Patient-oriented APIs and using HealtheIntent data syndication for bulk extraction and delivery

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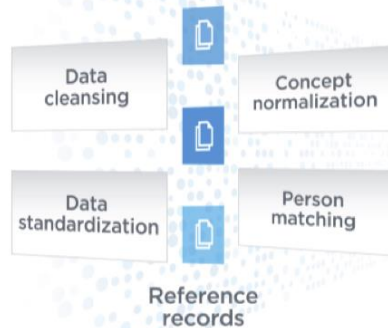*CODE LEARNING LAB 2018*

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10/10/2018

Overview

- Presenter Introductions
- Quick Review of HealtheIntent API Basics
- Patient APIs
  - Patient identification, lookup, and demographics.
  - Conditions, Observations, Immunizations, Allergies, Procedures, Medications, and Risk Assessments
- Patient API Q&A
- Data Syndication
  - Feeds, Channels, Deliveries, and Bundles
  - Longitudinal Record EDW
- Data Syndication Q&A
- Open Lab Plug

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HealtheIntent

Aggregate and normalize

Person | EHR
Payer | Pharmacy
Open data | Care continuum
Device | HIE
Lab | Employee

Data cleansing → Concept normalization
Data standardization → Person matching
Reference records

Create and apply intelligence

Longitudinal record
Populations

LEARNING SYSTEM
IDENTIFY · PREDICT · ATTRIBUTE · ACT · MEASURE
SURVEILLANCE

Act and measure

Longitudinal plan
Analytics
Data Syndication

→ Person
→ Health coach
→ Care manager
→ Home health assistant
→ Clinician
→ Provider
→ Data scientist
→ Executive

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HealtheIntent API Basics Refresher

- Documentation
  - https://docs.healtheintent.com/

- Authorization
  - OAuth 1.0a
  - Bearer Token

- Tenant
  - The technical representation(s) of a client within the HealtheIntent platform.

- Data Partition
  - Typically data partition is one-to-one with a data source, unless the data source is multi-tenant. In the case of multi-tenant, the data partition identifies which tenant contributed to the entity

- Population
  - A set of longitudinal person records on which a client performs population health activities using HealtheIntent capabilities.

- URI Structure
  - https://{client-mnemonic}.api.us.healtheintent.com/{api-name}/{version}
    - https://**cernerdemo**.api.us.healtheintent.com/**allergy**/**v1**/

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Common Models: SourceIdentifier

Field	Type	Description
dataPartitionId	string	The identifier of the source data partition.
id	string	The unique identifier for the entity in the data partition.

"sourceIdentifier":

{

  "dataPartitionId": "99f31909-5b3b-4560-8c83-627828b2c97d",

  "id": "1708574400011"

}

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Common Models: Provider

Field	Type	Description
aliases	[ProviderAlias]	The identifier of the source data partition.
ProviderAlias.system	string	Authority responsible for assigning the identifier.
ProviderAlias.value	string	The value or identifier within the context of the assigning authority.
ProviderAlias.type	string	The type of alias. (DEA, EXTERNAL, NPI, SL, TAX, UPIN)
name	ProviderName	The unique identifier for the entity in the data partition.
ProviderName.given	[string]	A list of given name portions of the provider's name. If a person has a first name and a middle name, the first name should be the first item in the list and the middle name should be the second item in the list.
ProviderName.family	[string]	A list of family (i.e. last) name portions of the provider's name. Some may have multiple family names.
ProviderName.formatted	string	The fully formatted name.

```
"author": {
    "aliases": [
        {
            "value": "1234",
            "type": "DEA",
            "system": "2.16.840.1.113883.4.814"
        }
    ],
    "name": {
        "family": ["Brizendine"],
        "formatted": "Brizendine, Margaret",
        "given": ["Margaret"]
    }
}
```

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Common Models: CodeableConcept

Field	Type	Description
codings	[Code]	A list of codified values from standard code systems recognized by *HealtheIntent*.
sourceCodings	[Code]	The list of codified values provided in the source data. Not all of these codes are available in the codings list. For example, local or proprietary codes are not included on the codings list because they are not recognized by *HealtheIntent*.
text	string	This may be a localized or annotated description of the element provided by a source system or display text associated with one of the codes on the codings or sourceCodings list.

Example:

```
status {
    "sourceCodings": [
        {
            "system": "vendor:allergystatus",
            "code": "1",
            "display": "Active"
        }
    ],
    "codings": [
        {
            "system": "2.16.840.1.113883.6.96", //SNOMED
            "code": "55561003",
            "display": "Active"
        }
    ],
    "text": "Active"
}
```

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Patient ID Lookup - Introduction

- Patients in HealtheIntent are represented by a **HealtheIntent Patient ID**.

- The HealtheIntent Patient ID **is unique** to HealtheIntent.

- The HealtheIntent Patient ID can be retrieved using the **Patient ID Lookup** API endpoint when the Source Person ID is known.

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Patient ID Lookup

- Goal: Retrieve Patient Sally's combined Longitudinal Record data from HealtheIntent.

- In order to ask HealtheIntent about Sally, the Northwest system needs to look up Sally's HealtheIntent Patient ID.

