

Writing Data with FHIR (Lab Exercises)

Prerequisites

- FHIR Core Concept labs - <https://github.com/cerner/ignite-learning-lab/wiki/FHIR-Core-Concepts>
- Authorization labs - <https://github.com/cerner/ignite-learning-lab/tree/master/authorization>
 - Labs 1-4, **minimum**

Home Page

- For context and lab links, see <https://github.com/cerner/ignite-learning-lab/wiki/FHIR-Writes>

Exercise 1 - Scopes

- What scopes are needed to search for an available appointment time and request an appointment? (Assume we aren't confined to a particular patient)

Answer

- `user/Slot.read`, `user/Appointment.write` at a minimum
- `user/Schedule.read` if you want to read the Schedule, as well
- `user/Appointment.read` to retrieve the written Appointment

Exercise 2 - Scopes

- What write-supported scopes are contained in this token?:
- Authorization:

[illegible]

Answer

- `user/MedicationStatement.write` `user/Condition.write`

Exercise 3 - Headers

- What header is missing from the following request and what response would it receive when sent to the FHIR server?:
- Headers:
 - *Authorization*: Bearer
eyJraWQiOiIyMDE3LTEwLTA0VDIzOjI1OjUyLjI0My5lYyIsInR5cCI6I...
- Body:
 - {"resourceType":"MedicationStatement","patient":{"reference":"Patient/4766007"},....}

Answer

- Missing the Content-Type header
- FHIR server would respond with a 415 Unsupported Media Type

Exercise 4 - OperationOutcome

- Post the following MedicationStatement:
 - `{"resourceType": "MedicationStatement", "patient": {"reference": "Patient/4766007"}, "implicitRules": "/com/cerner/fhir/medication-statement/rules"}`
- What location XPath value is returned in the OperationOutcome?

Answer

- `"/f:MedicationStatement/f:implicitRules"`

Exercise 5 - MedicationStatement Creation

- Create a MedicationStatement using the following body, filling in the TODOs with appropriate values
 - ```
{ "resourceType": "MedicationStatement", "patient":
 { "reference": "Patient/
 TODO" }, "status": "TODO", "medicationCodeableConcept":
 { "text": "TODO", "dosage": [{ "timing": { "code":
 { "coding": [{ "system": "http://hl7.org/fhir/v3/vs/
 GTSAbbreviation", "code": "BID" }], "text": "BID" } }], "quan
 tityQuantity": { "value":
 60.0, "units": "mg", "system": "http://
 unitsofmeasure.org", "code": "mg" } }] }
```
- Ensure you receive a 201 Created response
- Retrieve your MedicationStatement by id to verify the contents

# Answer

- Example body:
  - ```
{ "resourceType": "MedicationStatement", "patient": { "reference": "Patient/4766007" }, "status": "active", "medicationCodeableConcept": { "text": "code Learning Lab" }, "dosage": [ { "timing": { "code": { "coding": [ { "system": "http://hl7.org/fhir/v3/vs/GTSAbbreviation", "code": "BID" } ], "text": "BID" } }, "quantityQuantity": { "value": 60.0, "units": "mg", "system": "http://unitsofmeasure.org", "code": "mg" } } ] }
```

Exercise 6 - Resource Contention

- What header and value would you need to supply if you planned to update the MedicationStatement in the previous exercise but wanted to avoid resource contention?

