



## **Central Registry for Traceability (CRT)**

### **HL7 FHIR Cookbook**

#### **Version 0.1**

Created by



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**SMALS**

**Fonsnylaan 20 – 1000 Brussel**

**20, Avenue Fonsny – 1060 Bruxelles**

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# 1 Document management

## 1.1 Document history

Version*	Date	Author	Description of changes / remarks
0.1	20/04/2020	Patrick Moons	Initiation
0.2	25/06/2020	Sofiane Moualhi	update

Note that due to the fact that FHIR is a “next generation” standard framework, it is constantly subject to evolution.

## 2 Purpose of this document

This document describes the HL7 FHIR® message structure of the different methods of the REST Web services as offered to actors in the medical sector for the central registry for traceability.

This document is complementary to the cookbook explaining the different CRT REST Webservices methods that can be used with the system.

Only methods transferring medical information are converted into the HL7 FHIR® format. This document will give a detailed description of these HL7 FHIR® conversions for the following methods :

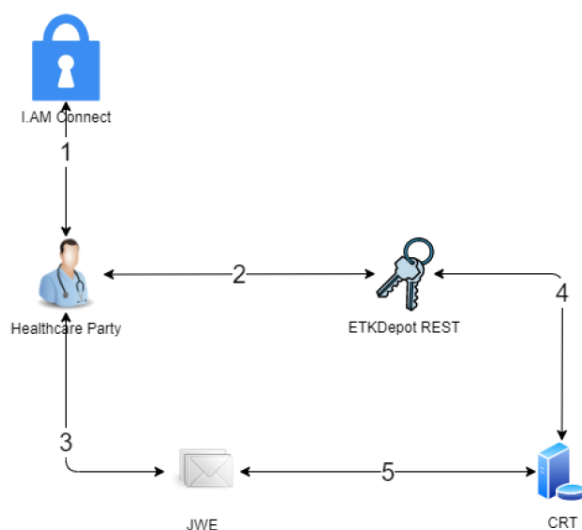
- **POST /surgicalNotifications**  
This method creates surgical notification of implants.  
The request part of the method will contain the message.
- **POST /surgicalNotifications/{surgicalNotificationId}**  
This method creates surgical notification for removal of implants based on an existing implantation notification. The request part of the method will contain the message.
- **GET /surgicalNotifications**  
This method returns surgical notifications by searching on one of its identifiers.  
The response part of the method will contain the message.
- **PUT /surgicalNotifications/{surgicalNotificationsId}**  
This method updates surgical notifications by its identifier.  
The request part of the method will contain the message.

The messages will contain one single element containing the message in HL7 FHIR® JSON format. This element will be signed using the private key of the sender, and encrypted using the public key of the recipient.

This public key can be retrieved from ETKDepot Rest. The sender of the message knows the recipient and the messages are sent directly in a synchronous way. At least 1 key must be defined for the recipient so that the sender can encrypt the message to be sent.

Messages sent to the system must be encrypted with the public key specific for the application "CRT".

Here is a high-level schema of the flow :



1. To use the endpoints, the client has to contact the I.A.M Connect service to get a secure token containing his identification.
2. CRT REST endpoints require content signing and encryption. Therefore the client needs to sign its message using its private key then encrypt it using CRT public key
3. The client sends (CRUD) implant and removal notifications to CRT.
4. CRT will decrypt the message using its private key then validate the signature with the client's public key.
5. CRT provides the client answers

More details can be found in the cookbook ***Central Registry Traceability (CRT) - REST Cookbook Version 1.0.pdf***

## 2.1 Introduction to the central registry for traceability

The main purpose of the Central Registry for Traceability (CRT) is to trace all implantable medical devices that are distributed in Belgium. This goal is achieved by allowing the healthcare actors to notify implantations and explantations, along with a series of relevant data concerning these interventions. These data are fed into this registry by two means: a Web application and a Web service (the subject of this manual).

### Web application

The Web application is designed for specialists who do not have a dedicated hospital system to register implants. It allows for a more comprehensive gathering of medical information than the Web service.

The information that is captured includes some details on the prescription, delivery and the procedure itself. Procedure details contain the list of implants that were implanted or explanted during the procedure.

All this information is mandatory. For more details, see the user-guide of the Web application.

The Web application makes all of the registry's hospitalizations available to specialists by means of a search.

## Web services

The REST Webservices are designed for specialists who have a dedicated (hospital) information system. The details of the medical information remain in the patient's file at the hospital, and the registry represents a summary of this information.

The integration with the dedicated information system will make a submission transparent for the specialist.

## 3 Functional description of the Web services

### 3.1 HL7 FHIR® introduction

#### 3.1.1 FHIR® approach

FHIR® is a standard for health care data exchange, published by HL7®. The philosophy behind FHIR® is to use a base set of resources that, either by themselves or when combined, satisfy a majority of use cases. These use cases are usually implemented by combining resources together through the use of resource references, in other words resources referencing one another.

#### Overview of FHIR® resources used in CRT

The best place to start is to list the resources used by the Central Registry of Traceability and look at the definition of each resource to see what it looks like, give some background about the scope and usage and about the resource content.

The resource content described hereafter will be limited to the elements that are:

- mandatory in the HL7 FHIR® specification
- made mandatory through the profiling of the resource by eHealth for the standardized Belgian FHIR® context
- mandatory to the CRT back-end system
- 

#### Remarks:

1. All FHIR® resources MUST be described in JSON format
2. Elements of enumerated type (e.g. gender in Patient resource further on) values must be:
  - entered in lower-case (e.g. *male, female, other, unknown*)
  - without spaces
3. Extra resource elements delivered in a message by the client application are possible, but will be ignored in CRT processing.

#### 3.1.1.1 Patient

This resource contains demographics and other administrative information about an individual receiving care or other health-related services.

A patient can be a Belgian patient or a foreign patient (provided he has an SSIN, Social Security Identification Number)



Detailed information for the patient can be found at [HL7 FHIR® Patient](#).

### 3.1.1.1.1 Scope and usage

The data in the Resource covers the "who" information about the patient: its elements are focused on the demographic information necessary to support the administrative, financial and logistic procedures. A Patient record is generally created and maintained by each organization providing care for a patient.

### 3.1.1.1.2 Resource content by example

```

{
  "resourceType": "Patient",
  "id": "7c24c922-eab8-41ca-b668-2b3c3f9c7fcf",
  "identifier": [
    {
      "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",
      "value": "67031804978"
    }
  ],
  "meta": {
    "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-patient" ]
  },
  "name": [
    {
      "family": "Shiver",
      "given": [ "Claude" ]
    }
  ],
  "deceasedDateTime": "2019-11-19T10:27:59+00:00"
  "gender": "male"
}

```

JSON 1- Patient resource

element id	definition	cardinality	value(s)
id	Persistent identifier	1..1	<string>
resourceType	The name of the resource you are describing	1..1	<string> <i>Patient</i>
identifier	An identifier - identifies some entity uniquely and unambiguously. Typically this is used for business identifiers.	1..*	<i>Only the first identifier will be treated</i>
Identifier.system	Establishes the namespace for the value - that is, a URL that describes a set values that are unique.	1..1	<URI> <i>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin</i>
Identifier.value	The portion of the identifier typically relevant to the user and which is unique within the context of the system.	1..1	<string>



*Must be a valid Belgian SSIN<sup>1</sup> number*

meta	Metadata about the resource		
meta.profile	The profile can be used to indicate which version(s) of FHIR® a resource conforms to.	1...1	<URI> <i><a href="https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-patient">https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-patient</a></i>
name	A name associated with the individual.	1...*	
name.family	The part of a name that links to the genealogy.	1...1	<string> The patient's last names tags are mandatory in the FHIR® message. However, in the checks done by the CRT, this tag will be ignored.
name.given	Given name.	1...*	<string> The patient's first names tags are mandatory in the FHIR® message. However, in the checks done by the CRT, this tag will be ignored.
gender	Administrative Gender - the gender that the patient is considered to have for administration and record keeping purposes.	1...1	<string> The patient's sex is mandatory in the FHIR® message. However, in the checks done by the CRT, this tag will be ignored one of enumeration ( <a href="http://hl7.org/fhir/administrative-gender">http://hl7.org/fhir/administrative-gender</a> ) : <ul style="list-style-type: none"> <li>• <i>male</i></li> <li>• <i>female</i></li> <li>• <i>other</i></li> <li>• <i>unknown</i></li> </ul>
deceasedDateTime	Indicates if the individual is deceased or not	0...1	<dateTime> If the patient is deceased this date will be returned. If there is no deceased date for the patient, the element will be omitted in the <i>Patient</i> resource.

<sup>1</sup> Social Security Identification Number, an identifier that corresponds to his or her 11-digit National Register number (INSS).

This number has the following structure:

\* the first 6 digits correspond to the date of birth in the format YYMMDD, where YY=# year, MM= # month, DD= # day;

\* the next 3 digits correspond to the daily counter of births; this is an even number for women and an odd number for men;

\* the last 2 digits correspond to a control number.

The format is YYYY-MM-DDThh:mm:ss+00:00, e.g.  
2019-11-19T10:27:59+00:00

Legend	
<i>Green</i>	Fixed values(s)
<i>Red</i>	Constraint
<i>Pink</i>	Element only in output

### 3.1.1.2 ServiceRequest

This resource describes a record of a request for service such as diagnostic investigations, treatments, or operations to be performed.



