# Canadian FHIR Baseline

## A Starting Point for Canadian FHIR© Implementation Guides

HINF 537 A01 May Workshop 2023

HL7® FHIR®

# Agenda

- Who is the Canadian Baseline Working Group
- Why does Canada Need a FHIR Baseline
- Canadian Baseline Approach to Profiling
- Canadian Baseline Approach to Terminology
- Impacts of Terminology Binding
- Summary & Questions
- Appendix: Binding Strength Exercise

# Who is the Canadian FHIR Baseline Working Group?

## 75+ Participants

- Profiling Streams
- Due Diligence Review Stream
- Governance Stream

## 40+ Organizations

- Clinical Organizations
- Jurisdictional & Regional Organizations (Operational Level)
- Strategic Federal Organizations
- Solution Vendors
- Standards Organizations
- Health Systems

## Multi-jurisdictional Representation

- Alberta
- British Columbia
- First Nations
- Manitoba
- Newfoundland
- Nova Scotia
- Ontario
- Quebec
- Pan-Canadian
- International

# Who Participates?












# Why Does Canada Need a FHIR Baseline?

# FHIR as a Platform Specification

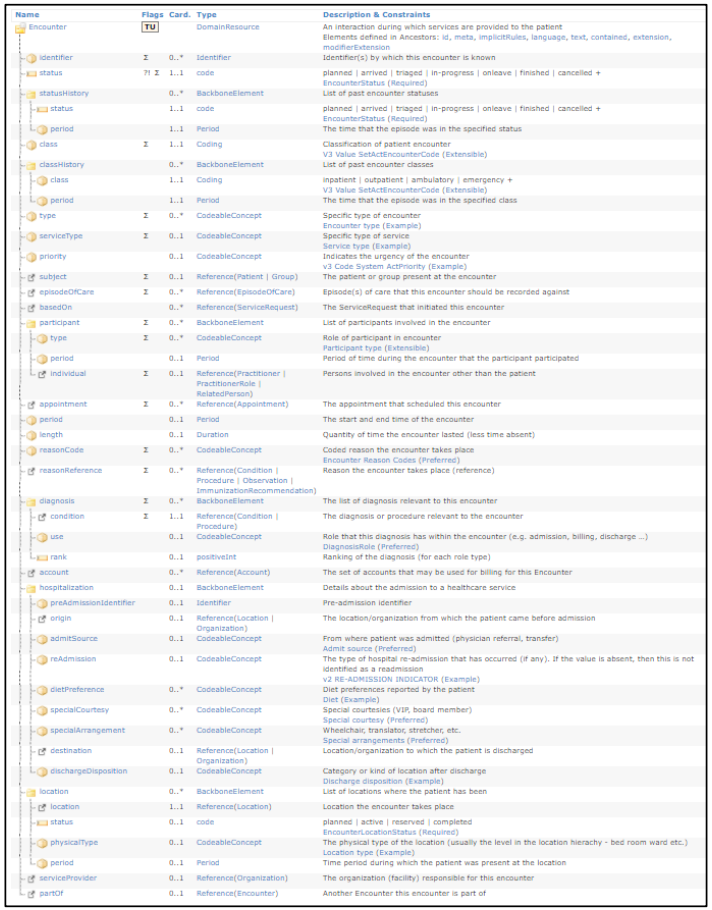
FHIR Base Specification = “building blocks”, whose defined data elements are expected to be encountered in 80% of systems around the world

Resources that are intended to support broad range of activities: Clinical Care, Patient Access, Pharmacy, Transitions of Care, Administrative Workflows, Insurance & Billing, Public Health, Research Trials, etc.

