Overview

• **Purpose:** This deck provides information for a non-technical audience about Fast Healthcare Interoperability Resources (FHIR®) technology and terminology with a focus on applications in post-acute care (PAC), including:
  
  • What is Health Level Seven® International (HL7®) FHIR® Standards?
  • What is an Application Programming Interface (API)?
  • What is HL7®?
**Key Terms**

- **Client**: software that connects to another system.
- **Server**: a computer system the client connects to / interacts with.
- **Use Case**: a hypothetical scenario that illustrates a problem by providing clinically relevant details about a patient and defining the interactions between the patient and the healthcare system to achieve a goal.
- **Implementation Guide (IG)**: provides instructions for developers on how to design and implement technological solutions to achieve the goal identified in the use case.
- **Implementation**: the technological solution developers design using the implementation guide as a template.
- **Connectathon**: an opportunity for multiple vendors to review the implementation guides, test the client and/or server software in a structured environment and provide constructive feedback; it can be described as a “test kitchen” and the implementation guide as a “recipe” that can be refined by participants.
- **Data Element**: most granular level at which a piece of data is represented (e.g., Brief Interview for Mental Status (BIMS) total score, gender, insulin dosage, systolic/diastolic blood pressure).
- **Value Set**: defines the possible values for a group of data elements, represented by a set of codes from one or more code systems (e.g., Current Procedural Terminology, [CPT] codes, Logical Observation Identifiers Names and Codes [LOINC] codes, International Classification of Diseases [ICD] codes), that can be used and re-used to exchange data between systems.
Key Terms Analogies

- Implementation Guide = Recipe
- Implementation = Cake
- Connectathon = Test Kitchen
What is Health Level Seven® International (HL7®) FHIR® Standards?
Fast, Efficient, & Flexible

- Uses 80/20 Rule: 20% of the requirements satisfy 80% of the needs
- FREE to use
- Uses mainstream web technology
- Solutions built from modular components called “Resources”
- Option to develop custom extensions

FHIR® is a standard for exchanging healthcare information electronically

- Standards establish a common language and process for all health information technology (IT) systems to communicate, allowing information to be shared seamlessly and efficiently
- FHIR® can be used as a stand-alone data exchange standard or with existing standards
## Standards: Comparing Apples to Apples

### Problem with Standards
- Stakeholders have both common & differing needs
- Creating one standard to fit all = SLOW & LARGE
- Everyone needs to adopt the same standard

### HL7® FHIR® Standard Solution
- Widespread adoption of base FHIR® resources
- Profiles tailor resources to specific use cases
- Informed by years of lessons learned around requirements ([https://www.hl7.org/fhir/comparison.html](https://www.hl7.org/fhir/comparison.html))

- **A RESOURCE** broadly identifies characteristics that define a concept or category – such as an observation, a patient, or a condition
- **A PROFILE** customizes a resource(s) to allow specified constraints
- **An EXTENSION** adds characteristics to a profile that are not part of the base resource

**R4** (the most current version of FHIR®) **consists of 143 resources**
Profiles (1/2)

A RESOURCE is a template that broadly identifies characteristics to define a concept or category.

**Resource: Cake**
- **Cake Flavor** (e.g., Chocolate, Yellow, Carrot, Marble)
- **Icing*** (e.g., Ganache, Buttercream, Cream Cheese)
- **Toppings** (e.g., Sprinkles, Walnuts, Raspberries, Raisins, Oreo Cookies)
- **Tiers** (e.g., 1, 2, 3)

*NOTE: Resource can refer to other resources*

A PROFILE customizes a resource(s) to allow specified constraints.

**Profile: Chocolate Cake**

**Profile Constraints**
- Cake Flavor must be Chocolate
- Icing must be Ganache, Buttercream, or Raspberry Jam
- Toppings may be any of *many* or none
- Tiers must be 1, 2, 3, or 4

*NOTE: An Implementation Guide includes one or more profiles*

An EXTENSION adds characteristics to a profile that are not part of the base resource.

**Extension: Shape**
- Cake can be round or square

**Extension: Size**
- Cake can be 6”, 8”, or 10”
An instance is each implementation of the Profile (each cake baked using the “Chocolate Cake” Recipe)

Instance: Betsy’s Chocolate Cake
- Cake Flavor: Chocolate
- Icing: Ganache
- Toppings: Raspberries, Sprinkles, Candles
- Tiers: 2
- Shape: Round (all tiers)
- Size: 8” (all tiers)

Instance: Johnny’s Chocolate Cake
- Cake Flavor: Chocolate
- Icing: Buttercream
- Toppings: Rose Petals, Pistachios
- Tiers: 3
- Shape: Round (all tiers)
- Size: 10” tier 1, 8” tier 2, 6” tier 3
**Prior Level of Function Profile**

**A RESOURCE** is a template that broadly identifies characteristics to define a concept or category.

**A PROFILE** customizes a resource(s) to allow specified constraints.

**An EXTENSION** adds characteristics to a profile that are not part of the base resource.

**Resource:** Observation
- Effective Date/Time
- Code
- Value
- Text
- Performer (to indicate who is responsible for the observation)
- Subject (refers to Patient Resource)

**Profile:** Prior Level of Function
**Profile Constraints**
- Must include Effective Date/Time
- Must include fixed the LOINC code 10158-4 "History of Functional status Narrative"
- May include Value or no Value
- Must include text summary of prior level of function for the patient
- Must include performer
- Must include Subject (refers to Patient Resource)

*NOTE: PACIO Functional Status IG includes 5 profiles*

**Extension:** Where the assessment occurred

**Extension:** Assistance Required
Recap: Resources are the Building Blocks of FHIR®

- Each Resource is comprised of one or more data elements
  - Resource = Patient
    - Characteristics: Patient name, gender, race, address, CMS ID #, etc.

