Ontario

Digital Health Immunization Repository (DHIR)

Point of Care Systems Access

HL7 FHIR Implementation Guide

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Significant Contributors

Organization	Contact
Ministry of Health	PublicHealthSolutions@Ontario.ca
Architecture and Standards, Ontario Health Digital Services	architecture@ehealthontario.on.ca

Version History

Version	Date	Summary of Change	Changed By
V4.0.0	2019-04-18	Updated to FHIR R4. Split the spec into two: Point of Care and Consumer specs. Added search by POST in addition to GET. Updated value sets in accordance to the new Canadian National Immunization Subsets and Canadian Vaccine catalogue. Added Bundle.timestamp. Added "OperationOutcome.expression" element and deprecated "OperationOutcome.location" element to align with FHIR R4. Submission MessageHeader profile: renames event to eventCoding, added receiver (PHU), changed sender to a reference to Organization (sender's office/practice): if receiver is not supplied, Organization.address.postalCode would be used by DHIR to find the PHU. Submission Immunization profile: renamed date to occurrenceDateTime, added coding to site to support codified anatomical site, renamed practitioner to performer, renamed role to function, removed Immunization reason. Submission Patient profile: changed cardinality of identifier from 0..2 to 1..2, changed cardinality of telecom from 1..1 to 0..1, removed managingOrganization. Submission Practitioner (Submitter) profile: changed cardinality of telecom from 1..2 to 0..2. Submission Organization profile: Organization is used for submitter's office/practice rather than for PHU, added required address with a required postalCode, which would be used by DHIR to find the PHU. Retrieval Immunization profile: renamed date to occurrenceDateTime, renamed practitioner to performer, renamed role to function. Retrieval ImmunizationRecommendation profile: moved ImmunizationRecommendation.recommendation.date to ImmunizationRecommendation.date, added a Trade Name slice to vaccineCode.coding.	MOH
V4.0.1	2019-06-12	Removed references to requirements documents in section 1.5. Added POST search options to Table 5 in section 3.4. Corrected description of Organization resource in section 4.4. Updated MessageHeader source name fixed values and accompanying example in sections 4.4.1 and 5.1.2. Clarified Submission Submitter Practitioner profile telecom slice in section 4.4.4.2. Indicated that Binary profile is for ICON only in section 4.4.7. Added phone and address to Patient resource example in section 5.1.4. Added phone and email to Practitioner (Submitter) resource example in section 5.1.6. Added Appendix F Integration Traceability.	MOH
V4.0.2	2019-08-26	Updated Ontario logo. Corrected support email address. Clarified supported search parameters in section 3.5.4. Moved address line extensions a level up under 'address' element because of HAPI bug. Added Immunization ID to the diagram in section 4.4 and updated the immunization id to more unique values in the submission examples. Clarified Immunization immPHU in retrieval profile. Changed cardinality of 'city', 'state' and 'postalCode' in Patient lookup profile. Added business logic for ImmunizationRecommendation. Corrected ImmunizationRecommendation.recommentation.forecastStatus and ImmunizationRecommendation.recommentation.dateCriterion codes and examples. Added POST search to Appendix A. Updated Appendix F.	MOH
V4.0.3	2020-02-19	Updated "Significant Contributors" details Updated "MOHLTC" to "MOH" Updated "eHealth Ontario" to "Ontario Health Digital Services"	MOH

Version	Date	Summary of Change	Changed By
		Removed all references and details specific to ICON HCP, including Binary and RelatedPerson resources Section 1.3: Updated DHIR statistics Section 1.5: Updated FHIR build Section 1.6: Added EMPI and OH Section 1.7: Updated [base-cvc] URL Sections 1.7, 2: Updated "eHealth Ontario Gateway" to "Ontario Health Provider Gateway" Section 2.2: Clarified forecast as optional request Section 2.2, Appendix A – Table 27: Clarified consent block behaviour Section 3.5.3: Clarified "server" Section 3.5.4: Corrected namespace identifier for HCN; clarified optional Immunization lastUpdated parameter Section 4.3.1: Updated verbiage Sections 4.4, 4.5: Updated business descriptions of fields in diagram; clarifications added throughout profiles where applicable; including explicitly stating if a value is "fixed", adding references to other profiles, more consistent wording Section 4.4.2: Added details for lot number lookup Sections 4.4.2, 4.5.1, 4.5.4, 5.1.3, 5.2.1, 5.2.4: Added "version" for SNOMED-CT coding where used Section 4.4.2.1: Removed section describing ISPA Section 4.4.5: Updated FHIR profile URL to R4 Section 5: Corrected punctuation and display text in examples Appendix A - Table 29: Corrected GET & POST parameters validation verbiage Appendix B: Removed namespace URIs that are not applicable *Potential Code-Breaking Updates:* Sections 3.4, 3.5: Removed query string parameters for POST based search Sections 4.3.4.2, 5.4.2, 5.5.2, Appendix A: Updated OperationOutcome consent block severity Sections 4.4.1, 5.1.2: Corrected MessageHeader.eventCoding.system uri Sections 4.4.4, 4.6.1, 5.1.4, 5.3.1: Corrected address extensions by moving under "_line" array Sections 4.4.4.1, 5.1.5: Corrected Practitioner.qualification to an array Sections 4.5.4, 5.2.4: Corrected ImmunizationRecommendation.recommendation cardinality; corrected ImmunizationRecommendation.recommendation.vaccineCode to an array; corrected ImmunizationRecommendation dateCriterion namespace URI	

1 Introduction

1.1 Summary and Scope

This document serves as a technical specification for implementing HL7 Fast Healthcare Interoperability Resources (FHIR) messages in order to interact with Ontario's Digital Health Immunization Repository and Web Services (DHIR) solution. Sufficient business rationale is provided to illustrate the scenarios that the specification aims to fulfill. Storyboards, interactions, message types, vocabulary, data types, object identifiers, and FHIR message examples are included to facilitate the implementation process.

1.2 Intended Audience

The intended audiences of this document are business and technical implementers who are interested in submitting immunization information to DHIR and retrieving immunization information from DHIR. The readers are expected to have an understanding of the business and technical requirements for querying and submitting and receiving immunization information to and from the DHIR.

1.3 Background

To enable the vision of a provincial immunization system where individuals, healthcare providers, and public health employees all have real-time access to the same immunization information, Ontario is taking a coordinated approach to facilitate easier collection of, and access to, complete, accurate, and timely immunization records. Our goal is to improve health outcomes by making comprehensive immunization information accessible in real time to support healthcare providers in clinical practice and to engage the public as active partners in the management of their own health. A key element of this approach is the provincial digital health immunization repository (DHIR), a centralized repository of standardized electronic immunization data, which forms the foundation of a broader interoperable ecosystem for immunization data in Ontario. The DHIR already contains approximately 105 million standardized immunization records for over 7.1 million clients.

The DHIR was originally developed to support the implementation of the Panorama public health platform in Ontario. Currently, the DHIR primarily supports data sharing for public health purposes. Ontario's 35 public health units access the DHIR through the Panorama solution.

The public are currently able to update and access their immunization records in the DHIR through a web-based tool, Immunization Connect Ontario/Digital Yellow Card.

To expand immunization data access options for healthcare providers and the public, this DHIR specification describes the data store environment and web services for submitting and retrieving immunization data. Intended approaches for expanded clinical access include DHIR integration with the regional clinical viewers, and direct integration with electronic medical record (EMR) systems. Expanded public (consumer) access will be accomplished through DHIR integration with consumer applications and patient portals.

1.4 Package Content

1.4.1 DHIR FHIR Implementation Guide

This document illustrates the use cases supported by DHIR solution, along with the content and data standard for the DHIR FHIR interfaces. To describe the structure of resources, we use the FHIR structure definition format. Each resource type has its definition and schema on the hl7.org/fhir site, linked via the FHIR resource list, along with examples in both XML and JSON formats.

1.4.2 Terminology

Value sets used within the DHIR Solution are hosted by the Canadian Vaccine Catalogue at https://cvc.canimmunize.ca. The value sets and code systems define the allowable values for each field and element in the DHIR FHIR specification, along with each value's definition and alignment with established standards. The terminology is dynamic in nature, and will require periodic updates and publications.

1.5 Reference Materials

Table 1 Reference Materials

Artifact	Location, Name of file
HL7 FHIR R4 (First Normative Content, v4.0.1)	http://hl7.org/fhir/R4/index.html
Canadian Vaccine Catalogue	https://cvc.canimmunize.ca

1.6 Acronyms

Table 2 Acronyms

Acronym	Full Name
CPSO	College of Physicians and Surgeons of Ontario
CVC	Canadian Vaccine catalogue
DHIR	Digital Health Immunization Repository
HER	Electronic Health Record
EMPI	Enterprise Master Patient Index
FHIR	Fast Healthcare Interoperability Resources
HCN	Health Card Number
HL7	Health Level Seven
JSON	JavaScript Object Notation
MOH	Ministry of Health
OH	Ontario Health
OID	Object Identifier
OIID	Ontario Immunization Identifier
Regex	Regular Expression
STU	Standard for Trial Use
UAO	Under the Authority Of
UPI	Unique Provider Identifier number
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UUID	Universal Unique Identifier
XML	Extensible Markup Language

1.7 Identifier Policy

The DHIR uses URIs whenever Object Identifiers are required. URIs (Uniform Resource Identifiers) are globally unique identifiers for individual objects, as well as for value sets, code systems, profiles, namespaces, and more. URIs are the preferred object identifiers for FHIR objects, and are usually represented as URLs. All OIDs and URIs used in Ontario Health Digital Services projects must conform to Ontario Health Digital Services' OID and URI Management Policy

For more information, or to obtain the proper OIDs and URIs, contact the Ontario Health Digital Services Architecture and Standards Team at architecture@ehealthontario.on.ca

These identifiers capture the URI specific to an implementation/environment, such as the URL for resources and extensions used in the DHIR solution.

The base URL for DHIR FHIR interface will be referred to as "[base]" in the sections and examples below. Please note that base URL might change over time.

The base for global identifier namespaces will be referred to as "[id-system-global-base]" in the sections and examples below.

The base for local identifier namespaces will be referred to as "[id-system-local-base]" in the sections and examples below.

The base for local code systems will be referred to as "[code-system-local-base]" in the sections and examples below.

Due to the evolving FHIR standard and its developing framework and governance, implementers should recognize that these identifiers may change if identifier registration becomes governed nationally or internationally. Implementers are recommended to implement URIs using configurable variables.

Table 3 Identifier Variables

Variable	Value
[base]	Please refer to Ontario Health Provider Gateway documentation
[base-structure]	http://ehealthontario.ca/fhir/StructureDefinition
[id-system-global-base]	https://fhir.infoway-inforoute.ca/NamingSystem
[id-system-local-base]	http://ehealthontario.ca/fhir/NamingSystem
[code-system-local-base]	http://ehealthontario.ca/fhir/NamingSystem
[base-cvc]	https://cvc.canimmunize.ca/v3

2 Use Cases

2.1 Use Case Diagram
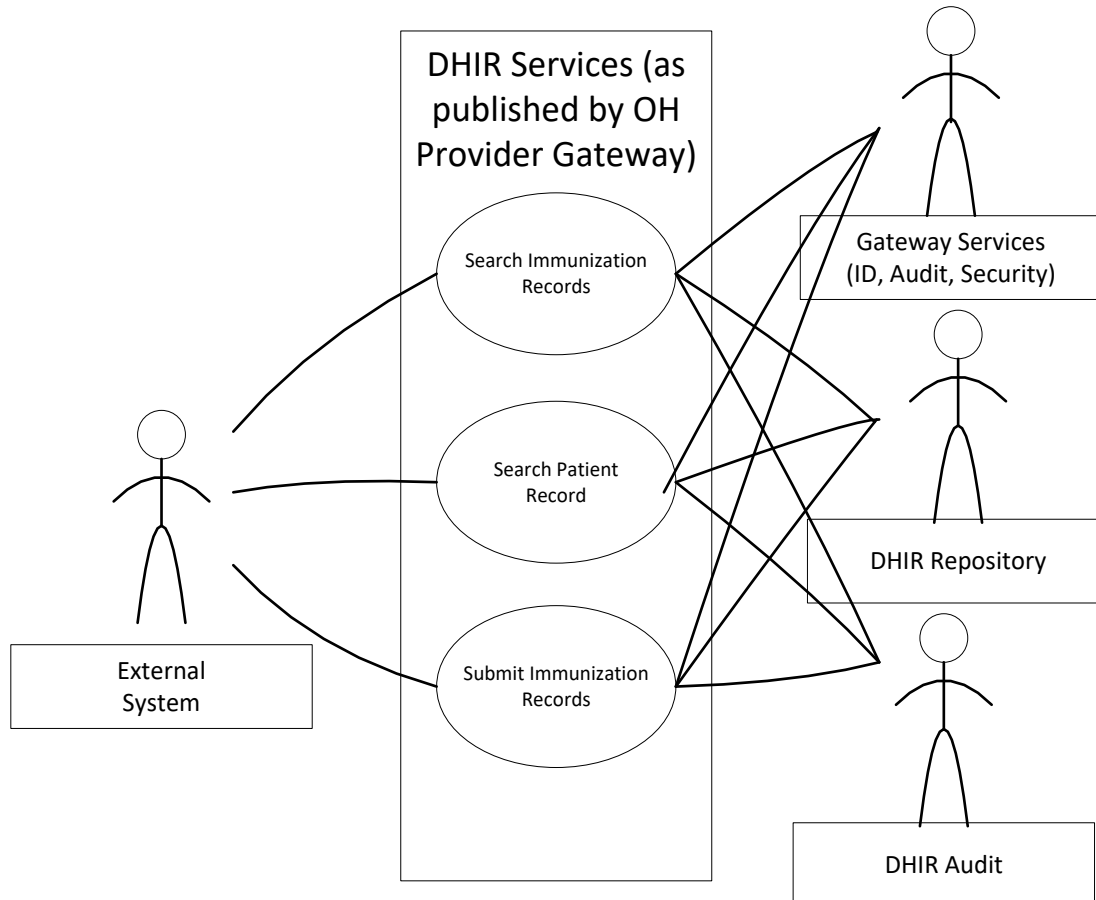
Figure 1 Ontario Health Digital Services DHIR Services Use Case Diagram

2.2 Business Scenario Category: Search Immunization

When an access request is made to the DHIR solution for a patient's immunization history, the DHIR solution uniquely identifies the patient based on the supplied patient identifiers, and returns that patient's immunization history and forecast (if requested) to the calling system. The calling system can then use the results to create a digital yellow card for the patient.

