



# Denodo HL7® FHIR® Service - User Manual

Revision 20210709

## NOTE

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**Please note:** This software is currently in **BETA**.

## 1 OVERVIEW

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**FHIR® (Fast Healthcare Interoperability Resources)** is a standard describing data formats and elements, known as resources, and an application programming interface (API) for health care data exchange. The standard was created by the **HL7® (Health Level Seven International)** health-care standards organization.

The Denodo HL7® FHIR® component consists of:

- Denodo Virtual DataPort templates: `denodo_hl7_fhir_templates.vql` script that defines interfaces for some HL7 FHIR resources.
- Denodo web service application: web service that reads the interface views created by the templates and translates that into the HL7 FHIR standard web service format (JSON).

**Note:** “FHIR” and “HL7” are registered trademarks of HL7 <http://www.hl7.org>

## 2 INSTALLATION AND CONFIGURATION

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The Denodo HL7 FHIR Service is distributed as a DenodoConnect that can be downloaded from the Support site.

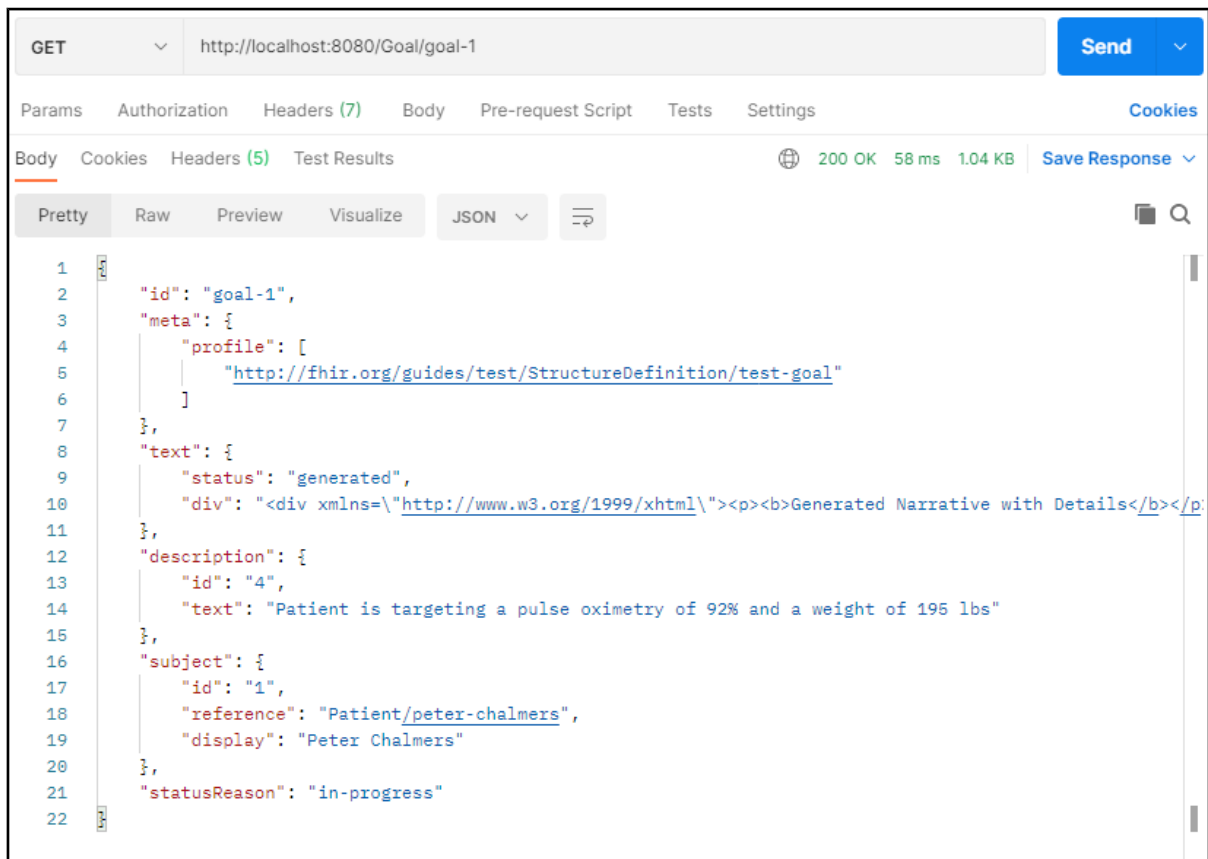
This Denodo HL7 FHIR Service distribution consists of:

