FHIR COURSE

Introduction to FHIR – Transactions

How to submit your activity

Contents

1. What is expected from you in this assignment?

Post at least 3 transactions for the same patient, holding four different measures for the 4 vital signs. The measures shall be separated by 15 minutes. Transactions are BUNDLES of the required resources.

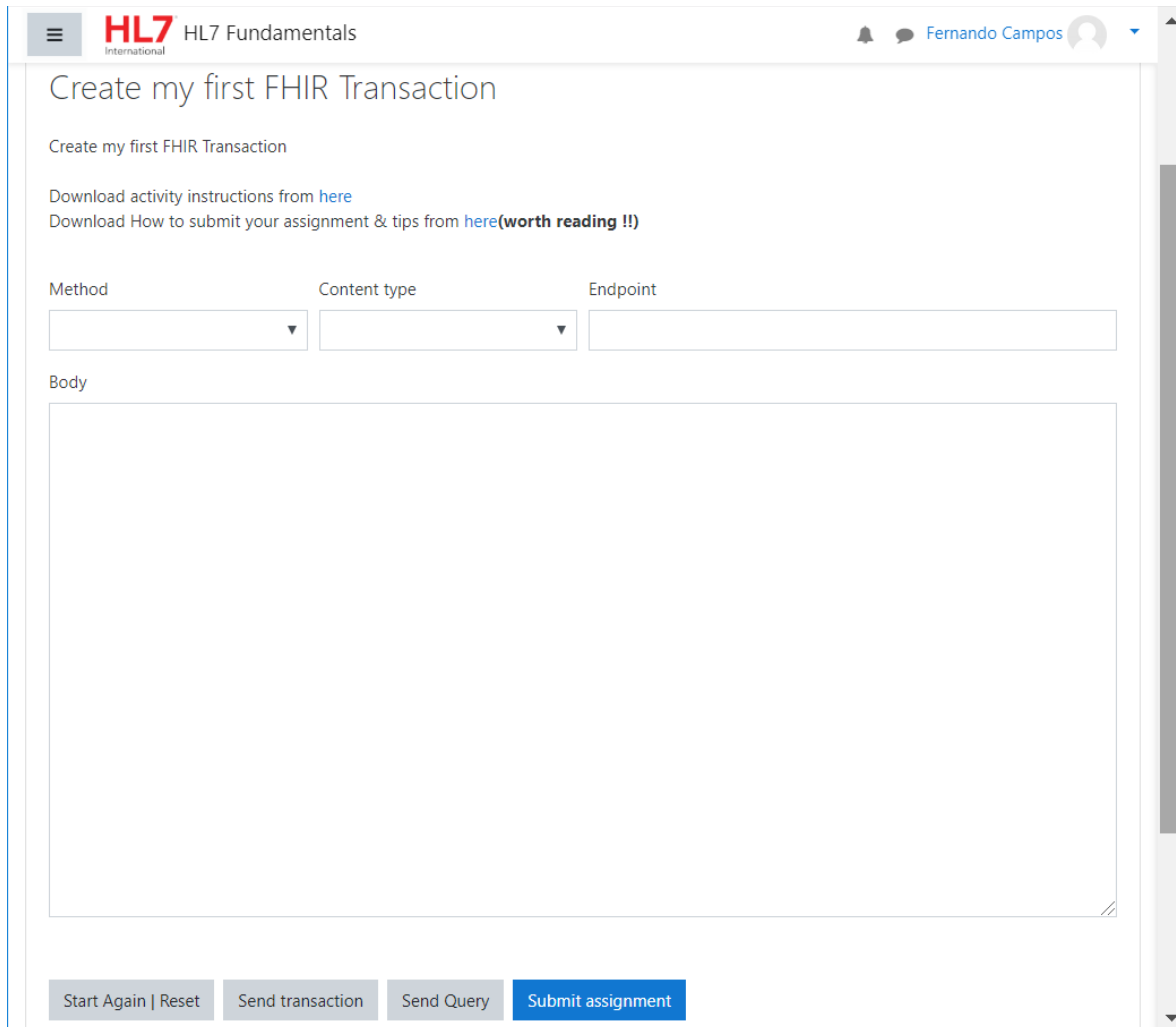Example: For Patient: DOE, JOHN # 120202, Device ZZZZZ,

Measure	05.12.2016 10:30	05.12.2016 10:45	05.12.2016 11:00
Systolic BP	120	125	120
Diastolic BP	80	85	78
Heart Rate	120	135	127
Respiratory Rate	15	18	22

You can try and test all these operations at any FHIR test server using your rest client but you will have to do the same finally **at the course software** for your grade record

NOTE: Some operations could work using POSTMAN or your REST client, and fail in the course server. Note that the course server is more restrictive and has more controls.

