vitalink
gegevens delen, van vitaal belang

brusafe+

Réseau Santé Wallon

FHIR@VAULTS COOKBOOK

For allergies and intolerances

Version 1.0

FHIR@VAULTS Cookbook

For allergies and intolerances

Contents

1. Document management

1.1. History

Version	Date	Description
1.0	24/03/2021	Initial version of the document.

1.2. Purpose

This cookbook is for developers, analysts and software producers involved in the integration into their software solution of the services delivered by the regional healthcare vaults dedicated to the storage and sharing of health data in support to the continuity of care:

- Vitalink for Flanders region,
- RSW for Wallonia region
- Brusafe+ for Brussels region

The provided services of the vaults discussed in this document make use of FHIR. Fast Healthcare Interoperability Resources (FHIR) is a next generation standards framework created by HL7. Solutions are built from a set of modular components called “Resources”. These resources can easily be assembled into working systems that can solve clinical and administrative problems. More about FHIR can be read on the FHIR website: http://hl7.org/fhir/.

FHIR has defined general, international definitions of resources. Nevertheless, within the standard, it is possible to create a local variant based on those international resources. In a co-creation with the industry, the healthcare-sector, HL7 and the different governments involved eHealth has created a Belgian version of those international resources (the BE-profiles). The full eHealth implementation guide can be found here: https://ehealthplatformstandards.github.io/index.html.

This version of the cookbook focuses on allergies and intolerances, represented by the BeAllergyIntolerance resource profile. It also tackles the underlying resources: intolerances are created for patients, represented by the BePatient resource profile; the authors of these medical information is a doctor or a healthcare worker, represented by the BePractitioner and BePractitionerRole resource profiles.

The goal of the cookbook is to document how a software can accomplish a technical integration with each of the three vaults by using HL7-FHIR and this within the limited scope of exchanging BeAllergyIntolerance-resources.

The business use cases and corresponding rules regarding information sharing (like among others allergies and intolerances) between caregivers is not part of this cookbook. For AllergyIntolerance, this will be dealt with in the CareSet-project by NIHDI.

This version is a first step. Further versions of this cookbook will be produced to integrate new resources accordingly to the direction defined by the eHealth roadmap.

The three regional vaults in Belgium have decided to publish a common cookbook regarding a specific set of FHIR-services that can be used in interaction with them. The directions described in this cookbook regarding those services are generic and therefore they are applicable for all three vaults (with the exception of some parameters). Each vault can additionally provide other interfaces, mechanisms and functionalities to support regional specificities but those are out-of-scope of the present document[1].

This document is composed of five main sections:

- Section Principles explains the architectural principles as authentication, authorization and security.
- Section Actors lists the actors that can use the system.
- Section Resources provides an overview of the used resources
- Section Web services operations describes all REST operations provided by the vaults
- The last section contains an overview of the HTTP codes.

[1] Some points of variants may however be briefly pointed out for the sake of clarity.

2. Principles

2.1. Architectural principles

The three vaults have selected a set of common operations that respect a common standard specification. The retained current standard relies on the standards defined by the eHealth platform. More precisely, the exposed interfaces are REST web services that

- respect the standard defined by the eHealth platform, for the authentication and encryption features;
- make use of the FHIR standard operated by the eHealth platform;
- add vault specific behaviour and constraints.

2.1.1. Authentication

All vaults support the integration of the authentication service[2] of eHealth, called I.AM Connect. It is an identity and access management solution. It allows clients to request and receive information about authenticated sessions and end-users. It allows the vaults to verify the identity of the end-user based on the authentication performed by an Authorization Server.

It uses the OpenID Connect (https://openid.net/connect/) layer on top of the OAuth2.0 protocol (https://oauth.net/2/), where it provides a JWT token for the client which he can use to identify himself at the vaults. The vaults use the REST web service to verify the access of the client.

More information about I.AM Connect can be found here: NL, FR. A client should register itself in a realm so that he can connect to the services of I.AM Connect. The client registration document should be filled out and sent to eHealth to get access.