2.2.1 Transaction: Search Immunization Query/Response

Immunization Search

The transactions will:

- Allow a client application to search the DHIR solution database for Immunization records matching the search criteria

- Allow the DHIR solution to return an appropriate set of Immunization records along with an ImmunizationRecommendation (forecast) if requested.
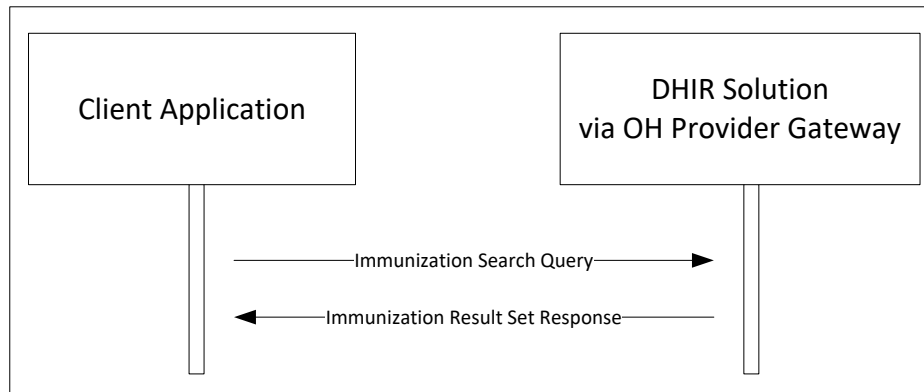
Figure 2 Search Immunization Transaction

2.2.2 Use Case Category: Search Immunization Records (Digital Yellow Card)

This describes the use case category for searching for immunization information, based on a patient's Ontario Immunization ID (OIID) or Ontario Health Number with additional demographics search criteria. OIID is a unique non-sequential 10 characters Client Identifier assigned by DHIR to each patient. Please note that in the current release, OIID and Ontario Health Number are the only patient identifier supported for searches, but in the future releases, multiple identifier types might be allowed as query parameters, e.g. a consuming system might get all identifiers associated with a patient from the Provincial Client Registry or from a local Enterprise Master Patient Index (EMPI) and then search DHIR for all immunizations of a patient using these identifiers.

Search Type: Search by OIID

Scenario Details: The User of the client application requests retrieval of immunization information, using only the OIID as query parameters.

Message Flow:

1. A "GET Immunization" is sent from the client application to the Gateway, containing query criteria in the URL string.

2. DHIR (via the Gateway) responds with the search results, in the form of a FHIR Bundle response.

Alternate Flow of Events:

1. Unable to process the request due to a system-related or business-related issue, the Gateway responds with an HTTP status code, and optionally an OperationOutcome resource.

2. If no Immunization records are found, then the Gateway will return a bundle with zero search results.

3. Search results are blocked by a patient Consent Directive. The response will indicate that an active consent block exists which prevents data from being returned.

Search Type: Search by Ontario Health Number and Date of Birth

Scenario Details: The User of the client application requests retrieval of immunization information, using patient's Ontario Health Number and date of birth as query parameters.

Message Flow:

1. A "GET Immunization" is sent from the client application to the Gateway, containing query criteria in the URL string.

2. DHIR (via the Gateway) responds with the search results, in the form of a FHIR Bundle response.

Alternate Flow of Events:

1. Unable to process the request due to a system-related or business-related issue, the Gateway responds with an HTTP status code, and optionally an OperationOutcome resource.

2. Unable to uniquely identify a patient, the Gateway returns a corresponding error. A user might try to resubmit the request using additional search parameters: Patient's Gender and First and Last Name.

3. If no Immunization records are found, then the Gateway will return a bundle with zero search results.

4. Search results are blocked by a patient Consent Directive. The response will indicate that an active consent block exists which prevents data from being returned.

Search Type: Search by Ontario Health Number, Date of Birth, Gender and First and Last Name

Scenario Details: The User of the client application requests retrieval of immunization information, using patient's Ontario Health Number, date of birth, gender, first and last name as query parameters.

Message Flow:

1. A "GET Immunization" is sent from the client application to the Gateway, containing query criteria in the URL string.

2. DHIR (via the Gateway) responds with the search results, in the form of a FHIR Bundle response.

Alternate Flow of Events:

1. Unable to process the request due to a system-related or business-related issue, the Gateway responds with an HTTP status code, and optionally an OperationOutcome resource.

2. Unable to uniquely identify a patient, the Gateway responds with an HTTP status code, and OperationOutcome resource. A user would need to contact the appropriate Public Health Unit.

3. If no Immunization records are found, then the Gateway will return a bundle with zero search results.

4. Search results are blocked by a patient Consent Directive. The response will indicate that an active consent block exists which prevents data from being returned.

2.3 Business Scenario Category: Search Patient

When an access request is made to the DHIR solution for a patient's record, the DHIR solution uniquely identifies the patient based on the supplied patient identifiers, and returns that patient's demographics record to the calling system.

2.3.1 Transaction: Search Patient Query/Response

Search Patient

Search Patient will fetch a specific Patient record from the DHIR solution database or from the provincial client registry.

The transactions will:

- Allow a client application to request a Patient record to populate demographics information on the screen for submission of immunizations

- Allow the DHIR solution to return the appropriate Patient record
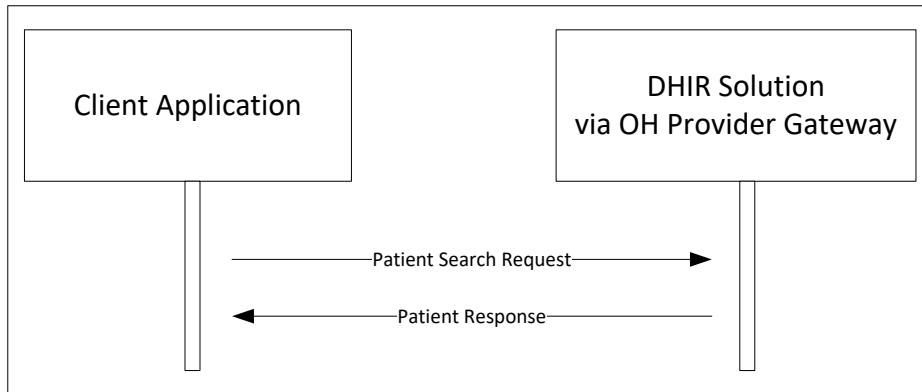
Figure 3 Search Patient Transaction

2.3.2 Use Case Category: Search Patient Record

This describes the use case category for retrieving a patient record, based on the patient's identifier and demographics parameters.

Search Types: Search by OIID

Scenario Details: The User of the client application requests retrieval of patient information, using only the OIID as query parameters.

Message Flow:

1. A "GET Patient" is sent from the client application to the Gateway, containing query criteria in the URL string.

2. DHIR (via the Gateway) responds with the search results, in the form of a FHIR Bundle (with one Patient resource) response.

Alternate Flow of Events:

1. Unable to process the request due to a system-related or business-related issue, the Gateway responds with an HTTP status code, and optionally an OperationOutcome resource.

2. If no Patient record is found, then the Gateway will return a bundle with zero search results.

Search Types: Search by Ontario Health Number and Date of Birth

Scenario Details: The User of the client application requests retrieval of patient information, using patient's Ontario Health Number and date of birth as query parameters.

Message Flow:

1. A "GET Patient" is sent from the client application to the Gateway, containing query criteria in the URL string.

2. DHIR (via the Gateway) responds with the search results, in the form of a FHIR Bundle response.

Alternate Flow of Events:

1. Unable to process the request due to a system-related or business-related issue, the Gateway responds with an HTTP status code, and optionally an OperationOutcome resource.

2. Unable to uniquely identify a patient, the Gateway responds with an HTTP status code, and OperationOutcome resource. A user might try to resubmit the request using additional search parameters: Patient's Gender and First and Last Name.

3. If no Patient record is found, then the Gateway will return a bundle with zero search results.

Search Types: Search by Ontario Health Number, Date of Birth, Gender and First and Last Name

Scenario Details: The User of the client application requests retrieval of patient information, using patient's Ontario Health Number, date of birth, gender, first & last name as query parameters.

Message Flow:

1. A "GET Patient" is sent from the client application to the Gateway, containing query criteria in the URL string.

2. DHIR (via the Gateway) responds with the search results, in the form of a FHIR Bundle response.

Alternate Flow of Events:

1. Unable to process the request due to a system-related or business-related issue, the Gateway responds with an HTTP status code, and optionally an OperationOutcome resource.

2. Unable to uniquely identify a patient, the Gateway responds with an HTTP status code, and OperationOutcome resource. A user will manually populate patient information on the submission screen. A public health employee will match the submission with the appropriate patient in DHIR.

3. If no Patient record is found, then the Gateway will return a bundle with zero search results. A user will manually populate patient information on the submission screen. A public health employee will review the submission and will create a patient record in DHIR if necessary.

2.4 Business Scenario Category: Submit Immunizations

When a patient's immunization information is submitted to DHIR by public (a patient or patient's delegate) or by a clinician, the DHIR solution stores this submission and later presents it to a public health employee, who reviews, clarifies and updates if necessary and uploads the immunization records to the DHIR database.

2.4.1 Transaction: Submit Immunization Records

Submit Immunizations

The transactions will:

▪ Allow a client application to submit Immunization record using "POST $process-message" operation
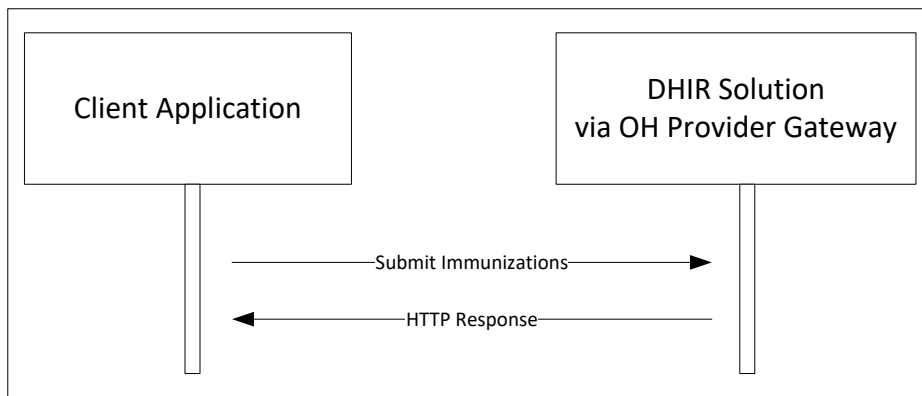
Figure 4 Submit Immunizations

2.4.2 Use Case Category: Submit Immunizations

Scenario Details: The User of the client application submits immunization information to DHIR

Message Flow:

1. A "POST" $process-message is sent from the client application to the Gateway, containing Patient, submitter & Immunization information as part of the Bundle with the MessageHeader being the first resource in the Bundle.

2. The DHIR solution (via the Gateway) returns a HTTP success status (acknowledges receipt of the submission).

Alternate Flow of Events:

1. Unable to process the request due to a system-related or business-related issue, the Gateway responds with an HTTP status code, and optionally an OperationOutcome resource.

3 FHIR Specification

3.1 Introduction

This DHIR FHIR specification defines the FHIR profiles (constraints) and extension elements that are used in the DHIR solution. All FHIR-based specifications rely on an underlying set of base "resources".

Resources

Resources are the building blocks of the FHIR standard. These resources convey the content of clinical records, identify patients or providers, or otherwise support messaging between systems. These resources have been developed by several working groups at HL7, based on members' experience and subject expertise. These resources are intended to capture and support 80% of all implementation use case requirements; projects are encouraged to meet the remaining 20% of requirements through extensions and profile constraints. The list of all available resources in the FHIR standard can be found at https://hl7.org/fhir/resourcelist.html, with additional details at https://hl7.org/fhir/resourceguide.html.

Profiles

Resources defined in the FHIR standard are intended to support a wide variety of use cases, resulting in a large number of available elements, and very few constraints. Implementers are encouraged to create and apply FHIR Profiles, which places constraints on the defined FHIR resources – tightening cardinality, identifying unused/unsupported elements, defining value sets for elements, and adding extension elements.

Transmission Specification

The formal MIME-type for FHIR resources is application/fhir+json or application/fhir+xml. The correct mime type SHALL be used by clients and servers:

- JSON (preferred): application/fhir+json

- XML (optional): application/fhir+xml

FHIR uses UTF-8 for all request and response bodies. Since the HTTP specification defines a default character encoding of ISO-8859-1, requests and responses SHALL explicitly set the character encoding to UTF-8 using the charset parameter of the MIME-type in the Content-Type header. Requests MAY also specify this charset parameter in the Accept header and/or use the Accept-Charset header.

Accept-Language field in HTTP header will be used to set the language of the search in the future releases. The allowed values are "en-CA" and "fr-CA". If this field is not set by the requestor, the default is "en-CA". In the current release, only "en-CA" is supported.

3.2 HL7.org FHIR Alignment

This DHIR FHIR specification is based on the draft FHIR R4.

Implementers should be aware of the stability of the FHIR standard, and that the DHIR may be subject to change to remain aligned with the international published FHIR standard.

3.3 Resource Types

The DHIR solution implements a subset of all FHIR resources. For a complete list of FHIR resources, visit http://www.hl7.org/fhir/R4/resourcelist.html Resources related to DHIR are listed below, with their corresponding

maturity levels in parentheses. The maturity level reflects the number of tested implementations for a resource, and provides implements with an indication of its stability. The FHIR Maturity Model (FMM) gives values from zero to five, with FMM-zero as draft status and FMM-five having greater than five production implementations. The definitions for each FMM level are abbreviated in the table below, and fully defined in Appendix C. Additional details on the FHIR Maturity Model are available at http://www.hl7.org/fhir/R4/versions.html#maturity.

Table 4 Identifier Variables

FMM Level	FMM Definition
FMM0	This level is synonymous with Draft
FMM1	The responsible WG consider the artifact substantially complete and ready for implementation
FMM2	The artifact has been successfully exchanged between at least three independently developed systems leveraging at least 80% of the core data elements
FMM3	The artifact meets Conformance Resource Quality Guidelines; has been subject to formal balloting; has 10+ distinct implementer comments from 3+ organizations resulting in at least one substantive change
FMM4	The artifact has been tested across its scope, formally published (Trial-Use), and implemented in multiple prototype projects
FMM5	The artifact has been formally published twice and has been implemented in 5+ independent production systems in more than one country
Normative	The artifact is now considered stable

The following resources are needed for the DHIR solution:

- Infrastructure Resources:

    - Resource (Normative)

    - DomainResource (Normative)

    - Bundle (Normative)

    - OperationOutcome (Normative)

- Clinical and Identification Resources:

    - Immunization (FMM3)

    - Patient (Normative)

    - ImmunizationRecommendation (FMM1)

    - Practitioner (FMM3)

    - Organization (FMM3)

    - MessageHeader (FMM4)

The DHIR solution uses DHIR FHIR profiles to constrain value sets and cardinality of data elements in the resources listed above. Where FHIR R4 does not support requirements for DHIR, extensions will be introduced.

3.4 Summary of Supported Resource Operations

The table below shows the allowed transactions on FHIR resources and their corresponding HTTP operations:

Table 5 DHIR FHIR HTTP Operations

Resource	Transaction	HTTP Verb	URL	Content Type	Request Body	Response Body	Document Sections
Immunization	search	GET	[base]/Immunization{?[parameters]}		None	Bundle	4.5
Immunization	search (alternative to GET)	POST	[base]/Immunization/_search	application/x-www-form-urlencoded	Form data	Bundle	4.5
Patient	search	GET	[base]/Patient{?[parameters]}		None	Bundle	4.5, 4.6
Patient	search (alternative to GET)	POST	[base]/Patient/_search	application/x-www-form-urlencoded	Form data	Bundle	4. 5, 4.6
Process Message operation	message	POST	[base]/$process-message		Bundle (Message)	None	4.4

See Appendix A for the full list of HTTP response codes.