Detailed information for the *ServiceRequest* can be found at [HL7 FHIR® ServiceRequest](#).

#### 3.1.1.2.1 Scope and usage

*ServiceRequest* is a record of a request for a procedure to be performed on a patient. The procedure will lead to a *Procedure* such as a clinical intervention (implantation or implant removal). The principal intention of *ServiceRequest* is to support ordering procedures for one patient. The *ServiceRequest* resource allows requesting only a single procedure.

#### 3.1.1.2.2 Resource content by example

```
{
  "resourceType": "ServiceRequest",
  "id": "45b71058-3a2e-4cb4-94f3-29da4c5c303e",
  "status": "completed",
  "intent": "order",
  "code": {
    "coding": [
      {
        "system": "http://snomed.info/sct",
        "code": "782902008",
        "display": "Implantation procedure (procedure)"
      }
    ]
  },
  "subject": {
    "reference": "urn:uuid:Patient_1"
  },
  "authoredOn": "2019-11-19T10:27:59+00:00",
  "requester": {
    "reference": "urn:uuid:Practitioner_2"
  },
  "bodySite": [
    {
      "text": "Pectoral region"
    }
  ]
}
```

```
}

```

JSON 2- ServiceRequest resource

element id	definition	cardinality	value(s)
id	Persistent identifier	1...1	<string>
resourceType	The name of the resource	1...1	<string> <i>ServiceRequest</i>
status	The status of the order.	1...1	<string> The activity described by the request has been fully performed. <i>completed</i>
intent	Whether the request is a proposal, plan, an original order or a reflex order.	1...1	<string> The request represented a request/demand and authorization for action by a Practitioner. <i>order</i>
code	What is being requested/ordered	1...1	
code.coding	Code defined by a terminology system	1...1	
code.coding.system	Identity of the terminology system	1...1	<URI> The SNOMED CT multilingual clinical healthcare terminology system is used <i>http://snomed.info/sct</i>
code.coding.code	Code in syntax defined by the system	1...1	<string> <i>Must be one of following :</i> <ul style="list-style-type: none"> <li>• <i>782902008</i> - implantation procedure</li> <li>• <i>284101009</i> - removal of implant</li> </ul>
code.coding.display	A representation of the meaning of the code in the system.	0...1	<string>
subject	On whom or what the service is to be performed. This is usually a human patient.	1...1	
subject.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to a Patient resource also included in the	1...1	<string>

FHIR® bundle delivered by the client.

authoredOn	Date request signed; when the request transitioned to being actionable.	1...1	<dateTime> The format is YYYY-MM-DDThh:mm:ss+00:00, e.g. 2019-11-19T10:27:59+00:00
requester	The individual who initiated the request and has responsibility for its activation.	1...1	
requester.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to a Practitioner resource also included in the FHIR® bundle delivered by the client.	1...1	<string>
bodysite	Location in the body of the implant.		
bodysite.text	A textual representation of the bodylocation	0...1	<string>

Legend	
<i>Green</i>	Fixed values(s)
<i>Red</i>	Constraint
<i>Pink</i>	Element only in output

### 3.1.1.3 Procedure

This resource describes the action that was performed on a patient. In our case it will be a physical intervention; an operation of the type implant or of the type removal of implant.



Detailed information for the *Procedure* can be found at [HL7 FHIR® Procedure](#).

#### 3.1.1.3.1 Scope and usage

This resource is used to record the details of an activity that is performed on a patient as part of the provision of care. Examples include surgical procedures, diagnostic procedures, etc... Procedures may be performed by a healthcare professional. This resource provides summary information about the occurrence of the procedure.

### 3.1.1.3.2 Resource content by example

```

{
  "resourceType": "Procedure",
  "id": "f9f8e333-f3ed-4e6b-88f4-c14570eed65e",
  "basedOn": [
    {
      "reference": "urn:uuid:ServiceRequest_1"
    }
  ],
  "status": "completed",
  "subject": {
    "reference": "urn:uuid:Patient_1"
  },
  "performedDateTime": "2019-11-19T10:27:59+00:00",
  "performer": [
    {
      "actor": {
        "reference": "urn:uuid:Practitioner_1"
      },
      "onBehalfOf": {
        "reference": "urn:uuid:Organization_1"
      }
    }
  ],
  "focalDevice": [
    {
      "manipulated": {
        "reference": "urn:uuid:Device_1"
      }
    }
  ]
}

```

JSON 3- Procedure resource

element id	definition	cardinality	value(s)
id	Persistent identifier	1..1	<string>
resourceType	The name of the resource	1..1	<string> <i>Procedure</i>
basedOn	A reference to the ServiceRequest resource that contains details of the request for this procedure.	1..*	<i>Only the first identifier will be treated</i>
basedOn.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to the ServiceRequest resource also included in the FHIR®	1..1	<string>

	bundle delivered by the client.		
status	A code specifying the state of the procedure.	1...1	<string> The event has now concluded. <i>completed</i>
subject	On whom or what the service is to be performed. This is usually a human patient.	1...1	
subject.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to the Patient resource also included in the FHIR® bundle delivered by the client.	1...1	<string>
performedDatetime	When the procedure was performed	1...1	<dateTime> The format is YYYY-MM-DDThh:mm:ss+00:00, e.g. 2015-02-07T13:28:17+00:00
performer	The people who performed the procedure	1...*	<i>Only the first occurrence of performer will be registered into the CRT registry</i>
performer.actor	The reference to the practitioner	1...1	
performer.actor.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to a Practitioner resource also included in the FHIR® bundle delivered by the client.	1...1	<string>
performer.onBehalfOf	Organization the practitioner was acting for	1...1	
performer.onBehalfOf.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves	1...1	<string>

to the location where the resource is found. In practice this will be the absolute reference to a Practitioner resource also included in the FHIR® bundle delivered by the client.

focalDevice	The implanted or removed device.	1...*	
focalDevice.manipulated	The device used during the procedure	1...1	
focalDevice.manipulated.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to a Device resource also included in the FHIR® bundle delivered by the client.	1...1	<string>

Legend	
<i>Green</i>	Fixed values(s)
<i>Red</i>	Constraint
<i>Pink</i>	Element only in output

### 3.1.1.4 Practitioner

This resource describes a person who is directly or indirectly involved in the provisioning of healthcare.



Detailed information for the Practitioner can be found at [HL7 FHIR® Practitioner](#).

#### 3.1.1.4.1 Scope and usage

*Practitioner* covers all individuals who are engaged in the healthcare process and healthcare-related services as part of their formal responsibilities and this Resource is used for attribution of activities and responsibilities to these individuals. Practitioners include (but are not limited to): physicians, dentists, pharmacists, etc...

#### 3.1.1.4.2 Resource content by example

```
{
```

```
"resourceType": "Practitioner",
```



```

    "id": "42581db2-ede2-4a06-a217-ea60440a7055",
    "identifier": [
      {
        "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",
        "value": "68031905678"
      }
    ],
    "meta": {
      "profile": [
        "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner"
      ]
    },
    "name": [
      {
        "family": "Kidmann",
        "given": [
          "Nicole"
        ]
      }
    ]
  }
}

```

JSON 4 - Practitioner resource

element id	definition	cardinality	value(s)
id	Persistent identifier	1...1	<string>
resourceType	The name of the resource you are describing	1...1	<string> <i>Practitioner</i>
identifier	An identifier - identifies some entity uniquely and unambiguously. Typically this is used for business identifiers.	1...1	
Identifier.system	Establishes the namespace for the value - that is, a URL that describes a set values that are unique.	1...1	<URI> <i>Must either be one of the following two possibilities:</i> 1) If we want to identify the practitioner by his SSIN <sup>2</sup> number: <i>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin</i> 2) If we want to identify the practitioner by his NIHI <sup>3</sup> number:

<sup>2</sup> Social Security Identification Number, an identifier that corresponds to his or her 11-digit National Register number (INSS).

This number has the following structure:

\* the first 6 digits correspond to the date of birth in the format YYYYMMDD, where YY=# year, MM= # month, DD= # day;

\* the next 3 digits correspond to the daily counter of births; this is an even number for women and an odd number for men;

\* the last 2 digits correspond to a control number.

<sup>3</sup> Number assigned by the National Institute for Health and Invalidity Insurance, identifying an organization in the health care sector (e.g. hospital). Note: A NIHI number can also be assigned to certain professionals in the health care sector (e.g. doctors). These numbers consist of 8 digits, to which 3 digits are added depending on the specialization in a medical domain.

			<a href="https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdin">https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdin</a>
Identifier.value	The portion of the identifier typically relevant to the user and which is unique within the context of the system.	1...1	<string> <i>Must either be one of the following two possibilities:</i> 1) if we want to identify the practitioner by his SSIN number: a valid Belgian SSIN number 2) If we want to identify the practitioner by his NIHII number : a valid NIHII number. Both 8 and 11 digits NIHII numbers are accepted.
meta	Metadata about the resource	1...1	
meta.profile	The profile can be used to indicate which version(s) of FHIR® a resource conforms to.	1...1	<URI> <a href="https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner">https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner</a>
name	A name associated with the individual.	1...*	
name.family	The part of a name that links to the genealogy.	1...1	<string>
name.given	Given name.	1...*	<string>

Legend	
<i>Green</i>	Fixed values(s)
<i>Red</i>	Constraint
<i>Pink</i>	Element only in output

### 3.1.1.5 Organization

This resource describes a (in)formally recognized grouping of people or organizations formed for the purpose of achieving some form of collective action. Includes companies, institutions, corporations, departments, community groups, healthcare practice groups, payer/insurer, etc.



