FHIR Intermediate Course, Unit 1
FHIR IMPLEMENTATION GUIDES
Reading Material

Course Overview

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Unit Content and Learning Objectives

This unit discusses the most globally relevant implementation guides (IGs) currently in use: Argonaut (which evolved into US Core, so sometimes we talk about them using the terms Argonaut or US Core) and International Patient Summary. We say that these are the most globally relevant based on their stakeholders and current adoption.

These implementation guides are the product of the work of relevant communities worldwide, applying the abstract power of FHIR to specific use cases and scenarios. In this unit, we will discuss the use cases, scenarios, and artifacts (resources and their constraints) covered by these IGs.

Throughout the whole course, we will use artifacts based on Argonaut/US Core and IPS for our practical work (FHIR clients, facades, etc.)

Argonaut Development and Roadmap

Why is Argonaut relevant?

FHIR is a platform specification. It requires adaptation to suit contexts of use –
"contexts" meaning scenarios and use cases. The consensus on how to handle specific scenarios and use cases (using FHIR) leads to the creation of implementation guides.
As with all implementation guides, their relevancy is measured by the involved stakeholders and the level of adoption: **Who created the implementation guides? Who is using them?**

Let's review both of those measures of relevancy:

Who created the IG? A group called the Argonauts, basically sponsored by Accenture, Allscripts, Apple, Athenahealth, Beth Israel Deaconess, Cerner, Epic, Humana, Intermountain Healthcare, Mayo Clinic, Meditech, Optum, Partners Healthcare System, Boston Children's Hospital (SMART), and Surescripts. There are more than 100 organizations registered, and the group works under a special HL7 program called FHIR Accelerators.
If you are based in the U.S., we don't need to explain the relevancy of these stakeholders. But we can say that they define what the healthcare IT business is about, with about 80-90% of the market in the case of the vendors. In the case of Apple, it defines what the IT business is about in terms of consumer software (more about this, and why it matters, below).

Who is using it? Obviously, the sponsors plus the biggest U.S.-based healthcare information exchange (HIE) networks: **Carequality** and the **CommonWell Health Alliance,** both encompassing thousands of hospitals, clinics and other healthcare providers.

Why was Argonaut created?

The trigger was a 2013 report created by JASON, an independent panel formed to advise the U.S. government on science and technology. The report was called "A Robust Health Data Infrastructure" and was critical of the status of U.S. healthcare interoperability. The report recommended "a unifying software architecture to migrate data from legacy systems to a new centrally orchestrated architecture, to be defined by the ONC in 12 months."
In 2014 the JASON Task Force recommended that "the foundation of interoperability should be an orchestrated architecture based on public APIs employing FHIR, current interoperability approaches should be replaced by API models, and MU Stage 3 requirements should be used to initiate this transition." This recommendation gave birth to the Argonaut project.
MU Stage 3 was replaced by other ONC regulations ("Promoting Interoperability" programs), and they include mentions of FHIR or API-enabled access to healthcare information, especially for patients.
An example of these requirements can be found here:
https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/MedicareEH_2019_Obj3.pdf

What is the Argonaut IGs' intended use?

The Argonaut IGs allow **consumers** of healthcare information (patients and physicians) to access data & documents **safely** using a **common API**, **regardless** of **where** the information is, the **underlying systems**, and the **specific providers**.

We've emphasized some words, so let's review why:

Consumers: The guides don't prescribe how to contribute data to an information system. It's mostly about **READING**. Specifically, if you are "REST-programming" against an Argonaut server, you will be doing a lot of GET but you will not be able to PUT/POST.

Safely: Argonaut is also about how to use oAuth to access the information, defining how to get a token and how to know what an app can/cannot do depending on who is using it (this is called "scopes").

Common API: The IGs define the content (through constraining FHIR resources) and the methods for accessing it. Methods + resources = common API.

Regardless of where it is and who is providing it: Again, common API, no major variations (think about when the last time was that you heard this in interoperability ... "never, until now" would be a good answer).

So, users of "Argonaut clients" will be able to query any "Argonaut server" about information covered by the Guides and show them to the customer – see Figure 1. The most famous consumer-oriented Argonaut client is **Apple Health**, included in IOS 12.
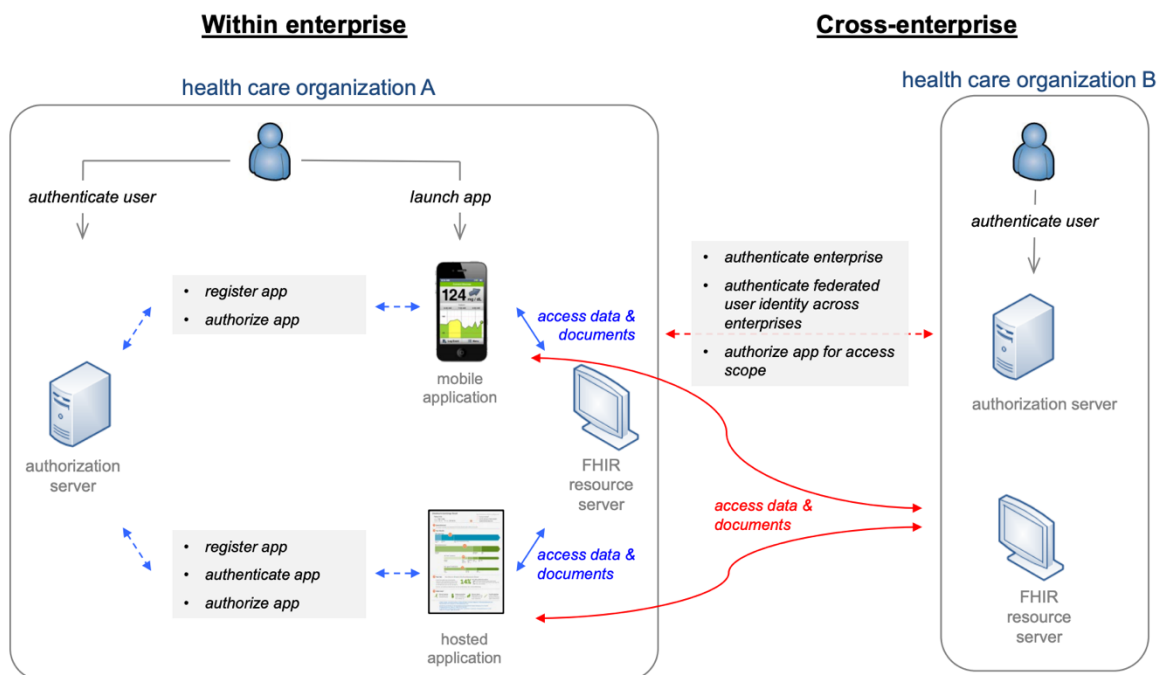