3.5 Search Immunizations (Get Digital Yellow Card) & Patient Lookup

This interaction searches a set of resources based on some filter criteria. The interaction can be performed by using either GET or POST HTTP commands.

```
GET [base]/[type]{?[parameters]{&_format=[mime-type]}}
```

This searches all resources of a particular type using the criteria represented in the parameters.

Because of the way that some user agents and proxies treat GET and POST requests, in addition to the GET based search method above, DHIR also supports a POST based search:

```
POST [base]/[type]/_search{?_format=[mime-type]}
Content-Type: application/x-www-form-urlencoded
param1=value&param2=value
```

Due to restrictions in the Ontario Health Provider Gateway, POST based searches must only have query parameters in the POST body, and not in the query URL.

Note: Supporting GET means that personal health information might appear in search parameters, and therefore in HTTP logs. For this reason, logs should be regarded as being as sensitive as the resources themselves. This is a general requirement irrespective of the use of GET. POST based search is the preferred method.

All these search interactions take a series of parameters that are a series of name=value pairs encoded in the URL (or as an application/x-www-form-urlencoded submission for a POST).

The AND search operator allows any combination of parameter expressions using "&", and will create a valid search expression. For example:

```
GET [base]/Patient?identifier=[id-system-global-base]/ca-on-patient-hcn|12345678&birthdate=2007-11-22&
gender=female&family=Doe&given=Jane&_format=application/fhir+json
```

If the search fails (i.e., cannot be executed, as opposed to not finding a match), the return value is a status code 4xx or 5xx with an OperationOutcome. If the search succeeds, DHIR returns a 200 OK HTTP status code and the return content is a Bundle with type = searchset containing the results of the search as a collection of resources in a defined order. The server may also return an OperationOutcome resource within the searchset Bundle entries that contains additional information about the search.

The DHIR does not implement all FHIR search capabilities as they are not needed for this solution. For more information about FHIR search capabilities refer to this page: https://www.hl7.org/fhir/search.html.

3.5.1 Search Parameter Types

Each search parameter is defined by a type that specifies how the search parameter behaves. These are the defined parameter types:

Table 6 General FHIR Search Parameters

Parameter Type	Description	Parameter Expression Structure	Example
number	Search parameter SHALL be a number (a whole number, or a decimal).	parameter =[comparator][number]	length=27// equal to 27 length=27,28//equal to 27 or 28 length=lt27// less than 27 length=le27.6 length=gt27
date	Search parameter is on a date/time. The date format is the standard XML format.	parameter =[comparator][date]	birthdate=2010-10-01 birthdate=gt2010-10-01
string	Search parameter is a simple string, like a name part. Search is case-insensitive and accent-insensitive. May match just the start of a string. String parameters may contain spaces.	parameter=[value]	name=john name=john,jack//john or jack
token	Search parameter on a coded element or identifier. May be used to search through the text, displayname, code and code/codesystem (for codes) and label, system and key (for identifier). Its value is either a string or a pair of namespace and value, separated by a "|", depending on the modifier used.	parameter=[system]|[code]	reference=www.url.com|123
reference	Search parameter on a reference element. Allows identification of resources where a referenced resource matches the query ID. Not used in the current release	parameter=[type]/[id]	requester=practitioner/123

3.5.2 Parameter Prefixes & Modifiers

For the ordered parameter types of **number**, **date**, and **quantity**, a prefix to the parameter value may be used to control the nature of the matching. To avoid URL escaping and visual confusion, the following prefixes are used:

Table 7 FHIR Search Numeric Parameter Modifiers

eq	the value for the parameter in the resource is equal to the provided value	the range of the search value fully contains the range of the target value
gt	the value for the parameter in the resource is greater than the provided value	the range above the search value intersects (i.e. overlaps) with the range of the target value
lt	the value for the parameter in the resource is less than the provided value	the range below the search value intersects (i.e. overlaps) with the range of the target value
ge	the value for the parameter in the resource is greater or equal to the provided value	the range above the search value intersects (i.e. overlaps) with the range of the target value, or the range of the search value fully contains the range of the target value
le	the value for the parameter in the resource is less or equal to the provided value	the range below the search value intersects (i.e. overlaps) with the range of the target value or the range of the search value fully contains the range of the target value

If no prefix is present, the prefix eq is assumed.

3.5.3   Server Conformance

In order to allow the client to be confident about what search parameters were used as criteria by the DHIR server, the DHIR server will return the parameters that were actually used to process the search. Applications processing search results SHALL check these returned values where necessary. For example, if the DHIR server did not support some of the filters specified in the search, a client might manually apply those filters to the retrieved result set, display a warning message to the user or take some other action.

In the case of a RESTful search, these parameters are encoded in the self link in the bundle that is returned:

```
  <link>
    <relation value="self"/>
    <url value="[base]/Immunization?patient.identifier=[id-system-local-base]/ca-on-
panorama-immunization-
id|95ZWBKWTC5&_include=Immunization:patient&_include=Immunization:performer&_format=ap
plication/fhir+json"/>
  </link>
```

In other respects, servers have considerable discretion with regards to supporting search:

- Server will declare additional parameter search-id in the profiles referenced from their conformance statements. This search-id will be generated for each search request, logged in audit database along with the search request & search response and returned to the client, who is expected to log this in their audit database too.

- Parameter names and URLs are case-sensitive.

- Server will choose how to sort the return results. In the current release, the _sort parameter will not be supported.

3.5.4 Supported Search Parameters

- Get Immunization (Get Digital Yellow Card / Patient's Immunizations History)
  - o Search by Patient's Ontario Immunization ID (OIID)
    - ▪ The Ontario Immunization ID is the patient.identifier parameter
    - ▪ Example: patient.identifier=[id-system-local-base]/ca-on-panorama-immunization-id|95ZWBKWTC5
  - o Search by Patient's Ontario Health Number and Date of Birth
    - ▪ The Ontario Health Number is the patient.identifier parameter
    - ▪ All parameters must be included
    - ▪ Example: patient.identifier=[id-system-global-base]/ca-on-patient-hcn|12345678&patient.birthdate=2007-11-22
  - o If Search by Patient's Ontario Health Number and Date of Birth is not able to uniquely identify a patient, then the client application would let a user search by Patient's Ontario Health Number, Date of Birth, Gender and First and Last Name
    - ▪ The Ontario Health Number is the patient.identifier parameter
    - ▪ All parameters must be included
    - ▪ Example: patient.identifier=[id-system-global-base]/ca-on-patient-hcn|12345678&patient.birthdate=2007-11-22&patient.gender=male&patient.family=PatienttLastName&patient.given=PatientFirstName
  - o Optional Immunization Date parameter: date
    - ▪ Example 1: date=gt2017-02-24
    - ▪ Example 2: date=ge2017-02-25&date=le2018-02-27T08:04:03.817-05:00
  - o Optional Immunization Last Updated Date parameter: lastUpdated
    - ▪ Example 1: lastUpdated=gt2017-02-24T08:04:03.817-05:00
    - ▪ Example 2: lastUpdated=ge2017-02-25T08:04:03.817-05:00&lastUpdated=le2018-02-27T08:04:03.817-05:00

  Resources to be included in the bundle (optional)

  - ▪ Request to include Patient resource
    - • Example: _include=Immunization:patient
  - ▪ Request to include Practitioner resource (performer of immunization)
    - • Example: _include=Immunization:performer
  - ▪ Request to include ImmunizationRecommendation resource
    - • Example: _revinclude:recurse=ImmunizationRecommendation:patient
    - • ImmunizationRecommendation resource will include zero or more recommendations
- Get Patient. Prior to filling the immunizations submission form, the client application might let a user run "Get Patient" lookup to get patient's information form DHIR prepopulated on the submission form. If the patient information is not found, a user would be expected to fill patient information or get it pre-poluated from the EMR. A Public Health reviewer of DHIR would confirm whether a new patient needs to be created in DHIR or matches to an existing patient.
  - o Search by Patient's Ontario Immunization ID
    - ▪ The Ontario Immunization ID is the identifier parameter
    - ▪ Example: identifier=[id-system-local-base]/ca-on-panorama-immunization-id|95ZWBKWTC5
  - o Search by Patient's Ontario Health Number and Date of Birth
    - ▪ The Ontario Health Number is the identifier parameter
    - ▪ All parameters must be included
    - ▪ Example: identifier=[id-system-global-base]/ca-on-patient-hcn|12345678&birthdate=2007-11-22
  - o If Search by Patient's Ontario Health Number and Date of Birth is not able to uniquely identify a patient, then the client application would let a user search by Patient's Ontario Health Number, Date of Birth, Gender and First and Last Name
    - ▪ The Ontario Health Number is the identifier parameter
    - ▪ All parameters must be included
    - ▪ Example: identifier=[id-system-global-base]/ca-on-patient-hcn|12345678&birthdate=2007-11-22&gender=female&family=PatientLastName&given=PatientFirstName

- In the future releases, server might generate and return an additional parameter search-id as per Server Conformance section above.
  - Example: search-id=76395924-28c2-4cb1-93c1-608fb6eea979
- Returned Immunization records will be returned in a chronological order (by immunization date ascending)
- Format: JSON (default) or XML
  - format=[mime-type]: _format=application/fhir+json or _format=application/fhir+xml

3.5.4.1 Search Examples

3.5.4.1.1 Search Immunizations

GET [base]/Immunization?patient.identifier=[id-system-local-base]/ca-on-panorama-immunization-id|95ZWBKWTC5&_include=Immunization:patient&_include=Immunization:performer&_revinclude:recurse=ImmunizationRecommendation:patient&_format=application/fhir+json

GET [base]/Immunization?patient.identifier=[id-system-local-base]/ca-on-panorama-immunization-id|95ZWBKWTC5&date=ge2017-02-25T08:04:03.817-05:00&date=le2018-02-27&lastUpdated=ge2017-02-25T08:04:03.817-05:00&lastUpdated=le2018-02-27T08:04:03.817-05:00&_include=Immunization:patient&_include=Immunization:performer&_revinclude:recurse=ImmunizationRecommendation:patient&_format=application/fhir+json

3.5.4.1.2 Search Immunizations using POST

POST [base]/Immunization/_search?_format=application/fhir+json

Content-Type: application/x-www-form-urlencoded

patient.identifier=[id-system-local-base]/ca-on-panorama-immunization-id|95ZWBKWTC5&_include=Immunization:patient&_include=Immunization:performer&_revinclude:recurse=ImmunizationRecommendation:patient

3.5.4.1.3 Search Patient

GET [base]/Patient?identifier=[id-system-local-base]/ca-on-panorama-immunization-id|95ZWBKWTC5&_format=application/fhir+json

GET [base]/Patient?identifier=[id-system-global-base]/ca-on-patient-hcn|12345678&birthdate=2007-11-22&gender=female&family=Doe&given=Jane&_format=application/fhir+json

3.5.4.1.4 Search Patient using POST

POST [base]/Patient/_search?_format=application/fhir+json

Content-Type: application/x-www-form-urlencoded

identifier=[id-system-global-base]/ca-on-patient-hcn|12345678&birthdate=2007-11-22&gender=female&family=Doe&given=Jane

3.6 Submit Immunizations

3.6.1 Submission of Immunizations ($process-message)

The simplest way to handle messages where there are also RESTful interactions occurring is to use the $process-message. This operation accepts a message, processes it according to the definition of the event in the message header, and returns one or more response messages.

When processing messages, a server may return one of several status codes:

- **200 OK**: Indicates that the message has been fully processed. If an application-level response is expected for the submitted message, that response is returned as the body of the 200 response.

- **201 Created**: Indicates that the message has been fully processed.

- **202 Accepted**: Indicates that the receiving system has accepted custody of the message

- **204 No Content**: Indicates that the message has been fully processed and would normally have had an application-level response, but because of instructions from the sender (e.g. the messageheader-response-request extension), no response is being provided

- **300+**: Indicates that the message was not successfully processed. The server MAY return an OperationOutcome with additional information, and does so if the response code is 400 or greater. The client shall interpret a 4xx response to indicate that there is no point resubmitting the unaltered message, and a 5xx response to indicate an unexpected error occurred on the part of the server, with the implication that it may be appropriate to resubmit the original message. Doing so will not result in a duplicate message response. Repeated failures indicate either a fatal problem with the submission or a problem with the receiving application.

The following rules apply when using $process-message:

- The operation only accepts POST transactions - any other HTTP method will result in an HTTP error

- The request content type submitted is always a Bundle with type "message" containing a Message Header resource as the first resource

- If the response is an error, the body is an OperationOutcome resource with full details

The following rules apply when using the $process-message operation synchronously:

- The URL (http://base/$process-message) has no parameters

- It is an error if the sender POSTs a message that requires multiple response messages

- The server will accept multiple concurrent message submissions and process them correctly (submissions might be processed sequentially internally, but multiple concurrent submissions is not an error in its own right)

Please see http://www.hl7.org/fhir/R4/messaging.html for more details on the HL7 FHIR messaging

4 FHIR Resources

Resources in this section are constrained from FHIR R4. Reminder: the sections below will use the URI variables defined in section 1.5, for maintainability purposes.

Note that some resources may not exist independently and be contained in another resource. Section 4 displays the containments and relationships between resources.

Table 8 shows the allowed transactions on resources in this server.

Table 8 Supported FHIR Operations, by Resource

Resource	Create	Update	Read	Search	Process Message
Immunization	-	-	-	✔	-
Patient	-	-	-	✔	-
ImmunizationRecommendation	-	-	-	-	-
Practitioner	-	-	-	-	-
Organization	-	-	-	-	-
MessageHeader	-	-	-	-	-
Bundle	-	-	-	-	✔
OperationOutcome	-	-	-	-	-

4.1 How to Read this Section

4.1.1 Supported Attributes

Only attributes described in the subsections below will be supported by DHIR in the current release. For some elements, cardinality has a superscripted asterisk symbol to the right, e.g. $0..1^*$: it means that this element has been constrained from "repeating" in the general FHIR spec (e.g. 0..*) to a single instance, but despite this constraint, this element should still be represented as an array in a FHIR JSON message, e.g. "element [{}]".

4.1.2 Format

DHIR will support JSON and XML formats. JSON is the preferred format.

4.1.3 Slicing

One common feature of constraining Structure Definitions is to take an element that may occur more than once (e.g. in a list), and split the list into a series of sublists, each with different restrictions on the elements in the sublist with associated additional meaning. In FHIR, this operation is known as "Slicing" a list. It is common to "slice" a list into sub-lists each containing just one element, effectively putting constraints on each element in the list. This technique can also be used on elements that do not repeat, but that have a choice of data types. A number in the brackets after the element name refers to its slicing number.

4.1.4 Special Case: Missing data

In some cases, implementers may find that they do not have appropriate data for an element with minimum cardinality = 1. In this case, the element must be present, but unless the resource or a profile on it has made the actual value of the primitive data type mandatory, it is possible to provide an extension that explains why the primitive value is not present:

XML

```
<uri>
  <extension url="http://hl7.org/fhir/StructureDefinition/data-absent-reason">
    <valueCode="unknown"/>
  </extension>
</uri>
```

JSON

```
"_uri": {
  "extension": [
    {
      "url": "http://hl7.org/fhir/StructureDefinition/data-absent-reason",
      "valueCode": "unknown"
    }
  ]
}
```

In this example, instead of a value, a data missing code is provided (http://www.hl7.org/fhir/extension-data-absent-reason.html). Note that it is not required that this particular extension is used. This extension is not a modifier extension, because the primitive data type has no value.