Detailed information for the *Organization* can be found at [HL7 FHIR® Organization](#).

#### 3.1.1.5.1 Scope and usage

The *Organization* resource is used for collections of people that have come together to achieve an objective.

### 3.1.1.5.2 Resource content by example

```

{
  "resourceType": "Organization",
  "id": "9ccdae22-385f-4371-a7e3-9e9d2efd85b6",
  "identifier": [
    {
      "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi",
      "value": "10294371001"
    }
  ],
  "meta": {
    "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-organization" ]
  },
  "type": [
    {
      "coding": [
        {
          "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/CD-HCPARTY",
          "code": "orgpharmacy"
        }
      ]
    }
  ],
  "name": "Apotheek Vandenbulcke nv"
}

```

JSON 5 - Organization resource

element id	definition	cardinality	value(s)
id	Persistent identifier	1..1	<string>
resourceType	The name of the resource	1..1	<string> <i>Organization</i>
identifier	An identifier - identifies some entity uniquely and unambiguously. Typically this is used for business identifiers.	1..1	
identifier.system	Establishes the namespace for the value - that is, a URL that describes a set values that are unique.	1..1	<URI> <i>Must either be one of the following two possibilities:</i> 1) If we want to identify the Organization by its NIHII <sup>4</sup> number : <i>https://www.ehealth.fgov.be/standards/fhir/NamingSystem</i>

<sup>4</sup> Number assigned by the National Institute for Health and Invalidity Insurance, identifying an organization in the health care sector (e.g. hospital). Note: A NIHII number can also be assigned to certain professionals in the health care sector (e.g. doctors). These numbers consist of 8 digits, to which 3 digits are added depending on the specialization in a medical domain.

			<p><i>/nihdi</i></p> <p>1) If we want to identify the Organization by its CBE<sup>5</sup> number :</p> <p><a href="https://www.ehealth.fgov.be/standards/fhir/NamingSystem/cbe">https://www.ehealth.fgov.be/standards/fhir/NamingSystem/cbe</a></p>
identifier.value	The portion of the identifier typically relevant to the user and which is unique within the context of the system.	1...1	<p>&lt;string&gt;</p> <p><i>Must either be one of the following two possibilities:</i></p> <p>1) If we want to identify the Organization by its NIHI number : a valid NIHI number. Both 8 and 11 digits NIHI numbers are accepted.</p> <p>2) If we want to identify the Organization by its CBE number : a valid CBE 10 digits number</p> <p><i>IF Pharmacist must be the head pharmacist of a pharmacy</i></p>
meta	Metadata about the resource	1...1	
meta.profile	The profile can be used to indicate which version(s) of FHIR® a resource conforms to.	1...1	<p>&lt;URI&gt;</p> <p><a href="https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-organization">https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-organization</a></p>
type	Kind of organization.	1...1	
type.coding	Code defined by a terminology system	1...1	
type.coding.system	Identity of the terminology system	1...1	<p>&lt;URI&gt;</p> <p>The Healthcare Party Type:</p> <p><a href="https://www.ehealth.fgov.be/standards/fhir/NamingSystem/CD-HCPARTY">https://www.ehealth.fgov.be/standards/fhir/NamingSystem/CD-HCPARTY</a></p>
type.coding.code	Value identifies the type of health care party.	1...1	<p>&lt;string&gt;</p> <ul style="list-style-type: none"> <li>• <i>orghospital</i> - If we are identifying a hospital</li> <li>• <i>orgpharmacy</i> - If we are identifying a pharmacy:</li> </ul>
Name	Name used for the organization	0...1	<string>

Legend

<sup>5</sup> Number assigned by the Crossroads Bank of Enterprises, identifying an enterprise having activities in Belgium.

Green	Fixed values(s)
Red	Constraint
Pink	Element only in output

### 3.1.1.6 Device

This resource describes a type of a manufactured item that is used in the provision of healthcare without being substantially changed through that activity. The device may be a medical or non-medical device.



Detailed information for the Device can be found at [HL7 FHIR® Device](#).

#### 3.1.1.6.1 Scope and usage

*Device* is an administrative resource that tracks individual instances of a device and their location. It is referenced by other resources for recording which device performed an action such as a procedure or an observation, referenced when prescribing and dispensing devices for patient use or for ordering supplies, and used to record and transmit Unique Device Identifier (UDI) information about a device such as a patient's implants.

#### 3.1.1.6.2 Resource content by example

```
{
  "resourceType": "Device",
  "id": "841e1c90-85ae-4e03-b80b-f7b1b1bfa9eb",
  "identifier": [
    {
      "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi",
      "value": "000001694629"
    },
    {
      "type": "SADMI-PRODUCTREFERENCE",
      "value": "FJ748T"
    },
    {
      "type": "RCT-TECHNICALID",
      "value": "83e155ca-bd87-4010-8e74-6bc19ce1183a"
    }
  ],
  "status": "active",
  "manufacturer": "Volkswagen",
  "deviceName": [
    {
      "name": "Dieteren",
      "type": "manufacturer-name"
    },
    {
      "name": "Passat",
      "type": "model-name"
    }
  ]
}
```

}

JSON 6 - Device resource

element id	definition	cardinality	value(s)
resourceType	The name of the resource	1...1	<string> <i>Device</i>
<b>id</b>	Persistent identifier	1...1	<string>
identifier	An identifier - identifies some entity uniquely and unambiguously. Typically this is used for business identifiers.	1...*	
identifier.system	Establishes the namespace for the value - that is, a URL that describes a set values that are unique.	0...1	<URI> <i>Must be the following:</i> 1) If we want to identify the <i>Device</i> by its NIHII <sup>6</sup> number : <a href="https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi">https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi</a>
identifier.type	Establishes the type for the value - that is, a (coded) type for the identifier that can be used to determine which identifier to use for a specific purpose.	0...1	<string> <i>Must be one of the following:</i> <ul style="list-style-type: none"> <li><i>rct-technicalid</i> - If we want to identify the <i>Device</i> by its technical identification known in CRT</li> <li><i>sadmi-productreference</i> - If we want to identify the <i>Device</i> by its SADM product reference (<b>only returned when in output !!</b>)</li> </ul>
identifier.value	The portion of the identifier typically relevant to the user and which is unique within the context of the system.	1...1	<string> <i>Must be one of the following possibilities:</i> 1) If we want to identify the <i>Device</i> by its NIHII number : a valid NIHII number. Both 8 and 11 digits NIHII numbers are accepted. 2) If we want to identify the <i>Device</i> by its technical-id know to CRT : a UUID valid string.

<sup>6</sup> The NIHII implant notification code is a unique identifier for a medical device ( an implant) and is attributed by the NIHDI when registering this medical device.

3) If we want to identify the *Device* by its product reference: a string

udiCarrier	Unique Device Identifier (UDI) Barcode string if we want to identify the Device by its UDI-DI <sup>7</sup> number	0...1	
udiCarrier.deviceIdentifier	Mandatory fixed portion of UDI	1...1	<string>
Status	Status of the device availability	0...1	<string> <i>Must be one of the following:</i> <ul style="list-style-type: none"> <li>• <i>active</i> – for implanted devices</li> <li>• <i>inactive</i> – for removed devices</li> </ul>
manufacturer	Name of device manufacturer	1...1	<string>
deviceName	The name of the device as given by the manufacturer	1...*	<string>
deviceName.name	The name of the device	1...1	<string>
deviceName.type		1...1	<string> The type of name the device is referred by. <ul style="list-style-type: none"> <li>• <i>udi-label-name</i></li> <li>• <i>user-friendly-name</i></li> <li>• <i>patient-reported-name</i></li> <li>• <i>manufacturer-name</i></li> <li>• <i>model-name</i></li> <li>• <i>other</i></li> </ul>

Legend	
<i>Green</i>	Fixed values(s)
<i>Red</i>	Constraint
<i>Pink</i>	Element only in output

### 3.1.1.7 SupplyDelivery

This resource describes the record of delivery of what is supplied.



Detailed information for the *SupplyDelivery* can be found at [HL7 FHIR® SupplyDelivery](#).

<sup>7</sup> The UDI-DI is a unique numeric or alphanumeric code specific to a model of device. The UDI-DI allows for the unequivocal identification of the device. It is assigned by the manufacturer in compliance with the rules of the issuing entity.

### 3.1.1.7.1 Scope and usage

The scope of the supply resource is for supplies used in the healthcare process. This includes supplies specifically used in the treatment of patients as well as supply movement within an institution (transport a set of supplies from materials management to a service unit (nurse station)).