- Command-line executable scripts for Windows and Linux (/bin folder)
- Configuration files: application.properties and log4j2.xml(/config folder)
- Java libraries (/lib folder)
  - Denodo HL7 FHIR Service application jar: denodo-hl7fhir-service-<version>-jar
  - Denodo driver jar: denodo-vdp-jdbcdriver-dist-<version>-full.jar  
If you need to use a JDBC driver corresponding to a Denodo update different to the one that is distributed, you only need to replace this jar.
- Virtual DataPort templates (/vq1 folder)

For installing it just download the .zip file and extract the service into the desired folder.

In order to run it, you need at least Java 8 and the environment variables JAVA\_HOME and PATH correctly configured.

After running the script in the /bin folder, you can use the Denodo HL7 FHIR Service at: <http://localhost:8080/>



```
1  {
2    "id": "goal-1",
3    "meta": {
4      "profile": [
5        "http://fhir.org/guides/test/StructureDefinition/test-goal"
6      ]
7    },
8    "text": {
9      "status": "generated",
10     "div": "<div xmlns=\"http://www.w3.org/1999/xhtml\"><p><b>Generated Narrative with Details</b></p>"
11   },
12   "description": {
13     "id": "4",
14     "text": "Patient is targeting a pulse oximetry of 92% and a weight of 195 lbs"
15   },
16   "subject": {
17     "id": "1",
18     "reference": "Patient/peter-chalmers",
19     "display": "Peter Chalmers"
20   },
21   "statusReason": "in-progress"
22 }
```

Denodo HL7 FHIR Service running

## 2.1 CONFIGURATION

The Denodo HL7 FHIR Service allows you to configure the following properties at the `resources/application.properties` file:

```
spring.datasource.driver-class-name=com.denodo.vdp.jdbc.Driver
spring.datasource.url=jdbc:vdb://{VDP_HOSTNAME}:{VDP_PORT}/{VDP_DATABASE}
spring.datasource.username={DATASOURCE_USERNAME}
spring.datasource.password={DATASOURCE_PASSWORD}
```

- **spring.datasource.driver-class-name:** The Virtual DataPort driver.
- **spring.datasource.url:** The database URI to access Denodo from the HL7 FHIR Service. Default VDP database is `h17_fhir` (the one created by importing the templates script).
- **spring.datasource.username:** Username to access the VDP database.
- **spring.datasource.password:** Password to access the VDP database.

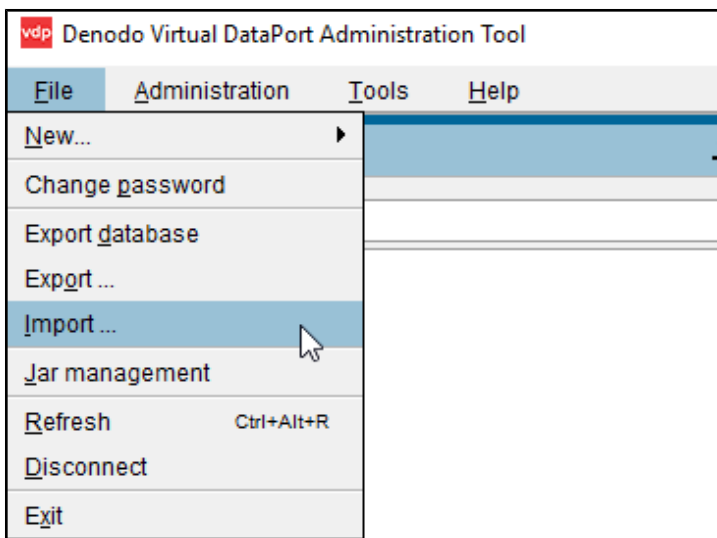
## 2.2 IMPORTING TEMPLATES

The `denodo_h17_fhir_templates.vql` script file contains interfaces for each one of the following HL7 FHIR resources:

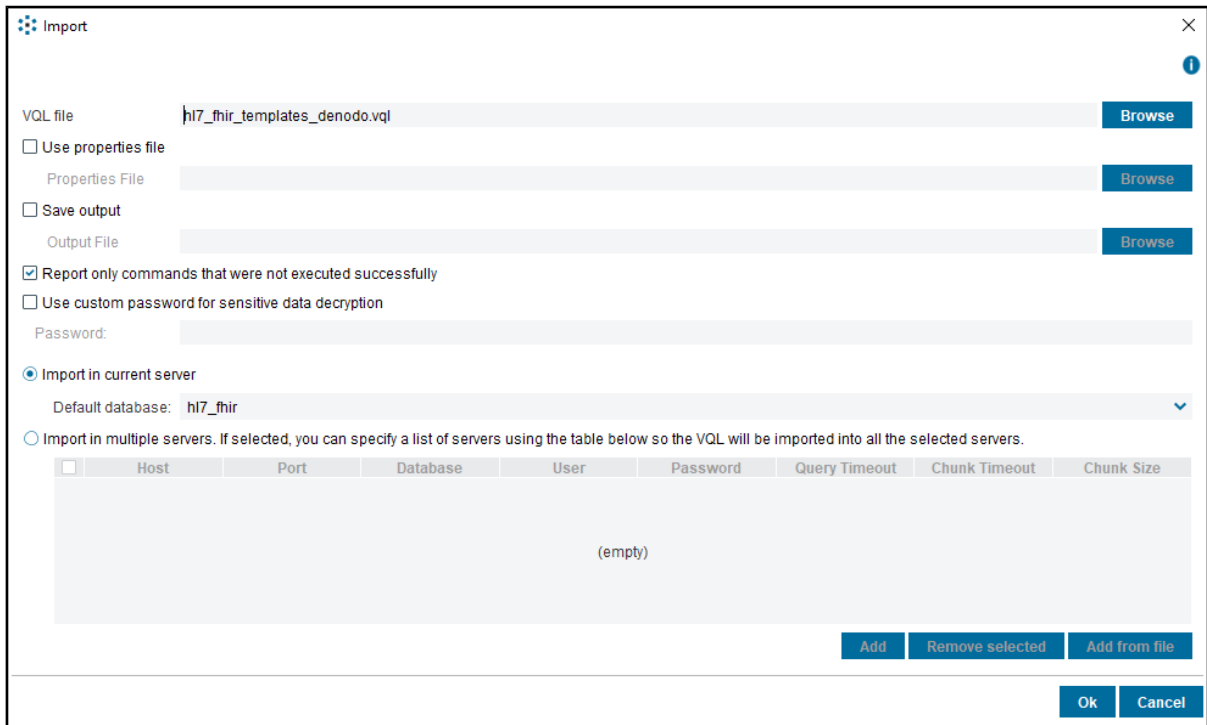
- AllergyIntolerance
- CarePlan
- Condition
- Device
- DiagnosticReport
- DocumentReference
- Goal
- Immunization
- MedicationRequest
- MedicationStatement
- Observation
- Patient
- PractitionerRole
- Procedure
- Provenance

**Please note:** importing this script will create a database called `h17_fhir` in your Virtual DataPort installation, and will drop any existing database previously existing with that exact name.

You only have to import the the `denodo_h17_fhir_templates.vql` file using the Import option of the VDP Administration Tool:



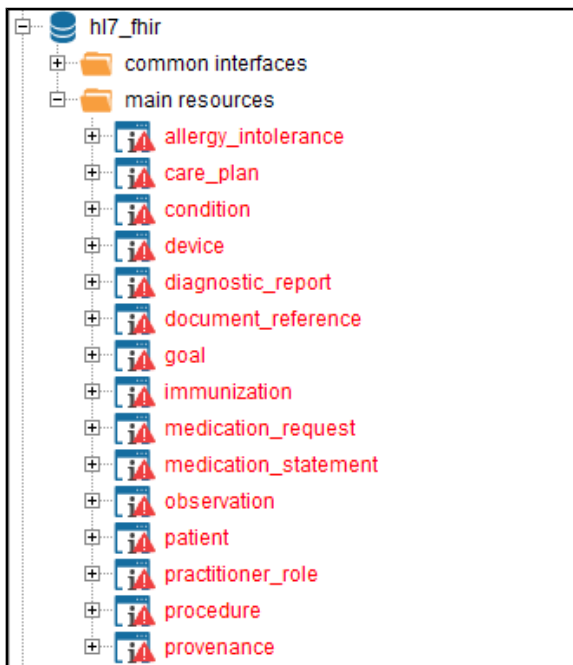
Import option in VDP



Import wizard in VDP

### 2.3 REFRESH

After the import operation finishes, refresh the Server Explorer by selecting File > Refresh and you will be able to see the interfaces:



Interfaces for HL7 FHIR resources

The hl7\_fhir database contains two folders:

- **common interfaces:** most of the interfaces of this folder represent complex types used by some HL7 FHIR resources fields.