EMR: Northwest   (HealtheIntent Data Partition: **15**)

id	Name	DOB	SSN
5	**Sally**	**Jan 1, 2001**	**111–11–1111**
6	Bob	Sept 9, 1999	999–99–9999

Patient ID Lookup: API Request

- ## Key Request Information
  - ### Tenant mnemonic: acme
  - ### Population id: ef9287
  - ### Data Partition ID: **15**
  - ### Source Person ID: **5**

EMR: Northwest   (HealtheIntent Data Partition: **15**)

```
id    Name           DOB              SSN
5     Sally      Jan  1, 2001      111-11-1111
6     Bob        Sept 9, 1999      999-99-9999
```

- https://**acme**.api.us.healtheintent.com/patient/v1/ populations/**ef9287**/patient-id-lookup?
dataPartitionId = **15** & sourcePersonId = **5**

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Patient ID Lookup: API Response

- HealtheIntent responds by indicating Sally's Patient ID is **1**.

```
{
  "items": [
    {
      "sourcePersonId": "5",
      "patient": {
        "id": "1"
      }
    }
  ]
}
```

EMR: Northwest   (HealtheIntent Data Partition: **15**)

id	Name	DOB	SSN
5	**Sally**	**Jan 1, 2001**	**111-11-1111**
6	Bob	Sept 9, 1999	999-99-9999

HealtheIntent: Enterprise Master Person Index used by population **ef9287**

Patient ID	Data Partition	Source Person ID
1	**15**	**5**
1	25	9

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Patient ID Lookup – Multiple IDs

- More than one person from the same Data Partition can be retrieved at once.

- https://acme.api.us.healtheintent.com/patient/v1/ populations/ef9287/patient-id-lookup?dataPartitionId=15 **&sourcePersonId=5 &sourcePersonId=6**

```
{
  "items": [
    {
      "sourcePersonId": "5",
      "patient": {
        "id": "1"
      }
    },
    {
      "sourcePersonId": "6",
      "patient": {
        "id": "2"
      }
    }
  ]
}
```

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Patient Demographics: Modeling

Field	Type	Description
id	string	An ID that uniquely identifies the demographic record in the context of the patient.
sourceIdentifier	SourceIdentifier	An ID that uniquely identifies this demographic record for a patient in a data partition.
birthDate	String	The date of birth of the patient. In *International Organization for Standardization (ISO)* 8601 formatting with precision ranging from YYYY to YYYY-MM-DD. The date of birth does not designate a time zone.
birthDateTime	String	The birth date time of the patient. In *ISO* 8601 formatting with precision ranging from YYYY-MM-DDThh to YYYY-MM-DDThh:mm:ss.SSS. The birth date time does not designate a time zone.
gender	CodeableConcept	The administrative gender code of the patient. The administrative gender can differ from the patient's clinical sex, preferred gender identity, legal sex, and birth sex.
languages	[CodeableConcept]	A list of languages that a patient can use to communicate.
maritalStatus	CodeableConcept	The marital (civil) status of the patient indicating their relationship to a significant other.
races	[CodeableConcept]	A list of races pertaining to the patient. In the U.S., the constructs of race and ethnicity are largely based on sociopolitical established practice and self-identification as opposed to anthropological or scientific classification.

Patient Demographics: Modeling

Field	Type	Description
ethnicities	[CodeableConcept]	A list of ethnicities pertaining to the patient. In the U.S., the constructs of race and ethnicity are largely based on sociopolitical established practice and self-identification as opposed to anthropological or scientific classification.
dateOfDeath	String	The date time of the patient death. In *ISO* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
deceased	Boolean	Indicates whether a patient is deceased.
causeOfDeath	CodeableConcept	The specific medical event that led to the death of the patient, including specific injuries illnesses, and other similar information.
names	[Name]	A list of patient names. The list may include previous names such as the maiden name.
aliases	[Alias]	A list of IDs for the patient that are intended to facilitate interoperability among systems and commonly and uniquely identify the individual. Aliases are distinguished from source IDs that have meaning only in the context of the source system.
addresses	[Address]	A list of addresses for the patient. This list may include multiple current addresses (for example, work and multiple home addresses) and previous addresses.
telecoms	[Telecom]	A list of contact details for a patient. These contact details may include current or previous email addresses and contact numbers.

Patient Demographics: Modeling

Entity: Name

Field	Type	Description
use	CodeableConcept	The purpose of the name, for example, Maiden or Phonetic.
formatted	String	The name formatted as the source indicates it should be displayed.
givenNames	[String]	An ordered list of given names (first and middle names).
familyNames	[String]	An ordered list of family names.
prefix	String	The parts that come before the name such as Dr., Mr., or Mrs.
suffix	String	The parts that come after the name such as MD, III, or Jr.
effectivePeriod	Period	The period of time when the name is valid for the patient.

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Patient Demographics: Modeling

Entity: Alias

Field	Type	Description
value	String	The ID issued by the assigning authority. The formatting may vary by source or alias type.
type	CodeableConcept	The type of the alias, for example, medical record number (MRN) or National Health Service (NHS).
system	String	The authority responsible for assigning the alias value. Alias values may be unique in each system but not across systems. For example, an MRN with a value of 12345 in one hospital\'s system may represent a different person than MRN 12345 in a different hospital\'s system. HealtheIntent avoids identity collisions by indicating the authority that assigned the alias. Ignoring the assigning authority presents security and data integrity concerns, for example, data being associated with the wrong patient or record.

