

Ignite change.



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FHIR Deep Dive: LAB

Setup

Installation

- Download PDF: <https://goo.gl/K4oofl>
- Install Postman: <https://www.getpostman.com/>
 - This is a ReST client that will help make service calls
- The FHIR server we will be working with today is: <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/>

Note: Make sure to remove spaces in your URL for FHIR - there should be none.

Patients

- Smart, Valerie (id: 4596007)
- Smart, Wilma (id: 4342008)
- Smart, Nancy (id: 4342009)
- Smart, Joe (id: 4342010)
- Smart, Hailey (id: 4342011)
- Smart, Timmy (id: 4342012)
- Smart, Fred (id: 4478007)
- Peters, Tim (id: 1316024)

Exercise 1

Exercise 1

- Identify the FMM (maturity model) of the Following resources for DSTU 2:
 - Patient
 - Condition
 - Observation
 - Coverage

Exercise 1: Answer

- Identify the FMM (maturity model) of the Following resources for DSTU 2: <http://hl7.org/fhir/dstu2/resourcelist.html>
 - Patient: 3
 - Condition: 2
 - Observation: 3
 - Coverage: 0

Exercise 2

Exercise 2

- Find out what resources are available in Millennium's HL7 FHIR DSTU 2 implementation that are not in the May2015 implementation.

Exercise 2: Answer

- RelatedPerson
- Contract
- Person
- Device
- Optional: MedicationOrder (MedicationPrescription was just renamed)

Exercise 3

Exercise 3

- What search parameters does the Millennium DSTU 2 implementation of Patient support? Are there any limitations or considerations?

Exercise 3: Answer

- Query by: id
- Query by: identifier
- Query by a combination of: birthdate, name, telecom
- _count (paging)
- birthdate, name, and telecom has limited availability, and “fuzzy”
- <http://fhir.cerner.com/dstu2/patient/#parameters>

Parameters

Name	Required?	Type	Description
_id	No, if populated all other parameters are ignored	token	The logical resource id associated with the resource.
identifier	Yes, or _id	token	A patient identifier. Example: urn:oid:1.3.6.1.4.1.311.1.1 10022228
birthdate	Yes, or name, telecom or _id	date	The patient's date of birth. Example: 1901-01-16
name	Yes, or birthdate, telecom or _id	string	A portion of either family or given name of the patient. Example: jwiers
telecom	Yes, or birthdate, name or _id	token	The value in any kind of telecom details of the patient. Example: (816) 475-2374
_count	No	number	The maximum number of results to return. Defaults to 20.

Notes:

- Either the `_id`, `identifier` or a combination of `birthdate`, `name` and `telecom` parameters must be provided.
- The `identifier`, `birthdate`, `name`, or `telecom` parameters may be provided exactly once and may have only a single value.

Limitations

- The `birthdate`, `name` and `telecom` search parameters are only available for the tenant `d075cf8b-3261-481d-97e5-b6c48d3b41f` and will perform a "fuzzy" search.

Exercise 4

Exercise 4

- According to the Conformance statement, does this FHIR server support OAuth? <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/>

Note: Make sure to remove spaces in your URL for FHIR - there should be none, and having spaces in the server URL will cause errors. HTTP URLs are space and case sensitive.

Exercise 4: Answer

- Answer: No (it's our open endpoint)
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/metadata?_format=json

```
  ],  
  "rest": [  
    {  
      "mode": "server",  
      "documentation": "All the functionality defined in FHIR",  
      "security": {  
        "cors": true  
      },  
      "resource": [  
        {  
          "type": "Conformance",  
          "interaction": [  
            {  
              "code": "read"  
            }  
          ]  
        }  
      ]  
    }  
  ]  
}
```

security	0..1	BackboneElement	Information about security of implementation
cors	0..1	boolean	Adds CORS Headers (http://enable-cors.org/)
service	0..*	CodeableConcept	OAuth SMART-on-FHIR NTLM Basic Kerberos Certificates RestfulSecurityService (Extensible)
description	0..1	string	General description of how security works
authentication	0..*	BackboneElement	Certificates associated with authentication

<http://hl7.org/fhir/dstu2/conformance.html>

Exercise 5

Exercise 5

- Find out the middle name for Fred Smart (id 4478007)

Exercise 5: Answer

- Answer: Rick
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Patient/4478007?_format=json
- <http://hl7.org/fhir/dstu2/datatypes.html#HumanName> (middle is subsequent given name)

```
"active": true,
"name": [
  {
    "use": "official",
    "text": "SMART, FRED RICK",
    "family": [
      "SMART"
    ],
    "given": [
      "FRED",
      "RICK"
    ],
    "period": {
      "start": "2016-08-31T18:24:54.000Z"
    }
  }
],
"gender": "male",
```

Note: Patient vs Person. Person represents people “in the real world” for example, it could link to your patient record in many FHIR servers. In CommonWell, most of the core is the “Person” and the records they’re tied to are Patient. We would use Patient here since we’re looking at patient records in an EHR.