FHIR Base Specification is international - intentionally avoids region-specific code systems & business rules (based on policy)

Expects implementations to constrain and extend the building blocks to meet their specific needs

# Making Use of a Platform Specification



| Name | Flags | Card. | Type | Description & Constraints |
|---|---|---|---|---|
| Encounter | TU | | DomainResource | An interaction during which services are provided to the patient<br>Elements defined in Ancestors: id, meta, implicitRules, language, text, contained, extension, modifierExtension |
| identifier | Σ | 0..* | Identifier | Identifier(s) by which this encounter is known |
| status | ?! Σ | 1..1 | code | planned \| arrived \| triaged \| in-progress \| onleave \| finished \| cancelled +<br>EncounterStatus (Required) |
| statusHistory | | 0..* | BackboneElement | List of past encounter statuses |
| status | | 1..1 | code | planned \| arrived \| triaged \| in-progress \| onleave \| finished \| cancelled +<br>EncounterStatus (Required) |
| period | | 1..1 | Period | The time that the episode was in the specified status |
| class | Σ | 1..1 | Coding | Classification of patient encounter<br>V3 Value SetActEncounterCode (Extensible) |
| classHistory | | 0..* | BackboneElement | List of past encounter classes |
| class | | 1..1 | Coding | inpatient \| outpatient \| ambulatory \| emergency +<br>V3 Value SetActEncounterCode (Extensible) |
| period | | 1..1 | Period | The time that the episode was in the specified class |
| type | Σ | 0..* | CodeableConcept | Specific type of encounter<br>Encounter type (Example) |
| serviceType | Σ | 0..1 | CodeableConcept | Specific type of service<br>Service type (Example) |
| priority | | 0..1 | CodeableConcept | Indicates the urgency of the encounter<br>v3 Code System ActPriority (Example) |
| subject | Σ | 0..1 | Reference(Patient \| Group) | The patient or group present at the encounter |
| episodeOfCare | Σ | 0..* | Reference(EpisodeOfCare) | Episode(s) of care that this encounter should be recorded against |
| basedOn | | 0..* | Reference(ServiceRequest) | The ServiceRequest that initiated this encounter |
| participant | Σ | 0..* | BackboneElement | List of participants involved in the encounter |
| type | Σ | 0..* | CodeableConcept | Role of participant in encounter<br>Participant type (Extensible) |
| period | | 0..1 | Period | Period of time during the encounter that the participant participated |
| individual | Σ | 0..1 | Reference(Practitioner \| PractitionerRole \| RelatedPerson) | Persons involved in the encounter other than the patient |
| appointment | Σ | 0..* | Reference(Appointment) | The appointment that scheduled this encounter |
| period | | 0..1 | Period | The start and end time of the encounter |
| length | | 0..1 | Duration | Quantity of time the encounter lasted (less time absent) |
| reasonCode | Σ | 0..* | CodeableConcept | Coded reason the encounter takes place<br>Encounter Reason Codes (Preferred) |
| reasonReference | Σ | 0..* | Reference(Condition \| Procedure \| Observation \| ImmunizationRecommendation) | Reason the encounter takes place (reference) |
| diagnosis | Σ | 0..* | BackboneElement | The list of diagnosis relevant to this encounter |
| condition | Σ | 1..1 | Reference(Condition \| Procedure) | The diagnosis or procedure relevant to the encounter |
| use | | 0..1 | CodeableConcept | Role that this diagnosis has within the encounter (e.g. admission, billing, discharge …)<br>DiagnosisRole (Preferred) |
| rank | | 0..1 | positiveInt | Ranking of the diagnosis (for each role type) |
| account | | 0..* | Reference(Account) | The set of accounts that may be used for billing for this Encounter |
| hospitalization | | 0..1 | BackboneElement | Details about the admission to a healthcare service |
| preAdmissionIdentifier | | 0..1 | Identifier | Pre-admission identifier |
| origin | | 0..1 | Reference(Location \| Organization) | The location/organization from which the patient came before admission |
| admitSource | | 0..1 | CodeableConcept | From where patient was admitted (physician referral, transfer)<br>Admit source (Preferred) |
| reAdmission | | 0..1 | CodeableConcept | The type of hospital re-admission that has occurred (if any). If the value is absent, then this is not identified as a readmission<br>v2 RE-ADMISSION INDICATOR (Example) |
| dietPreference | | 0..* | CodeableConcept | Diet preferences reported by the patient<br>Diet (Example) |
| specialCourtesy | | 0..* | CodeableConcept | Special courtesies (VIP, board member)<br>Special courtesy (Preferred) |
| specialArrangement | | 0..* | CodeableConcept | Wheelchair, translator, stretcher, etc.<br>Special arrangements (Preferred) |
| destination | | 0..1 | Reference(Location \| Organization) | Location/organization to which the patient is discharged |
| dischargeDisposition | | 0..1 | CodeableConcept | Category or kind of location after discharge<br>Discharge disposition (Example) |
| location | | 0..* | BackboneElement | List of locations where the patient has been |
| location | | 1..1 | Reference(Location) | Location the encounter takes place |
| status | | 0..1 | code | planned \| active \| reserved \| completed<br>EncounterLocationStatus (Required) |
| physicalType | | 0..1 | CodeableConcept | The physical type of the location (usually the level in the location hierachy - bed room ward etc.)<br>Location type (Example) |
| period | | 0..1 | Period | Time period during which the patient was present at the location |
| serviceProvider | | 0..1 | Reference(Organization) | The organization (facility) responsible for this encounter |
| partOf | | 0..1 | Reference(Encounter) | Another Encounter this encounter is part of |