2.1.2. Encryption in transit

As minimal requirement[3] for secure communication over the Internet the vaults use basic TLS (v1.2 or higher).
Contact the vault to get the latest valid certificate:

- Vitalink: vitalink@vlaanderen.be
- RSW : support@rsw.be
- Brusafe+: https://abrumetdesk.atlassian.net/servicedesk/customer/portals

2.1.3. Authorization

The JWT token that the client should provide will contain the necessary information to authorize himself. Based on the information provided in the JWT token the necessary authorization checks are performed.

Patient’s consent, exclusions, therapeutic relations and ‘access matrix’ are also verified according to the regulations. The vaults follow the same principles of authorization layers but are using different implementations. This has no implications on the specification described in the present document.

[2] Each vault is free to support other authentication service in addition.

[3] This is the minimal requirement defined by the eHealth platform. Each vault is free to propose, additionally, stronger mechanisms.

2.2. History of resources

FHIR provides the possibility to manage history of the resources. At the moment the consultation of the resource history in the common cookbook of the vaults is out of scope.

3. Actors

When using I.AM connect the actors will provide a JWT token for each request. In the JWT token we can find more information about the actor. In the current scope, only caretakers and individual caregivers are in the scope of this cookbook.

4. Resources

Like mentioned before we follow the FHIR standards. It provides default resource definitions, created by HL7. In Belgium, eHealth (together with all parties stated above) defined specific FHIR profiles according to the Belgian requirements. The implementation guide for these profiles can be found here: https://ehealthplatformstandards.github.io/artifacts.html.

We support version 1.1.0 of this implementation guide. More about the changes can be read here: https://ehealthplatformstandards.github.io/changes.html.

Starting from the eHealth implementation guide, the common cookbook of the vaults supports the following resources:

4.1. BePatient

Reference: https://ehealthplatformstandards.github.io/StructureDefinition-be-patient.html Version: 1.0.0

Representation of a patient, managed by vaults themselves, using authentic source.

4.2. BePractitioner

Reference: https://ehealthplatformstandards.github.io/StructureDefinition-be-practitioner.html Version: 1.0.0

Representation of a practitioner, managed by vaults themselves, using authentic source.

4.3. BePractitionerRole

Reference: https://ehealthplatformstandards.github.io/StructureDefinition-be-practitionerrole.html Version: 1.0.0

Representation of a practitioner’s role, managed by vaults themselves, using authentic source.

4.4. BeAllergyIntolerance

Reference: https://ehealthplatformstandards.github.io/StructureDefinition-be-allergyintolerance.html Version: 1.0.0

Representation of an allergy or an intolerance of a patient recorded by a practitioner.

Other resource types are not in scope of this cookbook.

5. Web services operations

As stated above, the services described in this cookbook are common for all regional vaults. Specific services provided by specific vaults on top of the common set of services are possible, but are not described in this cookbook.

As vaults we support different operations so BeAllergyIntolerance resources can be created, read, updated or deleted. These operations are provided as REST webservices. Details on the FHIR RESTful API can be read here: https://www.hl7.org/fhir/http.html. More technical implementation information can be found in the Swagger/OpenAPI UI. Please contact the vault for access to their Swagger-UI.

The operations are not allowed for every user. In order to check the authorization the JWT token should always be included in the header of the request!

Summary

5.1. Create BeAllergyIntolerance for a patient

5.1.1. Purpose

This operation can be used to create an BeAllergyIntolerance resource for a patient (with a certain SSIN number) as a practitioner (with a certain SSIN number).

5.1.2. Request

The request contains:

- A JWT token as authorization. It also contains some information about the actor, which can be used to validate or verify certain business rules;
- An BeAllergyIntolerance resource body where the fields are structured according the implementation guide of eHealth. For the reference to the patient and the recorder we expect logical references in the body (the SSIN number should be used, as described below).