Answer

- *If-Match: W/“0”*

Exercise 7 - MedicationStatement Update

- Update your MedicationStatement resource with a status of “completed”

Answer

- Retrieve the Medication Statement to obtain the full resource json.
- Update the status to “completed”
- Supply the If-Match header and PUT the json body
- Response should be 200 with an ETag header of W/“1”

Exercise 8 - Querying for Slots

- Build a FHIR URL that can be used to query for Slots, provided the following criteria:
 - Practitioner: 2578010 or 1314012
 - Type: SNOMED 394581000 (Community Medicine)
 - Start: any future availability

Answer

- Example query: `https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/Slot?slot-type=http://snomed.info/sct|394581000&schedule.actor=Practitioner/1314012&start=ge2017&start=lt2018`
- Authorization and Accept headers populated

Exercise 9 - Appointment Creation

- Create an appointment using the following body, filling in the TODOs with appropriate values
 - ```
{ "resourceType": "Appointment", "slot":
 { "reference": "TODO" }, "participant": [{ "actor":
 { "reference": "TODO" }, "required": "required", "s
tatus": "TODO" }], "status": "TODO" }
```
- Ensure you receive a 201 Created response.
- Retrieve your Appointment by id to verify the contents

# Answer

- Example body:
  - ```
{ "resourceType": "Appointment", "slot":  
  { "reference": "Slot/  
21265426-633867-6830199-0" }, "participant":  
  [ { "actor": { "reference": "Patient/  
4766007" }, "required": "required", "status": "needs-action" } ], "status": "proposed" }
```

Exercise 10 - XHTML Validation

- Run one of the recommended xhtml validators on the following content:

- ```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd"><html xmlns="http://www.w3.org/1999/xhtml"><head><title>Document Title</title></head><body><table><tbody><tr><th colspan="3">Table Heading</th></tr><tr><th>Column A</th><th>Column B</th><th>Column C</th></tr><tr><td>Value A</td><td>Value B</td><td>Value C</td></tr></tbody></table></body></html>
```

# Answer

- Validate using one of the following
  - [https://validator.w3.org/#validate\\_by\\_input+with\\_options](https://validator.w3.org/#validate_by_input+with_options)
  - <https://html5.validator.nu/>
- Invalid content
- Closing table tag missing (`</table>`), but various errors may be reported as a result, depending on which validator is run

# Exercise 11 - Base64 Encoding

- Using <https://www.base64encode.org/>, what is the Base64-encoded value of the following string:
  - code Learning Lab



# Answer

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- Y29kZSBMZWFybmluZyBMYWI=

# Exercise 12 - Base64 Decoding

- Using <https://www.base64decode.org/>, Base64 decode the following content to identify the body section of the xhtml page
  - PCFET0NUWVBFIGh0bWwgUFVCTEIDICltLy9XM0MvL0RURCBYSFRNTCAxLjAgU3RyaWN0Ly9FTilglmh0dHA6Ly93d3cudzMub3JnL1RSL3hodG1sMS9EVEQveGh0bWwxLXN0cmIjdC5kdGQiPjxodG1sIHhtbG5zPSJodHRwOi8vd3d3LnczLm9yZy8xOTk5L3hodG1slj48aGVhZD48dGI0bGU+Y29kZSBMZWFybmluZyBMZWl8L3RpdGxlPjwvaGVhZD48Ym9keT5JJ20gb24gRkhJUie8L2JvZHK+PC9odG1sPg==

# Answer

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- “I’m on FHIR!”

# Exercise 13 - DocumentReference Creation

- Pre-requisites
  - Base64-encode the following xhtml, customizing as you wish
    - `<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd"><html xmlns="http://www.w3.org/1999/xhtml"><head><title>code Learning Lab</title></head><body>TODO</body></html>`
  - Query for an available patient encounter
  - Choose a supported LOINC from the [fhir.cerner.com](http://fhir.cerner.com) documentation
- Create a DocumentReference using the body below, filling in the TODOs with appropriate values
  - ```
{ "resourceType": "DocumentReference", "subject": { "reference": "TODO" }, "type": { "coding": [ { "system": "http://loinc.org", "code": "TODO" } ] }, "author": [ { "reference": "Practitioner/2578010" } ], "indexed": "2017-10-05T18:00:00Z", "status": "current", "docStatus": { "coding": [ { "system": "http://hl7.org/fhir/composition-status", "code": "final" } ] }, "description": "TODO", "content": [ { "attachment": { "contentType": "application/xhtml+xml; charset=utf-8", "data": "TODO" } } ], "context": { "encounter": { "reference": "Encounter/TODO" } } }
```
- Ensure you receive a 201 Created response.