Figure 1 – What you can do after implementing the Argonaut IG

What are the different Argonaut Implementation Guides?

We will try to include which FHIR version(s) are used by each Argonaut IG (some of them have options on which FHIR version to implement).

If you are interested in details of IGs not explored in this course, look at them here:
https://confluence.hl7.org/display/AP/Argonaut+Project+Home

Smart App Authorization Guide
A framework on how to securely **connect to an Argonaut server** using oAuth, and **launch an app** in a given context (patient portal, physician EHR).

Argonaut Data Query Implementation Guide Version 1.0.0 (DSTU2, STU3, R4->)
Describes which **specific EHR patient data** can be accessed from an app or portal. The last version (and the most complete) is based on US CORE, and covers access to a broad variety of information about a patient: demographic data (and how to search for a specific patient), documents, diagnostic reports, immunizations, lab results, encounters, clinical goals, care teams, medications, etc.

Argonaut Provider Directory Implementation Guide v 1.0.0 (STU3)
Describes the foundation for an API to create a robust provider directory, including use cases and search capabilities (practitioners, organizations). Allows the creation of a distributed or centralized Provider or Healthcare directory.

Argonaut Scheduling Implementation Guide (STU3)
Defines a series of interactions for basic appointment creation workflow: registration of patients, updating coverage information, discovery of available appointments and scheduling/canceling appointments. It also covers patients' access to their appointments.

CDS Hooks Implementation Guide (FHIR version for resources can be stated)
This specification describes a "hook"-based pattern for invoking decision support from within a clinician's workflow. The API supports synchronous triggered CDS calls returning workflow relevant information and suggestions (called "cards") and also launching a SMART app when more interaction is needed.

Argonaut Questionnaire Implementation Guide (STU3)
Provides implementers with an API and guidance to create and share between organizations standard assessment forms ("questionnaires") and responses.

Argonaut Clinical Notes Implementation Guide (STU3, R4)
Provides implementers with FHIR profiles and guidance to create, use, and share clinical notes.

And this is the list of IGs in the roadmap:

Argonaut Subscriptions

Enables "push" workflow. The goal for 2019 was to create an Encounter Subscription guide enabling an authorized SMART on FHIR client application to register a long-term data subscription for a specific patient and/or practitioner identifier.

This means that the server will notify the client about changes in encounters for the patient and/or the practitioners, reversing the usual FHIR workflow (from "pull" to "push").

Argonaut CDS Hooks for PAMA

A specific implementation of CDS Hooks involving radiology services and the regulation known as PAMA (Protecting Access to Medicare Act): Given a certain patient and provided services, the CDS server will return whether the service is appropriate for the patient context under PAMA.

Argonaut R4

Update of Argonaut Data Query DSTU2 to R4, adding encounters and clinical notes. Allowing some "write" capabilities for a subset of the resources.

Argonaut Provenance

Consistent implementation of the Provenance resource to meet needs of end users (discovering WHO created a specific patient-related record and providing guidance on how to reconcile clinical records coming from different EHRs).

We are not able to cover all the guides in this course, and as you can see, some of them are still in the works, so we will try to focus on the details of the more mature IGs.

We will explore both the **Data Query** and **Provider Directory** in this unit and will go through the **SMART on FHIR** and **CDS Hooks** specs in the last unit of this course.

However, we may ask you to review other Argonaut guides to resolve the course assignments, because this is an intermediate course, and intermediate-level people are not afraid of anything.

Argonaut Data Query/US Core IG: Scope, Use Cases

Data Query IG - Scope

The initial scope for this guide (STU2) was:

- Allow access to individual data elements of the Common Clinical Data Set.
- Access structured documents containing all Common Clinical Data Set elements.
- Leverage oAuth2-based security and authorization.
- Set practical constraints on Server-Client interactions: how to search, what to expect as a response.