### 3.1.1.7.2 Resource content by example

```

{
  "resourceType": "SupplyDelivery",
  "id": "5a1f3a26-32ad-4023-9cef-8592d78f8cb9",
  "status": "completed",
  "suppliedItem": {
    "quantity": {
      "value": "2"
    },
    "itemReference": {
      "reference": "urn:uuid:Device_2"
    }
  },
  "occurrenceDateTime": "2019-11-19T10:27:59+00:00",
  "supplier": {
    "reference": "urn:uuid:Organization_2"
  },
  "receiver": [
    {
      "reference": "urn:uuid:Practitioner_3"
    }
  ]
}

```

JSON 7 - SupplyDelivery resource

element id	definition	cardinality	value(s)
id	Persistent identifier	1...1	<string>
resourceType	The name of the resource	1...1	<string> <i>SupplyDelivery</i>
status	A code specifying the state of the dispense event.	1...1	<string> <i>completed</i> Supply has been delivered ("completed").
suppliedItem	The item that is delivered or supplied	1...1	
suppliedItem.quantity	Amount dispensed	1...1	
suppliedItem.quantity.value	The numerical amount dispensed	1...1	<numerical>
suppliedItem.itemReference	Reference of the device supplied	1...1	



suppliedItem.itemReference.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to a Device resource also included in the FHIR® bundle delivered by the client.	1...1	<string>
occurrenceDateTime	Date and time when event occurred	1...1	<dateTime> The format is YYYY-MM-DDThh:mm:ss+00:00, e.g. 2015-02-07T13:28:17+00:00
supplier	The individual responsible for dispensing the medication, supplier or device.	1...1	
supplier.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to an Organization resource (pharmacy) also included in the FHIR® bundle delivered by the client.	1...1	<string>
receiver	Identifies the person who picked up the Supply.	1...*	<i>Only the first occurrence of receiver will be registered into the CRT registry</i>
receiver.reference	A reference to a location at which the other resource is found. The reference is the absolute URL that resolves to the location where the resource is found. In practice this will be the absolute reference to a Practitioner (pharmacist) resource also included in the FHIR® bundle delivered by the client.	1...1	<string>

Legend

Green	Fixed values(s)
Red	Constraint
Pink	Element only in output

### 3.1.1.8 Bundle

Bundles are used as a container for a collection of resources.



Detailed information for the *Bundle* can be found at [HL7 FHIR® Bundle](#).

#### 3.1.1.8.1 Scope and usage

One common operation performed with *Bundle* resources is to gather a collection of resources into a single instance with containing context. In FHIR® this is referred to as "bundling" the resources together. These resource bundles are useful for a variety of different reasons, including:

- Returning a set of resources that meet some criteria as part of a server operation e.g. a search operation
- Grouping a self-contained set of resources to act as an exchangeable and persistent collection with clinical integrity - e.g. a clinical document
- Creating/updating/deleting a set of resources on a server as a single operation

#### 3.1.1.8.2 Resource content by example

```
{
  "resourceType": "Bundle",
  "id": "9991a0fa-8bc8-48e0-add8-cf08123c7424",
  "meta": {
    "source": "UZGent"
  },
  "type": "transaction",
  "timestamp": "2015-02-07T13:28:17+00:00",
  "entry": [
    {
      "fullUrl": "urn:uuid:Patient_1",
      "resource": {
        . . . the resource
      },
      "request": {
        "method": "POST",
        "url": "Patient"
      }
    }
  ]
}
```

JSON 8 - Bundle resource

element id	definition	cardinality	value(s)
resourceType	The name of the resource	1...1	<string> <i>Bundle</i>
id	Persistent identifier for the bundle	1...1	<string>
meta	Metadata about the resource	1...1	
meta.source	Identifies where the resource comes from: i.e. the name of the system that composed the bundle	1...1	<URI> In the context of the implant registry, the sender of the message is always a hospital or a specialist working in a private practice.
type	Indicates the purpose of this bundle - how it is intended to be used.	1...1	<string> <ul style="list-style-type: none"> <li>• <i>transaction</i> - The bundle is a transaction - intended to be processed by a server as an atomic commit → incoming request</li> <li>• <i>searchset</i> - The bundle is a list of resources returned as a result of a search/query interaction, operation, or message → outgoing response</li> </ul>
timestamp	When the bundle was assembled.	1...1	<dateTime> The format is YYYY-MM-DDThh:mm:ss.sss+zz:zz, e.g. 2015-02-07T13:28:17.295+00:00
entry	Entry in the bundle - will have a resource or information	1...*	
entry.fullUrl	URI for resource (Absolute URL server address or URI for UUID/OID).	1...1	<Uri> The identifier that other resources will use to reference this resource.
entry.resource	The resource in the bundle	1...1	<string> <i>SHOULD be a resource of following type:</i> <ul style="list-style-type: none"> <li>• <i>ServiceRequest</i></li> <li>• <i>Patient</i></li> <li>• <i>Procedure</i></li> <li>• <i>Practitioner</i></li> <li>• <i>Organization</i></li> <li>• <i>Device</i></li> <li>• <i>SupplyDelivery</i></li> <li>• <i>Composition</i></li> </ul>

			Other types of resource will be skipped and thus not be treated by the CRT registry system
entry.request	Information on how process this resource entry as part of the transaction	1...1	<i>MUST be present when type of bundle = 'transaction'</i>
entry.request.method	The HTTP action to be executed for this entry	1...1	<string> <i>MUST be : POST</i>
entry.request.url	The URL for this entry, relative to the root (the address to which the request is posted)	1...1	<string> <i>MUST be the name of the resource : e.g. Patient</i>

Legend	
<i>Green</i>	Fixed values(s)
<i>Red</i>	Constraint
<i>Pink</i>	Element only in output

### 3.1.1.9 Composition

This resource describes a set of healthcare-related information that is assembled together into a single logical package that provides a single coherent statement of meaning, establishes its own context and that has clinical attestation with regard to who is making the statement. A *Composition* defines the structure and narrative content necessary for a document.



Detailed information for the *Composition* can be found at [HL7 FHIR® Composition](#).

#### 3.1.1.9.1 Scope and usage

A *Composition* is the basic structure from which FHIR® Documents - immutable bundles with attested narrative - are built. A single logical composition may be associated with a series of derived documents, each of which is a frozen copy of the composition. In RCT we will halt at composition level for delivering notification information from the registry.

```
{
  "resourceType": "Composition",
  "id": "f6160d4c-41b7-4e1c-81d4-45a878c50a94",
  "contained": [
    {RESOURCE1}, . . . , {RESOURCEN}
  ],
  "status": "final",
  "type": {
    "coding": [
      {
        "system": "http://loinc.org",
        "code": "57080-4" }
    ]
  }
}
```

```

    ],
    "subject": { "reference": "#Patient-1" },
    "date": "2013-02-01T12:30:02Z",
    "author": [
      { "reference": "#Patient-1" }
    ],
    "title": "Notification Summary",
    "confidentiality": "N",
    "section": [
      {
        "title": "=== Patient data section =====",
        "code": {
          "coding": [
            {
              "system": "http://snomed.info/sct",
              "code": "116154003",
              "display": "Patient (person)"
            }
          ]
        },
        "entry": [
          {
            "reference": "#Patient-1"
          }
        ]
      }
    ]
  ]
}

```

JSON 9 - Composition resource

element id	definition	cardinality	value(s)
id	Persistent identifier	1..1	<string>
resourceType	The name of the resource	1..1	<i>Composition</i>
contained	Contained, inline Resources (see definitions of all resources above)	1..*	<resource> <i>SHOULD be a resource of following type:</i> <ul style="list-style-type: none"> <li>• <i>ServiceRequest</i></li> <li>• <i>Patient</i></li> <li>• <i>Procedure</i></li> <li>• <i>Practitioner</i></li> <li>• <i>Organization</i></li> <li>• <i>Device</i></li> <li>• <i>SupplyDelivery</i></li> </ul> Other types of resource will be skipped and thus not be treated by the CRT registry system
status	The status of the composition	1..1	<string> <ul style="list-style-type: none"> <li>• <i>preliminary</i></li> <li>• <i>final</i> - This version of the composition is complete and verified</li> </ul>

			<ul style="list-style-type: none"> <li>• <i>amended</i></li> <li>• <i>entered-in-error</i></li> </ul>
type	Kind of composition (LOINC if possible)	1...1	
type.coding	Terminology system defining Kind of composition	1...1	
type.coding.system	Identity of the terminology system	1...1	<URI> <i>http://loinc.org</i> LOINC encoding system
type.coding.code	Value identifies the type of composition.	1...1	<string> <i>57080-4 - Implanted medical device Narrative</i>
subject	Who and/or what the composition is about	1...1	
subject.reference	Reference to the contained Patient resource	1...1	<string>
date	Composition editing time	1...1	<dateTime> The format is YYYY-MM-DDThh:mm:ss+00:00, e.g. 2015-02-07T13:28:17+00:00
author	Who and/or what authored the composition	1...1	
author.reference	Reference to the contained Patient resource	1...1	<string>
title	Human Readable name/title of the composition	1...1	<string> <i>Notification Summary</i>
confidentiality	Confidentiality code for the composition	0...1	one of enumeration <ul style="list-style-type: none"> <li>• <i>U</i></li> <li>• <i>L</i></li> <li>• <i>M</i></li> <li>• <i>N</i> – normal</li> <li>• <i>R</i></li> <li>• <i>V</i></li> </ul>
section	Composition is broken into sections	1...*	
section.title	Human readable label for section	1...1	<string>
section.code	Classification of section (recommended)	1...1	
section.code.coding	Code defined by a terminology system	1...1	
section.code.coding.system	Identity of the terminology system	1...1	<URI> <i>http://snomed.info/sct</i>

section.code.coding.code	Value identifies the context of the section	1...1	<string> <ul style="list-style-type: none"> <li>• 116154003 - Patient (person)</li> <li>• 373655009 - Medical service (procedure)</li> <li>• 370852006 - Recording of devices implanted during operative procedure</li> </ul>
section.code.coding.display	Human Readable code value text	1...1	
section.entry	A reference to data that supports this section; i.e. a reference to contained resources	0...*	
section.entry.reference	Reference to contained resources	1...1	<string>