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Patient Demographics: Modeling

Entity: Address

Field	Type	Description
use	CodeableConcept	The purpose of the address, for example, Home or Work.
lines	[String]	An ordered list of address lines indicating the house number, apartment number, street name, street direction, P.O. Box number, and similar address information.
city	String	The name of the city, town, or village.
state	CodeableConcept	The state or other subunit of a country.
postalCode	String	The region defined by the postal service for this address.
country	CodeableConcept	The nation specified for this address.
effectivePeriod	Period	The period of time when this address is valid for the patient.

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Patient Demographics: Modeling

Entity: Telecom

Field	Type	Description
use	CodeableConcept	The purpose of the telecom, for example, Home or Work.
systemCategory	String	The type of communication medium.
value	String	The contact information such as email address or phone number. The formatting of the value is determined by the data source.
extension	String	A number that is dialed after successfully connecting to a private phone network to further route the connection to an internal destination.
countryCode	String	The country code of the telecom.
effectivePeriod	Period	The period of time when this telecom is valid for the patient.

Patient Demographics: API Request

- Retrieve a list of demographic records for a patient.
  - *https://**acme**.api.us.healtheintent.com/patient/v1/populations/**ef9287**/patients/**1**/demographics/*

```
...
{
  "id": "c2daa46ed913ee115d42cd6ba7d76272c15d2fef6b206008f9cec46c94eea277",
  "sourceIdentifier": {
    "dataPartitionId": "877307a0-b5f5-4a01-9d4b-9fead6bcf788",
    "id": "151579"
  },
  "birthDate": "1980-08-02",
  "birthDateTime": "1980-08-02T06:00:00.000",
  "gender": CodeableConcept,
  "languages": [CodeableConcept],
  "maritalStatus": CodeableConcept,
  "races": [CodeableConcept],
  "ethnicities": [CodeableConcept],
  "dateOfDeath": "2018-08-23",
  "deceased": true,
  "causeOfDeath": CodeableConcept,
  "names": [
    {"use": CodeableConcept,
     "formatted": "Ms Analisa Roberson",
     "givenNames": ["Analisa","Elizabeth"],
     "familyNames": ["Roberson"],
     "prefix": "Ms",
     "effectivePeriod": {
       "start": "1980-08-02",
       "end": "2018-08-23"}
    }
  ],...
```

```
...
  "aliases": [{ "value": "151579",
    "type": CodeableConcept,
    "system": "1.2.3.4.5.6.7.8.9.10.1"}],
  "addresses": [
   {"use": CodeableConcept,
    "lines": ["1924 Schiller Plains","Apartment 19"],
    "city": "Los Angeles",
    "state": CodeableConcept,
    "postalCode": "90717",
    "country": CodeableConcept,
    "effectivePeriod": {
      "start": "1980-08-02",
      "end": "1990-08-20"}
   }
  ],
  "telecoms": [
   {
    "use": CodeableConcept,
    "value": "555-203-1314",
    "countryCode": "001",
    "effectivePeriod": {
      "start": "2000-01-01",
      "end": "2018-08-23" }
   }
  ]
},
...
```

Patient Conditions

- Definition
  - Conditions include both problems and diagnoses.
    - Diagnoses are typically captured in context of a specific encounter or visit for the purpose of billing. Problems can be anything that has risen to the level of concern or warrants management or tracking via a problem list. Conditions can be acute or chronic.

  - Conditions are not limited to diseases and illnesses. For example, pregnancy, risks, and family history can all be represented as conditions.

- API
  - Retrieve a list of the conditions for a given patient.
    - GET /populations/{populationId}/patients/{patientId}/conditions

  - Retrieve a single condition for a given patient.
    - GET /populations/{populationId}/patients/{patientId}/conditions/{conditionId}

Patient Conditions: Modeling

Field	Type	Description
assertedOn	string	The date the condition was first acknowledged and recorded in the system. In *International Organization for Standardization (ISO)* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
classification	CodeableConcept	The clinical stage or process at which the condition was identified, for example, Admitting, Discharge, Final, or Billing.
code	CodeableConcept	Identifies the condition, problem, diagnosis, or concern, or lack thereof using a textual description or codified values. Assertions of refuted conditions typically are done using the confirmationStatus whereas holistic assertions of no known problems at all can be conveyed using the code.
confirmationStatus	CodeableConcept	The verification status or degree of certainty of the condition.
id	string	The unique ID of the condition record.
notes	[ProviderNote]	Notes or comments associated with the condition.
onset	string	The clinically significant date when the condition was first reported as present. In *ISO* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
presentOnAdmission	CodeableConcept	Identifies whether the condition was present on admission in the context of a particular visit.
responsibleProvider	Provider	The provider who is associated with the condition. This could be who diagnosed the condition, who added the condition to the problem list, who recorded the condition, or who is responsible for treating the condition.
sourceIdentifier	SourceIdentifier	An ID that uniquely identifies this Condition for a person within the same data partition.
status	CodeableConcept	The state of the condition, such as active or resolved.
statusUpdatedOn	string	The date when the status was updated. In *ISO* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
type	CodeableConcept	A categorization of the condition, such as problem or diagnosis.