https://www.hl7.org/fhir/profiling.html#5.1.0

In FHIR base specification – most elements are considered optional – it's a guide to how concepts can be modeled but not intended to be implemented out of the box

**Profiling** – allows implementors to further restrict and extend the base specification to meet and enforce their specific needs. Examples include:

- Rules about which resource elements are or are not used, and what additional elements are added that are not part of the base specification
- Rules about which API features are used, and how
- Rules about which terminologies are used in particular elements
- Descriptions of how the Resource elements and API features map to local requirements and/or implementations

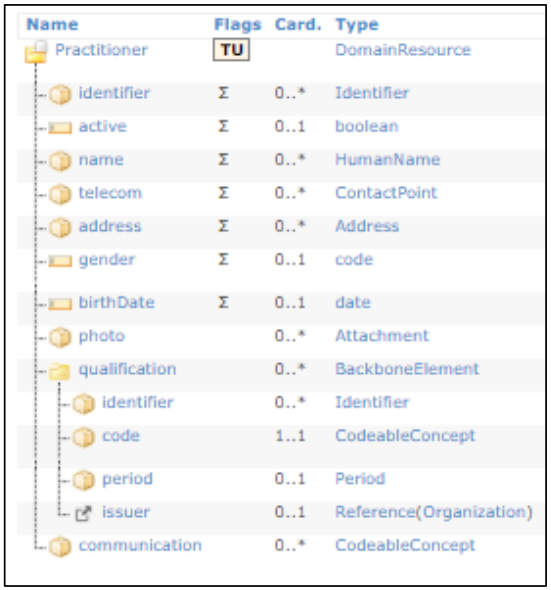
*Note that because of the nature of the healthcare ecosystem, there may be multiple overlapping sets of adaptations - by healthcare domain, by country, by institution, and/or by vendor/implementation.*

# Profiles Define Implementation Expectations

## Example: Practitioner Registry Profile

**FHIR R4 Base Resource**

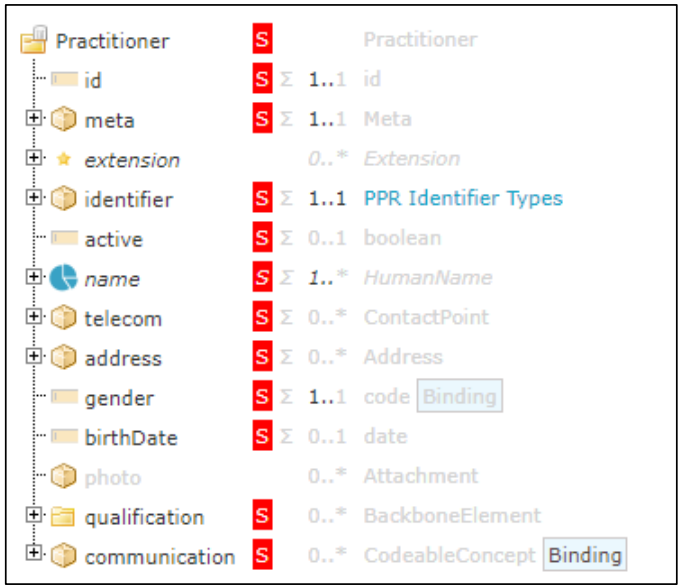
**Purpose:** Define a set of elements that systems around the world may use when capturing information about practitioner