It is not valid to create a fictional piece of data for the primitive value, and then to add an extension indicating that the data has been constructed to meet the data rules. This would be both a bad idea, and also a modifier extension, which is not allowed on data types.

4.2 Data Type Notes

4.2.1 Date

A date, or partial date (e.g. just year or year + month) as used in human communication. There is no time zone. Dates SHALL be valid dates. Regex: -?[0-9]{4}(-
(0[1-9]|1[0-2])(-(0[0-9]|[1-2][0-9]|3[0-1]))?)?

Examples: "2017-11-29"; "2017-09-03"

4.2.2 DateTime

A date, date-time or partial date (e.g. just year or year + month) as used in human communication. If hours and minutes are specified, a time zone SHALL be populated. Seconds must be provided due to schema type constraints but may be zero-filled and may be ignored. Dates SHALL be valid dates. The time "24:00" is not allowed.

Regex: -?[0-9]{4}(-(0[1-9]|1[0-2])(-(0[0-9]|[1-2][0-9]|3[0-1])(T([01][0-9]|2[0-3]):[0-5][0-9]:[0-5][0-9](\.[0-9]+)?(Z|(\+|-)((0[0-9]|1[0-3]):[0-5][0-9]|14:00)))?)?)?

Examples: "2017-11-13T14:10:50-04:00"; "2017-07-09T08:04:03.817-05:00"

4.2.3 Time

A time during the day, with no date specified (can be converted to a Duration since midnight). Seconds must be provided due to schema type constraints but may be zero-filled and may be ignored. The time "24:00" is not allowed, and neither is a time zone.

Regex: ([01][0-9]|2[0-3]):[0-5][0-9]:[0-5][0-9](\.[0-9]+)?

Examples: "14:10:50"; "08:04:03.817"

4.2.4 URI

A Uniform Resource Identifier Reference (RFC 3986). Note: URIs are case sensitive. For UUID (urn:uuid:53fefa32-fcbb-4ff8-8a92-55ee120877b7) use all lowercase.

URIs can be absolute or relative, and may have an optional fragment identifier.

4.3 Infrastructure Resources

4.3.1 Resource - Base Resource Definitions

The following elements and properties are defined for all resources.

Table 9 Base Resource Definition

Based on http://hl7.org/fhir/R4/resource.html

Name	Card	Type	Value/Vocab	Description	Comments
id	0..1	id		Logical id of this artifact. Unique ID set by the originating system.	Required to reference a resource within a resource (e.g. Immunization resource references Patient resource by Patient.id)
meta	0..1	Meta		Metadata about the resource	
lastUpdated	0..1	instant		This value changes each time the content of the resource changes	
language	0..1	code	Fixed: "en"	Language of the resource content	ValueSet: http://hl7.org/fhir/ValueSet/languages

4.3.2 DomainResource Resource

Based on http://hl7.org/fhir/R4/domainresource.html

A resource with narrative, extensions, and contained resources

- If a resource is contained in another resource, it SHALL NOT have a meta.versionId or a meta.lastUpdated

- If the resource is contained in another resource, it SHALL be referred to from elsewhere in the resource

- If the resource is contained in another resource, it SHALL NOT contain nested Resources

- If the resource is contained in another resource, it SHALL NOT contain any narrative

Most resources are derived from Domain Resources - so they also can contain text, contained resources, extensions, and data elements specific to the particular domain of the resource.

Table 10 DomainResource Resource Definition

Name	Card	Type	Value/Vocab	Description	Comments
text	0..1	Narrative		Text summary of the resource, for human interpretation	
contained	0..*	Resource		Contained, inline resources	
extension	0..*	Extension		Additional content defined by implementations	
modifierExtension	0..*	Extension		Extensions that cannot be ignored	

4.3.3 Bundle Resource

Based on http://hl7.org/fhir/R4/bundle.html

A special type of resource for collections of resources.

A set of search results (type = "searchset") consists of a series of zero or more entries. Each entry element will contain a resource.

Bundle.total may be used to return the total number of resources that match the search, and that may be returned by following the "next" link.

Table 11 Bundle Resource Definition

Name	Card	Type	Value/Vocab	Description	Comments
type	1..1	code	Fixed: "searchset"	Type of bundle	
timestamp	1..1	instant		When the bundle was assembled	
total	0..1	unsignedInt		The total number of matches	
link	0..*	BackboneElement		Links related to this Bundle	Optional element, might be returned by a server
relation	1..1	string	"self" for the link to the Bundle "next" for the link to the next page		ValueSet: http://www.iana.org/assignments/link-relations/link-relations.xhtml
url	1..1	uri		Reference details for the link	
entry	0..*	BackboneElement		Entry in the bundle - will have a resource, or information	
fullUrl	0..1	uri		Absolute URL for resource (server address, or UUID/OID)	The fullUrl element must be present when a resource is present, and not present otherwise
resource	0..1	Resource		A resource in the bundle	

4.3.4 OperationOutcome Resource

Based on http://hl7.org/fhir/R4/operationoutcome.html

Operation Outcomes are sets of error, warning and information messages that provide detailed information about the outcome of some attempted system operation. They are provided as a direct system response, or component of one, where they provide information about the outcome of the operation.

OperationOutcomes are used in the following circumstances:

- When a RESTful operation fails

- As the response on a validation operation, to provide information about the outcomes

- As part of a message response, usually when the message has not been processed correctly

This resource is not used for reporting clinical or workflow issues associated with a proposed or ongoing action. The resource is not designed to be persisted or referenced from other parts of the workflow.

Table 12 OperationOutcome Resource Definition

Name	Card	Type	Value/Vocab	Description	Comments
issue	1..*	BackboneElement		A single issue associated with the action	
severity	1..1	code	ValueSet: http://hl7.org/fhir/ValueSet/issue-severity		
code	1..1	code	ValueSet: http://hl7.org/fhir/ValueSet/issue-type	Error or warning code	
details	0..1	CodeableConcept		Additional details about the error	
coding	0..1*	Coding		A reference to a code defined by a terminology system	
system	0..1	uri		Identity of the terminology system	
code	0..1	code		Symbol in syntax defined by the system	
display	0..1	string		Representation defined by the system	
text	0..1	string		Plain text representation of the concept	
diagnostics	0..1	string		Additional diagnostic information about the issue	
location	0..*	string		XPath of element(s) related to issue	Deprecated
expression	0..*	string		FHIRPath of element(s) related to issue	

4.3.4.1   Using Operation Outcome Resources

On the RESTful interface, operation outcome resources are only relevant when a level of computable detail is required that is more granular than that provided by the HTTP response codes. This granularity could include:

- more detail about the location of an issue

- the ability to identify multiple distinct issues

- provision of finer error codes that connect to known business failure states

4.3.4.2   Consent Indicator in OperationOutcome

The OperationOutcome resource may be included in the DHIR response bundle, in response to an Immunization search request. This may indicate that there are additional Immunization records available for retrieval, but were not included due to a patient privacy consent directive. The OperationOutcome resource will have the following values:

- severity = warning

- code = suppressed

The code "suppressed" from Value Set http://hl7.org/fhir/valueset-issue-type.html is used in OperationOutcome.issue.code (Required)

Table 13 OperationOutcome ValueSet for Consent Block

Code	Display	Definition
suppressed	Information Suppressed	Some information was not or may not have been returned due to business rules, consent or privacy rules, or access permission constraints. This information may be accessible through alternate processes.

4.3.4.3   Reporting Errors in the HTTP Headers

Server may also need to report errors in the HTTP headers - especially query parameters when processing searches. Errors are reported using a case sensitive location that has two parts, a fixed "http" and the header or query parameter name separated by a ".". Some examples:

Table 14 HTTP Header Parameters.

Location	Description
http.name:exact	A reference to the search parameter "name" with the modifier ":exact"
http.Authorization	A reference to the Authorization header - perhaps to indicate that it is missing, and some form of authentication is required

The full list of errors is provided in Appendix A.

4.4 FHIR Profiles for Immunizations Submission
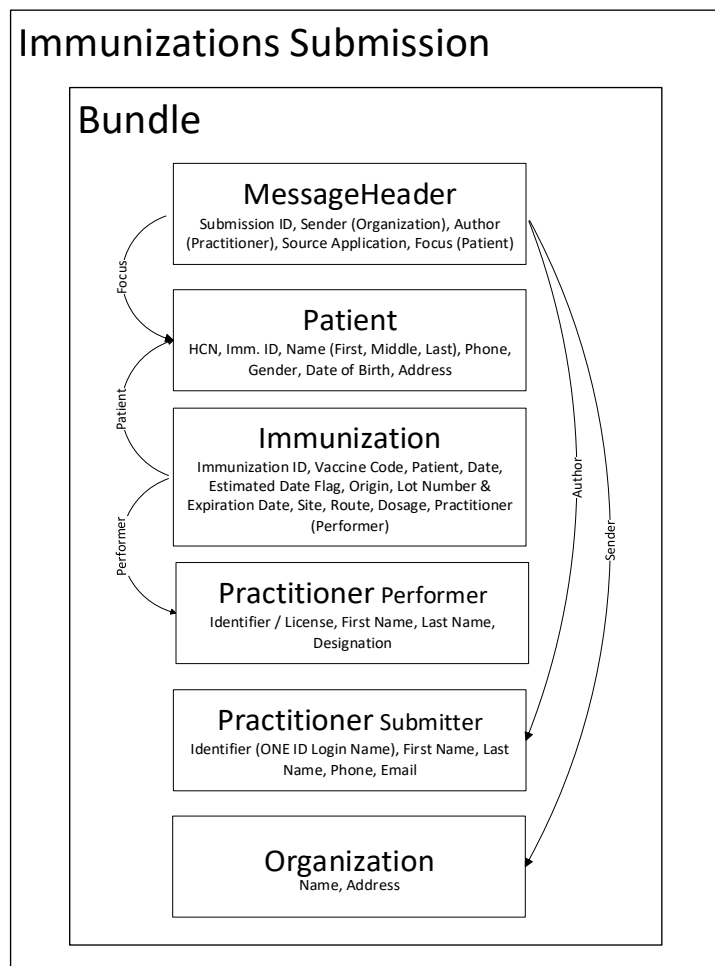
The Immunizations Submission is a Message / Bundle where the first resource is MessageHeader, followed by several other resources: Patient, one or more Immunization resources, Practitioner (one submitter and one or more performers of submitted immunizations) and Organization (the submitter's office/practice). The diagram above illustrates the resources that are referenced by the Bundle resource, which are contained in the DHIR Immunizations submission.

MessageHeader.id is the submission id and Immunization.id is the immunization id, which doesn't change if a message is resent. Bundle.id should be changed to a new value each time a message is sent.

4.4.1 Submission Message Header Profile

ca-on-immunizations-profile-submission-clinician-MessageHeader profile based on http://www.hl7.org/fhir/R4/messageheader.html

Table 15 ca-on-immunizations-profile-submission-clinician-MessageHeader Profile

Name	Card	Type	Value/Vocab	Description	Comments
eventCoding	1..1	Coding		Code for the event this message represents	
system	1..1	uri	Fixed: "http://hl7.org/fhir/message-events"		
code	1..1	code	Fixed: "MedicationAdministration-Recording"		
destination	1..1	BackboneElement		Message destination application	
name	1..1	string	Fixed: "DHIR"	Name of system	
endpoint	1..1	uri	URI of DHIR server	Actual message source address or id	
sender	1..1	Reference(Organization)	Submitter's office/practice	Real world sender of the message	Refer to Submission Organization Profile
reference	1..1	string		Relative, internal or absolute URL reference	
author	1..1	Reference(Practitioner)	URI to Practitioner resource (submitter profile) in the submitted bundle	The logical author of the message	Refer to Submission Submitter Practitioner Profile
reference	1..1	string		Relative, internal or absolute URL reference	
source	1..1	BackboneElement		Message source application	
name	1..1	string	Fixed: "EMR"	Name of system	
software	0..1	string		Name of software running the system	
version	1..1	string		Version of software running	
endpoint	1..1	uri		Actual message source address or id	
focus	1..1	Reference(Patient)	Reference to a Patient resource in the submitted bundle	The actual data of the message - a reference to the root/focus class of the event.	Refer to Submission Patient Profile
reference	1..1	string	Internal URIs to a Patient in the submission	Relative, internal or absolute URL reference	

4.4.2 Submission Immunization Profile

ca-on-immunizations-profile-submission-clinician-Immunization profile based on http://www.hl7.org/FHIR/R4/immunization.html

Table 16 ca-on-immunizations-profile-submission-clinician-Immunization Profile

Name	Card	Type	Value/Vocab	Description	Comments
status	1..1	code	Fixed: "completed"		ValueSet: http://hl7.org/fhir/ValueSet/immunization-status
vaccineCode	1..1	CodeableConcept		Immunizing Agent (Generic) / Trade Name. Vaccine product administered.	
coding	1..1*	Coding	ValueSet: [base-cvc]/ValueSet/Generic or [base-cvc]/ValueSet/Tradename	A reference to a code defined by a terminology system	Either Generic (Immunizing Agent) or Trade Name code of the vaccine
system	1..1	uri	Fixed: "http://snomed.info/sct"	Identity of the terminology system	
version	0..1	string	Fixed: "http://snomed.info/sct/20611000008710 1"	Version of the system	SNOMED-CT Canadian edition
code	1..1	code		Immunizing Agent (Generic) / Trade Name code. Symbol in syntax defined by the system	
display	1..1	string		Representation defined by the system	
patient	1..1	Reference (Patient)		Who was immunized	
reference	1..1	string	Reference to a Patient resource, e.g. "Patient/Patient1"	A reference to a location at which the other resource is found	Refer to Submission Patient Profile
occurrenceDateTime	1..1	dateTime		Vaccine administration date	Although FHIR data type allows for partial dates, DHIR requires year, month and day
_occurrenceDateTime	0..1			Indicates whether the vaccine administration date is estimated	"_occurrenceDateTime" element appears in JSON, not in XML
extension	1..1*	Element			
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-estimated-date"	Identifies the meaning of the extension	
valueBoolean	1..1	boolean	"true" if estimated, "false" if not estimated	Value of extension	
primarySource	1..1	boolean	"true" if immunization was administered by the submitting clinical office, otherwise "false"	An indication that the content of the record originated from the submitting clinical office	

Name	Card	Type	Value/Vocab	Description	Comments
reportOrigin	0..1	CodeableConcept		The source of the data when the report of the immunization event is not based on information from the person who administered the vaccine	Required if primarySource = false
coding	1..1*	Coding	ValueSet: [base-cvc]/ValueSet/RepSource	A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://snomed.info/sct"	Identity of the terminology system	
version	0..1	string	Fixed: "http://snomed.info/sct/20611000087101"	Version of the system	SNOMED-CT Canadian edition
code	1..1	code		Symbol in syntax defined by the system	
display	1..1	string		Representation defined by the system	
lotNumber	0..1	string	CVC: Lots lookup using: [base-cvc]/Medication/{snomedCtid} or [base-cvc]/Medication/{din}	Vaccine lot number	[base-cvc]/Medication/{snomedCtId} or [base-cvc]/Medication/{din} will return a Medication resource. On that Medication resource is an extension with URL [base-cvc]/StructureDefinition/ca-cvc-lots" that contains the list of lot/expiry pairs for that vaccine product. All Medication resources are also available through [base-cvc]/Bundle/CVC.
expirationDate	0..1	date		Vaccine lot expiration date	
site	0..1	CodeableConcept		Body site vaccine was administered	
coding	1..1*	Coding	ValueSet: [base-cvc]/ValueSet/AnatomicalSite	A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://snomed.info/sct"		
version	0..1	string	Fixed: "http://snomed.info/sct/20611000087101"	Version of the system	SNOMED-CT Canadian edition
code	1..1	code		Symbol in syntax defined by the system	
display	1..1	string		Representation defined by the system	
text	0..1	string		Plain text representation of the concept	
route	0..1	CodeableConcept		How vaccine entered body	