If you are wondering what CCDS or Common Clinical Data Set is, it's just a set of information that should be accessed through an API as defined by the US regulation (ONC-DAF): http://hl7.org/fhir/DSTU2/daf/daf.html
Basically, this:

**2015 Edition
Common Clinical Data Set**

Patient name
Sex
Date of birth
Race
Ethnicity
Preferred language
Smoking status
Problems
Medications
Medication allergies
Laboratory tests
Laboratory results
Vital signs
Procedures
Care team members
Immunizations
Unique Device identifiers
Assessment and Plan of Treatment
Goals
Health concerns

Figure 2 – Common Clinical Data Set

Examples:
- Search Patient by individual patient identifier or full name+gender/birthdate (data query)
- Search Procedures by Patient and date range (data query)
- Patient or Provider search for a patient's Documents (document query)

This guide defines the searches and constrains the FHIR content of the responses.
The DSTU2 version of this guide is widely implemented, but we will focus on the R4 version, because it's what everyone will likely have to implement.

Data Query IG - Use Cases / Actors

1. Patient uses provider-approved web application to access health data
2. Patient uses provider--approved mobile app to access health data
3. Clinician uses provider--approved web application to access health data
4. Clinician uses provider--approved mobile app to access health data

For the R4 version, this is simplified to two actors:

US Core Requestor: An application that initiates a data access request to retrieve patient data. This can be thought of as the **client** in a client-server interaction.

US Core Responder: A product that responds to the data access request providing patient data. This can be thought of as the **server** in a client-server interaction.

Data Query IG - Guided Tour

The current version of the Data Query IG (US Core R4) can be found here:
http://hl7.org/fhir/us/core/

Figure 3 – The FHIR US Core IG Home Page

Guidance: How to use the profiles: general guidance (on how to read the guide, how to handle unknown information, etc.), clinical notes, medication list, provenance, DSTU2-R4 conversion. Please read the guidance whether you are creating a client or a server: If you are creating a client, you will know what to expect. If you are creating a server, you will know what they are expecting you to provide. Remember the concept of "must-support": As a server, if you have this information in your system, you are mandated to send it. As a client, you are supposed to process this information, display it to your users, or at least not fail when receiving it.

Profiles (FHIR Artifacts): Specific content to be exchanged (FHIR constraints) and search parameters. Also, extensions defined by this guide. Remember that the US Core guide tries not to be too demanding for servers. The criteria are a *minimum* set of data to be extracted from any EHR, so there are not a lot of mandatory elements for each resource.

Terminology (FHIR Artifacts): Vocabulary requirements in this guide.

Capability Statements: Details of FHIR versions, methods, and profiled resources to be supported by servers and clients.

Security: General security requirements: authentication, authorization, logging, digital signatures, narrative, and labels.

Examples and Downloads: All examples in the guide and validation packages (for FHIR servers) and schematrons can be found on and downloaded from this page.

Data Query IG - Guided Tour: I - Patient Profile

Structure: Let's review the structure for the Patient profile for US-Core. What is different from a regular FHIR Patient? (Remember that FHIR resources are abstract; almost nothing is mandatory.)

1) There are a lot of red letter "S" flags: They mean **"Must-Support"**: It's mandatory to provide them if you are a server and you have the information in your system. Everything is Must-Support in this profile!

2) Very little **mandatory information** (Cardinality: 1 … 1): Identifier, at least a name, and gender.

3) **Extensions** for Race, Ethnicity, Birth Sex.

4) A few vocabulary bindings: Race, Ethnicity, Birth Sex, Contact Point System and Use, AdministrativeGender, US State Codes, Postal Codes, Language. Almost all of them "required," meaning that you need a value from the specific ValueSet named there.

5) Specific profile constraint for name: given and/or family SHALL be present

Figure 4 – The FHIR US Core Patient profile

Searches:

How can we search for a patient on an Argonaut server?

The guide defines mandatory and optional searches.

Mandatory: by server assigned _id, identifier, name, birthdate+name, gender+name

Optional: birthdate+family, gender+family

1. **SHALL** support fetching a Patient using the `_id` search parameter:

   `GET [base]/Patient[id]`

   Example:

   1. GET [base]/Patient/1032702
   2. GET [base]/Patient?_id=1032702

   Implementation Notes: (how to search by the logical id ⧉ of the resource)

2. **SHALL** support searching a patient by an identifier such as a MPI using the `identifier` search parameter:

   `GET [base]/Patient?identifier={[system]}|[code]`

   Example:

   1. GET [base]/Patient?identifier=http://hospital.smarthealthit.org|1032702

   Implementation Notes: Fetches a bundle containing any Patient resources matching the identifier (how to search by token ⧉)

3. **SHALL** support searching for a patient by a string match of any part of name using the `name` search parameter:

   `GET [base]/Patient?name=[string]`

   Example:

   1. GET [base]/Patient?name=Shaw

   Implementation Notes: Fetches a bundle of all Patient resources matching the name (how to search by string ⧉)

4. **SHALL** support searching using the combination of the `birthdate` and `name` search parameters:

   `GET [base]/Patient?birthdate=[date]&name=[string]`

   Example:

   1. GET [base]/Patient?name=Shaw&birthdate=2007-03-20

   Implementation Notes: Fetches a bundle of all Patient resources matching the specified birthdate and name (how to search by search by string ⧉)

5. **SHALL** support searching using the combination of the `gender` and `name` search parameters:

   `GET [base]/Patient?gender={[system]}|[code]&name=[string]`

   Example:

   1. GET [base]/Patient?name=Shaw&gender=female

   Implementation Notes: Fetches a bundle of all Patient resources matching the specified gender and name (how to search by s search by token ⧉)

Figure 5 – The FHIR US Core Patient mandatory searches

Finally, take the time to review the JSON example so you really know what to expect (or to build, if you are creating an Argonaut server):

http://hl7.org/fhir/us/core/Patient-example.json.html

Just so you know, we are not limited to searching only for patient demographic data. Let's review a clinical-oriented resource just to make sure you can read it by yourself later. Let's review ... Immunizations.

