,2</sup> Victor M. Ruiz,<sup>1,2</sup> Tony Gigliotti<sup>3</sup> and Fuchiang (Rich) Tsui<sup>1,2,4,5,6,7,8,\*</sup>

<sup>1</sup>Tsui Laboratory, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, USA, <sup>2</sup>Department of Biomedical Informatics, School of Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania, USA, <sup>3</sup>Information Services Division, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA, <sup>4</sup>Department of Anesthesiology and Critical Care Medicine, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, USA, <sup>5</sup>Department of Biomedical and Health Informatics, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, USA, <sup>6</sup>Institute for Biomedical Informatics, University of Pennsylvania, Philadelphia, Pennsylvania, USA, <sup>7</sup>School of Computing Information, University of Pittsburgh, Pittsburgh, Pennsylvania, USA and <sup>8</sup>Department of Bioengineering, University of Pittsburgh, Pittsburgh, Pennsylvania, USA

\*Corresponding author: Fuchiang (Rich) Tsui, Ph.D., Tsui Laboratory, Children's Hospital of Philadelphia, 2716 South Street, Philadelphia, PA 19146, USA (tsuif@email.chop.edu)

Received 8 September 2018; Revised 22 November 2018; Editorial Decision 10 December 2018; Accepted 20 December 2018

**ABSTRACT**

**Objectives:** We aimed to gain a better understanding of how standardization of laboratory data can impact predictive model performance in multi-site datasets. We hypothesized that standardizing local laboratory codes to logical observation identifiers names and codes (LOINC) would produce predictive models that significantly outperform those learned utilizing local laboratory codes.

**Materials and Methods:** We predicted 30-day hospital readmission for a set of heart failure-specific visits to 13 hospitals from 2008 to 2012. Laboratory test results were extracted and then manually cleaned and mapped to LOINC. We extracted features to summarize laboratory data for each patient and used a training dataset (2008–2011) to learn models using a variety of feature selection techniques and classifiers. We evaluated our hypothesis by comparing model performance on an independent test dataset (2012).

**Results:** Models that utilized LOINC performed significantly better than models that utilized local laboratory test codes, regardless of the feature selection technique and classifier approach used.

**Discussion and Conclusion:** We quantitatively demonstrated the positive impact of standardizing multi-site laboratory data to LOINC prior to use in predictive models. We used our findings to argue for the need for detailed reporting of data standardization procedures in predictive modeling, especially in studies leveraging multi-site datasets extracted from electronic health records.

**Key words:** hospital readmission, heart failure, logical observation identifiers names and codes, predictive modeling, medical informatics/standards

**INTRODUCTION**

The growing repository of available healthcare data has motivated the healthcare community to improve medical decision-making by integrating knowledge learned from data-driven analyses.<sup>1,2</sup> Often,

these analyses are geared toward enhancing clinical decision support (CDS) systems with models that predict events of clinical relevance, such as disease risk or progression.<sup>2</sup> Laboratory data are particularly valuable information in predictive modeling as they can provide in-

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Research and Applications

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**Fixed with FHIR**

# Microsoft, Amazon, other tech giants forge ahead on healthcare data sharing pledge

by James Thorne on · July 30, 2019 at 10:00 am



Executives from Amazon, Google, Microsoft and IBM on stage at the CMS Blue Button 2.0 Developer Conference in August 2018. From left: Dean Garfield, Alec Chalmers, Mark Dudman, Peter Lee and Greg Moore. (Microsoft Photo)

This past August, executives from Microsoft, Amazon, Google, IBM, Oracle, and Salesforce **banded together** to promote data sharing in healthcare. Nearly a year later, the world's largest tech companies aren't showing any signs of slowing.

## Cloud providers ❤️ FHIR

Big tech vendors were early voluntary adopters and now all have FHIR in their health data solutions



[Healthcare](#) [News and announcements](#) · 7 min read

# Power healthcare AI with unified and protected multi-modal healthcare data

By [Umesh Rustogi](#), General Manager, Microsoft Health and Life Sciences Data Platform

October 10, 2024



**Announcing general availability of healthcare data solutions in Microsoft Fabric and public preview of healthcare application templates in Microsoft Purview.**

Tags



Here are some of the capabilities being released in preview:

**Fast Healthcare Interoperability Resources (FHIR) data ingestion.** Enables easy ingestion of FHIR data from [Azure Health Data Services](#) in Microsoft Fabric Onelake environment and stores it in the bronze lakehouse as raw newline-delimited JavaScript object notation (NDJSON) files.