Method	POST			
Request URL	AllergyIntolerance			
Header	Authorization		Bearer {{token}}	
Parameters				
Body	JSON/XML of BeAllergyIntolerance resource (defined in eHealth implementation guide) with :			
	patient	identifier	system	https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin
			value	{{ssin}}
	recorder	identifier	system	https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin
			value	{{ssin}}

5.1.3. Conditions

For this request we expect the following conditions to guarantee a successful operation:

- The resource is structured according the Belgian FHIR profile and follows the defined terminology bindings;
- The JWT token is valid;
- The authorization is successful;
- The SSIN numbers (patient, recorder) do exist in the national and bis register;
- In the vault that is addressed, there is no BeAllergyIntolerance resource present with the same value in the field “code” for the same patient (identified with his SSIN number). This to avoid double registration of the same allergy or intolerance;
- The recorder is the person requesting the operation (based on the JWT token).

5.1.4. Response

If the request is successful, the BeAllergyIntolerance resource is stored in the vault. The resource will be returned with some additional information being the ID, an automatic generated narrative (client defined narratives are ignored) and a meta part (containing the version number and the profile type).

If the conditions for the operation are not met or something fails, the response will be an error (see chapter 6. HTTP codes).

Example: https://ehealthplatformstandards.github.io/AllergyIntolerance-allergyIntolerance1.html

5.2. Read BeAllergyIntolerance by ID (and patient identifier)

5.2.1. Purpose

This operation is provided to read a BeAllergyIntolerance by the resource ID and the patient identifier. This of course is only possible if both are known by the actor.

5.2.2. Request

The request contains:

- A JWT token as authorization;
- An ID in the body;
- The identifier of the patient linked to this BeAllergyIntolerance.

Method	POST	
Request URL	AllergyIntolerance/_search	
Header	Authorization	Bearer {{token}}
	Content-Type	application/x-www-form-urlencoded
Parameters		
Body	_id	{{id}}
	patient.identifier	https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin|{{ssin}}

5.2.3. Conditions

The expected conditions are:

- The JWT token is valid;
- The authorization is successful;
- The ID exists on the server;
- The patient identifier provided corresponds with the one linked in the BeAllergyIntolerance.

5.2.4. Response

If a BeAllergyIntolerance resource with the provided ID exists and the patient identifier corresponds with the one linked in the BeAllergyIntolerance, the BeAllergyIntolerance is returned in the response (inside a FHIR Bundle resource).

If the conditions are true, but the BeAllergyIntolerance can't be found, the response will be an empty FHIR Bundle.

If the conditions for the operation are not met or something fails, the response will be an error (see chapter 6. HTTP codes).

Example: https://ehealthplatformstandards.github.io/AllergyIntolerance-allergyIntolerance1.html

5.3. Update BeAllergyIntolerance by ID

5.3.1. Purpose

The update operation on a BeAllergyIntolerance allows an actor to edit some data if something changes with the BeAllergyIntolerance (of a patient). For this request the ID of the BeAllergyIntolerance is needed and a new body should be present.

5.3.2. Request

The request contains:

- A JWT token as authorization;
- The ID in the URL;
- An If-Match header with the version number that the updated resource is based on;
- An updated BeAllergyIntolerance resource body (including the corresponding ID).

Method	PUT			
Request URL	AllergyIntolerance/{{id}}			
Header	Authorization		Bearer {{token}}	
	If-Match		W/”{{version}}”	
Parameters				
Body	JSON/XML of BeAllergyIntolerance resource (defined in eHealth implementation guide) with :			
	id	{{id}}		
	patient	identifier	system	https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin
			value	{{ssin}}
	recorder	identifier	system	https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin
			value	{{ssin}}

5.3.3. Conditions

For this request we expect the following conditions to guarantee a successful operation:

- The ID of the resource exists on the server;
- The resource is structured according the Belgian FHIR profile and follows the defined terminology bindings;
- The JWT token is valid;
- The authorization is successful;
- The If-Match number matches with the latest version number on the server;
- The patient’s SSIN number must stay the same as the original version;
- In case of new recorder: the SSIN number exists in the national and bis register;
- The recorder is the person requesting the operation (based on the JWT token).