Data Query IG - Guided Tour: II - Immunizations Profile

Again, let's go to the specific US Core Profile for Immunization:
http://hl7.org/fhir/us/core/StructureDefinition-us-core-immunization.html

Figure 6 – The FHIR US Core Immunization profile

Structure: Now let's review the structure for the Immunization profile for US-Core. What is different from a regular FHIR Immunization? (Switch from the Differential view to the Full View to see how little information is required and understand our point about "minimum set of requirements for an EHR.")

1) **"Must-Support"**: status, vaccineCode, Patient reference, date/time for the immunization, whether the information is from a primary source, and status reason (if not given)
2) Mandatory: Almost the same: status, vaccineCode, patient reference, date
3) No specific extensions
4) Vocabulary binding: CVX codes for vaccines (required), NDC codes (should be supported)

Searches:

How can we search for an immunization on an Argonaut server? Only in the context of the patient: by patient id, or patient identifier + date range are mandatory. Optionally, you can search for patient and status.

After these two examples, you are free to explore the IG and review your favorite resources. Remember that all searches for clinical resources are tied to the patient reference (context) and some other optional criteria (dates, sometimes specific categories, etc.).

Data Query IG - Guided Tour: Compact Reference

If you are not in the mood, this is a compact reference on how to search and what to expect:

Query	Supported search operations	Scope of response	Content of response
Laboratory results (diagnostic reports)	Patient OR Patient + Diagnostic Report Code(s) OR Patient + Specified date range	All diagnostic reports	• Laboratory code (LOINC) • Result • Status • Time of measurement • Time of report • Source of report
Laboratory results (observations)	Patient OR Patient + Laboratory Code(s) OR Patient + Specified date range	All observations	• Laboratory code (LOINC) • Result value • Status • Time of measurement • Reference range
Problems and Health Concerns	Patient	All problems and health concerns, current and historical	• Problem or health concern code • Problem or health concern category code (Argonaut extension) • Problem or health concern status • Verification status
Procedures	Patient OR Patient + Specified date range	All procedures, current and historical	• Type of procedure • Date performed • Procedure status
Smoking status	Patient	Smoking status	• Smoking observation status • Result value code (LOINC) • Date recorded • Smoking status
Vital signs	Patient OR Patient + Specified date range	All vitals	• Type of measurement (Argonaut value set) • Time of measurement • Result value (Argonaut value set) • Observation status
Implantable devices	Patient	All UDIs for a patient's implantable devices	• Human readable form of barcode string • Type of device

Query	Supported searches	Scope of response	Content of response
Patient	Identifier (e.g., MRN) OR (Full name + gender OR Full name + birthdate)	FHIR patient resources	• Name • Patient identifier • Gender • Birthdate • Birth sex • Race, ethnicity, language
Allergies	Patient OR Patient + Date	All allergies	• Type of allergy • Allergy status
Assessment and Plan of Treatment	Patient OR Patient + Category OR Patient + Status OR Patient + Specified date range	All Assessment and Plan of Treatment information	• Care plan category (Argonaut extensions) • Care plan status • Narrative summary
Care Team	Patient OR Patient + Category OR Patient + Status	All current Care Team members	• Care plan category (Argonaut extensions) • Care plan status • Care team members • Care team provider roles
Goals	Patient OR Patient + Specified date range	All patient goals	• Narrative description of goals • Goals status
Immunizations	Patient	All immunizations	• Immunization status (Argonaut valueset) • Date of administration • Type of vaccine • Indicator of vaccine given or reported
Medications (statements)	Patient	All medications	• Medication • Medication status • Date or date range
Medications (order)	Patient	All medication orders	• Medication • Order date • Order status • Prescriber

Figure 7 – US Core IG Compact Reference

Argonaut Provider Directory IG: Scope, Use Cases

Provider Directory IG – Scope

This guide is based on the FHIR STU3 API and contains the foundation for a provider directory. It describes the use cases and search expectations for finding a practitioner or organization and defines the key elements and basic query guidance.
The requirements for the Argonaut Provider Directory are based on the IHE Healthcare Provider Directory and the ONC Provider Directory Workshop.

Provider Directory IG – Use Cases/Actors

The use cases are a combination of searches for Organizations and Practitioners.

- Search for Practitioner by demographics: Name, Specialty, region (city, state), specified distance
- Search for Organization and facility by: Name, Address
- Search for Practitioner by organizational relationships (health organization or clinic)
- Locate a provider Direct address or phone number in a specific location

The main actor is a server capable of maintaining the data about the practitioners and organizations (although this is not in the scope of the IG – the IG defines only the searches and the content of the response) and providing clients with the information as a response to the searches.

Provider Directory IG – Guided Tour I - Organizations

Structure: Since this is for a directory, the most important issue is how to find something / someone. So this IG emphasis is on the search options.

However, the minimal structure (mandatory and must-support) is defined: identifiers for the organization (NPI preferred, tax & local allowed), active (true/false), name, telecom (1 at least), address (at least the text, but can be separated into fields if the directory knows how – recommended for granular searches), and endpoint (how to reach this organization electronically, as defined by the Argonaut endpoint structure).