**Relational FHIR data foundation** enables the transformation of FHIR data in bronze to relational FHIR and tabular structure in open data format (delta-parquet) in Silver Lakehouse using highly scalable purpose-built pipelines. This creates a standard-based unified healthcare data model in Silver Data Lake. With support for all FHIR R4 resources, this now enables multiple downstream analytics support for scenarios leveraging the rich clinical, financial (claims and explanation of benefits), and administration data. Healthcare companies and partners can now build analytical scenarios such as quality reporting, population health management, clinical research studies, and operational reporting. It also allows a traditional SQL engine to run on top of the data for a data analyst to conduct ad-hoc exploratory analysis of the healthcare data.



# HL7 Product Portfolio



The extended FHIR family unlocks a massive world of opportunity

SMART on FHIR | Bulk FHIR | CQL | CDS Hooks

# Cheat Codes for Digital Innovation



*Semantically interoperable health data at scale*



SMART App  
Launch

*Standard integration for apps interacting with FHIR data*



Bulk

*Simple export of big FHIR data (e.g. for model training)*



CDS Hooks

*Workflow-integrated interaction with CDS (including AI)*



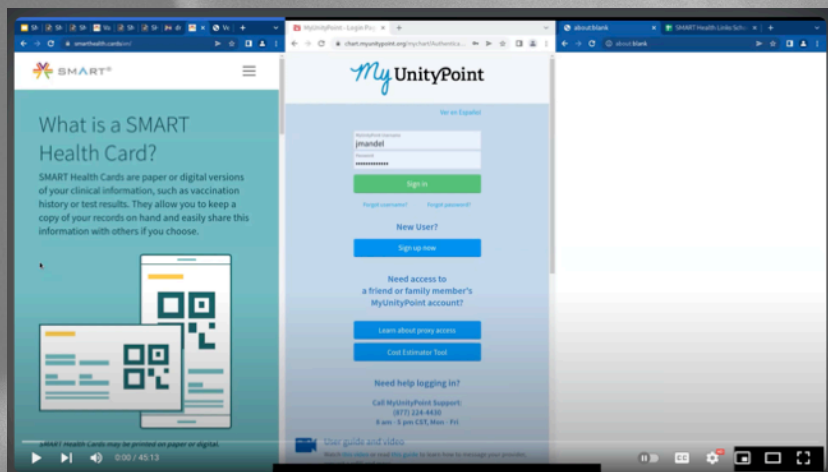
CQL

*Standardized clinical knowledge and metrics*

# Keep your eyes on this:

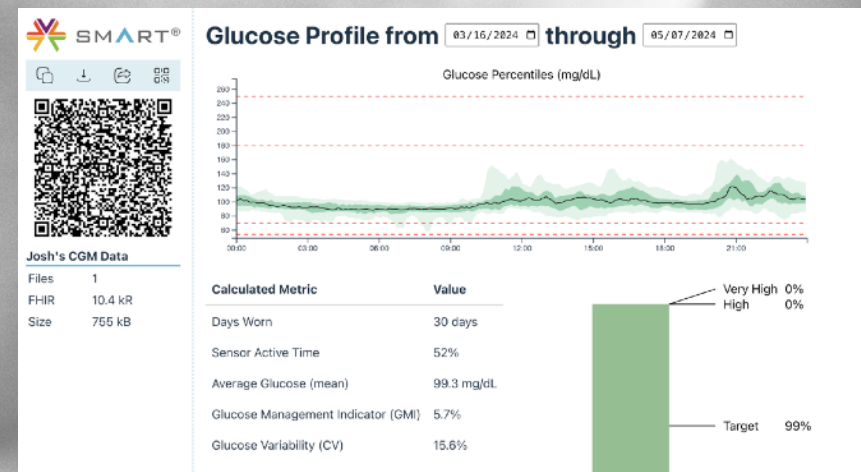
## *HL7 SMART Health Cards and Links*

September 2024 Ballot Cycle → anticipated publishing in 2025



The screenshot shows a video player with three browser windows. The first window displays the SMART Health Card overview, explaining that these cards are paper or digital versions of clinical information like vaccination history or test results. The second window shows the MyUnityPoint login page with fields for username and password, and options for 'New User?' and 'Need access to a friend or family member's MyUnityPoint account?'. The third window is partially visible on the right.