Patient Conditions: API Request

- Retrieve a list of our patient's conditions
  - *https://**acme**.api.us.healtheintent.com/condition/v1/populations/**ef9287**/patients/**1**/conditions/*

```
...
{
  "assertedOn": "2011-03-24",
  "classification": CodeableConcept,
  "code": CodeableConcept,
  "confirmationStatus": CodeableConcept,
  "id": "021bc72d0c51a99c7fe05109f2ebf4340bfc838b1821e4cf7297c99b05d73558",
  "notes": [...],
  "onset": "2011-03-24",
  "presentOnAdmission": CodeableConcept,
  "responsibleProvider": {...},
  "sourceIdentifier": {
    "dataPartitionId": "54dd3f9e-7c45-413d-88bc-3bafcee8b7ab",
    "id": "12345"
  },
  "status": CodeableConcept,
  "statusUpdatedOn": "2018-01-23",
  "type": CodeableConcept
},
...
```

Patient Allergies

- Definition
    - An allergy represents a potential risk of a patient to have an adverse reaction to a specified allergen.
    - An allergen can be a food substance, an environmental substance, a biologic substance, a medication substance, a pharmaceutical product, or a class of substances (such as penicillins).
    - Negation of an allergen can be holistic (No Known Allergies), per category (No Known Drug Allergies), or per substance (No Known Latex Allergy).

- API
    - Retrieves a list of the allergies for a given patient.
        - GET /populations/{populationId}/patients/{patientId}/allergies

    - Retrieve a single allergy for a given patient.
        - GET /populations/{populationId}/patients/{patientId}/allergies/{allergyId}

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Patient Allergies: Modeling

Field	Type	Description
assertedOn	string	The date when the allergy was first acknowledged and recorded in the system. In *International Organization for Standardization (ISO)* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
category	CodeableConcept	The category or type of allergy, such as drug, food, or environmental.
code	CodeableConcept	Describes the allergen, or a negation of an allergen, using text or codified values. An allergen can be a food substance, an environmental substance, a biologic substance, a medication substance, a pharmaceutical product, or a class of substances, (such as penicillins). Negation of an allergen can be holistic (No Known Allergies), per category (No Known Drug Allergies), or per substance (No Known Latex Allergy).
criticality	CodeableConcept	The potential seriousness of a future reaction. This represents a clinical judgment about the worst-case scenario for a future reaction. The criticality of the allergy condition is not the same as the severity of the reaction. For example, a severe rash may have a low risk (or criticality) of a life-threatening reaction.
id	string	The unique ID of the allergy record.
notes	[ProviderNote]	Notes or comments associated with the allergy.
onset	string	The clinically significant date when the allergy was first reported as present. In *ISO* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
reactions	[Reaction]	The clinical symptoms and their severity when the patient was exposed to the allergen substance, for example, a mild rash, moderate hives, or severe swelling.
resolvedOn	string	The date and time when the allergy was updated to resolved status. In *ISO* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
sourceIdentifier	SourceIdentifier	An ID that uniquely identifies this allergy for a patient in a data partition.
status	CodeableConcept	The current state of the allergy, for example, Active, Inactive, Canceled, or Resolved.

Patient Allergies: API Request

- Retrieve a list of our patient's allergies
  - *https://**acme**.api.us.healtheintent.com/allergy/v1/populations/**ef9287**/patients/**1**/allergies/*

```
...
{
  "assertedOn": "2018-04-01T13:21:12.123Z",
  "category": CodeableConcept,
  "code": CodeableConcept,
  "criticality": CodeableConcept,
  "id": "ce96771ac0b23280f02a89e1e3a6a72a28e17df3b94b1ffc7951c65c67c016f2",
  "notes": […],
  "onset": "2018-04-01T13:21:12.123Z",
  "reactions": [
    {
      "reaction": CodeableConcept,
      "severity": CodeableConcept
    }
  ],
  "resolvedOn": "2018-04-07T16:01:12.323Z",
  "sourceIdentifier": {
    "dataPartitionId": "99f31909-5b3b-4560-8c83-627828b2c97d",
    "id": "1708574400011"
  },
  "status": CodeableConcept
},
...
```

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Patient Medications

- Definition
  - Medications are pharmacy orders, statements from patients about their medication use, and medications inferred from claims.
  - Medications can include inpatient and outpatient prescription orders dispensed by retail or hospital pharmacies, over-the-counter medications (for example, aspirin), and dietary supplements.
- API
  - ## Retrieve a Single Medication
    - GET /populations/{populationId}/patients/{patientId}/medications/{medicationId}
  - ## Retrieve a List of Medications
    - GET /populations/{populationId}/patients/{patientId}/medications