Legend	
<i>Green</i>	Fixed values(s)
<i>Red</i>	Constraint
<i>Pink</i>	Element only in output

### 3.2 CRT REST methods

Whenever a client application executes a CRT REST method, a collection of resources will be received from or delivered to that client application. In order to handle these collections, HL7 FHIR uses *Bundle* and *Composition* resources. These *Bundle* and *Composition* resources are to be seen as containers for holding other resources. Inside these containers the resources are linked together. Independent of the method invoked by the client, the general scheme for linking resources in the CRT context is :

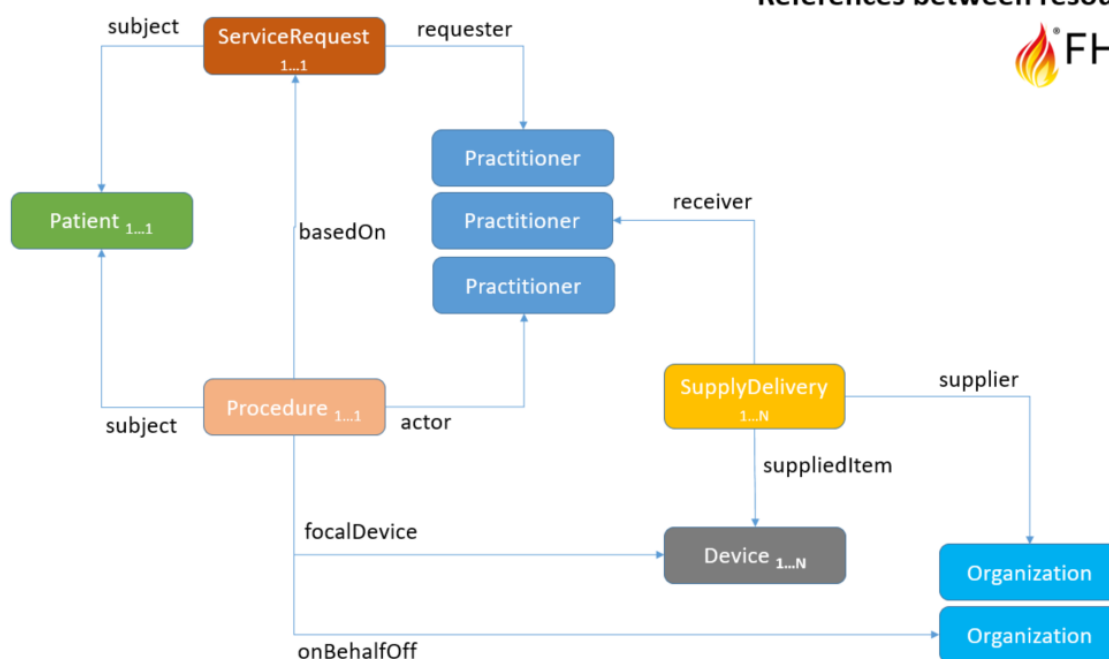


Figure 1 - References between resources

### 3.2.1 POST /surgicalNotifications

This method allows healthcare actors to notify the implantation of different implants to the registry.

This method allows healthcare actors to also notify the removal of different implants to the registry. Only the removal of implants that have been previously notified as “implanted” will be accepted by the registry. Removal of implants that are implanted but have never been notified cannot be registered into the registry.

Since we must refer to implanted medical devices already notified to CRT in the past, we provide a reference of that previous implantation using a technical ID parameter with the method. This parameter has "type": "RCT-TECHNICALID" and "value": "83e155ca-bd87-4010-8e74-6bc19ce1183a" (as example).

The request part of the method will contain the message. Only one FHIR® message a time is allowed to be reported. This single FHIR® message always concerns a single patient getting a single implantation. The message itself is a bundle collection of different FHIR® resources.

The FHIR® resources needed to compose a valid implantation notification into the registry will be described hereafter. Of each FHIR® resource the cardinality will be given; this is the number of times that FHIR® resource can occur in the message.

At the end of the chapter, a full example of a valid FHIR® request/response will be included.



At the end of the chapter, a full example of a valid FHIR® request/response will be included.

### 3.2.1.1 Schematic composition message

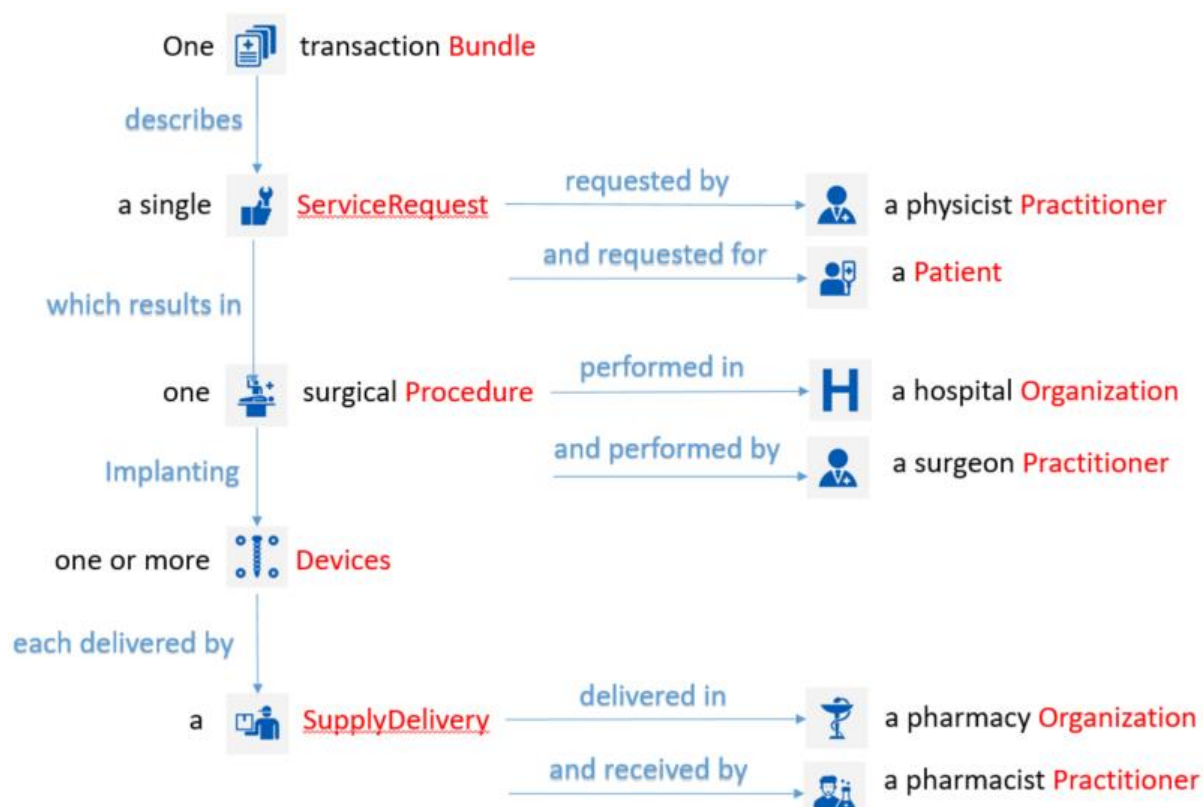










Figure 2 - POST implant notification

### 3.2.1.2 Cardinalities of the FHIR® resources in message

Resource	Cardinality	Remark
 Bundle	1	Wrapper or container which contains all the resources used in the implant notification
 ServiceRequest	1	Only one implant <i>ServiceRequest</i> a time is possible
 Procedure	1	One and only one (surgical) procedure associated with the <i>ServiceRequest</i> ; <i>ServiceRequest</i> and <i>Procedure</i> must exist together

 Device	<b>1 . . . N</b>	One or more devices implanted into the patient. Multiple implants possible, at least 1 required.
 SupplyDelivery	<b>1 . . . N</b>	Same cardinality as <i>Device</i> ; for each <i>Device</i> a <i>SupplyDelivery</i> must exist one device -> one delivery
 Patient	<b>1</b>	The only patient subject of the implantation
 Practitioner	<b>1 . . . M</b>	Requester, performer and pharmacist can all be different persons or all be the same person.
 Organization	<b>1 . . . K</b>	The hospital and pharmac(ies) could be the same or all be different.




