

Discovery Data Service

Technical Specification  
FHIR Care Connect API

Version	Date	Amendment history	Authors
1.0	02/12/2019	First version	Darren Sheavills
1.1	07/12/2019	Support for Care Connect FHIR Operations and Parameters	Darren Sheavills

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## 1 Purpose of this document

This document specifies the technical details for accessing and using the Discovery Data Service FHIR® Care Connect API, for the use by interoperability system suppliers developing integrations against the service.

## 2 Discovery Data Service

The Discovery Data Service (DDS) is an NHS owned service that provides low cost access to personal health and care data from combined primary, secondary, unscheduled and community health care data sets (<https://discoverydataservice.org/Content/Overview.htm>)

All data that is published or subscribed to and from DDS is governed by strict information governance rules and underpinned by Data Sharing Agreements, Sharing Flows and Subscriber Extract Projects (<https://discoverydataservice.org/Content/Governance.htm>)

DDS receives data from multiple source publishing systems in multiple formats and normalises the data into a common structure based on national care record standards.

DDS makes the data available to multiple subscribers in standardised formats, one of the common formats being FHIR®.

## 3 Care Connect FHIR Profiles

The Discovery Data Service supports the INTEROPen community and work done by NHS Digital to standardise interop across system suppliers within the NHS.

Discovery supports the exchange of health records using the nationally curated INTEROPen FHIR resources.

The INTEROPen vision is to create a library of nationally defined HL7® FHIR® resources and interaction patterns that implementers can adopt to simplify integration and interoperability within UK health and social care.

Discovery will continue to support and provide access to the latest adopted FHIR resources, and the current implemented version is *STU3*.

Discovery is following the specification for the Care Connect FHIR profiles as specified on the INTEROPen sponsored FHIR web site <https://fhir.hl7.org.uk/>

## 4 Data Sets

The Discovery Data Service provides access to the current data sets.

	EMIS Web		SystmOne		Vision	Adastra	Cerner Millennium				Rio
Data sets	Primary care GP	Primary care community	Primary care GP	Primary care community	Primary care GP	Out of hours	A&E	Inpatient	Outpatient	ADT feed	Community
Allergies	✓	✓	✓	✓	✓	—	✓	✓	✓	✗	✗
Appointments	✓	✓	✓	✓	✗	—	—	—	✓	✓	⌛
Care episodes	✓	⌛	✓	✓	✓	✓	✓	✓	✓	✓	⌛
Diagnoses	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	⌛
Documents	✗	✗	✗	✗	✗	✗	⌛	⌛	⌛	⌛	✗
Encounters/consultations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	⌛
Family history	✓	✓	✓	✓	✓	—	✓	✓	✓	✗	✗
Follow ups/diary recall	✓	✓	✓	✓	✗	—	—	—	—	—	✗
Free text	⌛	⌛	✗	✗	✗	✓	✓	✓	✓	✗	✗
Immunisations	✓	✓	✓	✓	✓	—	✓	✓	✓	✗	✗
Inpatient activity	—	—	—	—	—	—	✓	✓	—	✓	⌛
Medication	✓	✓	✓	✓	✓	✓ <sup>1</sup>	✗	✗	✗	✗	—
Non-scheduled activity	—	—	—	—	—	✓	✓	—	—	✓	—
Observations <sup>2</sup>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗
Outpatient activity	—	—	—	—	—	—	—	—	✓	✓	⌛
Patient demographics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	⌛
Problems	✓	✓	✓	✓	✓	—	✓	✓	✓	✗	✗
Procedures	✓	✓	✓	✓	✓	—	✓	✓	✓	✗	—
Questions & answers	—	—	—	—	—	✓	—	—	—	—	—
Referrals	✓	✓	✓	✓	✓	—	—	—	—	✗	⌛
Templates	✗	✗	✗	✗	✗	—	✗	✗	✗	✗	✗
Test orders	✗	✗	✗	✗	✗	—	✓	✓	✓	✗	—
Test results/ Pathology results	✓	✓	✓	✓	✓	—	✓	✓	✓	✗	—

All data requests for information hosted with DDS is linked to a project data set.