Patient Medications: Modeling

Name	Type	Description
code	CodeableConcept	The identification of the medication. The medication code can have varying degrees of specificity, such as for a noncodified free-text medication, a simple codified generic medication, a codified brand-name medication, or a preconfigured code for a medication with its brand name, strength, and dosage.
end	string	The date the medication was ended or set to stop. In International Organization for Standardization (ISO) 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
frequency	CodeableConcept	The frequency, expected schedule, or timing of the administration of the medication.
id	string	The unique identifier for the medication. This value may change between processing runs but can be used to retrieve the individual medication details as returned within this object.
ingredients	[Ingredient]	The ingredients of the medication.
intendedAdministrator	string	The intended administrator of the medication. The intendedAdministrator field can be used to distinguish between the administrator types. By using the intendedAdministrator field with the intendedDispenser field, you can infer certain information. For example, an inpatient medication would be dispensed from a hospital pharmacy and administered by a provider.
intendedDispenser	string	The intended dispenser of the medication. The intendedDispenser field can be used to distinguish among the dispenser types. By using the intendedDispenser field with the intendedAdministrator field, you can infer certain information. For example, an inpatient medication would be dispensed from a hospital pharmacy and administered by a provider.
notes	[ProviderNote]	The notes or comments associated with the medication. The notes or comments can be used to understand why a decision was made or to provide specific instructions regarding the medication.
prescriber	Provider	The ordering or prescribing provider for the medication.
referenceDrug	ReferenceDrug	Identification of the drug often expressed using the NDC code system
route	CodeableConcept	How the medication should enter the body, such as oral or topical.
sigDirections	string	Textual description of the dosage instructions. This may contain the dose per administration event, route, frequency, start date, duration. For example, 20 mg, PO, QD, 05/07/11, 30 days.
sourceIdentifier	SourceIdentifier	An ID that uniquely identifies this medication for a patient within the same data partition.
start	string	The date the medication was started or set to start. In ISO 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
status	CodeableConcept	The current state of the medication order or medication use, such as active, completed, discontinued, or on-hold.

Patient Medications: API Request

- Retrieve a list of our patient's medications
  - https://**acme**.api.us.healtheintent.com/medication/v1/populations/**ef9287**/patients/**1**/medications/

```
...
{
  "code": CodeableConcept,
  "end": "2018-04-18",
  "frequency": CodeableConcept,
  "id": "f09385c8e68530e2227097cffb70e464437b6faf560ee3a8ffca84369291e2b8",
  "ingredients": [
    {
      "code": CodeableConcept,
      "dose": {
        "strength": {"unit": CodeableConcept, "value": "4"},
        "quantity": {"value": "2"},
        "volume": {"unit": CodeableConcept, "value": "10}
      },
      "referenceDrug": {
        "brandType": "GENERIC",
        "code": CodeableConcept,
        "dosageForm": CodeableConcept,
        "route": CodeableConcept,
        "strength": {
          "unit": {
            "code": "C28253",
            "display": "mg",
            "system": "2.16.840.1.113883.3.26.1.1"
          },
          "value": "200"
        }
      }
    }
  ],
...
      "intendedAdministrator": "SELF",
      "intendedDispenser": "INPATIENT_FLOOR_STOCK",
      "notes": […],
      "prescriber": Provider,
      "referenceDrug": {
        "brandType": "GENERIC",
        "code": CodeableConcept,
        "dosageForm": CodeableConcept,
        "route": CodeableConcept,
        "strength": {
          "unit": {
            "code": "C28253",
            "display": "mg",
            "system": "2.16.840.1.113883.3.26.1.1"
          },
          "value": "200"
        }
      },
      "route": CodeableConcept,
      "sigDirections": "10 mg, 1 tab, Route: PO, Drug form: Tab, Daily, Start date: 04/13/18 9:00:00, Duration: 30 day, Stop date: 04/18/18 9:00:00.",
      "sourceIdentifier": {
        "dataPartitionId": "2e07f958-82fe-470b-871d-3f7227800a63",
        "id": "12345"
      },
      "start": "2018-04-13",
      "status": CodeableConcept
}
...
```

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Patient Immunizations

- Definition
  - Immunizations are the vaccines that have been administered to a patient. Immunizations data can include information about the administration, documentation about why a vaccine was not given, and patient statements or inferences that the vaccine was administered previously.

- API
  - Retrieve a list of the immunizations for a given patient.
    - GET /populations/{populationId}/patients/{patientId}/immunizations
  - Retrieve a single immunization for a given patient.
    - GET /populations/{populationId}/patients/{patientId}/immunizations/{immunizationId}

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Patient Immunizations: Modeling

Field	Type	Description
code	CodeableConcept	The vaccine or product that was or was not given to the patient. For example, the immunization can be described by a CVX, *CPT*, *RxNorm*, NDC, or *Multum* code.
date	string	The date and time the immunization was administered, or the date and time the immunization was planned to be administered but was not given (for example, if it was refused or contraindicated). In *International Organization for Standardization* (*ISO*) 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
dose	Dose	The quantity of the administered immunization dose.
given	boolean	Indicates whether the vaccine was administered.
id	string	The unique ID of the immunization record.
lot	string	The lot number of the drug or vaccine administered.
manufacturer	CodeableConcept	The organization that was responsible for making or producing the vaccine. For example, the manufacturer can be represented by an MVX code.
notes	[ProviderNote]	The notes or comments associated with the immunization.
reasonNotGiven	CodeableConcept	Indicates the reason the immunization was not given, for example, contraindicated or refused.
route	CodeableConcept	How the vaccine entered the body, for example, oral or intramuscular.
sourceIdentifier	SourceIdentifier	An ID that uniquely identifies this immunization for a patient in a data partition.
status	CodeableConcept	The state of the immunization record, such as completed or entered in error.