| Name | Flags | Card. | Type |
|---|---|---|---|
| Practitioner | TU | | DomainResource |
| identifier | Σ | 0..* | Identifier |
| active | Σ | 0..1 | boolean |
| name | Σ | 0..* | HumanName |
| telecom | Σ | 0..* | ContactPoint |
| address | Σ | 0..* | Address |
| gender | Σ | 0..1 | code |
| birthDate | Σ | 0..1 | date |
| photo | | 0..* | Attachment |
| qualification | | 0..* | BackboneElement |
| identifier | | 0..* | Identifier |
| code | | 1..1 | CodeableConcept |
| period | | 0..1 | Period |
| issuer | | 0..1 | Reference(Organization) |
| communication | | 0..* | CodeableConcept |

**Ontario PPR Practitioner Response Profile**

**Purpose:** Define expectations for what will be returned in a response when querying the Ontario PPR service for a provider

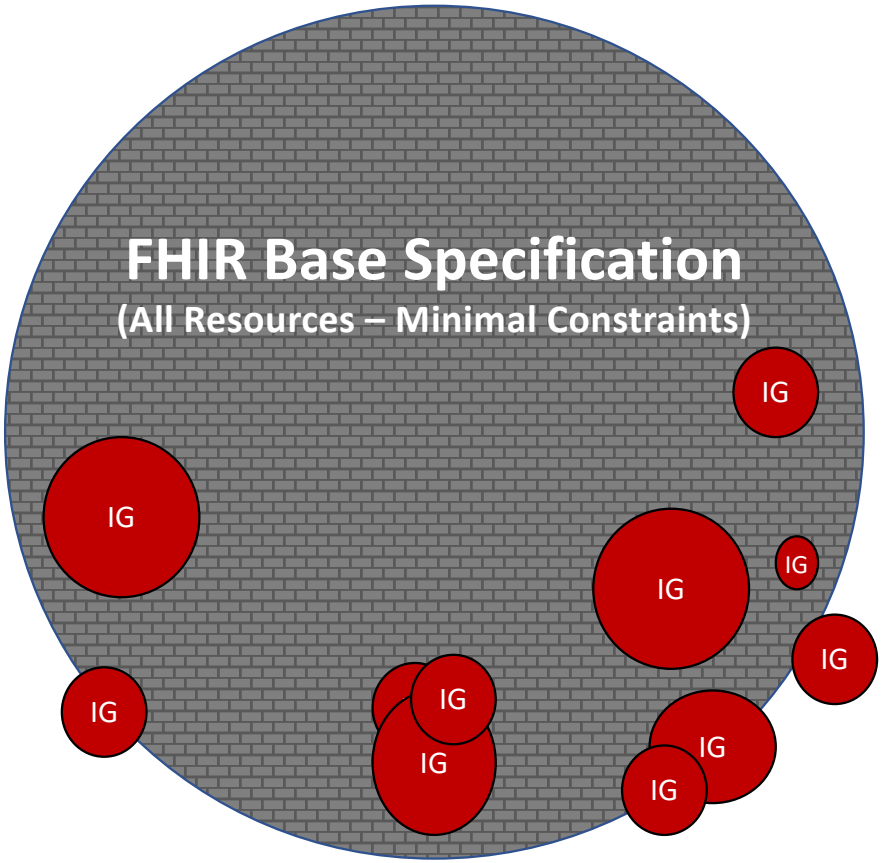


| | | | | |
|---|---|---|---|---|
| Practitioner | S | | | Practitioner |
| id | S | Σ | 1..1 | id |
| meta | S | Σ | 1..1 | Meta |
| *extension* | | | *0..** | *Extension* |
| identifier | S | Σ | 1..1 | PPR Identifier Types |
| active | S | Σ | 0..1 | boolean |
| *name* | S | Σ | *1..** | *HumanName* |
| telecom | S | Σ | 0..* | ContactPoint |
| address | S | Σ | 0..* | Address |
| gender | S | Σ | 1..1 | code Binding |
| birthDate | S | Σ | 0..1 | date |
| photo | | | 0..* | Attachment |
| qualification | S | | 0..* | BackboneElement |
| communication | S | | 0..* | CodeableConcept Binding |