The project data set is linked to a data sharing agreement from the publishing organisations.

A project data set also governs and limits the type and nature of the data required by the subscribing system.

For example, a diabetes system would request only diabetes data from DDS and therefore the data would be linked and filtered by a pre-authored diabetes data set, containing record type definitions (i.e. Conditions, Medication, Allergies, Diabetes related Observations etc), and value set definitions (i.e. the national diabetes code set).

## 5 Discovery and FHIR

A common standard interoperable standard supported by DDS is FHIR®.

DDS can consume and produce FHIR records between integrated and connected systems.

The current supported version of FHIR within Discovery is FHIR Care Connect STU3.

The following FHIR STU3 Care Connect resources are supported by DDS.

- Appointment
- AllergyIntolerance
- Condition
- DiagnosticReport
- Encounter
- EpisodeOfCare
- FamilyMemberHistory
- Immunization
- Location
- MedicationStatement
- Observation
- Organization
- Patient
- Practitioner
- PractitionerRole
- Procedure
- ProcedureRequest
- ReferralRequest
- RelatedPerson

## 6 FHIR and REST API

A standard interoperability method for making FHIR resources accessible between systems is REST(ful) APIs.

A RESTful API is an application program interface (API) that uses HTTP requests to GET, PUT, POST and DELETE data.

DDS supports PUT, POST and DELETE to send FHIR data to Discovery.

For the scope of this specification, only the retrieval of FHIR data is described (GET/POST).

DDS hosts REST APIs on the AWS API Gateway.

DDS data is hosted within Amazon Web Services (AWS).

The Amazon API Gateway is a fully managed service for creating, publishing, maintaining, monitoring, and securing APIs at scale.

API Gateway handles all the tasks involved in accepting and processing up to hundreds of thousands of concurrent API calls, including traffic management, CORS support, authorization and access control, throttling, monitoring, and API version management.

## 7 Discovery “\$getstructuredrecord” REST API

DDS implements a single REST API method and FHIR operation named **/\$getstructuredrecord** for retrieving a patient’s record in structured format.

**/\$getstructuredrecord** is a POST HTTPS method request, secured by certificates.

The reason it is POST and not GET, is that it allows for request parameters to be passed into the **/\$getstructuredrecord** call.

**/\$getstructuredrecord** conforms to the FHIR request operation standards as specified by GP and Care Connect for retrieving a patient’s record in structured format.

The request parameters also follow the GP and Care Connect standards by using the FHIR **Parameters** resource in the payload request body for identifying the patient and the types of FHIR resources requested.

[https://developer.nhs.uk/apis/gpconnect-1-4-1/accessrecord\\_structured\\_development\\_retrieve\\_patient\\_record.html#fhir-absolute-request](https://developer.nhs.uk/apis/gpconnect-1-4-1/accessrecord_structured_development_retrieve_patient_record.html#fhir-absolute-request)

The production version of the **/\$getstructuredrecord** request is secured by AWS Identity and Access Management (IAM) for request authorization, and API keys for additional security.

The demo, test and development versions of the **/\$getstructuredrecord** call have authorization switched off for ease of implementation.

Additional production level security controls include role based access, virtual private cloud configurations and security groups for IP and port level restrictions.

This is a development guide document and the documentation for securing the APIs and the use of authorization techniques can be found in the production release document.

The use of HTTPS is automatically used to encrypt the transport.

Access to the DDS **/\$getstructuredrecord** API can be made using any REST client application such as Postman (<https://www.getpostman.com/>) or online REST clients like reqbin (<https://reqbin.com/>)

DDS also provides a web application for testing the **/\$getstructuredrecord** API, and for viewing the associated structured health records in an HTML viewer. This is described in the next section.

The request parameter for the **/\$getstructuredrecord** API call is documented on the GP Connect [developer.nhs.uk](https://developer.nhs.uk) API Hub web site in the Payload request body section.

