FHIR

The Breakdown of Fast Health Interoperability Resources Standard

VICERT

Content

What is FHIR in short and why it was created

FHIR (pronounced “Fire”) is a next generation standard for **interoperable exchange of health care data** developed under the HL7 organization and successor to HL7 v2.x, v3 and CDA.

Given the limitations of previous standards, there was a need for a standard which is structured, standardized and human-readable, thus FHIR was created.

FHIR is expected to overcome the majority of the complex limitations of current standards.

**It’s interesting to know about 80/20 FHIR Rule, which means that FHIR focuses on common use cases and not on the exceptions. They are effectively saying: “We will give you ability for workarounds here and there, but workarounds or rules that are vendor specific or a project will not be part of the standard”.

V2.x: Boundaries for expansion
V3.x: Reference Implementation Model
CDA: Clinical document Summary

FHIR and why you will benefit from adhering to it

FHIR is actually a specification that defines: "... a series of different types of resource that can be used to exchange and/or store data in order to solve a wide range of healthcare related problems, both clinical and administrative." Additionally, FHIR also structures the interoperability process by defining several different ways of exchanging resources.

In this instance, the resource:

- has a known identity (a URL) by which it can be addressed
- identifies itself as one of the types of resource defined in this specification
- contains a set of structured data items as described by the definition of the resource type
- has an identified version that changes if the contents of the resource change

https://www.hl7.org/fhir/resourcelist.html

So what does it actually look like when implemented?

https://fhir-drills.github.io/index.html

What is a Resource?

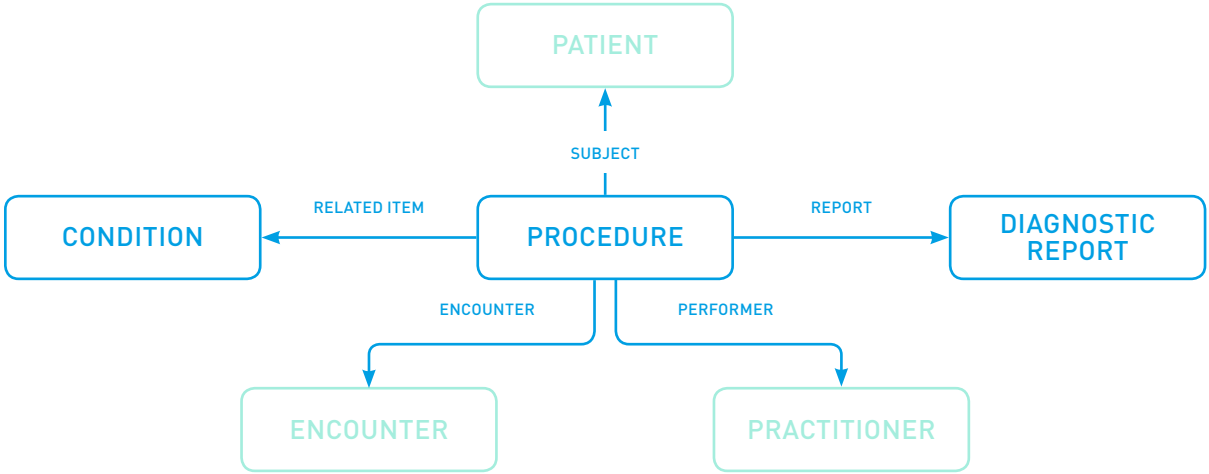
The most important aspect of the FHIR specification is well defined modular components called **Resources**. Resources are used to store and/or exchange data between different health record systems. The data format and the way the data is transmitted over the network is not dictated by the FHIR specification. A list of available resources can be found at the following URLs: DSTU2 Resource List and STU3 Resource List.

Resource data formats

The data formats that can be used for resource representation and the ones described by the specification are as follows: **XML, JSON** and **Turtle**. Other data formats can be used but they are not described by the FHIR specification.

https://www.hl7.org/fhir/resourcelist.html

And here is a logical model of one of the Resources



Versions of the FHIR specification

The current official published version is STU3, but the majority is still using the DSTU2 FHIR version of standard. For example, Epic is using the DSTU2 version of FHIR standard (URL). The differences between STU3 and DSTU2 revisions can be found on the following URL.

It's important to note that FHIR is still in the works. That

means that there are some parts of the specification that are still not production ready. One of the examples for standard immaturity is Coverage resource. The maturity level of this resource is 2, while a maturity level of 5 is considered to be production ready (Highest maturity level is 6). Here is a post from Keith Boone regarding Coverage resource. Keith Bone is Co chair of several committees in organizations such as IHE and HL7.

How is FHIR adapting to the constant changes in healthcare: **Interoperability Exchange Paradigms**

The axial age that we are experiencing today with accelerated evolution of computing and communications technology dictates the need for such a standard to be able to track and keep up with those changes. This means that FHIR has to be flexible and capable of being implemented to various technologies. The following approaches are described by the FHIR specification:

- **REST**
- **Documents**
- **Messages**
- **Services (Operations)**

There is no requirement for FHIR to use any of the above. It's simply one of the ways it can be implemented. You can transfer your messages through: email, mllp, file-system etc. However, the preferred way to exchange data is through REST.

https://corepointhealth.com/interoperability-paradigms-hl7-fhir

One denominator to rule them all: **Profiling**

Since there are many different contexts in healthcare that use the same set of base resources, frameworks and APIs, but fall under different jurisdictions, regulations, requirements a same denominator needed to be established. This is why term profiling was introduced that needed to adapt FHIR for specific scenarios.