Figure 8 – Provider Directory IG Organization Profile

Searches:

All searches are required – this means the server MUST implement them.

This means as a client that you can search an organization by identifier, name or address:

Figure 9 – Provider Directory IG Organization Searches

Provider Directory IG – Guided Tour II – Practitioners and Practitioner Roles

<u>**Structure:**</u> The PD IG defines the practitioner in the context of his/her work for a specific organization in a certain role, so to represent a single practitioner in the directory, we use two resources: Practitioner and PractitionerRole.
The preferred identifier for practitioners is NPI, but other identifiers are allowed (local, tax). Only one element is added: the name of the practitioner.

Figure 10 – Provider Directory IG Practitioner Profile

The PractitionerRole element holds the useful information for the specific practitioner: who the practitioner works for (organization), where the practitioner works (location), means of contact with the practitioner there (telecom), what the practitioner does for the organization (code/specialty, required coded using NUCC) and an endpoint (for example: Direct address).

Figure 11 – Provider Directory IG PractitionerRole Profile

Searches:

Searches in the PD are based on the practitioner's name, code, and organization name/location:

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Below is an overview of the required search and read operations for this profile. See the Conformance requirements for a complete list of supported RESTful operations and search parameters for this IG.

GET [base]/PractitionerRole?practitioner.identifier=[system]|[code]

Example: GET [base]/PractitionerRole?practitioner.identifier=http://hl7.org/fhir/sid/us-npi%7C14|97860456

Support: Mandatory to support search by Practitioner identifier.

Implementation Notes: Search based on Practitioner identifier (NPI) (how to search by token).

GET [base]/PractitionerRole?practitioner.family=[string]&given=[string]

Example: GET [base]/PractitionerRole?practitioner.name=Henry

Support: Mandatory to support search by Practitioner name.

Implementation Notes: Search based on text name (how to search by string).

GET [base]/PractitionerRole?specialty=[system]|[code]

Example: GET [base]/PractitionerRole?specialty=http://hl7.org/fhir/practitioner-specialty%7Ccardio

Support: Mandatory to support search by Specialty.

Implementation Notes: Search based on specialty (how to search by token).

Searches to consider for future

GET [base]/Practitioner?location.address-city=[city]   GET [base]/Practitioner?location.address-city=[city]&specialty=[string]
GET [base]/Practitioner?location.near=-72.519854,42.373222&near-distance=2m

Implementation Notes: Search based on location (how to search by reference).

Figure 12 – Provider Directory IG PractitionerRole Searches

Provider Directory IG - Guided Tour: Compact Reference

Query	Supported search operations	Scope of response	Content of response
Provider Directory	Practitioner OR Practitioner + Specialty OR Practitioner + Location (WIP) OR Organization Identifier OR Organization Name OR Organization Address OR Endpoint identifier OR Endpoint name	All practitioner, organization, and endpoint information	• Practitioner name • Practitioner Identifier • Practitioner Role and organization • Practitioner Qualifications • Organization name • Organization identifier • Organization status • Organization contact • Organization physical address • Organization endpoint address • Endpoint name • Endpoint status • Endpoint organization • Endpoint channel type • Endpoint address

Figure 13 – Provider Directory IG Compact Reference

Argonaut Reference Bibliography

ONC: Understanding Emerging API-Based Standards
https://www.healthit.gov/isa/understanding-emerging-api-based-standards

Argonaut Data Query (DSTU2)
https://www.fhir.org/guides/argonaut/r2/

Argonaut US Core (R4)
http://hl7.org/fhir/us/core/
(this guide is up to date with the last CDI requirements, and is the base for our course)

Argonaut Provider Directory
http://www.fhir.org/guides/argonaut/pd/index.html

Argonaut Questionnaire
http://www.fhir.org/guides/argonaut/questionnaire/

IPS FHIR IG: Scope, Use Cases

International Patient Summary FHIR IG - Scope

The IPS is a global, minimal, non-exhaustive patient summary, agnostic to specialty and patient condition, **usable by clinicians for cross-border unscheduled care of a patient.**

There is an alternative representation of the summary, based on HL7 CDA R2.

Although the IPS is not intended to reproduce the full content of a patient's EHR, the use for local applications and planned care is possible.