[https://developer.nhs.uk/apis/gpconnect-1-4-1/accessrecord\\_structured\\_development\\_retrieve\\_patient\\_record.html#fhir-absolute-request](https://developer.nhs.uk/apis/gpconnect-1-4-1/accessrecord_structured_development_retrieve_patient_record.html#fhir-absolute-request)

**Example 1 request parameter** - showing how referrals can be limited by date range.

```
{
  "meta": {
    "profile": [
      "https://fhir.hl7.org.uk/STU3/OperationDefinition/CareConnect-GetStructuredRecord-Operation-1"
    ]
  },
  "resourceType": "Parameters",
  "parameter": [
    {
      "name": "patientNHSNumber",
      "valueIdentifier": {
        "system": "https://fhir.hl7.org.uk/Id/nhs-number",
        "value": "5558549483"
      }
    },
    {
      "name": "includeReferrals",
      "part": [
        {
          "name": "referralsSearchPeriod",
          "valuePeriod": {
            "start": "2019-01-25",
            "end": "2019-06-25"
          }
        }
      ]
    }
  ]
}
```

**Example 2 request parameter** – showing how to return all FHIR resources for the patient with the specified NHS Number.

```
{
  "meta": {
    "profile": [
      "https://fhir.hl7.org.uk/STU3/OperationDefinition/CareConnect-GetStructuredRecord-Operation-1"
    ]
  },
  "resourceType": "Parameters",
  "parameter": [
    {
      "name": "patientNHSNumber",
      "valueIdentifier": {
        "system": "https://fhir.hl7.org.uk/Id/nhs-number",
        "value": "5558549483"
      }
    }
  ]
}
```



## 8 Testing “\$getstructuredrecord” REST API using REST clients

### If using Reqbin.

1. Set API HTTP method to POST.
2. Use the Discovery AWS API Gateway URL

[https://rqr8l5vl8l.execute-api.eu-west-2.amazonaws.com/discovery-fhir-api-dev/patient/\\$getstructuredrecord](https://rqr8l5vl8l.execute-api.eu-west-2.amazonaws.com/discovery-fhir-api-dev/patient/$getstructuredrecord)

1. Switch Authorization to No Auth for development.
2. Set Content: JSON (application/json)
3. Enter the /\$getstructuredrecord request params into Content body
4. Click SEND
5. Should get 200 (OK) STATUS with Content delivered as Care Connect STU3 bundle

### Post HTTP Requests Online

Send HTTP requests to the server and check server responses

POST

m/discovery-fhir-api-dev/patient/\$getstructuredrecord

Send

Status: 200 (OK) Time: 336 ms Size: 1.3 kb

Content Headers Raw

Authorization Headers Content

JSON (application/json)

Content Headers Raw

application/json

```

1 {
2   "meta": {
3     "profile": {
4       "https://fhir.hl7.org.uk/STU3/OperationDefinition/CareConnect-GetSt
5     }
6   },
7   "resourceType": "Parameters",
8   "parameter": [
9     {
10      "name": "patientNHSNumber",
11      "valueIdentifier": {
12        "system": "https://fhir.hl7.org.uk/Id/nhs-number",
13        "value": "5558549483"
14      }
15    }
16  ]
17 }

```

ReqBin is a free, online HTTP/REST/SOAP API client.  
Send custom HTTP requests to a server and check server responses. Test server performance and detect security problems.