SMART Health Links Overview Video



The screenshot displays a public SHL Demo of CGM Data. It includes a SMART logo, a QR code, and a glucose profile graph showing glucose levels over time. Below the graph is a table of calculated metrics.

Calculated Metric	Value
Days Worn	30 days
Sensor Active Time	52%
Average Glucose (mean)	99.3 mg/dL
Glucose Management Indicator (GMI)	5.7%
Glucose Variability (CV)	15.6%

Additional information shown includes 'Files: 1', 'FHIR: 10.4 kR', and 'Size: 755 kB'. A bar chart on the right indicates 'Very High 0%' and 'Target 99%'.

J Mandel's public SHL Demo of CGM Data



# Endless Possibilities

ZERO TO ONE | PETER THIEL | Virgin

EGO IS THE ENEMY RYAN HOLIDAY P

RYAN HOLIDAY THE OBSTACLE IS THE WAY  
The Timeless Art of Turning Trials into Triumph

EXponential ORGANIZATIONS ISMAIL, MALONE & VAN GEEST DIVERSION BOARDS

Value Proposition Design WILEY

THE STARTUP OWNER'S MANUAL

Steve Blank Bob Dorf

The corporate startup

Tendayi Viki Dan Toma Esther Gons



# HL7<sup>®</sup> FHIR<sup>®</sup>

## 5 Key Resources for Implementers

Connect | Discover | Build on | Test | Learn

# Connect: join the FHIR community online

The screenshot shows the chat.fhir.org web interface. At the top, the browser address bar displays 'chat.fhir.org'. The interface features a dark theme with a sidebar on the left containing navigation options: 'Views' (Recent conversations, Combined feed) and 'Channels' (Active: analytics on FHIR, Announcements, argonaut, australia, Belgium, bulk data, C-CDA, canada, Cancer Interoperability, Care Plan/Care Coordination, CARIN BB ExplanationOfBenefit, CARIN IG for Blue Button®, CCDA / FHIR mapping stream, cda to fhir, cds, cds hooks). The main area is titled 'Recent conversations' and includes a search bar and filter buttons (Include DMs, Unread, Participated). Below this is a table of conversations:

Channel	Topic	Participants	Time
committers/notification	<a href="#">ig-build</a>		6 minutes ago
IG creation	unknown NamingSystemIdentifierType code '?'		9 minutes ago
australia	AU eRequest		17 minutes ago
shorthand	pattern auto-population introduces duplicates		40 minutes ago
implementers	Longest Observation	+3	42 minutes ago
cql	function ToString(CodeableConcept)		46 minutes ago
implementers	OperationOutcome code/details for specific use cases		49 minutes ago
V2	ACK handling		56 minutes ago
tooling/Package Crawlers	stream events		An hour ago
Da Vinci	Claim Response service place		An hour ago

# Discover: find FHIR specifications



About FHIR

FHIR Packages

Publish a Package

## Refine package results

Latest release ?

### Only FHIR Versions

- R5
- R4B
- R4
- STU3
- DSTU2

[clear filter](#)

### Find matching contents by ?

- Instances
- Profiles

### Only in jurisdictions

- Australia
- Belgium

prior authorization



75 results found in 325 ms

POWERED BY SIMPLIFIER.NET

http://hl7.org/fhir/us/davinci-pas • hl7.fhir.us.davinci-pas

R4

## Da Vinci Prior Authorization Support (PAS) FHIR IG

2.0.1

December 2023

HL7 International / Financial Management

Guidelines for conveying coverage requirements to clinicians when planning treatment. (built Fri, Dec 1, 2023 20:54+0000+00:00)

Showing first 4 matches:

**StructureDefinition** AuthorizationNumber

**ImplementationGuide** DaVinciPriorAuthorizationSupport

**Bundle** ReferralAuthorizationBundleExample

**Bundle** HomecareAuthorizationBundleExample

# Build on: use open source reference implementations

The screenshot shows the Foundry website at [foundry.hl7.org](https://foundry.hl7.org). The page features a navigation bar with "About Foundry", "Catalog", and "Developer" links. A search bar is visible on the left. The main content area displays a grid of project cards, each representing an open source reference implementation. The cards are:

- FAST - UDAP Security Server**: A server reference implementation for the FAST Security for Scalable Registration, Authentication, and Authorization Implementation Guide. It includes a link to a GitHub repository for a Duende Identity Server reference implementation.
- SMART Bulk Data CLI Client**: An open-source, NodeJS command line interface for making bulk data requests against FHIR servers implementing the [FHIR Bulk Data API].
- Documentation Template and Rules (DTR) Examples CDS Library**: A library of Clinical Decision Support Rules (CDS) to support the CRD, DTR, and PAS use cases.
- Genomic Operations Examples and Exercises**: A section providing scenarios that demonstrate various capabilities of the FHIR Genomics Operations, including a link to a GitHub repository for a Postman collection.

The page also includes a sidebar with filters for Technology (FHIR Servers, FHIR Clients, Data & Scripts, CQL Libraries, Other), Badges (HL7 Accelerators like Argonaut, CARIN Alliance, CodeX, Da Vinci, FAST, Helios), Function (Directories, Financial, Infrastructure), World Regions (United States), and Domains (Genomics).

# Build on: many other open source tools

## Reference Libraries

JAVA

.Net

Delphi

R

Ruby

Python

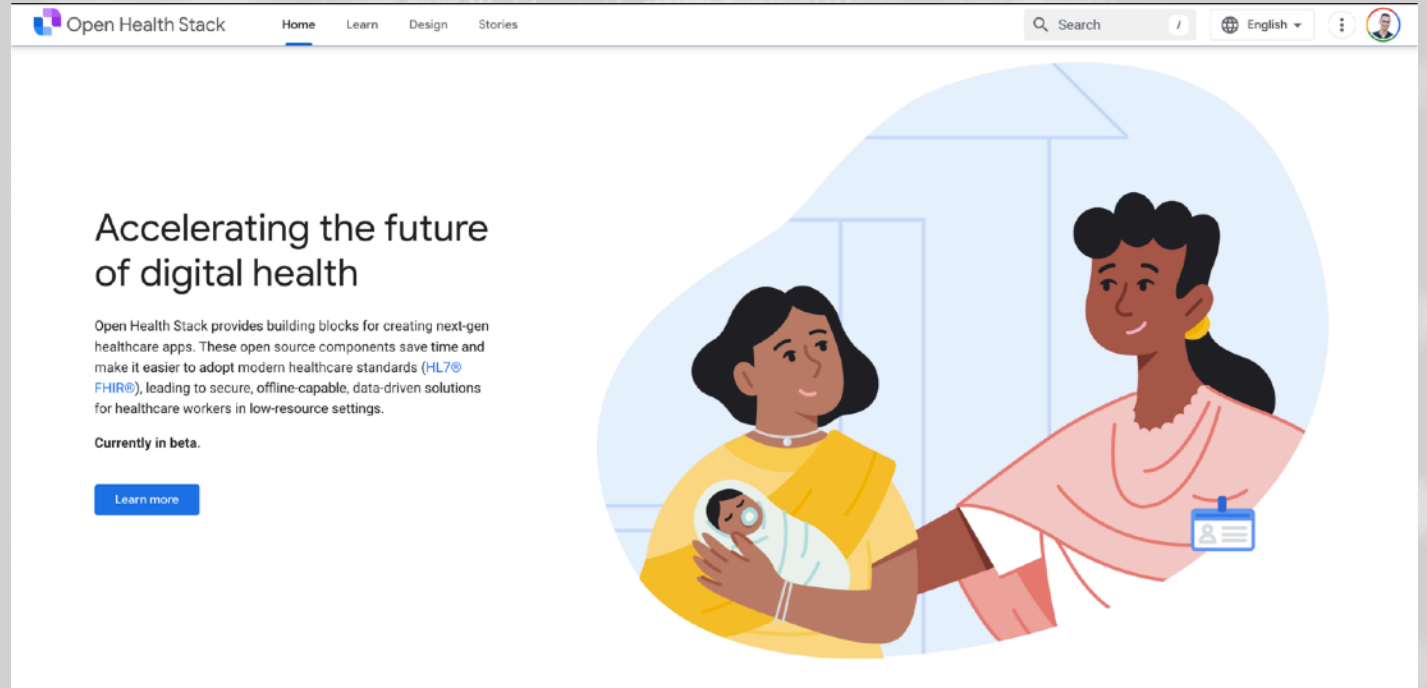
Swift

PHP

Dart/Flutter

Android

Clojure



## Example: Open Health Stack

FHIR SDK for Android

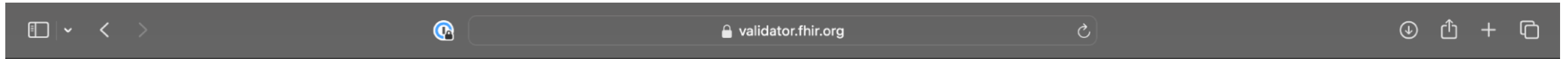
Offline-capable, mobile-first FHIR toolkit (including CQL!) allows developers to create applications helping community health workers in LMICs.

FHIR Analytics