Whence FHIR specification actually represents a platform specification. This platform provides a common foundation on which a variety of different solutions are implemented - more concretely describes the 'usage of FHIR' based on context.

The usages explained are turned into statements - usage statements - that need to be:

– Authored in a structured manner

– Published in a repository

– Discoverable

– Used as the basis for validation, code, report and UI generation.

Three main aspects:

– Constraining a resource

- Remove element or change multiplicity

– Change coded element binding

– Adding a new element (an extension)

https://www.hl7.org/fhir/profiling.html
https://www.hl7.org/fhir/profiling-examples.html

SMART on FHIR - or how to seamlessly create and run apps

Two not-for-profit institutions, Boston Children's Hospital Computational Health Informatics Program and the Harvard Medical School Department for Biomedical Informatics, decided to implement a project that will allow innovators to build apps on top of FHIR. They created the SMART Health IT platform, as an open, standards based technology platform, so innovators could seamlessly and securely create and run apps across the healthcare system. SMART as a guideline, is supported by the electronic health record (EHR) system or data warehouse, and thus allows patients, doctors, and healthcare practitioners to call on this library of apps to improve clinical care, research, and public health.

The SMART platform is composed of open standards, open source tools for developers building apps and a publicly accessible app gallery. To date, dozens of clinical applications have been built on this platform, and SMART applications are being used to provide clinical care at healthcare institutions, including Boston Children's Hospital and Duke Medicine.

https://smarthealthit.org/an-app-platform-for-healthcare/about/

SMART ON FHIR

Creating SMART applications is not challenging from a technological perspective. The documentation is not quite there yet, but it's still a young project and the expectation is that SMART organization and vendors will improve in this area. The bigger problem might be the vendors and their interpretation of the FHIR specification. One example of such differences is as follows: FHIR medication resource, Epic sites implement with the RXNorm standard; however, a Cerner implementation would use an internal Cerner ID.

When describing SMART Health IT we must have the following terms in mind:

1. FHIR is a data model definition.

2. EHR systems are populating the FHIR data model with actual patient data.

3. SMART defines how 3rd party applications can be executed inside of the EHR itself (There is a default launch mechanism definition). It tackles security as well, as it defines how to determine the identity and data access rights of the EHR user.

Benefits to Implementors and Vendors

- Familiar tooling and technologies – XML/JSON, HTTP, REST, SSL, OAuth
- Predefined resources and APIs – Allows implementer to focus on the core application functionality
- Extensive documentation, samples and reference server implementations Validation services
- Active and supportive community
- Open Source code libraries – HAPI (Java) and Furore (.Net)
- Mobile friendly
- Increased commercial viability of app development as FHIR compliant apps will work with different FHIR Servers (EMRs, HIEs)

Benefits to Clinicians

- Improved access to more complete, higher quality, patient information incl. genomics
- Easier to organize investigations and management
- Greater choice and variety of applications and devices to support clinical workflow
- Increased IT development speed – solving business problems faster, in innovative ways
- Improved Decision Support - E.g. Immunisation protocol Clinicians can get involved in system design
- Saved time

Benefits to Consumers

- Prospect of improved patient engagement apps, enabled through FHIR APIs to clinical systems – Can engage more deeply
- Clinician has access to a more complete patient record and improved decision making tools, leading to:
  – Better decision making
  – More efficient diagnosis and treatment
  – Higher quality care
- Overall improved patient experience – reducing wasted time

Benefits to HealthCare Organizations

- Most vendors are committed to FHIR
- Should lead to: – faster deployments – lower cost interoperability – reduced vendor lock in as FHIR is adopted by source systems
- Standards based APIs to support internal application development
- Capture data for analytics and Decision Support – Management – Population

1. https://www.hl7.org/fhir/summary.html

2. http://fhirtest.uhn.ca/resource?serverId=hapi_dev&pretty=false&resource=Patient

3. https://smarthealthit.org/an-app-platform-for-healthcare/about/

4. https://sandbox.hspconsortium.org/

And if you wish to learn with a more hands-on approach visit:

5. ClinFir is an UI tool that can be used to create FHIR requests. URL: http://clinfhir.com/builder.html

6. SyntheticMass is an open-source, simulated Health Information Exchange (HIE) populated with realistic "synthetic residents" of Massachusetts. URL: https://syntheticmass.mitre.org/fhir/Patient?_offset=0&_count=100

7. Synthea is a Synthetic Patient Population Simulator. URL: https://github.com/synthetichealth/synthea

8. Simplifier.net is a FHIR registry. There are a lot of samples uploaded by users. URL: https://simplifier.net/search

For more information visit

If you want to double click into FHIR and exchange ideas with our engineers around it ping us.

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