ReqBin is maintained by HTTP Debugger Team which provides a professional tool for developers to debug HTTP API Calls.

```

1 {
2   "entry": [
3     {
4       "resource": {
5         "identifier": [
6           {
7             "system": "https://discoverydataservice.org"
8           },
9           {
10            "extension": [
11              {
12                "valueCodeableConcept": {
13                  "coding": [
14                    {
15                      "system": "https://fhir.hl7.org.uk/CareConn
16                      "code": "01",
17                      "display": "Number present and verified"
18                    }
19                  ]
20                }
21              },
22              {
23                "url": "https://fhir.hl7.org.uk/STU3/StructureDefin
24              }
25            ]
26          },
27          "system": "https://fhir.hl7.org.uk/Id/nhs-number",
28          "value": "5558549483"
29        },
30        "extension": [
31          {
32            "extension": [
33              {
34                "valuePeriod": {
35                  "start": "2013-09-18T00:00:00+00:00"
36                }
37              },
38              {
39                "url": "registrationPeriod"
40              }
41            ]
42          }
43        ]
44      }
45    }
46  ]
47 }

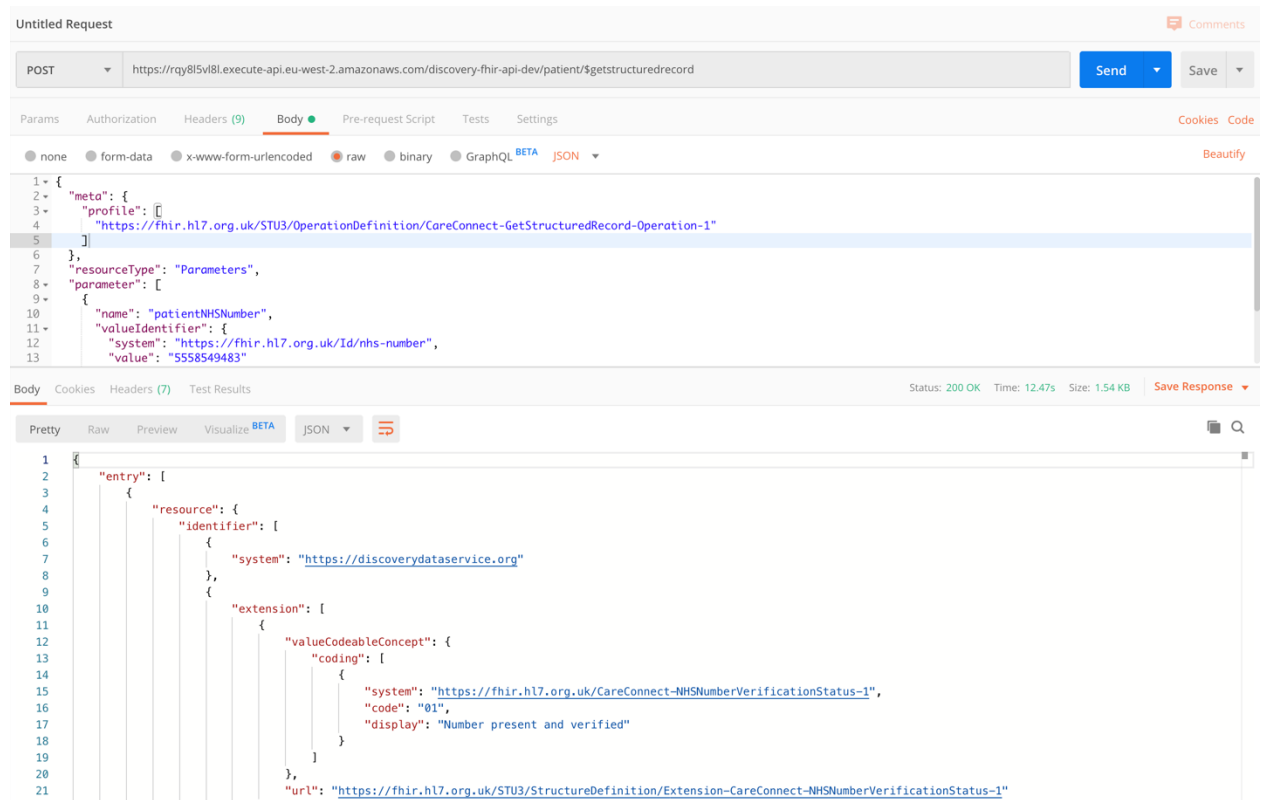
```

## If using Postman.

1. Set API HTTP method to POST.
2. Use the Discovery AWS API Gateway URL

[https://rqy8l5vl8l.execute-api.eu-west-2.amazonaws.com/discovery-fhir-api-dev/patient/\\$getstructuredrecord](https://rqy8l5vl8l.execute-api.eu-west-2.amazonaws.com/discovery-fhir-api-dev/patient/$getstructuredrecord)

1. Switch Authorization to No Auth for development.
2. Set Body: raw
3. Enter the /\$getstructuredrecord request params into body tab
4. Click SEND
5. Should get 200 (OK) STATUS with Content delivered as Care Connect STU3 bundle



The following API response codes are supported.