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Patient Immunizations: API Request

- Retrieve a list of our patient's immunizations
  - *https://**acme**.api.us.healtheintent.com/immunization/v1/populations/**ef9287**/patients/**1**/immunizations/*

```
...
{
  "code": CodeableConcept,
  "date": "2013-03-21",
  "dose": {
    "unit": CodeableConcept,
    "value": "0.5"
  },
  "given": true,
  "id": "922335064680677580716e7c2f791facb99c67ad147fc3fe34b61b1b56ac3fcac762ed2f7f75c80aef3",
  "lot": "M67951",
  "manufacturer": CodeableConcept,
  "notes": […],
  "reasonNotGiven": CodeableConcept,
  "route": CodeableConcept,
  "sourceIdentifier": {
    "dataPartitionId": "54dd3f9e-7c45-413d-88bc-3bafcee8b7ab",
    "id": "12345"
  },
  "status": CodeableConcept
},
...
```

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Patient Procedures

- Definition
  - A procedure is any activity or service performed on, with, or for the patient.
  - A procedure can be documented in great detail by the performer who executed the procedure. Alternatively, a procedure can have less detail when reported by the patient as part of past procedure history. Additionally, a procedure can be inferred from claims.
  - While procedures can be surgical, procedures can also be less invasive. For example, a procedure can be chiropractic manipulation, counseling, or education.

- API
  - Retrieve a Single Procedure
    - GET /populations/{populationId}/patients/{patientId}/procedures/{procedureId}
  - Retrieve a List of Procedures
    - GET /populations/{populationId}/patients/{patientId}/procedures

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Patient Procedures: Modeling

Name	Type	Description
code	CodeableConcept	The procedure that was performed or scheduled to be performed.
end	string	The ending date of the procedure. In International Organization for Standardization (ISO) 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
id	string	The unique ID of the procedure record.
modifiers	[CodeableConcept]	Modifiers denote additional details around the procedures such as the procedure location, repeat procedures, and procedures performed by specific specialties. These are typically CPT-4 modifiers.
notes	[ProviderNote]	Notes or comments associated with the procedure.
placeOfService	CodeableConcept	Where services were rendered, for example, inpatient hospital, office, pharmacy, home, assisted living facility, urgent care facility, school, or place of employment.
principalProvider	ProviderRelationship	The primary provider such as the surgeon for a surgical procedure.
relatedProviders	[ProviderRelationship]	All providers who performed the procedure, such as the surgeon and anesthesiologist for a surgical procedure. The principal provider is included in the list.
sourceIdentifier	SourceIdentifier	A unique ID of this procedure for a patient in the same data partition.
start	string	The start date of the procedure. In ISO 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.

Patient Procedures

- Retrieve a list of our patient's procedures
  - *https://__acme__.api.us.healtheintent.com/procedure/v1/populations/__ef9287__/patients/__1__/procedures/*

```
...
{
 "code":   CodeableConcept,
 "end": "2013-08-01T09:00:00.000Z",
 "id": "adc07a0f7d62da22eece277b96b22e4ab84484785cb812d849065e8a01474e49",
 "modifiers": [CodeableConcept],
 "notes": […],
 "placeOfService": CodeableConcept,
 "principalProvider": ProviderRelationship,
 "relatedProviders": [ProviderRelationship],
 "sourceIdentifier": {
  "dataPartitionId": "54dd3f9e-7c45-413d-88bc-3bafcee8b7ab",
  "id": "12345"
 },
 "start": "2013-08-01T05:00:00.000Z"
},
...
```

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Patient Observations

- Definition
  - Observations are measurements and simple name-value pair assertions about a patient, for example, lab results, vital signs, and personal characteristics such as eye color.
  - Additionally, observations can originate from procedures, physical exams, or devices that measure activity without the supervision of a provider, for example, fitness devices that measure steps.

- API
  - Retrieve a list of the observations for a given patient.
    - GET /populations/{populationId}/patients/{patientId}/observations
  - Retrieve a single observation for a given patient.
    - GET /populations/{populationId}/patients/{patientId}/observations/{observationId}

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Patient Observations: Modeling

Field	Type	Descriptions
accession	string	An identifier that can be used to group laboratory results and also uniquely identifies the specimen used.
code	CodeableConcept	The name of the test or kind of observation that was measured or observed, for example, height, eye color, tobacco use, or hemoglobin. The code may optionally have additional precoordinated information such as the method, sample type, timing of measurement, and scale of measurement.
device	Device	The device that recorded, measured, or transmitted the observation or measurement, for example, glucometer, blood pressure cuff, scale, thermometer, or fitness or sleep devices.
effectiveDate	string	The clinically significant date and time associated with the observation. For lab results, this is the specimen collection time; for vitals, this is the time the measurement was taken. In International Organization for Standardization (ISO) 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
effectivePeriod	Period	The clinically significant time period associated with the observation when the measurement is made over a period of time, for example, distance walked, calories burned, or REM sleep. In ISO 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.
id	string	The unique ID of the observation record.
interpretation	CodeableConcept	A categorization of the measurement value that indicates normalcy, for example, abnormal, normal, high, low, or critical.