Turn FHIR data into analytics-ready formats for on-prem or cloud processing

🌐 Open Health Stack

# Test: validate your FHIR content



Validate Options

Language  
English

- tx.fhir.org
- packages2.fhir.org

## Validate Resources

Manually enter, or upload resources for validation.

ENTER RESOURCE

UPLOAD RESOURCES

Code

```
{
  "resourceType": "Observation",
  "id": "cbc-hematocrit",
  "meta": {
    "profile": ["http://hl7.org/fhir/us/core/StructureDefinition/us-core-observation-lab"]
  },
  "status": "final",
  "category": [{
    "coding": [{
      "system": "http://terminology.hl7.org/CodeSystem/observation-category",
      "code": "laboratory",
      "display": "Laboratory"
    }],
    "text": "Laboratory"
  }],
  "code": {
    "coding": [{
      "system": "http://terminology.hl7.org/CodeSystem/observation-category",
      "code": "laboratory",
      "display": "Laboratory"
    }],
    "text": "Laboratory"
  }
}
```

# | **Learn:** advance *your* FHIR expertise

## **Education**

On Demand

Virtual training events

In person training

## **Credentialing**

Showcase your FHIR knowledge

Helps hirers find qualified people

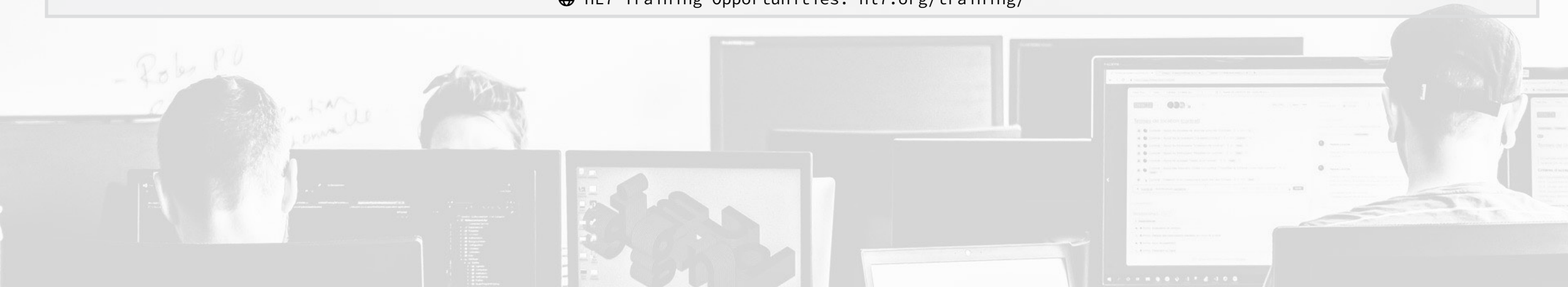
## **Events**

HL7 Work Group Meetings

HL7 FHIR Connectathons

DevDays

🌐 HL7 Training Opportunities: [hl7.org/training/](https://hl7.org/training/)





# Take Home Messages

# Why HL7<sup>®</sup> FHIR<sup>®</sup> ?

Accelerated development

Find top talent

Reduce dev costs

Interoperability + ease of integration

Regulatory compliance

Market access and scalability

Free to focus on innovation

**Let FHIR be the rocket fuel  
for your health innovations**