2. How to submit assignment?

1. When you edit your submission you will face an interface like the one depicted here:

2. Select the correct Method, content-type and endpoint. Then paste your first transaction in the text area and send it to the server with the **Send Transaction** button. If you bundle is correct you will create your first transaction.

After this, you need to send the second group of measures. **Same patient, same device** but the **observation values** and **effective time** have to be **different.** You need to paste the new bundle in the text area and repeat the first step using the **Send Transaction** button.

3. How to Start?

The base structure of your transaction XML is given in the activity. Go to the home page of the FHIR course, under unit-3, and you will find:

DraftMeasure.xml

This is "DraftMeasure.xml" file. You have to update or add more content to this file.

Please note that Bundle means, in layman's terms, one XML with multiple resources inside it. When you POST this Bundle as transaction, automatically, all resources inside it will also get POST on server. Each Bundle has different entries with all the needed resources according to the specification.

In this case you will need a Patient (your Patient), a Device (use the device template) and four observations (use the observation template).

Use the base url of server to POST transaction- http://fhir.hl7fundamentals.org/r4

Each **entry** shall contain a **resource** and a **request** element. And the **request** element has two mandatory elements:

- **METHOD** = "POST" / "PUT" / "DELETE" / "GET". This is to indicate at the server WHAT OPERATION will the server do with our resources.
- **URL**= the address for the method also including a search parameter if needed to perform conditional inserts or updates.

The Bundle structure, in this case has to be like this:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Bundle xmlns="http://hl7.org/fhir"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <type value="transaction"> </type>

  <entry>
    <resource>
      <Organization>
        …it's in the DraftMeasure.XML
      </Organization>
    </resource>
    <request>
      <method>
      <url>
    </request>
  </entry>

  <entry>
    <resource>
      <Patient>
        …(here you will need to include your patient. Remember that the Patient.identifier.value MUST be your HL7 course
userid
      </Patient>
    </resource>
    <request>
      <method>
      <url>
    </request>
  </entry>

  <entry>
    <resource>
      <Device>
        …. (This information is in DeviceTemplate.xml)
      </Device>
    </resource>
    <request>
      <method>
      <url>
    </request>
```

```
      </entry>
      <entry>
        <resource>
              <Observation>
              … FIRST MEASURE Systolic BP
              </Observation>
        </resource>
        <request>
           <method>
           <url>
        </request>

      </entry>
      <entry>
        <resource>
              <Observation>
              … SECOND MEASURE Diastolic BP
              </Observation>
        </resource>
        <request>
           <method>
           <url>
        </request>

      </entry>

      <entry>
        <resource>
              <Observation>
              … THIRD MEASURE Heart Rate
              </Observation>
        </resource>
        <request>
           <method>
           <url>
        </request>

      </entry>
      <entry>
        <resource>
              <Observation>
              …FOURTH MEASURE Respiratory Rate
              </Observation>
        </resource>
        <request>
           <method>
           <url>
        </request>

      </entry>
    </Bundle>
```

I. Adding resources to the Bundle Template.

a. Organization- for this Resource, values are already given, either you can use it "as- is" or can opt to change the identifier value to create your own Organization resource, like this-

```
  <entry>
   <fullUrl value=" urn:uuid:17C7D86E-664F-4FE2-91D7-AF9A8E47311E"/>
    <resource>

<Organization>

    <text>
          <status value="generated"/>
          <div xmlns="http://www.w3.org/1999/xhtml"> UWEARME - A DIVISION OF HEALTH GIZMOS
            CORP </div>
        </text>
        <identifier>
          <system value="www.nationalorgidentifier.gov/ids"/>
          <value value="UWEARME_JOHN.DOE"/>
        </identifier>
        <name value="UWEARME"/>
        <address>
          <line value="2000 WEARABLE DRIVE"/>
          <city value="ANN ARBOR"/>
          <state value="MI"/>
          <country value="US"/>
       </address>
      </Organization>
    </resource>
<request>
   <method value="PUT"/>
   <url value="Organization?identifier=www.nationalorgidentifier.gov/ids|UWEARME_JOHN.DOE"/>
</request> </entry>
```

VERY IMPORTANT NOTE : If you do not change the id, there might be a case that you get some server error, probably 412- Pre-condition error, because there might be case where more than one person have Posted the Organization resource and now there are multiple Organization Resource with the same identifier.

POST v/s PUT:

Whenever you send the POST verb or method, the server will create a new Resource, irrespective of whether the same resource (with the same identifier or other values is already stored on the server or not). So, if you POST the same resource multiple times, it will end up creating multiple resources on server for the same details instead of versions of the same resource. Resource is the most basic or atomic thing in FHIR.

CONDITIONAL PUT- When you issue a PUT verb/method, the FHIR RESTful server tries to update an existing resource and if not found, then it will create a new resource.

If you perform conditional updates, these rules apply

- **No matches:** The server performs a create interaction

- **One Match:** The server performs the update against the matching resource

- **Multiple matches:** The server returns a 412 Precondition Failed error indicating the client's criteria were not selective enough

So, for Organization, Patient, Device resources, in all three transactions, you can use the PUT method, the url containing the condition, and the server will try to search for these resources matching the condition given in value attribute of url element. So, **the first time**, when the server could not find such resource, **it will create a new one** and for **next two transactions it will not create new resources for Organization, Patient, Device.**