Patient Observations: Modeling Continued

Field	Type	Description
method	CodeableConcept	The means or technique used to make the observation. The method can be precoordinated in the observation code. For example, if the observation code is LOINC 60978-4 Heart Rate Intra Arterial Line Invasive, the code indicates both what is being measured as well as the method. By contrast, if the observation code is simply LOINC 8867-4 Heart Rate, then a method of Palpation, Auscultation, Electrocardiography (ECG or EKG), or Invasive provides additional context regarding how the heart rate was measured.
notes	[ProviderNote]	The notes or comments associated with the observation.
recorder	string	Identifies the entity that is reporting the observation, for example, SELF or DEVICE. If the data source doesn't differentiate or maintain the recorder per observation, then the data source may send the least common denominator across all observations. For example, if a data source has observations from a DEVICE as well as SELF, due to the patient entering data through a personal device dashboard, then all observations from that data source may have a recorder of SELF.
sourceIdentifier	SourceIdentifier	An ID that uniquely identifies this observation for a patient in a data partition.
specimenType	CodeableConcept	The kind of substance used in the analysis, such as blood or urine.
status	CodeableConcept	The state of the observation, such as Preliminary, Final, Amended, or Cancelled.
value	ObservationValue	The result of the observation or measurement. The data type of the result value will either be numeric, codified, text, or a date.

Patient Observations: API Request

- Retrieve a list of the Patient's Observations
  - *https://**acme**.api.us.healtheintent.com/observation/v1 /populations/**ef9287**/patients/**1**/observations/*

```
...
{
 "code": CodeableConcept,
 "device": [
  {
   "manufacturer": "QUALCOMM",
   "model": "Fora Thermometer  IR20b",
   "serialNumber": "xyz123",
   "type": CodeableConcept
  }
 ],
 "effectiveDate": "2011-07-26T20:53:00.000Z",
 "effectivePeriod": {},
 "id": "bac7450fc1e4bc5f3efa951c41d12ead28e6ad65b768b9042bc17065f9569b1f",
 "interpretation": CodeableConcept,
 "method": CodeableConcept,
 "notes": [...],
 "recorder": "PROVIDER",
 "sourceIdentifier": {
  "dataPartitionId": "3edf856e-08ba-4da1-9550-5a55a533523d",
  "id": "F585DD3407BB4409CBB971F9B8DD3C6F"
 },
 "specimenType": CodeableConcept,
 "status": CodeableConcept,
 "value": {
  "codified": [],
  "numeric": {
   "value": "36.8"
  },
  "unitOfMeasure": CodeableConcept
 }
},
```

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Patient Risk Assessments

- Definition
  - A risk assessment represents the quantified likelihood of certain outcomes for a patient, for example, the risk of potentially preventable encounters (PPEs) or the likelihood that a patient might suffer from cardiac arrest. In addition to to the type, a risk assessment includes attributes that indicate the method used to inform the assessment and the condition if the assessment pertains to one.
  - Today, this API only exposes some of the risk assessments that HealtheIntent calculates, it does not expose risk assessments calculated by external sources (EMRs for example)

- API
  - Retrieves a list of risk assessments for the specified patient identifier.
    - GET /populations/{populationId}/patients/{patientId}/risk-assessments
    - *Supports filtering by multiple patients and by risk assessment type.*
  - Retrieve a single risk assessment.
    - GET /populations/{populationId}/risk-assessments/{riskAssessmentId}
  - Retrieves a list of risk assessments.
    - GET /populations/{populationId}/risk-assessments
    - *Supports filtering by multiple patients and by risk assessment type.*

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Patient Risk Assessments: Modeling Continued

Field	Type	Description
id	string	An ID that uniquely identifies the risk assessment.
patient	Patient Reference	The patient associated with the risk assessment.
type	CodeableConcept	The type of risk assessment performed.
method	CodeableConcept	The algorithm, process, or mechanism used to evaluate the risk.
condition	CodeableConcept	The condition assessed if the assessment or prognosis is specific to a condition.
value	Value	The value of the risk assessment performed. (decimal)
assessedAt	string	The date or date and time when the risk score was created or recorded, in *ISO* 8601 formatting with precision ranging from YYYY to YYYY-MM-DDThh:mm:ss.SSSZ.

Patient Risk Assessments: API Request

- Retrieve a list of our patient's risk assessments
  - *https://**acme**.api.us.healtheintent.com/risk-assessment/v1/populations/**ef9287**/patients/**1**/risk-assessments/*

```
...
{
  "id": "2fb52376-cadd-3a98-8181-61cb77fdc3a3",
  "patient": {
    "id": "dd2cc519-caf5-4857-9f07-b12741bb5f92",
    "populationId": "1424e81d-8cea-4d6b-b140-d6630b684a58"
  },
  "type": CodeableConcept, //Example: Cardiac Risk
  "method": CodeableConcept, //Example: Algorithm name
  "condition": CodeableConcept,  //Example: Heart Failure
  "value": {
    "numeric": "2"
  },
  "assessedAt": "2018-07-18T17:10:00.000Z"
},
...
```

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Patient API Q&A

Data Syndication

The APIs and tooling for managing and delivering data, in bulk, out of *HealtheIntent*

Data Syndication

Data Syndication service does NOT expose ALL data residing in the HealtheIntent platform.

Data Syndication service does NOT produce the data that it exposes.

Data Syndication - Feed Types

Type of feeds available in *HealtheIntent*

Feed types are owned by the Solution that produce the data bundles

Available Feed Types
- Longitudinal Record EDW (available)
- Millennium ODW (available)
- CMS T-MSIS (coming in 2019)

Data Syntication - Feeds

Instance of a feed type, built specifically for a *HealtheIntent* tenant.