- Profiles and Extensions supplement existing resources

- Developers can “bundle” multiple Resources together with Profiles and/or Extensions to transmit only select information from a large amount of data (e.g., an electronic health record [EHR])

Source: Introduction to FHIR® – Grahame Grieve
87% OF HOSPITALS AND 69% OF MIPS ELIGIBLE CLINICIANS USING EHRS CERTIFIED TO HL7® FHIR®

What is an Application Programming Interface (API)?
What’s an API

- Application Programming Interface
  - Software that allows two systems to talk to each other
  - Request and Response
  - Enables the retrieval or exchange of **only** specified information from a large amount of data

CREATE ORDER → Requested:
Sauce: Tomato
Crust: Gluten Free
Toppings: Pepperoni, Mushroom
What’s a FHIR® API?

• Leverages same standards as web browsers to reduce bandwidth requirements

• Uses HL7® FHIR® standard with Representational State Transfer (REST): software used for Web services development

• Reduces miscommunication and impediments to communication between systems by establishing *common language (XML/JSON)* and protocol (HTTP) for how system exchanges data (i.e., directions)

• Improves searchability using standard terminology

• Implementation guides serve as instructions for developers to build FHIR® APIs

*English ≠ Russian*

\[ \mathcal{E} = \mathbb{Z} \]
What is HL7®?
Health Level Seven® International (HL7®)?

• HL7® sets standards for the health IT community

• Founded in 1987, HL7® is a not-for-profit, nonpartisan, membership-based, American National Standards Institute (ANSI)-accredited, standards developing organization

• HL7® provides a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services
• Balloting is the formal process that HL7® uses to vet specifications prior to publication

• Objective of balloting is to actively seek feedback on a proposed standard and to ensure that the community that will be governed by that standard is in agreement with the expectations set by the standard

• Prior to balloting, IG developers must: (1) gain sponsorship from at least 1 out of the 37 HL7® work groups; (2) participate in at least 1 Connectathon; and (3) have at least 3 reference implementations

• Who can vote:
  • HL7® Members
  • Non HL7® members with an administrative fee and strict instructions
    • Non-members can still submit comments through JIRA, though they do not count towards ballot totals
HL7® Balloting Levels

For Comment
• Used early in the development cycle to solicit feedback from the community

Informative
• Used to vet content that is not intended to be binding on implementers

Standard for Trial Use (STU)
• Used to vet content that is eventually intended to be binding on implementers
• Used to vet content that is deemed "ready to implement" by the sponsoring work group, but where there has not yet been significant implementation experience
• Content development is sometimes done in iterations, especially if there are significant changes. Each iteration is labelled as STU1, STU2, STU3...

Normative
• Used for final review of authoritative specifications that are intended to be binding on the implementer community and where there are strict rules around future changes to preserve a degree of forward and/or backward compatibility
STU Ballot Preparation

- Submit Project Proposal for acceptance by HL7® community
- Submit the Project Scope Statement (PSS) to sponsoring WG for approval
- Gain approval of Project Scope Statement (PSS) from US Realm, Clinical Steering Division, FHIR Management Group (FMG), and Technical Steering Committee (TSC)
- Complete work proposed in PSS (e.g., Implementation Guide (IG))
- Complete three vendor implementations of the IG through participation in Connectathons
- Gain approval of completed work proposed in PSS from the FMG
- Submit the Notice of Intent to Ballot (NIB)

Ballot

- Ballot open for voting

Post Comment Period

- Decision made to approve/not approve (affirmative to negative ratio is at least 60% to publish as STU1)
- If threshold is not reached, voters must rescind negative votes
- Even if the threshold is reached, EVERY SINGLE COMMENT must be addressed to the satisfaction of the sponsoring work group
Conclusion

• The HL7® FHIR® standard establishes a fast, efficient, and flexible common language and process for all health IT systems to communicate, allowing information to be shared seamlessly and efficiently

• FHIR® APIs enable the exchange of specified information from a large amount of data, using request and response commands

• HL7® provides a comprehensive framework and related standards process for the exchange, integration, sharing, and retrieval of electronic health information
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The PACIO Project is a collaborative effort to advance interoperable health data exchange between post-acute care (PAC) and other providers, patients, and key stakeholders across health care and to promote health data exchange in collaboration with policy makers, standards organizations, and industry through a consensus-based approach.

Learn and share more about the PACIO Project at www.PACIOproject.org