Even when the summary is defined as a FHIR Document, the specification of the individual clinical components (sections) can be reused in other artifacts, conforming what IPS calls the IPS Library:
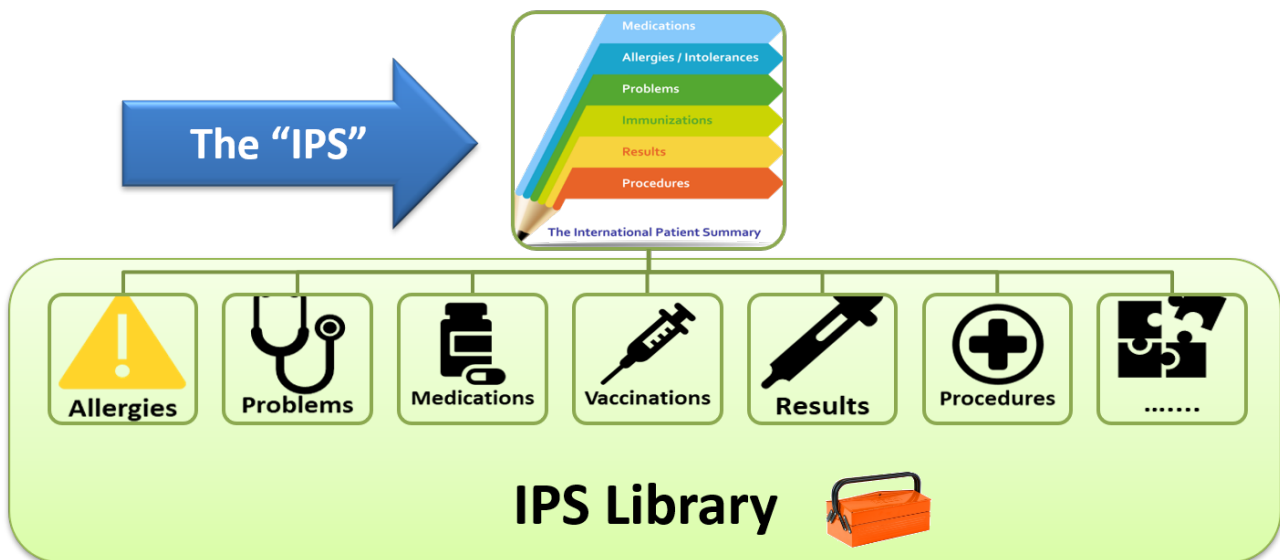
Figure 14 – The IPS Library

Since the IPS is a joint venture between HL7 and CEN TC 251, its focus for scope and use is mainly European, but its use is not restricted to European countries.

International Patient Summary FHIR IG – Use Cases

As explained in the Scope, the primary use case is sharing a minimum document as a summary or snapshot of the patient "baseline" condition, when a patient needs clinical care outside of the country of residence and usual medical treatment.
The steps would be
   - 1. The patient provides some "hard" identifier (EU card #, National Patient Identifier, etc.)
   - 2. The Hospital Information System or EHR where the patient is located sends a request for an IPS to the IPS provider in the patient's home country
   - 3. The IPS provider returns the IPS to the HIS or EHR
   - 4. The HIS or EHR creates an encounter report and sends it to the IPS provider
   - 5. The IPS provider updates the IPS and stores the report
   - 6. The patient gets the new, updated IPS and the report from the IPS provider

Flows 2-3, 4-6 have not been defined by the IPS IG/Spec yet, but regular IHE XDS or FHIR MHD can be used.
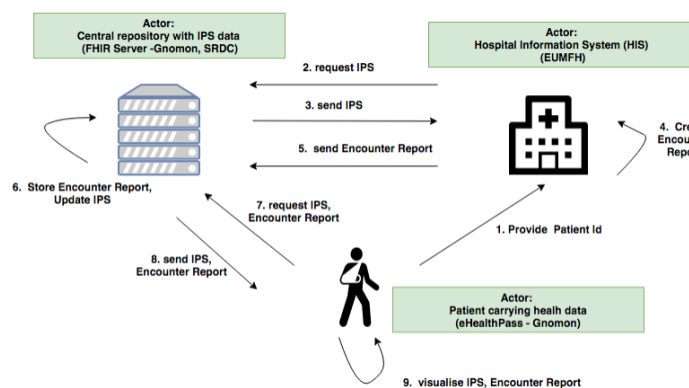
Figure 15 – IPS Use Case Scenario Example

International Patient Summary FHIR IG – Guided Tour

The current version of the Guide is here: http://hl7.org/fhir/uv/ips/index.html
and the general structure of the IPS is depicted here: http://hl7.org/fhir/uv/ips/ipsStructure.html

The IPS FHIR IG defines a composition (the FHIR document header) and a list of required, recommended, and optional sections to be included when creating the summary.
Each of these sections is defined as a FHIR profile.
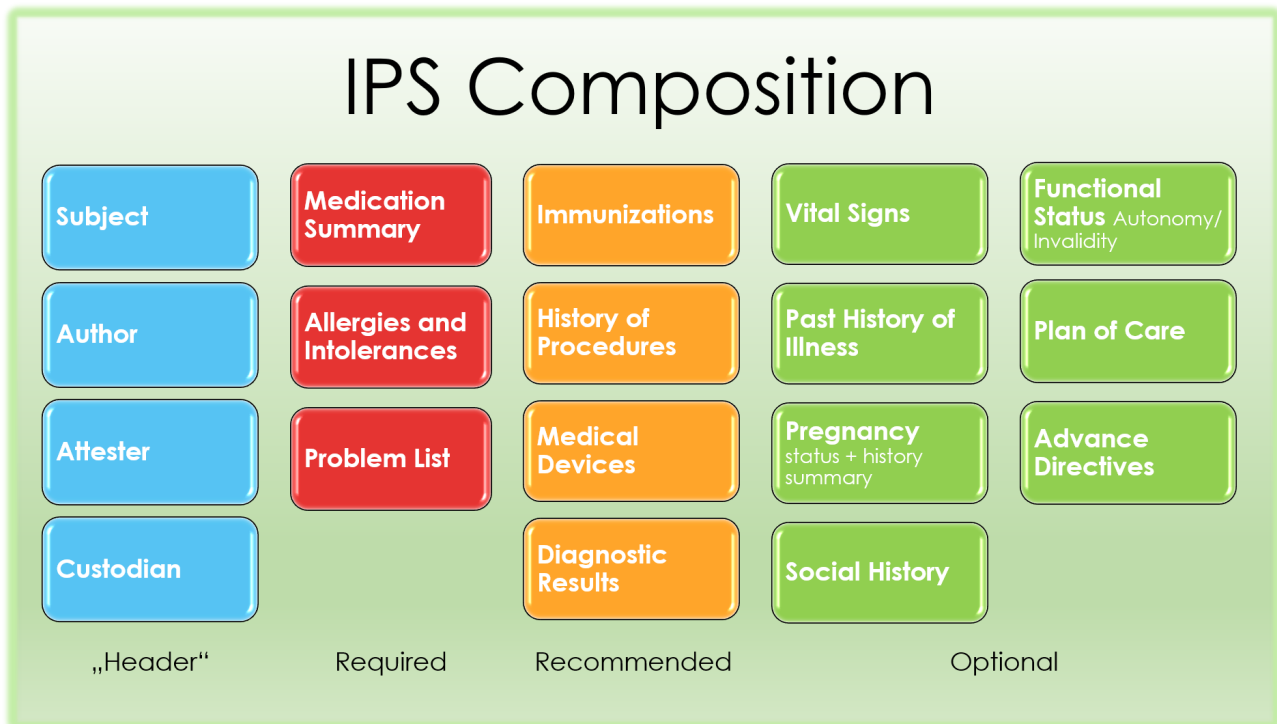
Figure 16 – IPS Composition Required/Recommended and Optional Sections