Feeds inform the Solutions to produce the data bundles.

Example: "Longitudinal Record EDW Feed for XYZ Population"

GET ../feeds/{feedId}

```
.{
  "id": "0f1c7802-6255-46f0-b898-6e5b851bc0af",
  "name": "Primary Population Records",
  "status": "ACTIVE",
  "scope": {
    "population": {
      "id": "5bdb91f7-c779-450d-8309-e14cd7672589"
    }
  },
  "feedType": {
    "mnemonic": "long-record-edw"
  },
  "createdAt": "2018-04-06T21:17:55.423Z",
  "updatedAt": "2018-04-06T21:17:55.423Z"
}
```

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Data Syndication – Channel Types

Mechanisms in which the data bundles can be delivered to consumers

Available Channel Types

- Download (available)
- AWS S3 (coming in 2019 Q1)

Data Syndication - Channels

Instances of channel types, built specifically for feed.

Can have multiple channels for a given feed.

Example: "Longitudinal Record EDW for XYZ Population - File Download

GET ../channels/{channelId}

```
{
  "id": "5fcdb1e1-3b82-4272-acfb-1242d456e4f4",
  "name": "Download Primary Population Records",
  "feed": {
    "id": "0f1c7802-6255-46f0-b898-6e5b851bc0af"
  },
  "type": "DOWNLOAD",
  "config": {
    "archiveFormat": "TAR_GZ"
  },
  "status": "ACTIVE",
  "createdAt": "2018-04-11T17:02:40.936Z",
  "updatedAt": "2018-04-11T17:02:40.936Z"
}
```

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Data Syntication - Data Bundles

Instances of outputted data produced by a feed.

Contents of the data bundles is dictated by the solution owning the feed type.

Frequency of data bundles is controlled by the solution owning the feed type

Use *releasedAfter* query param to retrieve new bundles since a given point in time

Use *orderby* query param to sort

GET ../feeds/{feedId}/bundles?releasedAfter=2018-02-03T01:00:00.000Z&orderBy=releasedAt

```
{
  "items": [
    {
      "id": "5ebcac9e-1f1a-4181-8c0f-4300a3af83d9",
      "feed": {
        "id": "0f1c7802-6255-46f0-b898-6e5b851bc0af"
      },
      "releasedAt": "2018-04-11T18:37:25.063Z",
      "metadata": {}
    },
    {
      "id": "8d75de0e-358b-434d-97fe-6f1ba3598098",
      "feed": {
        "id": "0f1c7802-6255-46f0-b898-6e5b851bc0af"
      },
      "releasedAt": "2018-04-11T20:21:12.461Z",
      "metadata": {}
    }
  ],
  "totalResults": 2,
  "firstLink": "...",
  "lastLink": "...",
}
```

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Data Syndication – Bundle Deliveries

Deliveries of a data bundles for a given channel.

Use *bundleReleasedAfter* query param to retrieve new deliveries since a given point in time

Use *orderby* query param to sort

The *status* indicates that availability of the delivery.

- DELIVERED
- FAILED
- PURGED

GET ../channels/{channelId}/deliveries?bundleReleasedAfter=2018-02-03T01:00:00.000Z&orderBy=bundleReleasedAt

```
{
  "items": [
    {
      "id": "5e8af1e6-1cdf-45f6-9d9a-3c314beac597",
      "bundle": {
        "id": "5ebcac9e-1f1a-4181-8c0f-4300a3af83d9",
        "releasedAt": "2018-04-11T18:37:25.063Z"
      },
      "channel": {
        "id": "5fcdb1e1-3b82-4272-acfb-1242d456e4f4"
      },
      "status": "DELIVERED",
      "deliveredAt": "2018-04-12T16:02:01.333Z",
      "metadata": {
        "bytesSize": 1073741824,
        "archiveFormat": "TAR_GZ"
      }
    },
  ],
  "totalResults": 1,
  "firstLink": "...",
  "lastLink": "..."
}
```

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Data Syndication – File Download

Downloads a specific bundle delivery

Payload is a compressed archive containing one to
many files.

GET ../downloads/{deliveryId}

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Data Syndication – Bundle Retention

Due to bundle size, the Data Syndication service does not keep the bundles available through the *Download* channel type indefinitely.

Current retention policy is set at 3 weeks. After which, the bundle's archive file is eligible for purging.

The bundle delivery is always accessible from the /deliveries API, but once the archive file is purged, the delivery status is set to PURGED.

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Longitudinal Record EDW Feed Type

EDW Longitudinal Record

- Consist of 121 files
  - Person, Encounters, Medication, Results and more

- Files are in .csv format

- Data is modeled the same way it is in HealtheEDW
  - Table names: PH_F_* or PH_D_*

- Deliver one historical file then produce daily incremental files

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Data Syndication Q&A

References

- HealtheIntent API Documentadtion
  - https://docs.healtheintent.com/

- Understanding Data Standardization in HealtheIntent
  - https://wiki.cerner.com/x/NsUITQ

- Understand Sensitive Data in HealtheIntent
  - https://wiki.cerner.com/x/OhLYSw

- Index of all HealtheIntent Reference Pages
  - https://wiki.cerner.com/x/hZOuRw

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