5.3.4. Response

If the request is successful, the BeAllergyIntolerance resource is updated in the vault. The resource will be returned with some additional information being the ID, an automatic generated narrative (client defined narratives are ignored) and a meta part (containing the version number and the profile type).

If the conditions for the operation are not met or something fails, the response will be an error (see chapter 6. HTTP codes).

Example: https://ehealthplatformstandards.github.io/AllergyIntolerance-allergyIntolerance1.html

5.4. Delete BeAllergyIntolerance by ID (and patient identifier)

5.4.1. Purpose

An BeAllergyIntolerance resource can be deleted in the vault using this operation. The ID needs to be specified in the URL accompanied with the patient identifier. The JWT token will determine if the resource can be deleted by the actor.

5.4.2. Request

The request contains:

- A JWT token as authorization;
- The ID in the URL;
- The identifier of the patient linked to this BeAllergyIntolerance.

Method	`DEL`	
Request URL	`AllergyIntolerance`	
Header	`Authorization`	`Bearer {{token}}`
Parameters	`_id`	`{{id}}`
	`patient.identifier`	`https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin|{{ssin}}`
Body		

5.4.3. Conditions

For this request we expect the following conditions to guarantee a successful operation:

- The JWT token is valid;
- The authorization is successful;
- The ID of the resource exists on the server;
- The patient identifier provided corresponds with the one linked in the BeAllergyIntolerance.

5.4.4. Response

If the request is successful, the BeAllergyIntolerance resource is deleted in the vault. The response will contain an OperationOutcome resource with a message that the deletion succeeded.

If the conditions for the operation are not met or something fails, the response will be an error (see chapter 6. HTTP codes).

5.5. Search BeAllergyIntolerances for a patient's SSIN

5.5.1. Purpose

With a search operation it is possible to find some resources based on the included parameters. This specific search operation allows the actor to find all active BeAllergyIntolerance resources, in the vault addressed, belonging to one specific patient based on his or her SSIN number.

5.5.2. Request

The request contains:

- A JWT token as authorization;
- A reference to a patient using the SSIN identifier.

Method	POST		
Request URL	AllergyIntolerance/_search		
Header	Authorization	Bearer {{token}}	
	Content-Type	application/x-www-form-urlencoded	
Parameters			
Body	patient.identifier	https://www.ehealth.fgov.be/standards/fhir/NamingSystem/ssin|{{ssin}}	
	_include	AllergyIntolerance.recorder	optional
	_include:iterate	PractitionerRole:practitioner	optional

5.5.3. Conditions

The expected conditions are:

- The JWT token is valid;
- The SSIN number is valid;
- The authorization is successful;

5.5.4. Response

If BeAllergyIntolerance resources exists (and are not labeled as deleted) for the patient with the provided SSIN number, they are returned in a FHIR bundle. If the patient doesn't exist in the vault or no allergies are present, the bundle is empty.

If the *_include=AllergyIntolerance.recorder* search parameter is present, the bundle will also contain the PractitionerRole resources that are referred to in the AllergyIntolerance.recorder field which represents the author of the allergy or intolerance. If the *_include:iterate=PractitionerRole:practitioner* search parameter is present in the body, the bundle will also contain the Practitioner resources that are linked to the PractitionerRole resources.

If the conditions for the operation are not met or something fails, the response will be an error (see chapter 6. HTTP codes).