Exercise 6

Exercise 6

- How many **current** allergies or intolerances does Tim Peters have?
 - Current: actual or possible existing allergies or intolerances
 - Hint: What indicates “current” for this FHIR resource?

Exercise 6: Answer

- 20
 - GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance?patient=1316024&_format=json
 - GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance?patient=1316024&status=active,unconfirmed,confirmed&_format=json

Note: AllergyIntolerance/123 is looking up an Allergy by its id (not a patient id). Similarly, AllergyIntolerance?_id=123 is looking up allergy by id, not by the patient id.

This value set has an inline code system <http://hl7.org/fhir/allergy-intolerance-status>, which defines the following codes:

Lvl	Code	Display	Definition
1	active	Active	An active record of a reaction to the identified Substance.
2	unconfirmed	Unconfirmed	A low level of certainty about the propensity for a reaction to the identified Substance.
2	confirmed	Confirmed	A high level of certainty about the propensity for a reaction to the identified Substance, which may include clinical evidence by testing or rechallenge.
1	inactive	Inactive	An inactive record of a reaction to the identified Substance.
2	resolved	Resolved	A reaction to the identified Substance has been clinically reassessed by testing or rechallenge and considered to be resolved.
2	refuted	Refuted	A propensity for a reaction to the identified Substance has been disproven with a high level of clinical certainty, which may include testing or rechallenge, and is refuted.
2	entered-in-error	Entered In Error	The statement was entered in error and is not valid.

<http://hl7.org/fhir/DSTU2/valueset-allergy-intolerance-status.html>

substance	Σ	1..1	CodeableConcept	Substance, (or class) considered to be responsible for risk
status	⌈⌋ Σ	0..1	code	Allergy[Intolerance Substance and Negation Codes (Example) active unconfirmed confirmed inactive resolved refuted entered-in-error

What if it wasn't mapped/
known?

<http://hl7.org/fhir/dstu2/allergyintolerance.html>

Exercise 7

Exercise 7

- Does Wilma Smart have a normal blood pressure?
- Hint: LOINC 55284-4 can be used to find blood pressures

Exercise 7: Answer

- No - it's High
- GET <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Observation?subject%3APatient=4342008&code=http%3A%2F%2Floinc.org%7C55284-4> (code: http://loinc.org|55284-4)

You need to ensure you properly escape/encode the URL so that protected characters are percent encoded. This is to ensure that the server can interpret the URL correctly. Postman does this for you, and *some* http libraries will, but make sure your code (or app) handles this logic to encode or decode as needed.

4.20.1 Scope and Usage 🌐

Observations are a central element in healthcare, used to support diagnosis, monitor progress, and even capture demographic characteristics. Most observations are simple name/value pairs.

observations g	interpretation	0..1	CodeableConcept	Observation Value Absent Reason (Extensible) High, low, normal, etc.
resource provi	comments	0..1	string	Observation Interpretation Codes (Extensible) Comments about result
• Vital signs	bodySite	0..1	CodeableConcept	Observed body part SNOMED CT Body Structures (Example)
• Laboratory	method	0..1	CodeableConcept	How it was done Observation Methods (Example)
• Imaging re	specimen	0..1	Reference(Specimen)	Specimen used for this observation
• Devices M	device	0..1	Reference(Device DeviceMetric)	(Measurement) Device
• Clinical asi	referenceRange	1	0..* BackboneElement	Provides guide for interpretation Must have at least a low or a high or text
• Personal c	low	1	0..1 SimpleQuantity	Low Range, if relevant
• Social hist	high	1	0..1 SimpleQuantity	High Range, if relevant
• Core char	meaning	0..1	0..1 CodeableConcept	Indicates the meaning/use of this range of this range Observation Reference Range Meaning Codes (Example)
	age	0..1	Range	Applicable age range, if relevant
	text	0..1	0..1 string	Text based reference range in an observation
	related	1	0..* BackboneElement	Resource related to this observation
	type	0..1	code	has-member derived-from sequel-to replaces qualified-by interfered-by ObservationReferenceRangeType (Deprecated)

<http://hl7.org/fhir/dstu2/observation.html>

			is about. tuc: 123456
code	Recommended to search by code, component-code, or date	token	The code of the observation type, can be a list of comma separated values. The system portion of the code is required. EG: http://loinc.org 3094-0
component-code	Recommended to search by code, component-code, or date	token	The component code of the observation type, can be a list of comma separated values. Results will qualify if their components match the code. The system portion of the code is required. EG: http://loinc.org 3094-0
date	Recommended to search by code, component-code.	date	Date range into which the observation falls (effectiveDateTime). Single dates are treated as implied ranges. EG: date=et2014-09-24T17:00:00.000Z

<http://fhir.cerner.com/dstu2/observation/>

Exercise 8

Exercise 8

- What is the name of the patient with MRN 10000363
- Hint: the system is urn:oid:1.1.1.1.1.1 (oid)

Exercise 8: Answer

- Amy Hilton
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Patient?identifier=urn:oid:1.1.1.1.1.1|10000363&_format=json

```
43     ],
44     "text": "MRN"
45   },
46   "system": "urn:oid:1.1.1.1.1.1",
47   "value": "10000363",
48   "period": {
49     "start": "2012-05-17T15:24:13.000Z"
50   }
51 }
52 ],
53 "active": true,
54 "name": [
55   {
56     "use": "official",
57     "text": "Hilton, Amy",
58     "family": [
59       "Hilton"
60     ],
```

Exercise 9

Exercise 9

- Is Fred Smart currently taking insulin?