Name	Card	Type	Value/Vocab	Description	Comments
coding	1..1*	Coding	ValueSet: [base-cvc]/ValueSet/RouteOfAdmin	A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://snomed.info/sct"		
version	0..1	string	Fixed: "http://snomed.info/sct/20611000087101"	Version of the system	SNOMED-CT Canadian edition
code	1..1	code		Symbol in syntax defined by the system	
display	1..1	string		Representation defined by the system	
doseQuantity	0..1	SimpleQuantity		Amount of vaccine administered	
value	1..1	decimal		Numerical value (with implicit precision)	
unit	1..1	string	e.g. "ml" or "mg"	Unit representation	
performer	0..1*	BackboneElement		Who performed event	
function	1..1	CodeableConcept		What type of performance was done	
coding	1..1*	Coding	Value Set: https://www.hl7.org/fhir/valueset-immunization-function.html	A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://terminology.hl7.org/CodeSystem/v2-0443"	Identity of the terminology system	
code	1..1	code	Fixed: "AP"	Symbol in syntax defined by the system	
display	1..1	string	Fixed: "Administering Provider"	Representation defined by the system	
actor	1..1	Reference (Practitioner)		Individual who was performed the event	
reference	1..1	string	Reference to a Practitioner resource, e.g. "Practitioner/PractitionerPerformer"	A reference to a location at which the other resource is found	Refer Submission Performer Practitioner Profile

4.4.3 Submission Patient Profile

ca-on-immunizations-profile-submission-clinician-Patient profile based on http://www.hl7.org/FHIR/R4/patient.html

Table 17 ca-on-immunizations-profile-submission-clinician-Patient Profile

Name	Card	Type	Value/Vocab	Description	Comments
identifier	1..2	Identifier	Sliced element, discriminator: system	An identifier for this patient	
identifier[1] (onHcn)	1..1		Slice 1: onHcn	Ontario health number slice (logical name)	
system	1..1	uri	Fixed: "[id-system-global-base]/ca-on-patient-hcn"	Namespace in which set of possible id values is unique	
value	1..1	string		The portion of the identifier typically displayed to the user and which is unique within the context of the system	
identifier[2] (onImmunizationId)	0..1		Slice 2: onImmunizationId	DHIR immunization identifier slice (logical name)	Unique identifier assigned to DHIR patient
system	1..1	uri	Fixed: "[id-system-local-base]/ca-on-panorama-immunization-id"	Namespace in which set of possible id values is unique	
value	1..1	string		The portion of the identifier typically displayed to the user and which is unique within the context of the system	
name	1..1*	HumanName		A name associated with the patient	
family	1..1	string		Last name	
given	1..2	string	1st repetition: first name, 2nd repetition: middle name	First and middle name	
telecom	0..1*	ContactPoint		A contact detail for the patient	The preferred local phone number
system	1..1	code	Fixed: "phone"	Telecommunications form for contact point	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-system
value	1..1	string	e.g. "+1-416-555-5555", "+1-416-555-5555 ext.123", "416-555-5555", "4165555555"	The actual contact point details	
use	0..1	code	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-use	Use of contact point	
gender	1..1	code	ValueSet: http://hl7.org/fhir/ValueSet/administrative-gender	The gender of the patient used for administrative purposes	

Name	Card	Type	Value/Vocab	Description	Comments
birthDate	1..1	date		The date of birth for the patient	Although FHIR data type allows for partial dates, DHIR requires year, month and day
address	0..1*	Address		Address for the patient	The preferred Ontario address
use	0..1	code	ValueSet: http://hl7.org/fhir/ValueSet/address-use	The use of an address	
line	0..2	string		Street name, number, direction, PO box etc.	
_line	0..1*	string		Address extensions for addresses stored as individual elements in the originating system (alternative to address in line1 / line 2 format)	"_line" element appears only in JSON, not in XML. If "_line" is included, one "line" must also be included, but "line" can be null if a value does not exist (i.e. "line": [null]).
extension	0..9	Element	Sliced element, discriminator: url	Extension element	
extension[1] (StreetNo)	0..1			Street number slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-houseNumber"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[2] (StreetName)	0..1			Street name slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-streetName"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[3] (StreetType)	0..1			Street name type slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-streetNameType"	Identifies the meaning of the extension	

Name	Card	Type	Value/Vocab	Description	Comments
valueString	1..1	string		Value of extension	
extension[4] (StreetDirection)	0..1			Street direction slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-direction"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[5] (UnitNo)	0..1			Unit number slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-unitID"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[6] (PostBox)	0..1			PO box number slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-postBox"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[7] (RuralRoute)	0..1			Rural route slice (logical name)	
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-rural-route"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[8] (Station)	0..1			Station slice (logical name)	
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-station"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[9] (RetailPostalOutlet)	0..1			Retail postal outlet slice (logical name)	
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-retail-postal-office"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
city	1..1	string		Name of city, town etc.	
state	1..1	string		Sub-unit of country (abbreviations ok)	

Name	Card	Type	Value/Vocab	Description	Comments
postalCode	1..1	string		Postal code for area	Regex: ^(?!.*[DFIOQU])[A-VXY][0-9][A-Z] ?[0-9][A-Z][0-9]$

4.4.4 Submission Practitioner Profiles

4.4.4.1 Submission Performer Practitioner Profile

ca-on-immunizations-profile-submission-clinician-Practitioner-performer profile based on http://hl7.org/fhir/R4/practitioner.html

Table 18 ca-on-immunizations-profile-submission-clinician-Practitioner-performer Profile

Name	Card	Type	Value/Vocab	Description	Comments
identifier	0..1*	Identifier		An identifier for the person as this agent. Either identifier or name has to be populated. If both are not known, don't create Practitioner	
system	1..1	uri	URI of a college that issued the license – see Appendix B	Namespace in which set of possible id values is unique	
value	1..1	string	License Number	The portion of the identifier typically displayed to the user and which is unique within the context of the system	
name	0..1*	HumanName		The name associated with the practitioner. Either identifier or name has to be populated. If both are not known, don't create Practitioner	
family	0..1	string		Practitioner last name	
given	0..1*	string		Practitioner first name	
qualification	0..1*	BackboneElement		Provider designation. Qualifications obtained by training and certification.	
code	1..1	CodeableConcept		Coded representation of the qualification	
coding	1..1*	Coding		A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "[code-system-local-base]/ca-on-immunizations-practitioner-designation"	Identity of the terminology system	
code	1..1	code	From Appendix E Ontario Healthcare Provider Designation Codes	Symbol in syntax defined by the system	
display	1..1	string		Representation defined by the system	

4.4.4.2 Submission Submitter Practitioner Profile

ca-on-immunizations-profile-submission-clinician-Practitioner-submitter profile based on http://hl7.org/fhir/R4/practitioner.html

Table 19 ca-on-immunizations-profile-submission-clinician-Practitioner-submitter Profile

Name	Card	Type	Value/Vocab	Description	Comments
identifier	1..1*	Identifier		An identifier for the person as this agent	
system	1..1	uri	URI of Ontario Health Digital Services ONE ID identifier – see Appendix B	Namespace in which set of possible id values is unique	
value	1..1	string	ONE ID login name	The portion of the identifier typically displayed to the user and which is unique within the context of the system	
name	1..1*	HumanName		The name associated with the practitioner	
family	1..1	string		Practitioner last name	
given	1..1*	string		Practitioner first name	
telecom	0..2	ContactPoint	Sliced element, discriminator: system		
telecom[1] (telecomPhone)	1..1		Slice 1: telecomPhone	Phone slice (logical name)	
system	1..1	code	Fixed: "phone"	Telecommunications form for contact point	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-system
value	1..1	string	e.g. "+1-416-555-5555", "+1-416-555-5555 ext.123", "416-555-5555", "4165555555"	The actual contact point details	
use	1..1	code	Fixed: "work"	Use of contact point	ValueSet: http://hl7.org/fhir/valueset-contact-point-use.html
telecom[2] (telecomEmail)	0..1		Slice 2: telecomEmail	Email slice (logical name)	
system	1..1	code	Fixed: "email"	Telecommunications form for contact point	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-system
value	1..1	string	e.g. "drbest@clinic.ca"	The actual contact point details	

4.4.5 Submission Organization Profile

ca-on-immunizations-profile-submission-clinician-Organization profile based on http://www.hl7.org/FHIR/R4/organization.html

Table 20 ca-on-immunizations-profile-submission-clinician-Organization Profile

Name	Card	Type	Value/Vocab	Description	Comments
name	1..1	string		Organization name	
address	1..1*	Address		Address for the organization	
line	0..2	string		Street name, number, direction, PO box etc.	
city	0..1	string		Name of city, town etc.	
state	0..1	string		Sub-unit of country (abbreviations ok)	
postalCode	1..1	string		Postal code for area	Regex: ^(?!.*[DFIOQU])[A-VXY][0-9][A-Z] ?[0-9][A-Z][0-9]$

4.5 FHIR Profiles for Immunizations Retrieval (Digital Yellow Card)
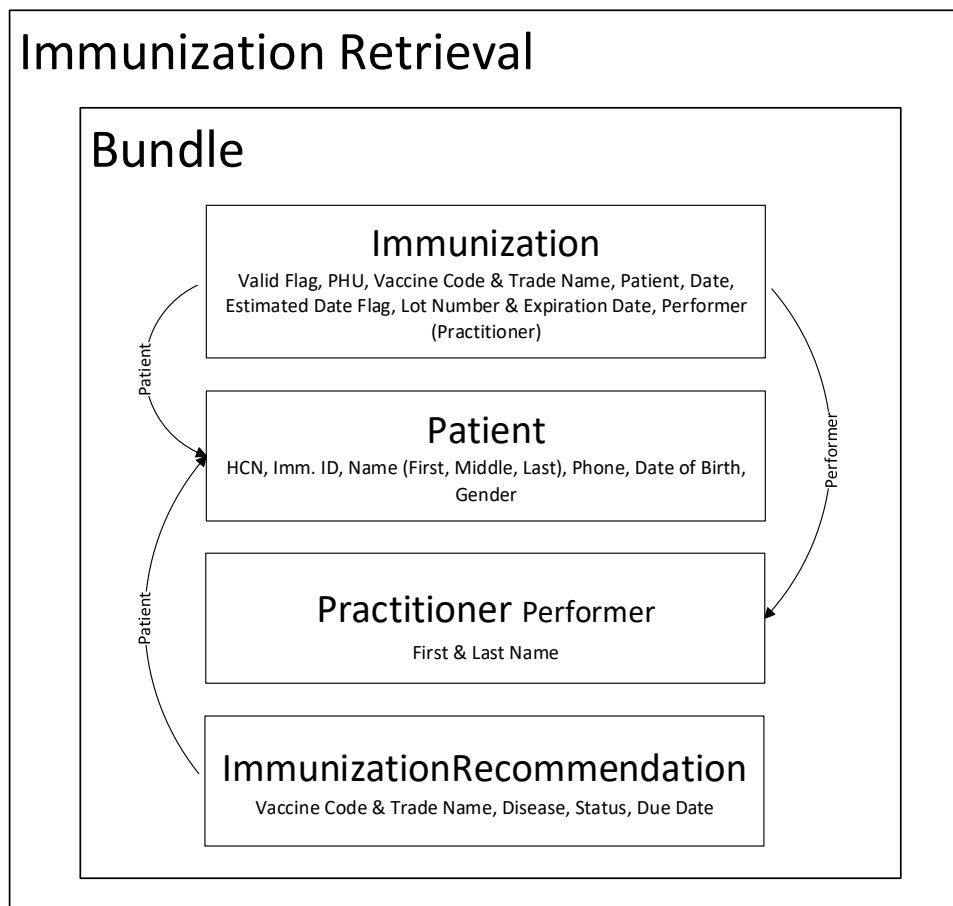
The Immunization Retrieval response (if successful) is a Bundle with one or more Immunization resources, Patient, Practitioner (performers of all immunizations in the bundle) and ImmunizationRecommendation (forecast). The diagram above illustrates the resources that are referenced by the Bundle resource, which are contained in the DHIR Immunizations Retrieval response.

4.5.1 Retrieval Immunization Profile

ca-on-immunizations-profile-retrieval-clinician-Immunization profile based on http://www.hl7.org/fhir/R4/immunization.html

Table 21 ca-on-immunizations-profile-retrieval-clinician-Immunization Profile

Name	Card	Type	Value/Vocab	Description	Comments
extension	1..2	Element	Sliced element, discriminator: url		
extension[1] (immValidFlag)	1..1	Element	Slice1: immValidFlag	Indicates whether immunization is valid based on the forecaster logic	
url	1..1	uri	Fixed: "[base-structure]/ca-on-immunizations-extension-valid-flag"	Identifies the meaning of the extension	
valueBoolean	1..1	boolean	True if valid, false if invalid	Value of extension	
extension[2] (immPHU)	0..1	Element	Slice2: immPHU	PHU that provided the vaccine product for the administered immunization (not historical)	
url	1..1	uri	Fixed: "[base-structure]/ca-on-immunizations-extension-public-health-unit"	Identifies the meaning of the extension	
valueString	1..1	string	Name of a PHU	Value of extension	
status	1..1	code	Fixed: "completed"		ValueSet: http://hl7.org/fhir/ValueSet/immunization-status
vaccineCode	1..1	CodeableConcept		Vaccine product administered	
coding	1..2	Coding	Sliced element, discriminator: code, display	A reference to a code defined by a terminology system	
coding[1] (agent)	1..1		Slice 1: Immunizing Agent (Generic)		
system	1..1	uri	Fixed: "http://snomed.info/sct"	Identity of the terminology system	
version	1..1	string	Fixed: "http://snomed.info/sct/20611000 087101"	Version of the system	SNOMED-CT Canadian edition
code	1..1	code	ValueSet: [base-cvc]/ValueSet/Generic	Immunizing agent / generic vaccine code. Symbol in syntax defined by the system	
display	1..1	string		Immunizing agent (Generic)	
coding[2] (trade)	0..1		Slice 2: Trade Name	Will be included if recorded in the DHIR	
system	0..1	uri	Fixed: "http://snomed.info/sct" if code has a value	Identity of the terminology system	