Example BeAllergyIntolerance: https://ehealthplatformstandards.github.io/AllergyIntolerance-allergyIntolerance1.html

Example BePractitionerRole: https://ehealthplatformstandards.github.io/PractitionerRole-practitionerrole1.html

Example BePractitioner: https://ehealthplatformstandards.github.io/Practitioner-practitioner1.html

Example Bundle response:

```
{ "resourceType": "Bundle",
  "type": "searchset",
  "total": 3,
  "entry": [{
      "resource": {
        "resourceType": "AllergyIntolerance",
        "id": "305dafb1-1708-4bdf-b329-3d10b36413dc",
        "meta": { "profile": [
         "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-allergyintolerance"
          ]},
        "patient": {
          "reference": "Patient/abd90de8-5ce1-453d-b474-9506abd7bd88"
        },
        "recorder": {
          "reference": "PractitionerRole/ec9d9225-b647-466c-b93d-19e82b525a4c"
        }
      },
      "search": {"mode": "match"}
    },{
      "resource": {
        "resourceType": "PractitionerRole",
        "id": "ec9d9225-b647-466c-b93d-19e82b525a4c",
        "meta": { "profile": [
            "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitionerrole"
          ]},
        "practitioner": {
          "reference": "Practitioner/1866afd0-0d76-4827-ac2a-622253aa0b3b"
        },
        "code": [{
            "coding": [{
                "system": "",
                "code": "",
                "display": ""
              }]
          }]
      },
      "search": {"mode": "include"}
    },{
      "resource": {
        "resourceType": "Practitioner",
        "id": "1866afd0-0d76-4827-ac2a-622253aa0b3b",
        "meta": { "profile": [
            "https://www.ehealth.fgov.be/standards/fhir/StructureDefinition/be-practitioner"
          ]},
        "identifier": [
          {
            "system": "https://www.ehealth.fgov.be/standards/fhir/NamingSystem/nihdi",
            "value": ""
          }
        ],
        "name": [{
            "family": "",
            "given": ["", ""]
          }]
      },
      "search": {"mode": "include"}
    }]
}
```

6. HTTP codes

As a RESTful API we use HTTP status codes in the response of the requests as described in the FHIR specifications for HTTP: https://www.hl7.org/fhir/http.html.

The outcome of an operation can be specified using the FHIR resource OperationOutcome: https://www.hl7.org/fhir/operationoutcome.html.

The general HTTP code shall always be compliant with the FHIR standard as listed below.

6.1. Generic

Operation	HTTP Status code	HTTP Status	Comments
CRUD	200	OK	
CRUD	201	Created	
CRUD	400	Bad Request	Resource could not be parsed or failed basic FHIR validations. U: If-Match header is required.
CRUD	401	Not Authorized	
CRUD	403	Forbidden	
R	404	Not Found	
U	405	Method Not Allowed	The resource did not exist prior to the update, and the server does not allow client defined ids.
U	409	Conflict	Version conflict. The resource the client is trying to update is already updated by someone else. The client should request the resource again and work on the latest version.
R	410	Gone	Resource was deleted.
CU	422	Unprocessable Entity	The proposed resource violated applicable FHIR profiles or server business rules.

6.2. Business rules

If the error concerns a business rule the OperationOutcome will contain a vault specific code and message.

The OperationOutcome will look like this:

```
{
  "resourceType": "OperationOutcome",
  "issue": [
    {
      "severity": "error",
      "code": "processing",
      "details": {
        "coding": [
          {
            "system": "vault.error.codes",
            "code": "{{VAULT ERROR CODE}}",
            "display": "{{VAULT ERROR MESSAGE}}"
          }
        ]
      },
      "diagnostics": "Detailed error message specific for the case"
    }
  ]
}
```

6.2.1. BeAllergyIntolerance

Operation	HTTP Status Code	HTTP Status	Vault code	Vault message
CU	422	Unprocessable Entity	BeAllergyIntolerance .BR.1	BeAllergyIntolerance business rule: No duplicate allergies (based on code) allowed for one patient.
U	422	Unprocessable Entity	BeAllergyIntolerance .BR.2	BeAllergyIntolerance business rule: Not allowed to change the patient of an existing BeAllergyIntolerance.
CU	422	Unprocessable Entity	BeAllergyIntolerance .BR.3	BeAllergyIntolerance business rule: Recorder needs to be the person logged in.