- **main resources:** this folder contains the interfaces which represent the HL7 FHIR resources.

Note that all the interfaces are unimplemented, you must set the implementation of each one using your own views.

## 2.4 **IMPLEMENT A FHIR RESOURCE INTERFACE**

Interface views are a special type of derived views that consist only of a definition of fields and a reference to another view. You have to set the implementation view in order the queries work properly. The implementation view must have the same number of fields and with the same type.

The `denodo_hl7_fhir_templates.vql` script defines also some new data types:

- `registerdatetime`: a register with a value of type `datetime`
- `registerstring`: a register with a value of type `string`
- `registertime`: a register with a value of type `time`
- `arraydatetime`: an array of `registerdatetime` registers
- `arraystring`: an array of `registerstring` registers
- `arraytime`: an array of `registertime` registers

Make sure your implementation views make use of these types when necessary.

In order to set the implementation of an interface you just need to edit the interface, select the `Implementation` tab and drag and drop the implementation view to this window.



The screenshot shows the Denodo interface configuration for the Patient interface. The top part displays two tables: 'Interface Definition' and 'patient1'. The 'Interface Definition' table lists fields like id, language, identifier\_ids, extension\_ids, text\_id, text\_div, text\_status, meta\_id, meta\_extension\_ids, meta\_version\_id, meta\_last\_updated, meta\_source, meta\_profile, meta\_security\_coding\_ids, and meta\_tag\_coding\_ids. The 'patient1' table lists fields like id, meta\_profile, text\_status, text\_div, identifier\_ids, active, name\_ids, gender, birthdate, address\_ids, telecom\_contact\_point\_ids, and communication\_type\_ids. Arrows indicate the mapping between these fields. Below the tables, a search bar and instructions are provided, followed by a table of implementation expressions.

You can define the implementation expressions for each field of the interface in two ways:

- Using the model above, linking the fields from the definition with the fields of the implementation view.
- Typing the expressions in the table below

Definition Field Name	Definition Field Type	Implementation Expression
meta_tag_coding_ids	hl7_fhir.arraystring	NULL
active	boolean	active
name_ids	hl7_fhir.arraystring	name_ids
telecom_contact_point_ids	hl7_fhir.arraystring	telecom_contact_point_ids
gender	text	gender