Answer

- Example body:

- ```
{ "resourceType": "DocumentReference", "subject":
 { "reference": "Patient/4766007", "type": { "coding":
 [{ "system": "http://loinc.org", "code": "11488-4" }] }, "author":
 [{ "reference": "Practitioner/
 2578010" }] }, "indexed": "2017-10-05T18:00:00Z", "status": "current",
 "docStatus": { "coding": [{ "system": "http://hl7.org/fhir/
 composition-status", "code": "final" }] }, "description": "code
 Lab", "content": [{ "attachment": { "contentType": "application/xhtmll
 +xml; charset=utf-8", "data": "PCFET0NUWVBFIgh0bWwgUFVCTE1DICI tLy9
 XM0MvL0RURCBYSFRNTCAxLjAgU3RyaWN0Ly9FTiIgImh0dHA6Ly93d3cudzMub3
 JnL1RSL3hodG1sMS9EVEQveGh0bWwxLXN0cm1jdC5kdGQiPjxodG1sIHhtbG5zP
 SJodHRwOi8vd3d3LnczLm9yZy8xOTk5L3hodG1sIj48aGVhZD48dG10bGU
 +Y29kZSBMZWFybmluZyBMWVI8L3RpdGxlPjwvaGVhZD48Ym9keT5UZjvZH
 k8L2JvZk8k+PC9odG1sPg==" }] }, "context": { "encounter":
 { "reference": "Encounter/4329906" } } }
```

# Exercise 14 - Condition Creation

- Create a diagnosis Condition for Influenza
  - code - SNOMED 6142004
  - encounter - search for an available patient encounter
  - practitioner - 2578010 or 1314012
- Ensure you receive a 201 Created response.
- Retrieve your Condition by id to verify the contents

# Answer

- Example body:

- ```
{ "resourceType": "Condition", "patient":  
  { "reference": "Patient/4766007" }, "code":  
    { "coding": [ { "system": "http://snomed.info/  
sct", "code": "6142004" } ] }, "category":  
      { "coding": [ { "system": "http://hl7.org/fhir/  
condition-  
category", "code": "diagnosis", "display": "Diagn  
osis" } ] }, "text": "Diagnosis", "clinicalStatus":  
        "active", "verificationStatus": "differential",  
        "encounter": { "reference": "Encounter/  
4329906" } }
```

Exercise 15 - AllergyIntolerance Creation

- Prerequisites:
 - Query the patient's existing AllergyIntolerances
 - Identify a standard code for a medication or non-medication substance for which there are no existing AllergyIntolerances
 - practitioner - 2578010 or 1314012
 - Search for an available patient encounter
- Create an AllergyIntolerance
- Ensure you receive a 201 Created response.
- Retrieve your AllergyIntolerance by id to verify the contents

Answer

- Example query for current allergies: <https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance?patient=4766007>
- Example body, provided an available substance is found
 - ```
{ "resourceType": "AllergyIntolerance", "category": "environment", "criticality": "CRITL", "recordedDate": "2017-02-28T15:03:00-06:00", "status": "active", "type": "allergy", "onset": "2015-12-15T00:00:00Z", "patient": { "reference": "Patient/4766007" }, "reporter": { "reference": "Patient/4766007" }, "recorder": { "reference": "Practitioner/2578010" }, "reaction": [{ "manifestation": [{ "text": "Bad reaction" }] }, "note": { "authorReference": { "reference": "Practitioner/2578010" }, "time": "2017-02-28T09:03:00Z", "text": "Keep close watch" }, "substance": { "coding": [{ "system": "TODO", "code": "TODO" }] } }
```