HTTP status	Description
200	Successful operation
404	Resource not found
410	Resource deleted

## 9 Using the Discovery FHIR API and record viewer web portal

Discovery provides a web app for testing the FHIR Care Connect **/\$getstructuredrecord** API

<https://devgateway.discoverydataservice.net/record-viewer/>

The application requires a user account for login.

Please apply to the LHS team for a user account (<https://learning-health.co.uk/>)

The web application provides a module for testing the **/\$getstructuredrecord** call.

The screenshot shows the 'Patient Record Viewer' interface. At the top, it displays the user 'professional user' and the patient 'SMITH, Bob (Mr)' with details: Born: 01-Jan-2002, Age: 17, Gender: Male, NHS: 8018910499, Address: The House, 10, The Street, Leeds, LS196BA. A 'Swap patient' button is visible.

The main section is titled 'FHIR Care Connect API' and describes it as a portal for testing the Discovery FHIR API service. It shows the endpoint **/patient/\$getstructuredrecord** with the description: 'REST API operation for retrieving a patient's record in structured format, returns a FHIR bundle'.

The 'Request URL' field contains: `POST: https://r98l5v18l.execute-api.eu-west-2.amazonaws.com/discovery-fhir-api-dev/patient/$getstructuredrecord`.

The 'Request Parameters (application/json)' field contains: `{ "resourceType": "Parameters", "parameter": [ { "name": "patientNHSNumber", "valueIdentifier": { "system": "https://fhir.hl7.org.uk/id/nhs-number", "value": "8018910499" } } ] }`.

The 'HTTP Status' is 200 (OK).

The 'Response Content (FHIR Resource Bundle)' shows a JSON response with an entry containing a resource of type 'Parameters' with a single parameter named 'patientNHSNumber'.

A module is also provided for finding patients to test the **/\$getstructuredrecord** API.

The screenshot shows the 'Find Patient' module. It prompts the user to 'Use any of the criteria below to find the required patient'. The search criteria fields are: Patient ID (374), NHS Number, Name (smith), and Date of Birth (dropdown menu). A 'Find patient' button is present.


The results table lists patients with columns: Name, Age, Gender, Date of Birth, NHS Number, and Address.

Name	Age	Gender	Date of Birth	NHS Number	Address
SMITH, Simon (Mr)	7	Male	01-Jan-2012	559561819	183 Sough Road
SMITH, Bob (Mr)	17	Male	01-Jan-2002	8018910499	The House, 10, The Street, Leeds, LS196BA
SMITH, Rtergtewr (Miss)	6	Female	28-Jan-2013	6466541738	Erwert, , Werw
SMITH, Agent (Mr)	48	Male	01-Jan-1971	9625603476	Kjdfokfsdj, Okk
SMITH, Boris (Dr)	18	Male	01-Jan-2001	9434296609	2 Highbury Stre
SMITH, Jennifer Carol (Mrs)	48	Female	08-Apr-1971	9400340990	66 Sackup Lane
SMITH, Bertie (Mr)	44	Male	01-May-1975	9223331250	6, Leeds, Leeds
SMITH, Ilias R S (Mr)	40	Male	02-Jun-1979	9400730616	Seagull's Rest, 22 Green street, Quay West, Leeds, LS197LX
SMITH, Sam (Mr)	41	Unknown	14-Nov-1978	8845237958	76, High Moor Crescent, , Leeds, LS85RR
SMITH, Lee (Mrs)	18	Female	01-Feb-2001		8, Hrtyrghwer, , Leeds,


At the bottom, there are 'Cancel' and 'Ok' buttons. A pagination bar shows 'Items per page: 10' and '1 - 10 of 20'.


There are further modules available for testing the content of the FHIR response bundles against the care record structured views.