Set implementation view of Patient interface

## 3 ENDPOINT OPERATIONS

---

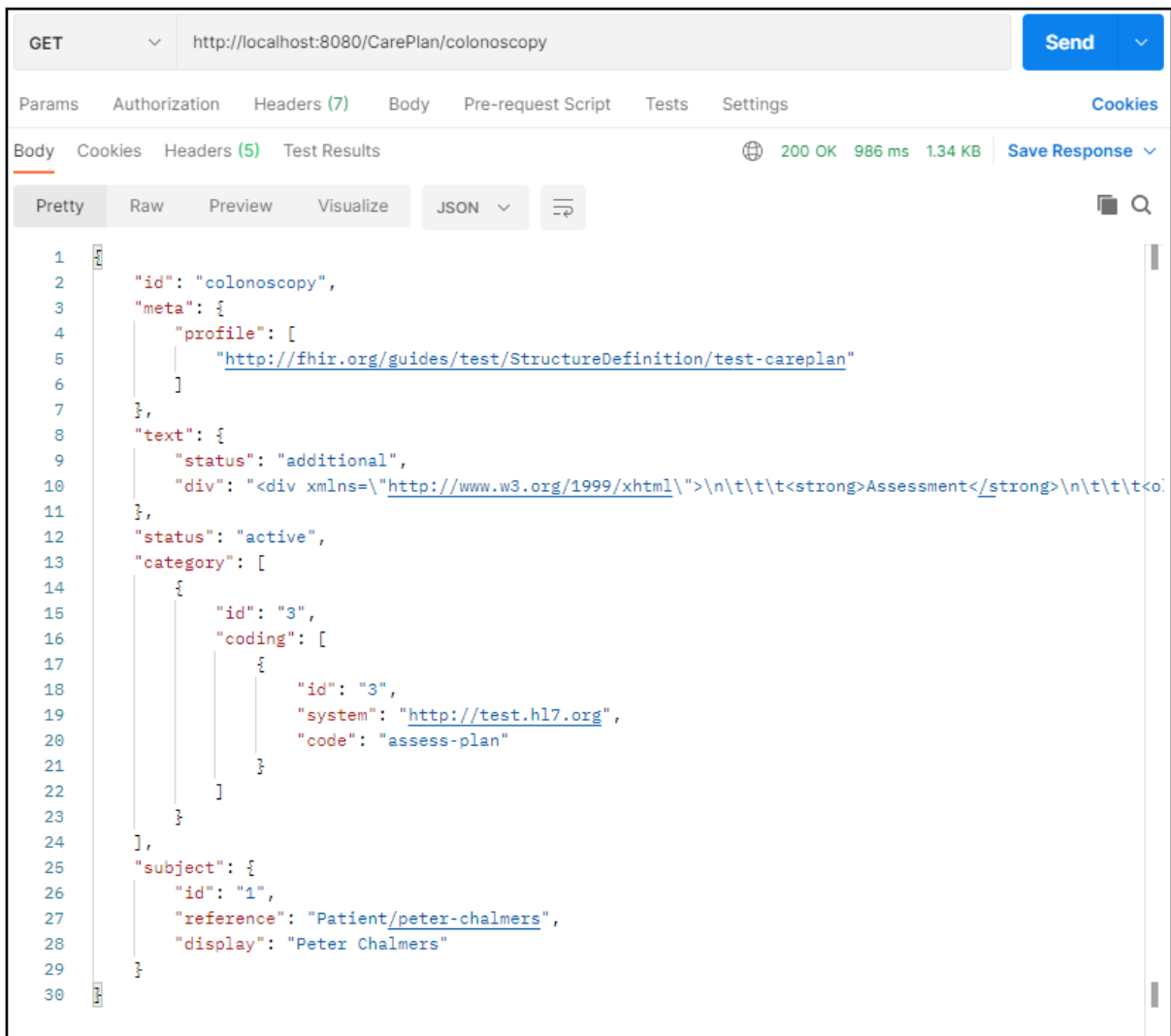
The Denodo HL7 FHIR Service implements the read by id and search operations of HL7 FHIR RESTful API, both without parameters, for the following resources:

- AllergyIntolerance
- CarePlan
- Condition
- Device
- DiagnosticReport
- DocumentReference
- Goal
- Immunization
- MedicationRequest
- MedicationStatement
- Observation
- Patient
- PractitionerRole
- Procedure
- Provenance

### 3.1 READ OPERATION

This operation follows the syntax:  
[http://localhost:8080/<resource\\_name>/<resource\\_id>](http://localhost:8080/<resource_name>/<resource_id>).

For example, if we want to see the details of a care plan with id is "colonoscopy", the url to be invoke will be: `http://localhost/CarePlan/colonoscopy`