We have no time or scope to go through all the definitions in this unit. However, we will review the Patient and Immunization resources in IPS to give you the opportunity to discover similarities and differences with the Argonaut guide, and we will discuss the Composition resource, because it is the core element when creating FHIR documents.

International Patient Summary FHIR IG – Guided Tour: I - Patient

Structure: Let's review the structure for the Patient profile for the IPS. What is different from the regular FHIR Patient, or from the US-Core Patient we just reviewed?

a) Very little **mandatory information** (cardinality: 1..1): Name, and birth date **(but no Identifier)**

b) Again, there are 10 red letter "S" flags: They mean **"Must-Support"**: It's mandatory to provide them if you are a server and you have the information in your system.

c) **No Extensions** for Race, Ethnicity, Gender with the regular FHIR definition

d) Only one vocabulary bindings: Country Code, "required," meaning that you need a value from the specific ValueSet named there.

e) Specific profile constraint for name: should include the text, given and/or family

| Name	Flags	Card.	Type	Description & Constraints
Patient		0..*	Patient	Information about an individual or animal receiving health care services
identifier	S	0..*	Identifier	An identifier for this patient
name	S C	1..*	HumanName	A name associated with the patient **ips-pat-1:** Patient.name.given, Patient.name.family or Patient.name.text SHALL be present
text	S	0..1	string	Text representation of the full name
family	S	0..1	string	Family name (often called 'Surname')
given	S	0..*	string	Given names (not always 'first'). Includes middle names
telecom	S	0..*	ContactPoint	A contact detail for the individual
gender	S	0..1	code	male | female | other | unknown
birthDate	S	1..1	date	The date of birth for the individual
address	S C	0..*	Address	An address for the individual **pat-cnt-2or3-char:** The content of the country element (if present) SHALL be selected EITHER from ValueSet ISO Country Alpha-2 http://hl7.org/fhir/ValueSet/iso3166-1-2 OR MAY be selected from ISO Country Alpha-3 Value Set http://hl7.org/fhir/ValueSet/iso3166-1-3, IF the country is not specified in value Set ISO Country Alpha-2 http://hl7.org/fhir/ValueSet/iso3166-1-2.
contact				
relationship		0..*	CodeableConceptIPS	Concept - reference to a terminology or just text
generalPractitioner	S	0..*	Reference(Organization | Practitioner | PractitionerRole)	Patient's nominated primary care provider

Figure 17 – IPS Patient Profile

Searches: We are not discussing them, because the IPS does not discuss them. Why not? It's not a spec for an API, but (initially) only for the contents of a static document. Nothing to search here. You know which specific patient you are talking about; you ask for a summary based on the patient's id, you get the summary. No granular access to specific content (you can, however, process the IPS you receive as a response and extract the specific information you need).
There is one specific operation which is a candidate for standardization
https://build.fhir.org/ig/HL7/fhir-ips/OperationDefinition-summary.html
The operation is $summary and requires either the patient id (/Patient/[id]/$summary) or some parameters (identifier and profile).
You can test this operation using the reference implementation for IPS
Example:
https://ips.health/fhir/Patient/98549f1a-e0d5-4454-849c-f5b97d3ed299/$summary

You can use this server https://ips.health/fhir/
1) adding (POST) your own patient demographics and other clinical resources (allergies, labs, procedures, immunizations, etc.).
2) request the server $summary operation for your patient

International Patient Summary FHIR IG – Guided Tour: II – Immunization

Structure: Now let's review the structure for the Immunization profile for the IPS. What is different from a regular and US-CORE FHIR Immunization?

1) **"Must-Support"**: 6 elements
2) Mandatory: Almost the same: status, vaccineCode (ATC code), patient reference, date.
3) Extensions for "no information": no vaccines known, no vaccines administered
4) Vocabulary binding: ATC/Free Subset of SNOMED CT codes for vaccines (required)

Searches:

Again, no searches. You get what the server packs into the IPS for the patient.

Figure 18 – IPS Immunization Profile

International Patient Summary FHIR IG – Guided Tour: III – Composition

The composition can be divided into two parts: the header, where the context is set, and the sections with the clinical content.