Exercise 9: Answer

- Answer: Yes
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationStatement?patient=4478007&_format=json
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationOrder?patient=4478007&_format=json
- Difference?

4.13.2 Boundaries and Relationships 🌍

The Medication domain includes a number of related resources

MedicationOrder	An order for both supply of the medication and the instructions for administration of the medicine to a patient.
MedicationDispense	Provision of a supply of a medication with the intention that it is subsequently consumed by a patient (usually in response to a prescription).
MedicationAdministration	When a patient actually consumes a medicine, or it is otherwise administered to them
MedicationStatement	This is a record of medication being taken by a patient, or that the medication has been given to a patient where the record is the result of a report from the patient, or another clinician. A medication statement is not a part of the prescribe->dispense->administer sequence but is a report that such a sequence (or at least a part of it) did take place resulting in a belief that the patient has received a particular medication.

<http://hl7.org/fhir/dstu2/medicationorder.html#bnr>

Exercise 10

Exercise 10

- Which has a pacemaker: Fred Smart or Tim Peters?

Exercise 10: Answer

- Fred
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Device?patient=4478007&_format=json
 - and possibly Google (Medtronic Advisea MRI SureScan)
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Device?patient=1316024&_format=json

Exercise 11

Exercise 11

- How many different orders of *Advil Cold and Sinus* does Tim Peters have?

Exercise 11: Answer

- 1
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationOrder?patient=1316024&status=active,on-hold&_format=json

Paging

```
1,
  "link": [
    {
      "relation": "self",
      "url": "https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationOrder?patient=1316024&_count=25&status=active%2Con-hold"
    },
    {
      "relation": "next",
      "url": "https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationOrder?patient=1316024&-pageContext=1184038_1184051_1316024_1_1&-pageDirection=NEXT"
    }
  ]
}
```

- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/MedicationOrder?patient=1316024&-pageContext=1184038_1184051_1316024_1_1&-pageDirection=NEXT&_format=json
- Added _format parameter

MedicationStatement?

- Could have, though question said order.
- Result would have been the same, but statuses would have been “active,intended”

Exercise 12

Exercise 12

- Who is patient 2918007's mother?

Exercise 12: Answer

- Answer: CWDTEST, GUARDIAN
- GET https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/RelatedPerson?patient=2918007&_format=json

```
    "versionId": "1"
  },
  "text": {
    "status": "generated",
    "div": "<div><p><b>RelatedPerson</b></p><p><b>Name</b>: CWDTEST, GUARDIAN"
  },
  "patient": {
    "reference": "Patient/2918007",
    "display": "CWDTESTING, CHGDEMOGRAPHIC L"
  },
  "relationship": {
    "text": "Mother"
  },
  "name": {
    "use": "official",
    "text": "CWDTEST, GUARDIAN",
    "family": [
      "CWDTEST"
    ]
  }
}
```

5 r

Exercise 13

Exercise 13

- What happens when you query Condition for Joe Smart and filter by a category of complaint? Why?

Exercise 13: Answer

- Answer: An error (422), because complaint isn't supported
- GET <https://fhir-open.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Condition?patient=4342010&category=complaint&format=json>
- <http://fhir.cerner.com/dstu2/condition/#terminology-bindings>

Condition.category

Description

A category assigned to the condition.

Note

Currently `diagnosis` and `problem` category codes are supported. Code `diagnosis` is bound to condition category codes and `problem` is bound to argonaut extension codes terminology system shown below.

Condition Category Codes

Argonaut Extension Code

GET <https://fhir-open.sandboxe...>

Body Cookies Headers (18) Tests

Server → Apache

Status → 422 Unprocessable Entity

Transfer-Encoding → chunked

cache-control → no-cache

expires → Mon, 01 Jan 1990 00:00:00 GMT

pragma → no-cache

server-response-time → 27.580464

strict-transport-security → max-age=631152000

vary → Origin,User-Agent,Accept-Encoding

x-content-type-options → nosniff

x-frame-options → SAMEORIGIN

x-request-id → d500e72a-9f28-4646-b134-6060254ef820

x-runtime → 0.027559

x-vm-protection → 1; mode=block

Time: 71 ms

1 Unsupported category code supp

Bonus Round

Questions?