Name	Card	Type	Value/Vocab	Description	Comments
version	1..1	string	Fixed: "http://snomed.info/sct/20611000 087101" if code has value	Version of the system	SNOMED-CT Canadian edition
code	0..1	code	ValueSet: [base-cvc]/ValueSet/Tradename	Code of vaccine trade name (if known)	
display	1..1	string		Vaccine trade name	
patient	1..1	Reference (Patient)		Who was immunized	
reference	1..1	string	Reference to a Patient resource in the bundle	A reference to a location at which the other resource is found	Refer to Retrieval Patient Profile
occurrenceDateTime	1..1	dateTime		Vaccine administration date	
_occurrenceDateTime	0..1			Indicates whether the date is estimated	"_occurenceDateTime" appears only in JSON, not in XML
extension	1..1*	Element			
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-estimated-date"	Identifies the meaning of the extension	
valueBoolean	1..1	boolean	"true" if estimated, "false" if not estimated	Value of extension	
primarySource	1..1	boolean	"true" if immunization was administered by the immPHU, otherwise "false"	An indication that the content of the record originated from the immPHU	
lotNumber	0..1	string		Vaccine lot number	
expirationDate	0..1	date		Vaccine lot expiration date	
performer	0..1*	BackboneElement		Who performed event	
function	1..1	CodeableConcept		What type of performance was done	
coding	1..1*	Coding	ValueSet: https://www.hl7.org/fhir/valueset-immunization-function.html	A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://terminology.hl7.org/CodeSystem/v2-0443"	Identity of the terminology system	
code	1..1	code	Fixed: "AP"	Symbol in syntax defined by the system	
display	1..1	string	Fixed: "Administering Provider"	Representation defined by the system	
actor	1..1	Reference(Practitioner)		Individual who was performed the event	

Name	Card	Type	Value/Vocab	Description	Comments
reference	1..1	string	Reference to a Practitioner resource in the bundle	A reference to a location at which the other resource is found	Refer to Retrieval Practitioner Profile

4.5.2 Retrieval Patient Profile

ca-on-immunizations-profile-retrieval-clinician-Patient profile based on http://www.hl7.org/fhir/R4/patient.html

Table 22 ca-on-immunizations-profile-retrieval-clinician-Patient Profile

Name	Card	Type	Value/Vocab	Description	Comments
identifier	1..2	Identifier	Sliced element, discriminator: system	An identifier for this patient. Either Ontario health number or Immunization Id has to be supplied.	
identifier[1] (onImmunizationId)	1..1		Slice 1: onImmunizationId	DHIR immunization identifier slice (logical name)	Unique identifier assigned to DHIR patient
system	1..1	uri	Fixed: "[id-system-local-base]/ca-on-panorama-immunization-id"	Namespace in which set of possible id values is unique	
value	1..1	string		The portion of the identifier typically displayed to the user and which is unique within the context of the system	
identifier[2] (onHcn)	0..1		Slice 2: OnHcn	Ontario health number slice (logical name)	
system	1..1	uri	Fixed: "[id-system-global-base]/ca-on-patient-hcn"	Namespace in which set of possible id values is unique	
value	1..1	string		The portion of the identifier typically displayed to the user and which is unique within the context of the system	
name	1..1*	HumanName		A name associated with the patient	
family	1..1	string		Last name	
given	1..2	string	1st repetition: first name, 2nd repetition: middle name	First and middle name	
telecom	0..1*	ContactPoint		A contact detail for the patient	
system	1..1	code	Fixed: "phone"	Telecommunications form for contact point	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-system
value	1..1	string	e.g. "+1-416-555-5555" or "+1-416-555-5555 ext. 123"	The actual contact point details	

Name	Card	Type	Value/Vocab	Description	Comments
use	1..1	code	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-use	Use of contact point	
gender	1..1	code	ValueSet: http://hl7.org/fhir/ValueSet/administrative-gender	The gender of the patient used for administrative purposes	
birthDate	1..1	date		The date of birth for the patient	

4.5.3 Retrieval Practitioner Profile

ca-on-immunizations-profile-retrieval-clinician-Practitioner profile based on http://hl7.org/fhir/R4/practitioner.html

Table 23 ca-on-immunizations-profile-retrieval-clinician-Practitioner Profile

Name	Card	Type	Value/Vocab	Description	Comments
name	0..1*	HumanName		The name associated with the practitioner	
family	0..1	string		Practitioner last name	
given	0..1*	string		Practitioner first name	

4.5.4 Retrieval ImmunizationRecommendation Profile

ca-on-immunizations-profile-retrieval-clinician-ImmunizationRecommendation profile based on http://www.hl7.org/fhir/R4/immunizationRecommendation.html

The immunization recommendation is based on the Ontario's Routine Immunization Schedule and the Canadian Immunization Guide. vaccineCode is only returned for the recommendation(s) with a past due date. targetDisease is returned for all recommendation(s) with any due date. The information contained in the resource is intended to support clinical decisions, but clinical judgement is *always* required. It is possible that zero recommendations are returned if the patient has allergies, contraindications and/or exemptions that prevent the administration of an immunization.

Table 24 ca-on-immunizations-profile-retrieval-clinician-ImmunizationRecommendation Profile

Name	Card	Type	Value/Vocab	Description	Comments
patient	1..1	Reference (Patient)		Who this profile is for	
reference	1..1	string	Reference to a Patient resource in the bundle	A reference to a location at which the other resource is found	
date	1..1	dateTime		Date recommendation(s) created	
recommendation	0..*	BackboneElement		Vaccine administration recommendations	Either vaccineCode or targetDisease will be present for each

Name	Card	Type	Value/Vocab	Description	Comments
					recommendation, but not both
vaccineCode	0..1*	CodeableConcept		Vaccine recommendation applies to	
coding	1..2	Coding	Sliced element, discriminator: code, display	A reference to a code defined by a terminology system	
coding[1] (agent)	1..1		Slice 1: Immunizing Agent		
system	1..1	uri	Fixed: "http://snomed.info/sct"	Identity of the terminology system	
version	1..1	string	Fixed: "http://snomed.info/sct/20611000087101"	Version of the system	SNOMED-CT Canadian edition
code	1..1	code	ValueSet: [base-cvc]/ValueSet/Generic	Immunizing Agent (Generic) code. Symbol in syntax defined by the system.	
display	1..1	string		Immunizing agent (Generic)	
coding[2] (trade)	0..1		Slice 2: Trade Name		
system	0..1	uri	Fixed: "http://snomed.info/sct" if code has a value	Identity of the terminology system	
version	1..1	string	Fixed: "http://snomed.info/sct/20611000087101"	Version of the system	SNOMED-CT Canadian edition
code	0..1	code	ValueSet: [base-cvc]/ValueSet/Tradename	Code of vaccine trade name (if known)	
display	1..1	string		Vaccine trade name	
targetDisease	0..1	CodeableConcept		Disease to be immunized against	
coding	1..1	Coding	ValueSet: [base-cvc]/ValueSet/Disease	A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://snomed.info/sct"	Identity of the terminology system	
version	1..1	string	Fixed: "http://snomed.info/sct/20611000087101"	Version of the system	SNOMED-CT Canadian edition
code	1..1	code		Disease code. Symbol in syntax defined by the system.	
display	1..1	string		Representation defined by the system	
forecastStatus	1..1	CodeableConcept		Vaccine recommendation status	"Eligible": Patient is immunologically able to receive the immunization, but is not yet due
coding	1..1	Coding	ValueSet: [base-cvc]/ValueSet/ForecastStatus	A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://snomed.info/sct"	Identity of the terminology system	

Name	Card	Type	Value/Vocab	Description	Comments
version	1..1	string	Fixed: "http://snomed.info/sct/206110000 87101"	Version of the system	"Due": Patient is due for the immunization
code	1..1	code		Symbol in syntax defined by the system	"Overdue": Patient is overdue for the immunization
display	1..1	string		Representation defined by the system	"Up to Date": The patient is not required to and should not receive the immunization at this time
dateCriterion	1..1	BackboneElement		Dates governing proposed immunization	
code	1..1	CodeableConcept		Type of date.	
coding	1..1	Coding		A reference to a code defined by a terminology system	
system	1..1	uri	Fixed: "http://loinc.org"	Identity of the terminology system	
code	1..1	code	Fixed: "30980-7"	Symbol in syntax defined by the system	
display	1..1	string	Fixed: "Date vaccine due"	Representation defined by the system	
value	1..1	dateTime		Recommended date	

4.6 FHIR Profiles for Patient Lookup

4.6.1 Patient Lookup Profile

ca-on-immunizations-profile-lookup-clinician-Patient profile based on http://www.hl7.org/fhir/R4/patient.html

Table 25 ca-on-immunizations-profile-lookup-clinician-Patient Profile

Name	Card	Type	Value/Vocab	Description	Comments
identifier	1..2	Identifier	Sliced element, discriminator: system	An identifier for this patient. Either Ontario health number or Immunization Id or both will be returned.	
identifier[1] (onImmunizationId)	0..1		Slice 1: onImmunizationId	Panorama immunization identifier slice (logical name)	
system	1..1	uri	Fixed: "[id-system-local-base]/ca-on-panorama-immunization-id"	Namespace in which set of possible id values is unique	
value	1..1	string		The portion of the identifier typically displayed to the user and which is	

Name	Card	Type	Value/Vocab	Description	Comments
				unique within the context of the system	
identifier[2] (onHcn)	0..1		Slice 2: OnHcn	Ontario health number slice (logical name)	
system	1..1	uri	Fixed: "[id-system-global-base]/ca-on-patient-hcn"	Namespace in which set of possible id values is unique	
value	1..1	string		The portion of the identifier typically displayed to the user and which is unique within the context of the system.	
name	1..1*	HumanName		A name associated with the individual	
family	1..1	string		Last name	
given	1..2	string	1st repetition: first name, 2nd repetition: middle name	First and middle name	
telecom	0..1*	ContactPoint		A contact detail for the person	
system	1..1	code	Fixed: "phone"	Telecommunications form for contact point	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-system
value	1..1	string	e.g. "416-555-5555" or "(416) 123 4567 ext. 876"	The actual contact point details	
use	1..1	code	ValueSet: http://hl7.org/fhir/ValueSet/contact-point-use	Use of contact point	
gender	1..1	code	ValueSet: http://hl7.org/fhir/ValueSet/administrative-gender	The gender of a person used for administrative purposes	
birthDate	1..1	date		The date of birth for the individual	
address	0..1*	Address		Address for the individual	
use	0..1	code	Fixed: "home".	The use of an address	ValueSet: http://hl7.org/fhir/ValueSet/address-use
line	0..4	string		Street name, number, direction & P.O. Box etc.	
_line	0..1*	string		Address extensions for addresses stored as individual elements in the DHIR (alternative to address in line1 / line 2 format)	"_line" element appears only in JSON, not in XML If "_line" is included, one "line" must also be included, but "line" may be

Name	Card	Type	Value/Vocab	Description	Comments
					null if a value does not exist (i.e. "line": [null]).
extension	0..9	Element	Sliced element, discriminator: url	Extension element	
extension[1] (StreetNo)	0..1			Street number slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-houseNumber"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[2] (StreetName)	0..1			Street name slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-streetName"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[3] (StreetType)	0..1			Street name type slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-streetNameType"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[4] (StreetDirection)	0..1			Street direction slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-direction"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[5] (UnitNo)	0..1			Unit number slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-unitID"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[6] (PostBox)	0..1			PO box number slice (logical name)	
url	1..1	uri	Fixed: "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-postBox"	Identifies the meaning of the extension	

Name	Card	Type	Value/Vocab	Description	Comments
valueString	1..1	string		Value of extension	
extension[7] (RuralRoute)	0..1			Rural route slice (logical name)	
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-rural-route"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[8] (Station)	0..1			Station slice (logical name)	
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-station"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
extension[9] (RetailPostalOutlet)	0..1			Retail postal outlet slice (logical name)	
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-retail-postal-office"	Identifies the meaning of the extension	
valueString	1..1	string		Value of extension	
city	0..1	string		Name of city, town etc.	
state	0..1	string		Sub-unit of country (abbreviations ok)	
postalCode	0..1	string		Postal code for area	

5 FHIR Resource Examples

Reminder: Please note that in the examples below, the FHIR URIs have been replaced by [id-system-global-base] and other similar variables (see Section 1.5: Identifier Policy) for better readability and portability.

5.1 Immunizations Submission Examples

5.1.1 Bundle (Message) Resources Example

This is an example of the Bundle resource (with entries for resources in the message) for submission to DHIR.

```
{
  "resourceType": "Bundle",
  "id": "10bb101f-a121-4264-a920-67be9cb82c74",
  "type": "message",
  "timestamp": "2019-01-04T07:39:34.000-04:00",
  "entry": [
    {
      "resource": {
        "resourceType": "MessageHeader",
        "id": "1cbdfb97-5859-48a4-8301-d54eab818d68",
        …
      }
    },
    {
      "resource": {
        "resourceType": "Patient",
        …
      }
    },
    {
      "resource": {
        "resourceType": "Immunization",
        …
      }
    },
    {
      "resource": {
        "resourceType": "Immunization",
        …
      }
    },
    {
      "resource": {
        "resourceType": "Practitioner",
        …
      }
    },
    {
      "resource": {
        "resourceType": "Organization",
        …
      }
    }
  ]
}
```

5.1.2 MessageHeader Resource Example

This is an example of the MessageHeader resource for submission to DHIR.

```
{
  "resourceType": "MessageHeader",
  "id": "1cbdfb97-5859-48a4-8301-d54eab818d68",
  "eventCoding": {
    "system": "http://hl7.org/fhir/message-events",
    "code": "MedicationAdministration-Recording"
  },
  "destination": [
    {
      "name": "DHIR",
      "endpoint":
"https://wsgateway.prod.ehealthontario.ca/API/FHIR/Immunizations/v4/",
      "receiver": {
        "identifier": {
          "system": "[id-system-local-base]/ca-on-panorama-phu-id",
          "value": "55"
        },
        "display": "Toronto Public Health"
      }
    }
  ],
  "sender": {
    "reference": "Organization/Org1"
  },
  "author": {
    "reference": "Practitioner/PractitionerSubmitter1"
  },
  "source": {
    "name": "EMR",
    "software": "Some EMR",
    "version": "3.1.45.AABB",
    "endpoint": "https://www.someemr1.com/api/fhir"
  },
  "focus": [
    {
      "reference": "Patient/Patient1"
    }
  ]
}
```

5.1.3 Immunization Resources Example

This is an example of the Immunization resource for submission to DHIR.

```
{
  "resourceType": "Immunization",
  "id": "1cbdfb97-5859-48a4-8301-d54eab818d68-Imm01",
  "status": "completed",
  "vaccineCode": {
    "coding": [
      {
        "system": "http://snomed.info/sct",
        "version": "http://snomed.info/sct/20611000087101",
        "code": "61153008",
        "display": "MMR"
      }
```

```json
      ]
    },
    "patient": {
      "reference": "Patient/Patient1"
    },
    "occurrenceDateTime": "2016-02-14T10:22:00-05:00",
    "_occurrenceDateTime": {
      "extension": [
        {
          "url": "[base-structure]/ca-on-extension-estimated-date",
          "valueBoolean": true
        }
      ]
    },
    "primarySource": false,
    "reportOrigin": {
      "coding": [
        {
          "system": "http://snomed.info/sct",
          "version": "http://snomed.info/sct/20611000087101",
          "code": "223366009",
          "display": "Health care provider"
        }
      ]
    },
    "lotNumber": "AAJN11K",
    "expirationDate": "2017-02-15",
    "site": {
      "coding": [
        {
          "system": "http://snomed.info/sct",
          "version": "http://snomed.info/sct/20611000087101",
          "code": "368209003",
          "display": "Right arm"
        }
      ]
    },
    "route": {
      "coding": [
        {
          "system": "http://snomed.info/sct",
          "version": "http://snomed.info/sct/20611000087101",
          "code": "372464004",
          "display": "Intradermal: ID"
        }
      ]
    },
    "doseQuantity": {
      "value": 50,
      "unit": "mg"
    },
    "performer": [
      {
        "function": {
          "coding": [
            {
              "system": "http://terminology.hl7.org/CodeSystem/v2-0443",
              "code": "AP",
              "display": "Administering Provider"
            }
          ]
        },
        "actor": {
```

```
            "reference": "Practitioner/PractitionerPerformer1"
        }
    }]
}
```