### 3.2.1.3 Full example for Implantation






```

{
  "resourceType": "Bundle",
  "id": "Bundle-1",
  "meta": {
    "source": "UZGent"
  },
  "type": "transaction",
  "timestamp": "2015-02-07T13:28:17+00:00",
  "entry": [
    {
      "fullUrl": "urn:uuid:ServiceRequest_1",
      "resource": {
        "resourceType": "ServiceRequest",
        "status": "completed",
        "intent": "order",
        "code": {
          "coding": [
            {
              "system": "http://snomed.info/sct",
              "code": "782902008",
              "display": "Implantation procedure (procedure)"
            }
          ]
        }
      },
      "subject": {
        "reference": "urn:uuid:Patient_1"
      },
      "authoredOn": "2015-02-07T13:28:17+00:00",
      "requester": {
        "reference": "urn:uuid:Practitioner_2"
      },
      "bodySite": [
        {
          "text": "heart"
        }
      ]
    },
    {
      "request": {
        "method": "POST",
        "url": "serviceRequest"
      }
    }
  ],
  {
    "fullUrl": "urn:uuid:Patient_1",
    "resource": {
      "resourceType": "Patient",

```

	<pre> "identifier": {   "system":     "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",     "value": "70082500295" }, "meta":{   "profile": [     "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-patient" ]   },   "name": [     {       "family": "Shieffer",       "given": [         "Claudia"       ]     }   ],   "gender" : "female" }, "request": {   "method": "POST",   "url": "Patient" } }, {   "fullUrl": "urn:uuid:Practitioner_2",   "resource": {     "resourceType": "Practitioner",     "identifier": [       {         "system":           "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",           "value": "67062000271" }     ]   },   "meta":{     "profile": [       "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner" ]     },     "name": [       {         "family": "Kidmann",         "given": [           "Nicole"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Practitioner_1",   "resource" : {     "resourceType": "Practitioner",     "identifier": [       {         "system":           "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",           "value": "61050600168" }     ]   },   "meta":{     "profile": [       "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner" ]     },     "name": [       {         "family": "Clooney", </pre>
	<pre> "fullUrl": "urn:uuid:Practitioner_2",   "resource": {     "resourceType": "Practitioner",     "identifier": [       {         "system":           "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",           "value": "67062000271" }     ]   },   "meta":{     "profile": [       "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner" ]     },     "name": [       {         "family": "Kidmann",         "given": [           "Nicole"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Practitioner_1",   "resource" : {     "resourceType": "Practitioner",     "identifier": [       {         "system":           "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",           "value": "61050600168" }     ]   },   "meta":{     "profile": [       "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner" ]     },     "name": [       {         "family": "Clooney", </pre>
	<pre> "fullUrl": "urn:uuid:Practitioner_1",   "resource" : {     "resourceType": "Practitioner",     "identifier": [       {         "system":           "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",           "value": "61050600168" }     ]   },   "meta":{     "profile": [       "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner" ]     },     "name": [       {         "family": "Clooney", </pre>

	<pre>                 "given": [                     "George"                 ]             }         ],         "request": {             "method": "POST",             "url": "Practitioner"         }     },     {         "fullUrl": "urn:uuid:Practitioner_3",         "resource": {             "resourceType": "Practitioner",             "identifier": [                 {                     "system": "<u>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin</u>",                     "value": "62042600164" }             ],             "meta":{                 "profile": [ "<u>https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner</u>" ]             },             "name": [                 {                     "family": "Van Looy",                     "given": [                         "Erik"                     ]                 }             ]         },         "request": {             "method": "POST",             "url": "Practitioner"         }     },     {         "fullUrl": "urn:uuid:Organization_1",         "resource": {             "resourceType": "Organization",             "identifier": [                 {                     "system": "<u>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi</u>",                     "value": "71100012943"                 }             ],             "meta": {                 "profile": [ "<u>https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-organization</u>"                 ]             },             "type": [                 {                     "coding": [                         {                             "system": "<u>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/CD-HCPARTY</u>",                             "code": "orghospital"                         }                     ]                 }             ],             "name": "UZJette"         },         "request": { </pre>
	

	<pre>                 "method": "POST",                 "url": "Organization"             },         },         {             "fullUrl": "urn:uuid:Organization_2",             "resource": {                 "resourceType": "Organization",                 "identifier": [                     {                         "system": "<u>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi</u>",                         "value": "10294371001"                     }                 ],                 "meta": {                     "profile": [ "<u>https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-organization</u>"                     ]                 },                 "type": [                     {                         "coding": [                             {                                 "system": "<u>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/CD-HCPARTY</u>",                                 "code": "orgpharmacy"                             }                         ]                     }                 ],                 "name": "Apotheek Vandenbulcke nv"             },             "request": {                 "method": "POST",                 "url": "Organization"             }         },         {             "fullUrl": "urn:uuid:Device_1",             "resource": {                 "resourceType": "Device",                 "identifier": [                     {                         "system": "<u>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi</u>",                         "value": "000001694629"                     }                 ],                 "status": "active"             },             "request": {                 "method": "POST",                 "url": "Device"             }         },         {             "fullUrl": "urn:uuid:SupplyDelivery_1",             "resource": {                 "resourceType": "SupplyDelivery",                 "status": "completed",                 "suppliedItem": {                     "quantity": {                         "value": "1"                     },                     "itemReference": {                         "reference": "urn:uuid:Device_1"                     }                 }             },             "occurrenceDateTime": "2015-02-07T13:28:17+00:00",         }     ] } </pre>
	<pre>         },         {             "fullUrl": "urn:uuid:Device_1",             "resource": {                 "resourceType": "Device",                 "identifier": [                     {                         "system": "<u>https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi</u>",                         "value": "000001694629"                     }                 ],                 "status": "active"             },             "request": {                 "method": "POST",                 "url": "Device"             }         },         {             "fullUrl": "urn:uuid:SupplyDelivery_1",             "resource": {                 "resourceType": "SupplyDelivery",                 "status": "completed",                 "suppliedItem": {                     "quantity": {                         "value": "1"                     },                     "itemReference": {                         "reference": "urn:uuid:Device_1"                     }                 }             },             "occurrenceDateTime": "2015-02-07T13:28:17+00:00",         }     ] } </pre>
	<pre>         },         {             "fullUrl": "urn:uuid:SupplyDelivery_1",             "resource": {                 "resourceType": "SupplyDelivery",                 "status": "completed",                 "suppliedItem": {                     "quantity": {                         "value": "1"                     },                     "itemReference": {                         "reference": "urn:uuid:Device_1"                     }                 }             },             "occurrenceDateTime": "2015-02-07T13:28:17+00:00",         }     ] } </pre>






```



        "supplier": {
            "reference": "urn:uuid:Organization_2"
        },
        "receiver": [
            {
                "reference": "urn:uuid:Practitioner_3"
            }
        ]
    },
    "request": {
        "method": "POST",
        "url": "SupplyDelivery"
    }
},
{
    "fullUrl": "urn:uuid:Procedure_1",
    "resource": {
        "resourceType": "Procedure",
        "basedOn": {
            "reference": "urn:uuid:ServiceRequest_1"
        },
        "status": "completed",
        "subject": {
            "reference": "urn:uuid:Patient_1"
        },
        "performedDateTime": "2015-02-07T13:28:17+00:00",
        "performer": [
            {
                "actor": {
                    "reference": "urn:uuid:Practitioner_1"
                },
                "onBehalfOf": {
                    "reference": "urn:uuid:Organization_1"
                }
            }
        ],
        "focalDevice": [
            {
                "manipulated": {
                    "reference": "urn:uuid:Device_1"
                }
            }
        ]
    },
    "request": {
        "method": "POST",
        "url": "Procedure"
    }
}
]
}

```

JSON 10 - POST implant

### 3.2.1.4 Full example for explantation (implant removal)

	<pre> {   "resourceType": "Bundle",   "id": "Bundle-1",   "meta": {     "source": "UZGent"   },   "type": "transaction",   "timestamp": "2015-02-07T13:28:17+00:00",   "entry": [     {       "fullUrl": "urn:uuid:ServiceRequest_1",       "resource": {         "resourceType": "ServiceRequest",         "status": "completed",         "intent": "order",         "code": {           "coding": [             {               "system": "http://snomed.info/sct",               "code": "284101009",               "display": "Removal of implant (procedure)"             }           ]         },         "subject": {           "reference": "urn:uuid:Patient_1"         },         "authoredOn": "2015-02-07T13:28:17+00:00",         "requester": {           "reference": "urn:uuid:Practitioner_3"         },         "bodySite": [           {             "text": "heart"           }         ]       },       "request": {         "method": "POST",         "url": "serviceRequest"       }     },     {       "fullUrl": "urn:uuid:Patient_1",       "resource": {         "resourceType": "Patient",         "identifier": {           "system": <a href="https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin">"https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin"</a>,           "value": "70082500295"         },         "meta": {           "profile": [ <a href="https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-patient">"https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-patient"</a>           ]         },         "name": [           {             "family": "Shieffer",             "given": [               "Claudia"             ]           }         ],         "gender": "female"       },       "request": {         "method": "POST",         "url": "Patient"       }     }   ] } </pre>
	
	