Structure for the Header:

a) Mandatory elements: **status**, **type**: fixed to 60591-5, LOINC for "International Patient Summary," **subject** (patient resource reference), **author** (reference to the resource identifying the practitioner or organization creating the summary), **title** – fixed to "International Patient Summary."

Name	Flags	Card.	Type	Description & Constraints
Composition		0..*	Clinical Document	International Patient Summary composition
text	S	0..1	Narrative	Text summary of the resource, for human interpretation
identifier	S	0..1	Identifier	Version-independent identifier for the Composition
status	S	1..1	code	preliminary	final	amended	entered-in-error
type	S	1..1	CodeableConceptIPS	Kind of composition ("Patient Summary") **Required Pattern: At least the following**
subject	S	1..1	Reference(Patient (IPS))	Who and/or what the composition is about
encounter		0..1	Reference(Encounter)	Context of the Composition
date	S	1..1	dateTime	Composition editing time
author	S	1..*	Reference(Practitioner | PractitionerRole | Device | Patient | RelatedPerson | Organization)	Who and/or what authored the IPS
title	S	1..1	string	International Patient Summary
confidentiality		0..1	code	As defined by affinity domain
attester	S	0..*	BackboneElement	Attests to accuracy of composition
custodian	S	0..1	Reference(Organization)	Organization which maintains the composition
relatesTo		0..*	BackboneElement	Relationships to other compositions/documents
Slices for event		0..*	BackboneElement	The clinical service(s) being documented *Slice: Unordered, Open by pattern:code*
event:careProvisioningEvent	S	0..1	BackboneElement	The care provisioning being documented

Figure 19 – IPS Composition Profile

Structure for the Sections:

Mandatory, recommended, and optional sections, as we explained before. Each section contains a code, title, narrative text, and a list of entries with the FHIR structured/coded content specific for the section contents (allergies resources, procedure resources, etc.).

After these three examples, you are free to explore the IPS and review your favorite resources.

International Patient Summary FHIR IG – Terminology

The IPS is based on structured and coded data because this enables the possibility of TRANSLATING the content from one language to another. Hence, vocabulary for the IPS is mainly SNOMED CT, which enables easy and mostly safe translation of discrete (coded) clinical vocabulary from one language to another – there is a FREE subset of SNOMED which can be used regardless of the country's SNOMED affiliation – but it's not limited to SNOMED.

The basis for representation of these translations is also an extended datatype called CodingIPS (http://hl7.org/fhir/uv/ips/StructureDefinition-Coding-uv-ips.html) which supports several translations at the display level of the coded element.

A complete library of value sets has been defined for the IPS, including special guidance on how to represent null or non-valued elements (Examples: "No vaccines," "No allergies," etc.)

You can find all these definitions here: http://hl7.org/fhir/uv/ips/terminology.html

International Patient Summary FHIR IG – Bibliography

IPS @ FHIR Devdays:
https://international-patient-summary.net/ips-at-fhir-devdays-2022/

IPS update:
https://international-patient-summary.net/ips-update-2022-12-07/

IPS and extensibility:
https://international-patient-summary.net/the-international-patient-summary-and-the-extensibility-requirement/

This week's assignments

Since this is the first week, we will not have extensive programming assignments, but we will provide you with some small Argonaut and IPS example programs in C#, Python and JavaScript so you can get used to access FHIR data using FHIR client or plain http access libraries.

It's a good time to set up your environment. Get a good code editor, like Sublime or Visual Studio Code (highly recommended for all the platforms - even Java! -, VS Code works in Windows / MacOS / Linux.
Make sure you can run JavaScript, Java or C#, whatever you prefer.

For this unit, there is a quiz and a first set of assignments.
You will have to review or write small fragments of code, select IGs/resources and answer some questions on what you've learned about Argonaut and IPS in this unit.

Unit Summary and Conclusion

FHIR is a "platform" specification. To achieve real interoperability, we need to constrain.

And constraints are ways to express community consensus on how to use the standard for real-world problems, use cases and scenarios. We explored two implementations guides in this unit: Argonaut/US CORE and IPS. They are the result of months (years!) of discussions and are being widely implemented.

But the requirements are different, so the resulting interoperability artifacts and even the methods for exchange (granular API search vs. bundled document) are different.

We hope this unit helps you understand that even when you can create a FHIR client or server (native of facade) for a specific goal or compliant with a specific IG, it doesn't mean that it will automatically be good for another use case/scenario or implementation guide.

This may be seen as a weakness for FHIR, but we think just the opposite: FHIR is powerful, and you need to use this power for your specific goals satisfying your stakeholders' needs.

Additional Reading Material

Information about FHIR

There are a number of places where you can get information about FHIR.

- The specification itself is available online at www.hl7.org/FHIR. It is fully hyperlinked and very easy to follow. It is highly recommended that you have access to the specification while you are reading this module, as there are many references to it – particularly for some of the details of the more complex aspects of FHIR.
- All the subjects detailed in this unit are deeply documented in the FHIR specification and implementation guides. If you can't explain something, this should be the first source of truth.
- The root HL7 wiki page for FHIR can be found at http://wiki.hl7.org/index.php?title=FHIR . The information here is more for people developing resources, but still very interesting. Some wiki information is more historical and may not reflect the most recent version of the specification.
- The team uses the FHIR chat (http://chat.fhir.org) as a place to answer implementation-related questions, and therefore have both question and answer available for reference.