5.1.4 Patient Resources Example

This is an example of the Patient resource for submission to DHIR.

```
{
  "resourceType": "Patient",
  "id": "Patient1",
  "identifier": [
    {
      "system": "[id-system-global-base]/ca-on-patient-hcn",
      "value": "9393881587"
    },
    {
      "system": "[id-system-local-base]/ca-on-panorama-immunization-id",
      "value": "95ZWBKWTC5"
    }
  ],
  "name": [
    {
      "family": "Doe",
      "given": [
        "John",
        "W."
      ]
    }
  ],
  "telecom": [
    {
      "system": "phone",
      "value": "416-444-4444",
      "use": "home"
    }
  ],
  "gender": "male",
  "birthDate": "2012-02-14",
  "address": [
    {
      "use": "home",
      "line": [
        "535 Sheppard Avenue West, Unit 1907",
        "RR 66, Station A, RPO 123"
      ],
      "_line": [
        {
          "extension": [
            {
              "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
houseNumber",
              "valueString": "535"
            },
            {
              "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
streetName",
              "valueString": "Sheppard"
            },
            {
```

```
                    "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
streetNameType",
                    "valueString": "Avenue"
                },
                {
                    "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
direction",
                    "valueString": "West"
                },
                {
                    "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
unitID",
                    "valueString": "1907"
                },
                {
                    "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
postBox",
                    "valueString": "1234"
                },
                {
                    "url": "[base-structure]/ca-on-extension-address-rural-route",
                    "valueString": "66"
                },
                {
                    "url": "[base-structure]/ca-on-extension-address-station",
                    "valueString": "A"
                },
                {
                    "url": "[base-structure]/ca-on-extension-address-retail-postal-
office",
                    "valueString": "123"
                }
            ]
        }
    ],
    "city": "Toronto",
    "state": "ON",
    "postalCode": "M3H4X8"
    }
  ]
}
```

5.1.5 Practitioner (Performer) Resources Example

This is an example of the Practitioner (Performer) resource for submission to DHIR.

```
{
  "resourceType": "Practitioner",
  "id": "PractitionerPerformer1",
  "identifier": [
    {
      "system": "[id-system-global-base]/ca-on-license-nurse",
      "value": "8976590"
    }
  ],
  "name": [
    {
      "family": "Onpharmlast",
      "given": [
        "Onpharmfirst"
      ]
    }
```

```
    ],
    "qualification": [
      {
        "code": {
          "coding": [
            {
              "system": "[code-system-local-base]/ca-on-immunizations-practitioner-
designation",
              "code": "RN",
              "display": "Registered Nurse"
            }
          ]
        }
      }
    ]
}
```

5.1.6 Practitioner (Submitter) Resources Example

This is an example of the Practitioner (Submitter) resource for submission to DHIR.

```
{
  "resourceType": "Practitioner",
  "id": "PractitionerSubmitter1",
  "identifier": [
    {
      "system": "[id-system-global-base]/ca-on-provider-oneid",
      "value": "8976590"
    }
  ],
  "name": [
    {
      "family": "Onpharmlast",
      "given": [
        "Onpharmfirst"
      ]
    }
  ],
  "telecom": [
    {
      "system": "phone",
      "value": "416-555-5555",
      "use": "work"
    },
    {
      "system": "email",
      "value": "drbest@clinic.ca"
    }
  ]
}
```

5.1.7 Organization Resources Example

This is an example of the Organization resource for submission to DHIR.

```
{
  "resourceType": "Organization",
  "id": "Org1",
  "name": "Toronto Public Health",
  "address": [
```

```
    {
      "line": [
        "277 Victoria St"
      ],
      "city": "Toronto",
      "state": "ON",
      "postalCode": "M5B2L6"
    }
  ]
}
```

5.2 Immunizations Retrieval Examples

5.2.1 Immunization Resources Example

This is an example of the Immunization resource for retrieval from DHIR.

```
{
  "resourceType": "Immunization",
  "id": "Immunization01",
  "meta": {
    "lastUpdated":"2017-07-25T15:43:54.271-05:00"
  },
  "extension": [
    {
      "url": "[base-structure]/ca-on-immunizations-extension-valid-flag",
      "valueBoolean": true
    },
    {
      "url": "[base-structure]/ca-on-immunizations-extension-public-health-unit",
      "valueString": "Toronto PHU"
    }
  ],
  "status": "completed",
  "vaccineCode": {
    "coding": [
      {
        "system": "http://snomed.info/sct",
        "version": "http://snomed.info/sct/20611000087101",
        "code": "61153008",
        "display": "MMR"
      },
      {
        "system": "http://snomed.info/sct",
        "version": "http://snomed.info/sct/20611000087101",
        "code": "7171000087106",
        "display": "MMR Priorix GSK"
      }
    ]
  },
  "patient": {
    "reference": "Patient/Patient1234"
  },
  "occurrenceDateTime": "2016-02-14T10:22:00-05:00",
  "_occurrenceDateTime": {
    "extension": [
      {
        "url": "[base-structure]/ca-on-extension-estimated-date",
        "valueBoolean": true
      }
    ]
  },
  "primarySource": false,
  "lotNumber": "Some Lot",
  "performer": [
    {
      "function": {
        "coding": [
          {
            "system": "http://terminology.hl7.org/CodeSystem/v2-0443",
            "code": "AP",
            "display": "Administering Provider"
```

```
        }
      ]
    },
    "actor": {
      "reference": "Practitioner/Practitioner1234"
    }
  }]
}
```

5.2.2 Patient Resources Example

This is an example of the Patient resource for retrieval from DHIR.

```
{
  "resourceType": "Patient",
  "id": "Patient1234",
  "identifier": [
    {
      "system": "[id-system-local-base]/ca-on-panorama-immunization-id",
      "value": "95ZWBKWTC5"
    },
    {
      "system": "[id-system-global-base]/ca-on-patient-hcn",
      "value": "9393881587"
    }
  ],
  "name": [
    {
      "family": "Doe",
      "given": [
        "John",
        "W."
      ]
    }
  ],
  "telecom": [
    {
      "system": "phone",
      "value": "+1-416-444-4444",
      "use": "home"
    }
  ],
  "gender": "male",
  "birthDate": "2012-02-14"
}
```

5.2.3 Practitioner Resources Example

This is an example of the Practitioner resource for retrieval from DHIR.

```
{
  "resourceType": "Practitioner",
  "id": "Practitioner1234",
  "name": [
    {
      "family": "Nurse",
      "given": [
        "Best"
      ]
  }]
```

```
}
```

5.2.4 ImmunizationRecommendation Resources Example

This is an example of the ImmunizationRecommendation resource for retrieval from DHIR.

```
{
  "resourceType": "ImmunizationRecommendation",
  "id": "ImmunizationRecommendation01",
  "patient": {
    "reference": "Patient/Patient1234"
  },
  "date": "2016-07-28T11:04:15.817-05:00",
  "recommendation": [
    {
      "vaccineCode": [
        {
          "coding": [
            {
              "system": "http://snomed.info/sct",
              "version": "http://snomed.info/sct/20611000087101",
              "code": "61153008",
              "display": "MMR"
            },
            {
              "system": "http://snomed.info/sct",
              "version": "http://snomed.info/sct/20611000087101",
              "code": "7171000087106",
              "display": "MMR Priorix GSK"
            }
          ]
        }
      ],
      "forecastStatus": {
        "coding": [
          {
            "system": "http://snomed.info/sct",
            "version": "http://snomed.info/sct/20611000087101",
            "code": "171279008",
            "display": "Due"
          }
        ]
      },
      "dateCriterion": [
        {
          "code": {
            "coding": [
              {
                "system": "http://loinc.org",
                "code": "30980-7",
                "display": "Date vaccine due"
              }
            ]
          },
          "value": "2016-07-01"
        }
      ]
    },
    {
      "targetDisease": {
        "coding": [
```

```
            {
              "system": "http://snomed.info/sct",
              "version": "http://snomed.info/sct/20611000087101",
              "code": "14189004",
              "display": "Measles"
            }
          ]
        },
        "forecastStatus": {
          "coding": [
            {
              "system": "http://snomed.info/sct",
              "version": "http://snomed.info/sct/20611000087101",
              "code": "171279008",
              "display": "Due"
            }
          ]
        },
        "dateCriterion": [
          {
            "code": {
              "coding": [
                {
                  "system": " http://loinc.org",
                  "code": "30980-7",
                  "display": " Date vaccine due"
                }
              ]
            },
            "value": "2016-07-01"
          }
        ]
      },
      {
        "targetDisease": {
          "coding": [
            {
              "system": "http://snomed.info/sct",
              "version": "http://snomed.info/sct/20611000087101",
              "code": "36989005",
              "display": "Mumps"
            }
          ]
        },
        "forecastStatus": {
          "coding": [
            {
              "system": "http://snomed.info/sct",
              "version": "http://snomed.info/sct/20611000087101",
              "code": "171279008",
              "display": "Due"
            }
          ]
        },
        "dateCriterion": [
          {
            "code": {
              "coding": [
                {
                  "system": " http://loinc.org",
                  "code": "30980-7",
                  "display": " Date vaccine due"
                }
```

```
            ]
          },
          "value": "2016-07-01"
        }
      ]
    },
    {
      "targetDisease": {
        "coding": [
          {
            "system": "http://snomed.info/sct",
            "version": "http://snomed.info/sct/20611000087101",
            "code": "36653000",
            "display": "Rubella"
          }
        ]
      },
      "forecastStatus": {
        "coding": [
          {
            "system": "http://snomed.info/sct",
            "version": "http://snomed.info/sct/20611000087101",
            "code": "171279008",
            "display": "Due"
          }
        ]
      },
      "dateCriterion": [
        {
          "code": {
            "coding": [
              {
                "system": " http://loinc.org",
                "code": "30980-7",
                "display": " Date vaccine due"
              }
            ]
          },
          "value": "2016-07-01"
        }
      ]
    }
  ]
}
```

5.3 Patient Lookup Examples

5.3.1 Patient Resources Example

This is an example of the Patient resource for retrieval from DHIR.

```
{
  "resourceType": "Patient",
  "id": "Patient1",
  "identifier": [
    {
      "system": "[id-system-local-base]/ca-on-panorama-immunization-id",
      "value": "95ZWBKWTC5"
    },
    {
      "system": "[id-system-global-base]/ca-on-patient-hcn",
      "value": "9393881587"
    },
  ],
  "name": [
    {
      "family": "Doe",
      "given": [
        "John",
        "W."
      ]
    }
  ],
  "telecom": [
    {
      "system": "phone",
      "value": "+1-416-444-4444",
      "use": "home"
    }
  ],
  "gender": "male",
  "birthDate": "2012-02-14",
  "address": [
    {
      "use": "home",
      "line": [
        "535 Sheppard Avenue West, Unit 1907",
        "RR 66, Station A, RPO 123"
      ],
      "_line": [
        {
          "extension": [
            {
              "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
houseNumber",
              "valueString": "535"
            },
            {
              "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
streetName",
              "valueString": "Sheppard"
            },
            {
              "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
streetNameType",
              "valueString": "Avenue"
```

```
                },
                {
                  "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
direction",
                  "valueString": "West"
                },
                {
                  "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
unitID",
                  "valueString": "1907"
                },
                {
                  "url": "http://hl7.org/fhir/StructureDefinition/iso21090-ADXP-
postBox",
                  "valueString": "1234"
                },
                {
                  "url": "[base-structure]/ca-on-extension-address-rural-route",
                  "valueString": "66"
                },
                {
                  "url": "[base-structure]/ca-on-extension-address-station",
                  "valueString": "A"
                },
                {
                  "url": "[base-structure]/ca-on-extension-address-retail-postal-
office",
                  "valueString": "123"
                }
              ]
            }
        ],
        "city": "Toronto",
        "state": "ON",
        "postalCode": "M3H4X8"
      }
    ]
}
```

5.4 OperationOutcome Examples

These are examples of OperationOutcome resources, which will be returned as part of responses from the DHIR server.

5.4.1 OperationOutcome Example — Search Failed

```
{
  "resourceType": "OperationOutcome",
  "id": "searchfail",
  "text": {
    "status": "generated",
    "div": "<div xmlns=\"http://www.w3.org/1999/xhtml>\n<p>Missing required data
element: patient.identifier</p>\n</div>"
  },
  "issue": [
    {
      "severity": "error",
      "code": "required",
      "details": {
        "text": "Missing required data element: patient.identifier"
      },
      "expression": [
        "patient.identifier"
      ]
    }
  ]
}
```

5.4.2 OperationOutcome Example — Consent Block

A note that some information is blocked and additional information might accessible through alternate processes.

```
{
  "resourceType": "OperationOutcome",
  "id": "OperationOutcome1235",
  "issue": [
    {
      "severity": "warning",
      "code": "suppressed",
      "details": {
        "text": "Some information was not or may not have been returned due to
business rules, consent or privacy rules, or access permission constraints. This
information may be accessible through alternate processes."
      }
    }
  ]
}
```

5.5 Bundle Examples (Immunizations Search Response)

5.5.1 Bundle Example – Search Result

This is an example of the Bundle resource, which will be returned as part of responses from the DHIR server.

```
{
  "resourceType": "Bundle",
  "id": "76395924-28c2-4cb1-93c1-608fb6eea979",
  "language": "en",
  "type": "searchset",
  "timestamp": "2019-02-25T15:43:54.271-05:00",
  "total": 11,
  "link": [
    {
      "relation": "self",
      "url": "[base]/Immunization?patient.identifier=[id-system-local-base]/ca-on-
panorama-immunization-id|95ZWBKWTC5&_format=application/fhir+json"
    }
  ],
  "entry": [
    {
      "fullUrl": "[base]/Immunization/9",
      "resource": {
        "resourceType": "Immunization",
        "id": "9",
        …
      }
    },
    {
      "fullUrl": "[base]/Immunization/10",
      "resource": {
        "resourceType": "Immunization",
        "id": "10",
        …
      }
    }
  ]
}
```

5.5.2 Bundle Example – Immunizations Search with Consent Block

This is an example of the Bundle resource, which will be returned as part of responses from the DHIR server when access to the records is blocked by a consent directive.

```
{
  "resourceType": "Bundle",
  "id": "76395924-28c2-4cb1-93c1-608fb6eea979",
  "language": "en",
  "type": "searchset",
  "timestamp": "2019-02-25T15:43:54.271-05:00",
  "total": 0,
  "link": [
    {
      "relation": "self",
      "url": "[base]/Immunization?patient.identifier=[id-system-local-base]/ca-on-
panorama-immunization-id|95ZWBKWTC5&_format=application/fhir+json"
    }
  ],
```

```
  "entry": [
    {
      "fullUrl": "[base]/OperationOutcome/searchblock",
      "resource": {
        "resourceType": "OperationOutcome",
        "id": "searchblock",
        "issue": [
          {
            "severity": "warning",
            "code": "suppressed",
            "details": {
              "text": "Some information was not or may not have been returned due to
business rules, consent or privacy rules, or access permission constraints. This
information may be accessible through alternate processes."
            }
          }
        ]
      }
    }
  ]
}
```

5.5.3 Bundle Example – Patients Search Result

This is an example of the Bundle resource, which will be returned as part of responses from the DHIR server.

```
{
  "resourceType": "Bundle",
  "id": "76395924-28c2-4cb1-93c1-608fb6eea979",
  "language": "en",
  "type": "searchset",
  "timestamp": "2019-02-25T15:43:54.271-05:00",
  "total": 5,
  "link": [
    {
      "relation": "self",
      "url": "[base]/Patient?birthdate=2007-11-
22&gender=female&family=Doe&given=Jane&address-
postalcode=M2M1A1&_format=application/fhir+json"
    }
  ],
  "entry": [
    {
      "fullUrl": "[base]/Patient/9",
      "resource": {
        "resourceType": "Patient",
        "id": "9",
        …
      }
    },
    {
      "fullUrl": "[base]/Parient/10",
      "resource": {
        "resourceType": "Patient",
        "id": "10",
        …
      }
    }
  ]
}
```

Appendix A: HTTP Response Codes

HTTP Response Codes

This specification makes rules about the use of specific HTTP status codes in particular circumstances where the status codes SHALL map to particular states correctly, and only where the correct status code is not obvious. Other HTTP status codes may be used for other states as appropriate, and this particularly includes various authentication related status codes and redirects. Authentication redirects should not be interpreted to change the location of the resource itself.