	<pre> }, {   "fullUrl": "urn:uuid:Practitioner_2",   "resource": {     "resourceType": "Practitioner",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",         "value": "67062000271" }     ],     "meta":{       "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be- practitioner" ]     },     "name": [       {         "family": "Kidmann",         "given": [           "Nicole"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Practitioner_1",   "resource" : {     "resourceType": "Practitioner",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",         "value": "61050600168" }     ],     "meta":{       "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be- practitioner" ]     },     "name": [       {         "family": "Clooney",         "given": [           "George"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Organization_1",   "resource": {     "resourceType": "Organization",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi",         "value": "71100012943"       }     ],     "meta": {       "profile": [ </pre>
	<pre> }, {   "fullUrl": "urn:uuid:Practitioner_2",   "resource": {     "resourceType": "Practitioner",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",         "value": "67062000271" }     ],     "meta":{       "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be- practitioner" ]     },     "name": [       {         "family": "Kidmann",         "given": [           "Nicole"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Practitioner_1",   "resource" : {     "resourceType": "Practitioner",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",         "value": "61050600168" }     ],     "meta":{       "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be- practitioner" ]     },     "name": [       {         "family": "Clooney",         "given": [           "George"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Organization_1",   "resource": {     "resourceType": "Organization",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi",         "value": "71100012943"       }     ],     "meta": {       "profile": [ </pre>
	<pre> }, {   "fullUrl": "urn:uuid:Practitioner_2",   "resource": {     "resourceType": "Practitioner",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",         "value": "67062000271" }     ],     "meta":{       "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be- practitioner" ]     },     "name": [       {         "family": "Kidmann",         "given": [           "Nicole"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Practitioner_1",   "resource" : {     "resourceType": "Practitioner",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin",         "value": "61050600168" }     ],     "meta":{       "profile": [ "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be- practitioner" ]     },     "name": [       {         "family": "Clooney",         "given": [           "George"         ]       }     ]   },   "request": {     "method": "POST",     "url": "Practitioner"   } } }, {   "fullUrl": "urn:uuid:Organization_1",   "resource": {     "resourceType": "Organization",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi",         "value": "71100012943"       }     ],     "meta": {       "profile": [ </pre>



	<pre> "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be- organization"     ]     },     "type": [       {         "coding": [           {             "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/CD-HCPARTY",             "code": "orghospital"           }         ]       }     ],     "name": "UZJette"   },   "request": {     "method": "POST",     "url": "Organization"   } }, {   "fullUrl": "urn:uuid:Device_1",   "resource": {     "resourceType": "Device",     "identifier": [       {         "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi",         "value": "000001694629"       }     ],     "system": "http://smals.rct.org/RCT-TECHNICALID"     "value": "3f5baf2-3c54-45f5-a22e-f8f0234c04cc"   } },   "status": "inactive" },   "request": {     "method": "POST",     "url": "Device"   } }, {   "fullUrl": "urn:uuid:Procedure_1",   "resource": {     "resourceType": "Procedure",     "basedOn": {       "reference": "urn:uuid:ServiceRequest_1"     },     "status": "completed",     "subject": {       "reference": "urn:uuid:Patient_1"     },     "performedDateTime": "2015-02-07T13:28:17+00:00",     "performer": [       {         "actor": {           "reference": "urn:uuid:Practitioner_1"         },         "onBehalfOf": {           "reference": "urn:uuid:Organization_1"         }       }     ],     "focalDevice": [       {         "manipulated": {           "reference": "urn:uuid:Device_1"         }       }     ]   } } </pre>

```

    ],
    "request": {
      "method": "POST",
      "url": "Procedure"
    }
  }
]
}

```

JSON 11 - POST implant removal

### 3.2.2 PUT /surgicalNotifications/{surgicalNotificationId}

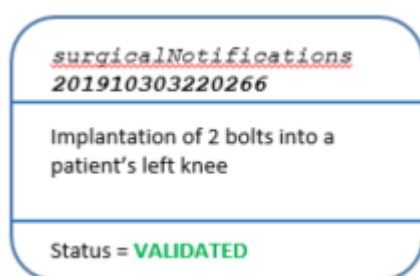
This method allows healthcare actors to update existing surgical notifications (implant or implant removal notifications) by its identifier.

This method is to be seen as performing two steps :

1. The old *surgicalNotifications* referenced by the *surgicalNotificationId* is logically deleted in the registry and thus leaving a historical trace.
2. A new *surgicalNotifications* is created with a new *surgicalNotificationId* returned in output.

Schematically this gives us :

If an old erroneous notification in the registry as given below . . .



. . . is corrected by the method **PUT /surgicalNotifications/201910303220266**  
 . . . this will result in the following situation in the registry . . .

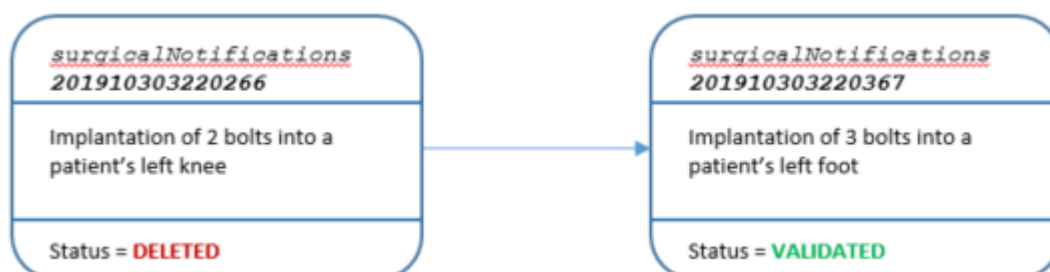


Figure 3 - PUT implant/removal notification

The path parameter *surgicalNotificationsId* in the method references the notification to be corrected. The request part of the method contains the modified notification message.

The collection of FHIR® resources needed to compose a valid modification notification into the registry system will be described hereafter. Of each FHIR® resource the cardinality will be given; this is the number of times that resource can occur in the message.

At the end of the chapter, a full example of a valid FHIR® request/response will be included.

### *3.2.2.1 Schematic composition message*

Depending on the type of the existing message to change in the CRT registry, the message schematic will be :

- either the one of an implantation
- either the one of a removal

### 3.2.2.1.1 Schematic composition implant message

For this we refer to the use case 3.2.1.1

### 3.2.2.1.2 Schematic composition removal message

For this we refer to the use case 1.1.1.1

## 3.2.2.2 Cardinalities of the FHIR® resources in message

Depending on the type of the existing message to change in the CRT registry, the message, the cardinalities for the FHIR® resources will be :

- either the one of an implantation
- either the one of a removal

### 3.2.2.2.1 Cardinalities of the FHIR® resources in implant message

For this we refer to the use case 3.2.1.2

### 3.2.2.2.2 Cardinalities of the FHIR® resources in removal message

For this we refer to the use case 1.1.1.1

## 3.2.2.3 Full example

Depending on the type of the existing message to change in the CRT registry, the full message will be :

- either the one of an implantation
- either the one of a removal

### 3.2.2.3.1 Full example implant message

For this we refer to the use case 3.2.1.3

### 3.2.2.3.2 Full example removal message

For this we refer to the use case 3.2.1.4

## 3.2.3 GET /surgicalNotifications

This method allows healthcare actors to retrieve surgical notifications from the registry. By providing parameters to the retrieval method, searches can be performed in a variety of ways: search by notification identifier, retrieve all notifications for a given patient, retrieve all notifications of patients given a specific medical device, perform date ranges on the query result etc... Our goal is not to explain the correct usage of these parameters (see [eHealth documentation of CRT](#)), instead we will focus on the results returned by this method.

The result will be a *Bundle*, a collection of zero, one or more *Compositions* (hence notifications). A *Composition* on its turn is a set of healthcare-related information assembled together into a single logical package that provides a single coherent statement of meaning.

The response part of the method will contain the message. The collection of FHIR® resources returned from the registry system will be described hereafter. Of each FHIR® resource the cardinality will be given; this is the number of times that FHIR® resource can occur in the message.

At the end of the chapter, a full example of a valid FHIR® response will be included.

### 3.2.3.1 Schematic composition message

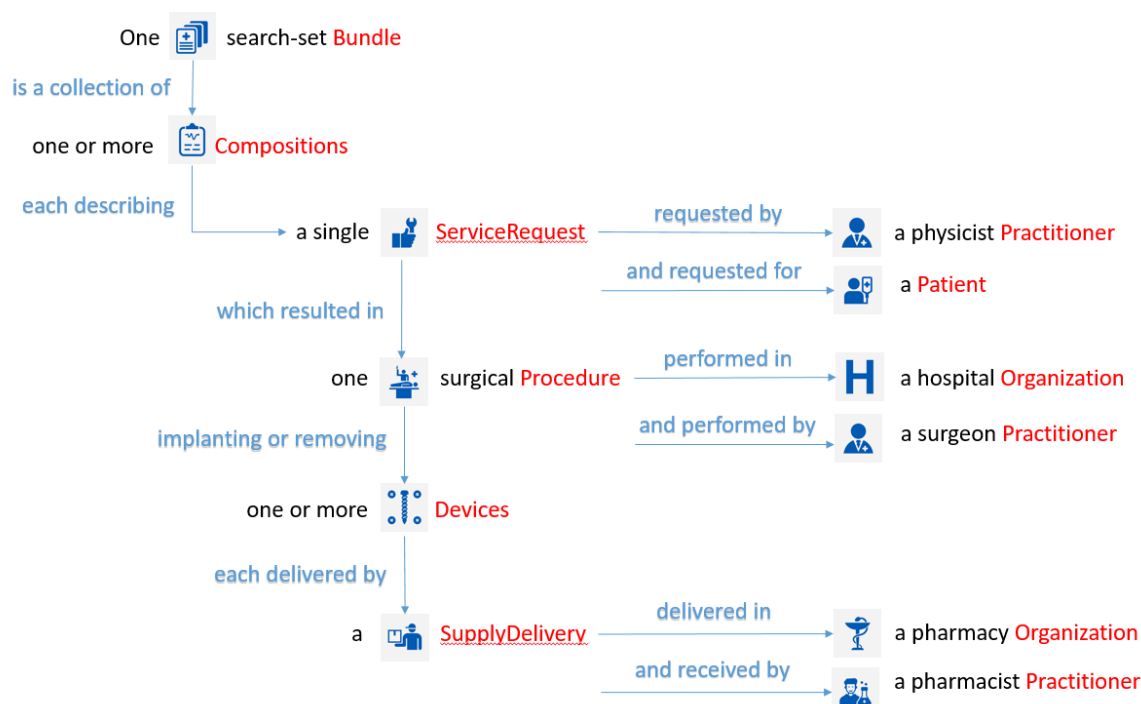














Figure 4 - GET implant/removal notification(s)