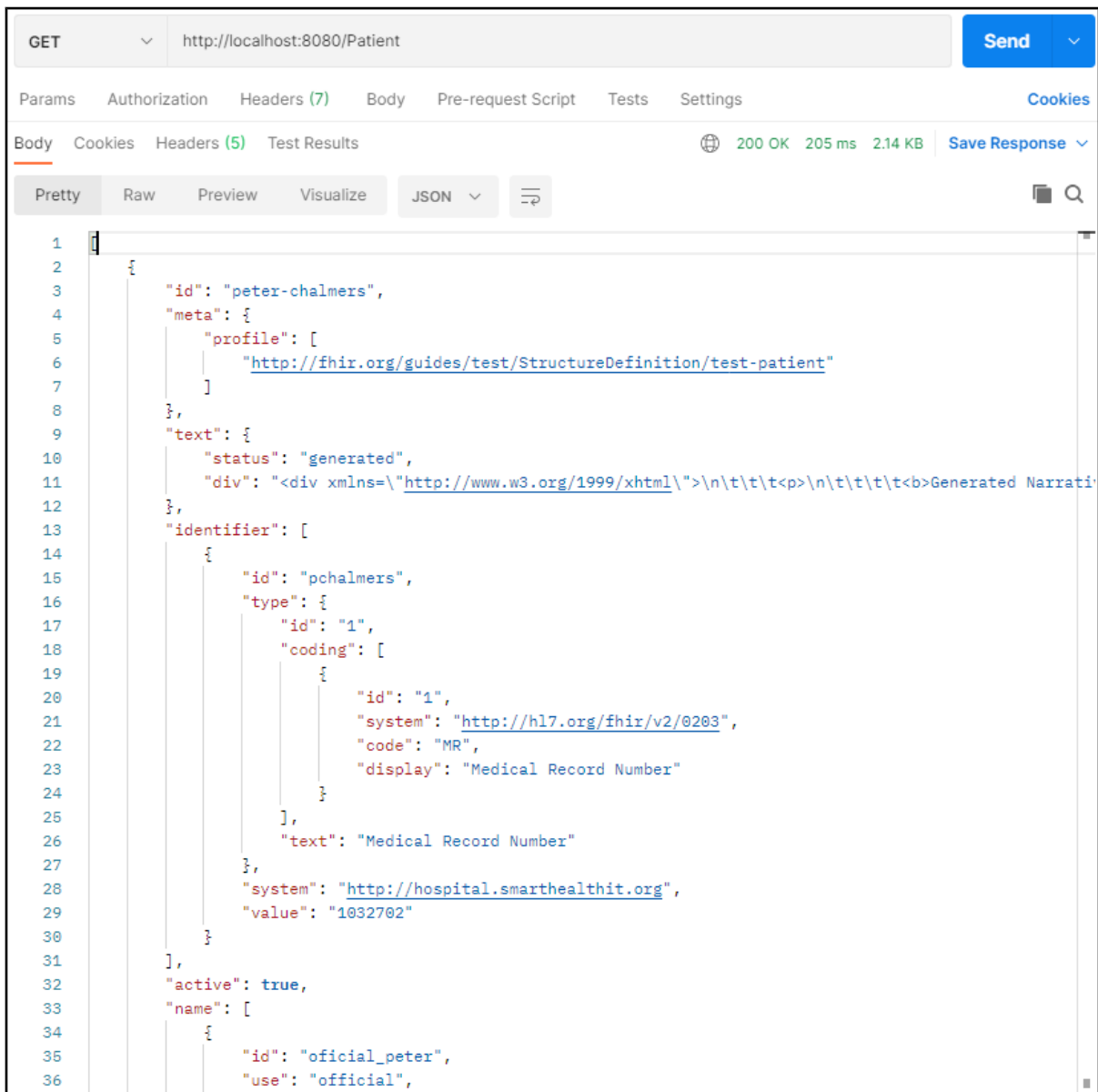
read CarePlan HL7 FHIR resource by id

### 3.2 SEARCH OPERATION

This operation follows the syntax: [http://localhost:8080/<resource\\_name>](http://localhost:8080/<resource_name>).

The Denodo HL7 FHIR server implements only this operation, without search parameters. It really works as a list operation.

For example, if we want to list all the patients of our database, the url to be invoke will be: <http://localhost/Patient>



The screenshot shows a REST client interface with a GET request to `http://localhost:8080/Patient` and a successful response (200 OK, 205 ms, 2.14 KB). The response is displayed in JSON format, showing a patient resource with an identifier and a name.

```

1  {
2
3    "id": "peter-chalmers",
4    "meta": {
5      "profile": [
6        "http://fhir.org/guides/test/StructureDefinition/test-patient"
7      ]
8    },
9    "text": {
10     "status": "generated",
11     "div": "<div xmlns=\<a href='http://www.w3.org/1999/xhtml'>\n\t\t\t<p>\n\t\t\t\t<b>Generated Narrati
12
13    "identifier": [
14      {
15        "id": "pchalmers",
16        "type": {
17          "id": "1",
18          "coding": [
19            {
20              "id": "1",
21              "system": "http://hl7.org/fhir/v2/0203",
22              "code": "MR",
23              "display": "Medical Record Number"
24            }
25          ],
26          "text": "Medical Record Number"
27        },
28        "system": "http://hospital.smarthealthit.org",
29        "value": "1032702"
30      }
31    ],
32    "active": true,
33    "name": [
34      {
35        "id": "official_peter",
36        "use": "official",

```

search all Patients HL7 FHIR resource