```
<request>
   <method value="PUT"/>
   <url value="Organization?identifier=www.nationalorgidentifier.gov/ids|UWEARME_JOHN.DOE"/>
</request>
```

II.   Patient Resource

```
<entry>
    <fullUrl="urn:uuid:0fc374a1-a226-4552-9683-55dd510e67c9"/>
    <resource>

   <Patient>

   <text>
           <status value="generated"/>
           <div xmlns="http://www.w3.org/1999/xhtml">
              [YOUR NAME] Id # [YOUR PATIENT ID]
           </div>
       </text>
       <identifier>
          <system value="www.mypatientidentifier.com/ids"/>
          <value value="[YOUR PATIENT ID]"/>
       </identifier>
       <name>
          <family value="[YOUR LAST]"/>
          <given value="[YOUR FIRST]"/>
       </name>
       <address>
          <line value="[YOUR ADDRESS]"/>
          <city value="[YOUR CITY]"/>
          <state value="[YOUR STATE]"/>
          <country value="[YOUR COUNTRY]"/>
       </address>
       <managingOrganization>
          <reference value="urn:uuid:17C7D86E-664F-4FE2-91D7-AF9A8E47311E"
          > </reference>
       </managingOrganization>
     </Patient>

   </resource>
   <request>
      <method value="PUT"/>
      <url
```

```
        value="Patient?identifier=www.mypatientidentifier.com/ids|[YOUR PATIENT ID]"
    />
  </request>
</entry>
```

Make sure that for "[YOUR PATIENT ID]", you use the same id, you have used in Unit-1 and Unit-2. In example, it is "john.doe"

Please also note that the request method url value attribute must have the exact same value as written for Patient **identifier.**

```
<request>
    <method value="PUT"/>
    <url
      value="Patient?identifier=www.mypatientidentifier.com/ids|john.doe"
    />
  </request>
```

III.   Device Resource

Please find the Device template (draft Device resource) under unit-3 on home page of the FHIR course:

Device Resource Template

Right click on this link and save the file on your system.

This template gives a complete Device Resource, the only thing required from you is to fill the identifier value, this will be same as your Patient id, and for me it will be: john.doe

```
<entry>
    <resource>
     <!-- Device goes here -->
    </resource>
    <request>
      <method value="PUT"/>
      <url value="Device?identifier=www.uwearme.com/dev|[YOUR PATIENT ID]"/>
    </request>
  </entry>
```

Note: Make sure that in the request method, you have PUT and the url.value attribute with the same identifier as you filled for Device identifier. [YOUR PATIENT ID] – Here write the value you have written for Device identifier.value and would be same as Patient identifier.

IV.   Observation Resource

Observation Resource template is given in Unit-3 on home page of FHIR course:

Observation Template

Right click on this link and save the file on your system.

Fill the values in this template to make your Observation Resource. Below I have pasted Observation Resource template given in course.

Important points to remember for Observation Resource-

- `<code value="[LOINC_CODE]"/>`
  LOINC codes are given in activity PDF-
- Patient Reference

```
<subject>
    <reference value="urn:uuid:0fc374a1-a226-4552-9683-55dd510e67c9"> </reference>
</subject>
```

   Same goes for Device.

-    Observation values

```
<valueQuantity>
    <value value="[VALUE]"/>
    <unit value="[UNIT]"/>
</valueQuantity>
```

POST or PUT for request method

Please note that request method is missing for some of the elements in the Transaction XML (Bundle XML). This is because we wanted you to figure out what would be the request method and url. See the entry below, I have added the request method. PUT or POST?
You need to create a new Observation Resources in all three transactions. So, you need to simply POST it, also the url value is going to be just 'Observation', because we don't want the server to search for any Observation (like we did for Patient, Device etc.). We want to create new Observation resources each time we POST our transaction (for all three).
You will need to change Observation.effectiveTime to simulate the different observation times.

Up to now all points discussed were about the First Transaction. Please note that you have to place all resources in one single XML file and that XML is "DraftMeasure.xml" file.

Once you are ready with your Transaction XML, POST it on the course site

4. Operations Outcome after POSTing the transaction

I am pasting what I got after the first POST:

```xml
<Bundle xmlns="http://hl7.org/fhir">
  <id value="2356d76f-b9df-4077-96ca-6b916adb1c10"/>
  <type value="transaction-response"/>
  <link>
    <relation value="self"/>
    <url value="http://fhir.hl7fundamentals.org/baseDstu3"/>
  </link>
  <entry>
    <response>
      <status value="201 Created"/>
      <location value="Organization/17146/_history/1"/>
      <etag value="1"/>
      <lastModified value="2017-07-14T13:47:44.253-04:00"/>
    </response>
  </entry>
  <entry>
    <response>
      <status value="201 Created"/>
      <location value="Patient/17147/_history/1"/>
      <etag value="1"/>
      <lastModified value="2017-07-14T13:47:44.254-04:00"/>
    </response>
  </entry>
  <entry>
    <response>
      <status value="200 OK"/>
      <location value="Device/1027/_history/76"/>
      <etag value="76"/>
      <lastModified value="2017-07-14T13:47:44.257-04:00"/>
    </response>
  </entry>
  <entry>
    <response>
      <status value="201 Created"/>
      <location value="Observation/17148/_history/1"/>
      <etag value="1"/>
      <lastModified value="2017-07-14T13:47:44.254-04:00"/>
    </response>
  </entry>
  <entry>
    <response>
      <status value="201 Created"/>
      <location value="Observation/17149/_history/1"/>
      <etag value="1"/>
      <lastModified value="2017-07-14T13:47:44.254-04:00"/>
    </response>
  </entry>
  <entry>
    <response>
      <status value="201 Created"/>
      <location value="Observation/17150/_history/1"/>
      <etag value="1"/>
      <lastModified value="2017-07-14T13:47:44.255-04:00"/>
    </response>
```

```
  </entry>
  <entry>
    <response>
      <status value="201 Created"/>
      <location value="Observation/17151/_history/1"/>
      <etag value="1"/>
      <lastModified value="2017-07-14T13:47:44.255-04:00"/>
    </response>
  </entry>
</Bundle>
```

The outcome status makes clear that the transaction was posted on server successfully

- Another important thing to notice is that my Organization or Patient resources are created now and the response gave me their actual Resource id.

  "location": " Organization/17146/_history/1",

  "location": " Patient/17147/_history/1",

_history/1 is showcasing that this is the first version of my resource. But here, I got the Resource id as highlighted above. In my next transaction, instead of using reference id (for conditional referencing), I can use actual Resource id for all these Resources except Observation. Try to fetch these resources by using GET on postman and using these Resource ids.

Observation Resource- for the next two transactions also, we want to create new Resources.

5. Tips for 2nd part

When you are finished posting the 12 observations you will have to perform a single query in order to READ ALL THE OBSERVATIONS. You have to retrieve all the patient's measures.

Select the correct Method, content-type, complete the URL with the FHIR query and now use the Send Query button to retrieve all of them.

If you succeed you will receive feedback like this: 4 extra points for the query and your final grade will be 10. !!!

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International

| Start Again | Reset | Send transaction | Send Query | **Submit assignment** |

Grade: 10, **Feedback :**

- Perfect ! Observation/50240 was retrieved.
- Perfect ! Observation/50241 was retrieved.
- Perfect ! Observation/50242 was retrieved.
- Perfect ! Observation/50243 was retrieved.
- Perfect ! Observation/50250 was retrieved.
- Perfect ! Observation/50251 was retrieved.
- Perfect ! Observation/50252 was retrieved.
- Perfect ! Observation/50253 was retrieved.
- Perfect ! Observation/50260 was retrieved.
- Perfect ! Observation/50261 was retrieved.
- Perfect ! Observation/50262 was retrieved.
- Perfect ! Observation/50263 was retrieved.

AMAZING !!!!!! http://fhir.hl7fundamentals.org/r4/

Your correct attempts

- 2016-10-01T10:30:00 - Result: 200 - Grade: 2 Feedback: Perfect. - Observation/50240 Observation/50241 Observation/50242 Observation/50243
- 2016-10-01T10:40:00 - Result: 200 - Grade: 2 Feedback: Perfect. - Observation/50250 Observation/50251 Observation/50252 Observation/50253
- 2016-10-01T10:50:00 - Result: 200 - Grade: 2 Feedback: Perfect. - Observation/50260 Observation/50261 Observation/50262 Observation/50263

IMPORTANT After finish performing the query, submit your assignment to save your grade.