DISCOVERY


  
professional user  
professional@test.com


HTTP FHIR Care Connect API


 Patient Demographics


 Care Record Summary


 Conditions


 Medication


 Warnings


 Investigations


 Allergies


 Encounters


 Procedures


 Procedure requests


 Referrals

 Diagnostic Reports

 Family history


 Immunisations

 Appointments


 Observations

Patient Record Viewer

Discovery Internal Administration (Discovery organisation) professional user

 **SMITH, Bob (Mr)**  
Born: 01-Jan-2002 Age: 17 Gender: Male NHS: 8018910499 Address: The House, 10, The Street, Leeds, LS196BA

Swap patient

 **Care Record Summary**  
A summary of the key care record events

Condition (Problem)	Status	Date Diagnosed
Lymphocytic Pseudotumor Of Lung (disorder)	Active	14-Dec-2012
Sigvaris Cotton Class 1 (18-21mmHg) Below Knee Open Toe Lymphoedema Garment Long Extra Small	Active	01-Nov-2009
Conjunctival Argyrosis (disorder)	Active	14-Dec-2012
Vitreous Touch Syndrome (disorder)	Active	05-Jun-2013
Pyromania (disorder)	Past	06-Jun-2013


Items per page: 5 1 - 5 of 5

**Current Medication**


Current Medication	Dose	Quantity	Date Prescribed
Anusol HC Ointment (Pfizer Consumer Healthcare) (product)	APPLY TWICE DAILY	30 gram	20-Jan-2012
Naproxen 500 Milligram/1 Each Conventional Release Oral Tablet (clinical Drug)	One To Be Taken Twice A Day With Food	56 tablet	12-Apr-2016
Amoxicillin 500 Milligram/1 Each Conventional Release Oral Capsule (clinical Drug)	One To Be Taken Three Times A Day	15 capsule	13-May-2013
Nicotine 25mg/16hours Transdermal Patches (product)	Apply One Patch Each Day As Directed	7 patch	24-Mar-2014
Salbutamol 100micrograms/dose Inhaler CFC Free	TWO PUFFS FOUR TIMES A DAY	1 inhaler	16-Feb-2011


Items per page: 5 1 - 5 of 25


DISCOVERY


  
professional user  
professional@test.com


HTTP FHIR Care Connect API


 Patient Demographics


 Care Record Summary


 Conditions


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Patient Record Viewer

Discovery Internal Administration (Discovery organisation) professional user

 **SMITH, Bob (Mr)**  
Born: 01-Jan-2002 Age: 17 Gender: Male NHS: 8018910499 Address: The House, 10, The Street, Leeds, LS196BA

Swap patient

 **Patient Demographics**  
Full demographic information for the patient.

Patient ID  
374

NHS Number  
8018910499

Title  
Mr

Name  
Smith, Bob

Gender  
Male

Date of Birth  
01-Jan-2002

Date of Death

Address (HOME)  
The House  
10 The Street  
Westville

City  
Leeds

Post Code  
LS19 6BA

Telephone  
07398830944

Registered Organisation  
West Side Surgery

Registration Date  
23-Oct-2003

Other Addresses  
5 New Street, Leeds, LS12

## 10 FHIR resource content

All FHIR resources returned by the **/\$getstructuredrecord** REST API method are wrapped in a **FHIR bundle**, which is a container for a collection of resources.

An example of resources wrapped in a bundle:

```
{
  "resourceType": "Bundle",
  "type": "collection",
  "meta": {
    "profile": [
      "https://fhir.hl7.org.uk/STU3/StructureDefinition/CareConnect-StructuredRecord-Bundle-1"
    ]
  },
  "entry": [
    {
      "resource": {
        "resourceType": "Patient",
        "id": "04603d77-1a4e-4d63-b246-d7504f8bd833",
        "meta": {
          "versionId": "1469448000000",
          "profile": [
            "https://fhir.hl7.org.uk/STU3/StructureDefinition/CareConnect-Patient-1"
          ]
        }
      }
    },
    .....
    {
      "resource": {
        "resourceType": "MedicationStatement",
        "id": "6bff710a-0bdc-4c9b-b98b-40db0a107edc",
        "meta": {
          "profile": [
            "https://fhir.hl7.org.uk/STU3/StructureDefinition/CareConnect-MedicationStatement-1"
          ]
        }
      }
    },
    .....
  ]
}
```

Further specifications for programming against FHIR Care Connect resources, and the extensions used within the resources can be found at

<https://fhir.hl7.org.uk/>

Please contact Learning Health Solutions Ltd, for any questions or advise on the use of this technical specification.

<https://learning-health.co.uk/>