FHIR defines an OperationOutcome resource that can be used to convey specific detailed processable error information. For a few combinations of interactions and specific return codes, an OperationOutcome is required to be returned as the content of the response. The OperationOutcome may be returned with any HTTP 4xx or 5xx response, but is not required - many of these errors may be generated by generic server frameworks underlying a FHIR server. An HTTP 2xx response code (e.g. 200, 201, 202, etc.) indicates a successful operation.

Gateway HTTP Response Codes

Table 26 Gateway HTTP Response Codes

HTTP End Point	HTTP Verb	Scenario	HTTP Response Code	Notes
DHIR end point	GET & POST	Authorization success	application dependent	Successfully authorized. Copy the code returned from the application.
		Invalid token format	400	Bad Request
		Token information incorrect	401	Unauthorized
		Unauthorized	403	Forbidden
		Unhandled exception	500	Server internal error
	Any other		405	Method not allowed

In all the cases above except for the successful authorization, Gateway will respond with appropriate FHIR response to the client using an OperationOutcome Resource (Ref. http://hl7.org/fhir/R4/operationoutcome.html).

DHIR HTTP Response Codes

Table 27 DHIR HTTP Response Codes

Operation	Validation	HTTP Code	OpOutcome Code	OpOutcome Severity	OperationOutcome.issue.details.text & OperationOutcome.text
GET & POST (Search)	Failed authentication	401	security	error	Authorization is required for the interaction that was attempted
	Rate Limit	429	throttled	error	Too Many Requests
	Unhandled Exception	500	exception	fatal	Internal Error
	Success	200			
	Missing patient identifier parameter	400	required	error	Missing mandatory search parameter: patient identifier
	Invalid patient identifier parameter	400	value	error	Invalid search parameter: patient identifier
	Invalid patient identifier type parameter	400	value	error	Invalid search parameter: patient identifier type
	Missing patient's date of birth parameter	400	required	error	Missing mandatory search parameter: patient's date of birth
	Invalid patient's date of birth parameter	400	value	error	Invalid search parameter: patient's date of birth
	Invalid patient's gender parameter	400	value	error	Invalid search parameter: patient's gender
	Multiple patient records found in Panorama for given search criteria	400	duplicate	error	Duplicate: Multiple patients matching search parameters
	Invalid Request	400	invalid	error	Invalid Request
	Consent block	200	suppressed	warning	Information was not returned due to business rules, consent or privacy rules, or access permission constraints. This information may be accessible through alternate processes.
	No matches	200	not-found	information	Not found: Resource matching search parameters
POST (Submit)	Success	201			
	Missing required data element	422	required	error	Missing required data element: [element-name]
	Invalid value	422	value	error	Invalid value: [element-name]
	Reference not found	422	not-found	error	The reference provided was not found: [reference-link]
	Invalid code	422	code-invalid	error	The code or system could not be understood, or it was not valid in the context of a particular ValueSet.code: [code-system|code]
	Invalid Resource	400	invalid	error	Invalid Resource

IANA Defined HTTP Status Codes

http://www.iana.org/assignments/http-status-codes/http-status-codes.xhtml

The IANA HTTP Status Codes listed below describes HTTP responses that may be processed by the Gateway without accessing the DHIR solution. As a result, OperationOutcome resources would not be returned in these cases.

Table 28 IANA-Defined HTTP Status Codes

Response Code	Description	FHIR Usage Notes
100	Continue	
101	Switching Protocols	
102	Processing	
103-199	Unassigned	
200	OK	
201	Created	
202	Accepted	
203	Non-Authoritative Information	
204	No Content	
205	Reset Content	
206	Partial Content	
207	Multi-Status	
208	Already Reported	
209-225	Unassigned	
226	IM Used	
227-299	Unassigned	
300	Multiple Choices	
301	Moved Permanently	
302	Found	
303	See Other	
304	Not Modified	
305	Use Proxy	
306	(Unused)	
307	Temporary Redirect	
308	Permanent Redirect	
309-399	Unassigned	
400	Bad Request	Resource could not be parsed or failed basic FHIR validation rules (or multiple matches were found for
401	Unauthorized	
402	Payment Required	
403	Forbidden	Authorization is required for the interaction that was attempted
404	Not Found	Resource type not supported, or not a FHIR end-point
405	Method Not Allowed	The resource did not exist prior to the update, and the server does not allow client defined ids
406	Not Acceptable	

Response Code	Description	FHIR Usage Notes
407	Proxy Authentication Required	
408	Request Timeout	
409	Conflict	
410	Gone	
411	Length Required	
412	Precondition Failed	The client's criteria were not selective enough (e.g. multiple matches for Update)
413	Payload Too Large	
414	URI Too Long	
415	Unsupported Media Type	
416	Range Not Satisfiable	
417	Expectation Failed	
418-420	Unassigned	
421	Misdirected Request	
422	Unprocessable Entity	The proposed resource violated applicable FHIR profiles or server business rules. OperationOutcome resource provides additional detail.
423	Locked	
424	Failed Dependency	
425	Unassigned	
426	Upgrade Required	
427	Unassigned	
428	Precondition Required	
429	Too Many Requests	
430	Unassigned	
431	Request Header Fields Too Large	
432-450	Unassigned	
451	Unavailable for Legal Reasons	
452-499	Unassigned	
500	Internal Server Error	
501	Not Implemented	
502	Bad Gateway	
503	Service Unavailable	
504	Gateway Timeout	
505	HTTP Version Not Supported	
506	Variant Also Negotiates	
507	Insufficient Storage	
508	Loop Detected	
509	Unassigned	
510	Not Extended	
511	Network Authentication Required	
512-599	Unassigned	

Appendix B: Ontario Namespace URIs

URI	Type	OID	System
[id-system-global-base]/ca-on-patient-hcn	Patient ID	2.16.840.1.113883.4.59	Ontario, Canada Personal Health Number
[id-system-local-base]/ca-on-panorama-immunization-id	Patient ID		Ontario, Canada Panorama Immunization ID (OIID)
[id-system-global-base]/ca-on-license-physician	Practitioner ID	2.16.840.1.113883.4.347	Ontario, Canada CPSO License Number
[id-system-global-base]/ca-on-license-midwife	Practitioner ID	2.16.840.1.113883.3.239.13.12	College of Midwives of Ontario Licence Number
[id-system-global-base]/ca-on-license-nurse	Practitioner ID	2.16.840.1.113883.3.239.13.15	College of Nurses of Ontario Licence Number
[id-system-global-base]/ca-on-license-pharmacist	Practitioner ID	2.16.840.1.113883.3.239.13.43	Ontario College of Pharmacists Licence Number
[id-system-global-base]/ca-on-provider-upi	Practitioner ID	2.16.840.1.113883.3.239.9	Unique identifier assigned by Ontario Health Digital Services to providers and organizations
[id-system-global-base]/ca-on-provider-oneid	Practitioner ID	2.16.840.1.113883.3.239.35.3.1	Ontario Health Digital Services ONE ID Identity Provider
[id-system-local-base]/ca-on-panorama-phu-id	Organization ID		Ontario, Canada Public Health Unit (PHU) Identifier
http://snomed.info/sct	Code System	2.16.840.1.113883.6.96	SNOMED CT
[code-system-local-base]/ca-on-immunizations-practitioner-designation	Code System		Ontario Healthcare Provider Designation

Appendix C: FHIR Maturity Model

From http://www.hl7.org/fhir/R4/versions.html#maturity

All resources in the FHIR specification are assigned a "Maturity Level", known as FMM (following the well-established CMM grades- Capability Maturity Model).

The FMM level can be used by implementers to judge how advanced - and therefore stable - a resource is. The following FMM levels are defined as follows:

Table 29 FHIR Maturity Model Definition

FMM Level	FMM Definition
FMM0	The resource or profile (artifact) has been published on the current build. This level is synonymous with Draft
FMM1	FMM0 + the artifact produces no warnings during the build process and the responsible WG has indicated that they consider the artifact substantially complete and ready for implementation
FMM2	FMM1 + the artifact has been tested and successfully exchanged between at least three independently developed systems leveraging at least 80% of the core data elements using semi-realistic data and scenarios based on at least one of the declared scopes of the resource (e.g. at a connectathon). These interoperability results must have been reported to and accepted by the FMG
FMM3	FMM2 + the artifact has been verified by the work group as meeting the Conformance Resource Quality Guidelines; has been subject to a round of formal balloting; has at least 10 distinct implementer comments recorded in the tracker drawn from at least 3 organizations resulting in at least one substantive change
FMM4	FMM3 + the artifact has been tested across its scope (see below), published in a formal publication (e.g. Trial-Use), and implemented in multiple prototype projects. As well, the responsible work group agrees the resource is sufficiently stable to require implementer consultation for subsequent non-backward compatible changes.
FMM5	FMM4 + the artifact has been published in two formal publication release cycles at FMM1+ (i.e. Trial-Use level) and has been implemented in at least 5 independent production systems in more than one country
Normative	the artifact is now considered stable

Appendix D: Extensions

Immunization.date Extension ca-on-extension-estimated-date

Name	Card	Type	Value/Vocab	Description
extension	0..1	Extension		Indicates whether the date is estimated
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-estimated-date"	Identifies the meaning of the extension
valueBoolean	1..1	boolean		Value of extension

Immunization Extension ca-on-immunizations-extension-public-health-unit

Name	Card	Type	Value/Vocab	Description
extension	0..1	Extension		Responsible PHU – Public Health Unit
url	1..1	uri	Fixed: "[base-structure]/ca-on-immunizations-extension-public-health-unit"	Identifies the meaning of the extension
valueString	1..1	string		Value of extension

Immunization Extension ca-on-immunizations-extension-valid-flag

Name	Card	Type	Value/Vocab	Description
extension	0..1	Extension		Indicates whether the record is valid
url	1..1	uri	Fixed: "[base-structure]/ca-on-immunizations-extension-valid-flag"	Identifies the meaning of the extension
valueBoolean	1..1	boolean		Value of extension

Patient.address Extension ca-on-extension-address-rural-route

Name	Card	Type	Value/Vocab	Description
extension	0..1	Extension		Rural Route address part
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-rural-route"	Identifies the meaning of the extension
valueString	1..1	string		Value of extension

Patient.address Extension ca-on-extension-address-station

Name	Card	Type	Value/Vocab	Description
extension	0..1	Extension		Station address part
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-station"	Identifies the meaning of the extension
valueString	1..1	string		Value of extension

Patient.address Extension ca-on-extension-address-retail-postal-office

Name	Card	Type	Value/Vocab	Description
extension	0..1	Extension		Retail Postal Office address part
url	1..1	uri	Fixed: "[base-structure]/ca-on-extension-address-retail-postal-office"	Identifies the meaning of the extension
valueString	1..1	string		Value of extension

Appendix E: Additional Codes & Identifiers

Ontario Healthcare Provider Designation Codes

Code System: [code-system-local-base]/ca-on-immunizations-practitioner-designation

Table 30 Ontario Healthcare Provider Designation Codes

Code	Display Name
MD	Medical Doctor
RNP	Nurse Practitioner
RN	Registered Nurse
RPN	Registered Practical Nurse
PHARM	Pharmacist
RM	Registered Midwife
OD	Other Designation

Personal Relationship Codes

Code System: http://terminology.hl7.org/CodeSystem/v3-RoleCode

Table 31 Personal Relationship Codes

Code	Display Name
GUARD	guardian
ONESELF	self

Ontario Public Health Units (PHU) Identifiers

This set of Organization identifiers will be harmonized with the Provincial Provider Registry

System URI: [id-system-local-base]/ca-on-panorama-phu-id

Table 32 Ontario Public Health Units (PHU) Identifiers

ID	Name
6	Grey Bruce Health Unit
9	Huron County Health Unit
11	Oxford County Public Health
12	Simcoe Muskoka District Health Unit
13	Hastings and Prince Edward Counties Health Unit
14	Peel Public Health
15	Brant County Health Unit
16	Leeds, Grenville and Lanark District Health Unit
17	Chatham-Kent Public Health Unit
18	Eastern Ontario Health Unit
19	Wellington-Dufferin-Guelph Public Health
20	Hamilton Public Health Services
21	Northwestern Health Unit
22	Kingston, Frontenac and Lennox & Addington Public Health
23	Middlesex-London Health Unit

ID	Name
24	Timiskaming Health Unit
25	York Region Public Health Services
26	North Bay Parry Sound District Health Unit
27	Halton Region Health Department
28	Ottawa Public Health
29	Renfrew County and District Health Unit
30	Peterborough County-City Health Unit
31	Lambton Public Health
32	Haliburton, Kawartha, Pine Ridge District Health Unit
33	Algoma Public Health Unit
34	Haldimand-Norfolk Health Unit
35	Elgin-St. Thomas Health Unit
36	Perth District Health Unit
40	Sudbury and District Health Unit
41	Niagara Region Public Health Unit
46	Thunder Bay District Health Unit
54	Porcupine Health Unit
55	Toronto Public Health
56	Region of Waterloo, Public Health
57	Durham Region Health Department
58	Windsor-Essex County Health Unit

Appendix F: Integration Traceability

HTTP Header Attributes

The ONE Access Gateway - Provider Integration Specification defines the requirements for connectivity and integration between provider and point-of-service systems with Ontario Health Digital Services EHR assets.

The ONE Access Gateway specification identifies HTTP Header attributes that support integration traceability, in addition to other attributes to support integration requirements such as authentication and authorization. Please contact architecture@ehealthontario.on.ca for additional information on this specification.

In addition to the HTTP Header attributes defined in the ONE Access Gateway, please also include the following HTTP Header attributes required for DHIR Integration:

Table 33 Request Attributes

Attribute Name	Description	Note
x-app-desc	Client application name to be passed by the client application	Fixed value: "EMR"