### 3.2.3.2 Cardinalities of the FHIR® resources in message

Resource	Cardinality	Remark
 Bundle	1	Searchset wrapper or container which contains the composition(s) describing the implant/implant removal notification(s)
 Composition	1 . . . X	One or more <i>Compositions</i> are returned in the <i>Bundle</i> depending on the search performed.
 ServiceRequest	1 . . . X	One or more explant/implant <i>ServiceRequest</i> (s) – one and only one for each <i>Composition</i>
 Procedure	1 . . . X	One or more (surgical) <i>Procedure</i> (s); one and only one for each <i>ServiceRequest</i>
 Device	1 . . . N	One or more <i>Devices</i>
 SupplyDelivery	1 . . . N	Same cardinality as <i>Device</i> ; for each <i>Device</i> a <i>SupplyDelivery</i> must exist one device -> one delivery. Only present when the <i>Composition</i> is an implant.

 Patient	<b>1 . . . X</b>	One or more <i>Patient</i> subject(s) – one and only one for each <i>ServiceRequest</i>
 Practitioner	<b>1 . . . M</b>	Requester, performer and pharmacist can all be different persons or all be the same person. Numbers can vary for each <i>Composition</i> .
 Organization	<b>1 . . . K</b>	The hospital and pharmac(ies) could be the same or all be different. Numbers can vary for each <i>Composition</i> .

### 3.2.3.3 Full example

			<pre> {   "resourceType" : "Bundle",   "id": "bundle-response",   "meta": {     "source": "RCT"   },   "type": "searchset",   "total": 1,   "link": [     { "relation": "self",       "url": <a href="https://example.com/base/MedicationRequest?patient=347&amp; include=MedicationRequest.medication&amp; count=1">"https://example.com/base/MedicationRequest?patient=347&amp; include=MedicationRequest.medication&amp; count=1"</a>     }   ],   "entry" : [     {       "resourceType": "Composition",       "id": "Composition-201910303220266",       "contained": [          {           "resourceType": "ServiceRequest",           "id": "ServiceRequest-1",           "status": "completed",           "intent": "order",           "code": {             "coding": [               {                 "system": <a href="http://snomed.info/sct">"http://snomed.info/sct"</a>,                 "code": "782902008",                 "display": "Implantation           procedure (procedure)"               }             ]           },           "subject": {             "reference": "#Patient-1"           },           "authoredOn" : "2015-02-07T13:28:17.239+00:00",           "requester": {             "reference": "#Practitioner-2"           },           "bodySite": [             {               "text": "heart-chambre"             }           ]         },         {           "resourceType": "Patient",           "id": "Patient-1",           "identifier": [             {               "system": <a href="https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin">"https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin"</a>,               "value": "68031904954"             }           ]         }       ]     }   ] } </pre>

			<pre>                 }             ],             "meta":{                 "profile": [                     "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/b                     e-patient" ]             },             "name": [                 {                     "family": "Moons",                     "given": [                         "Patrick"                     ]                 }             ],             "gender" : "male"         },         ...          {             "resourceType": "Procedure",             "id": "Procedure-1",             "basedOn": {                 "reference": "#ServiceRequest-1"             },             "status": "completed",             "subject": {                 "reference": "#Patient-1"             },             "performedDateTime": "2015-02-             07T13:28:17.239+00:00",             "performer" : [                 {                     "actor": {                         "reference": "#Practitioner-2"                     },                     "onBehalfOf": {                         "reference": "#Organization-1"                     }                 }             ],             "focalDevice": [                 {                     "manipulated": {                         "reference": "#Device-1"                     }                 },                 {                     "manipulated": {                         "reference": "#Device-2"                     }                 }             ]         }     ],     "status": "final",     "type": {         "coding": [             {                 "system": "http://loinc.org",                 "code": "57080-4" }         ]     },     "subject": { "reference": "#Patient-1" },     "date": "2013-02-01T12:30:02Z",     "author": [         { "reference": "#Patient-1" }     ],     "title": "Notification Summary",     "confidentiality": "N",     "section": [         {             "title": "=== Patient data section             =====", </pre>
--	--	--	---






```

        "code": {
            "coding": [
                {
                    "system":
"http://snomed.info/sct",
                    "code": "116154003",
                    "display": "Patient (person)"
                }
            ],
            "entry": [
                { "reference": "#Patient-1" }
            ]
        },
    {
        "title": "=== Medical service data section
=====",
        "code": {
            "coding": [
                {
                    "system":
"http://snomed.info/sct",
                    "code": "373655009",
                    "display": "Medical service
(procedure)"
                }
            ],
            "entry": [
                { "reference": "#ServiceRequest-1" },
                { "reference": "#Practitioner-2" },
                { "reference": "#Practitioner-1" },
                { "reference": "#Organization-1" },
                { "reference": "#Procedure-1" }
            ]
        },
    {
        "title": "=== Medical Devices data section
=====",
        "code": {
            "coding": [
                {
                    "system":
"http://snomed.info/sct",
                    "code": "370852006",
                    "display": "Recording of devices
implanted during operative procedure"
                }
            ],
            "section": [
                {
                    "title": "=== Device section
=====",
                    "code": {
                        "text": "Model 102/102R NCP
Generator+Toebehoren/Accessoires"
                    },
                    "entry": [
                        { "reference": "#Device-1" },
                        { "reference": "#SupplyDelivery-
1" },
                        { "reference": "#Organization-2"
},
                        { "reference": "#Practitioner-3"
}
                    ]
                },
                {
                    "title": "=== Device section
=====",
                    "code": {
                        "text": "Omnilink Elite
Peripheral Stent System"
                    },
                    "entry": [
                        { "reference": "#Device-2" },
                        { "reference": "#SupplyDelivery-
2" },
                        { "reference": "#Organization-2"
},

```



			<pre>                 { "reference": "#Practitioner-3"             }         ]     },     ...      {         "resourceType": "Composition",         "id": "Composition-201910303220367",         "contained": [              {                 "resourceType": "ServiceRequest",                 "id": "ServiceRequest-1",                 "status": "completed",                 "intent": "order",                 "code": {                     "coding": [                         {                             "system": "http://snomed.info/sct",                             "code": "284101009",                             "display": "Removal of implant (procedure) "                         }                     ]                 },                 "subject": {                     "reference": "#Patient-1"                 },                 "authoredOn" : "2015-02- 07T13:28:17.239+00:00",                 "requester": {                     "reference": "#Practitioner-2"                 },                 "bodySite": [                     {                         "text": "heart-chambre "                     }                 ]             },             ...              {                 "resourceType": "Procedure",                 "id": "Procedure-1",                 "basedOn": {                     "reference": "#ServiceRequest-1"                 },                 "status": "completed",                 "subject": {                     "reference": "#Patient-1"                 },                 "performedDateTime": "2015-02- 07T13:28:17.239+00:00",                 "performer" : [                     {                         "actor": {                             "reference": "#Practitioner-2"                         },                         "onBehalfOf": {                             "reference": "#Organization-1"                         }                     }                 ]             }         ]     } </pre>
			
			

```

        ],
        "focalDevice": [
            {
                "manipulated": {
                    "reference": "#Device-1"
                }
            },
            {
                "manipulated": {
                    "reference": "#Device-2"
                }
            }
        ]
    },
    "status": "final",
    "type": {
        "coding": [
            {
                "system": "http://loinc.org",
                "code": "57080-4" }
        ]
    },
    "subject": { "reference": "#Patient-1" },
    "date": "2013-02-01T12:30:02Z",
    "author": [
        { "reference": "#Patient-1" }
    ],
    "title": "Notification Summary",
    "confidentiality": "N",
    "section": [
        {
            "title": "=== Patient data section
=====",
            "code": {
                "coding": [
                    {
                        "system":
"http://snomed.info/sct",
                        "code": "116154003",
                        "display": "Patient (person)"
                    }
                ]
            },
            "entry": [
                { "reference": "#Patient-1" }
            ]
        },
        ...
    ]
}
}
}

```

JSON 12 - GET notifications

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