# What are the Limitations of the FHIR Base Specification?

Each implementor builds an Implementation Guides (IG) that uses those blocks to meet their needs

Starting from base specification is like starting from scratch each time




Lack of alignment between IGs operating in same countries and domains

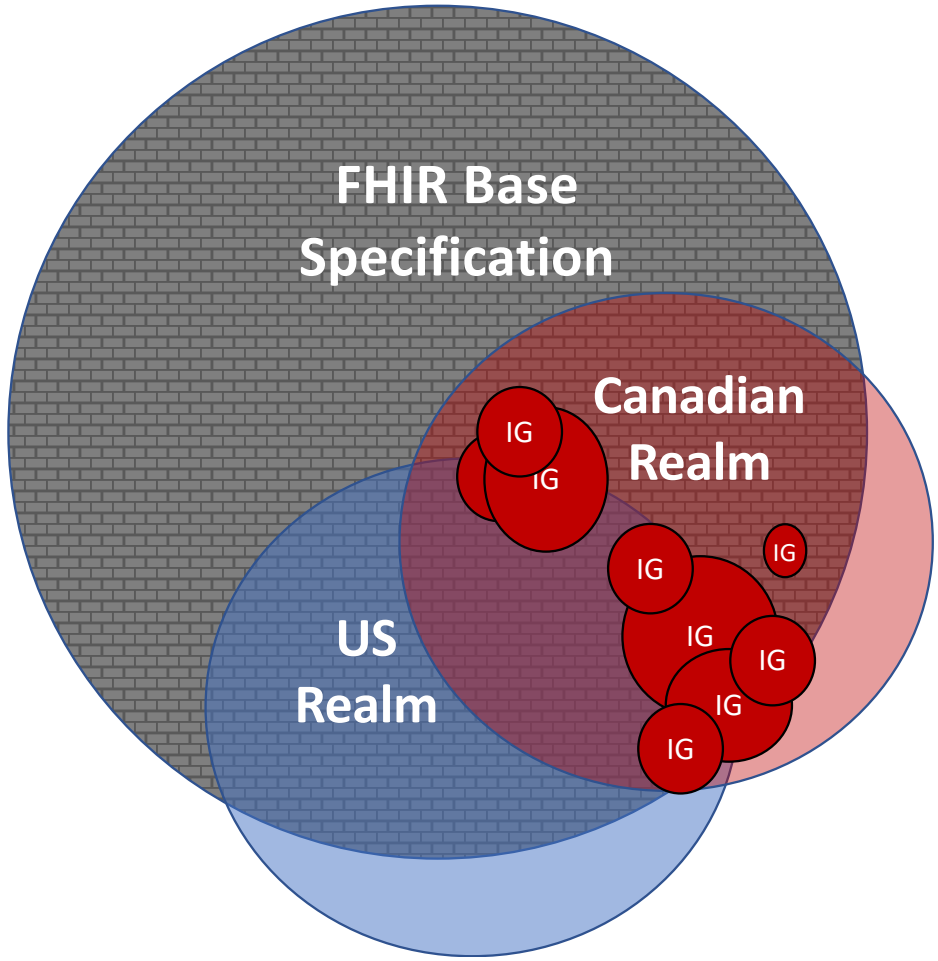
We all need customization, but we aren't leveraging each other's efforts

# What are We Doing in the CA Baseline and Why?

Realm-specific guidance (i.e. Canadian Baseline)

Completed effort upfront to identify the basic constraints and extensions that any FHIR implementation operating in Canada can expect to include

Intended as a common starting point, not an out-of-the-box implementation




Convened Canadian implementers and Implementation Guide authors to develop initial draft over the last 18 months

Due diligence reviews against existing Canadian FHIR Implementation Guides to ensure alignment and appropriate scope maintained

Ready for the larger community to review it (which helps us refine the content to support the breadth of use cases in the Canadian realm)

# What Are We Doing in the CA Baseline And Why?

**Canadian Baseline:**
27 Profiles
(resources from the base specification constrained/extended for Canadian use)

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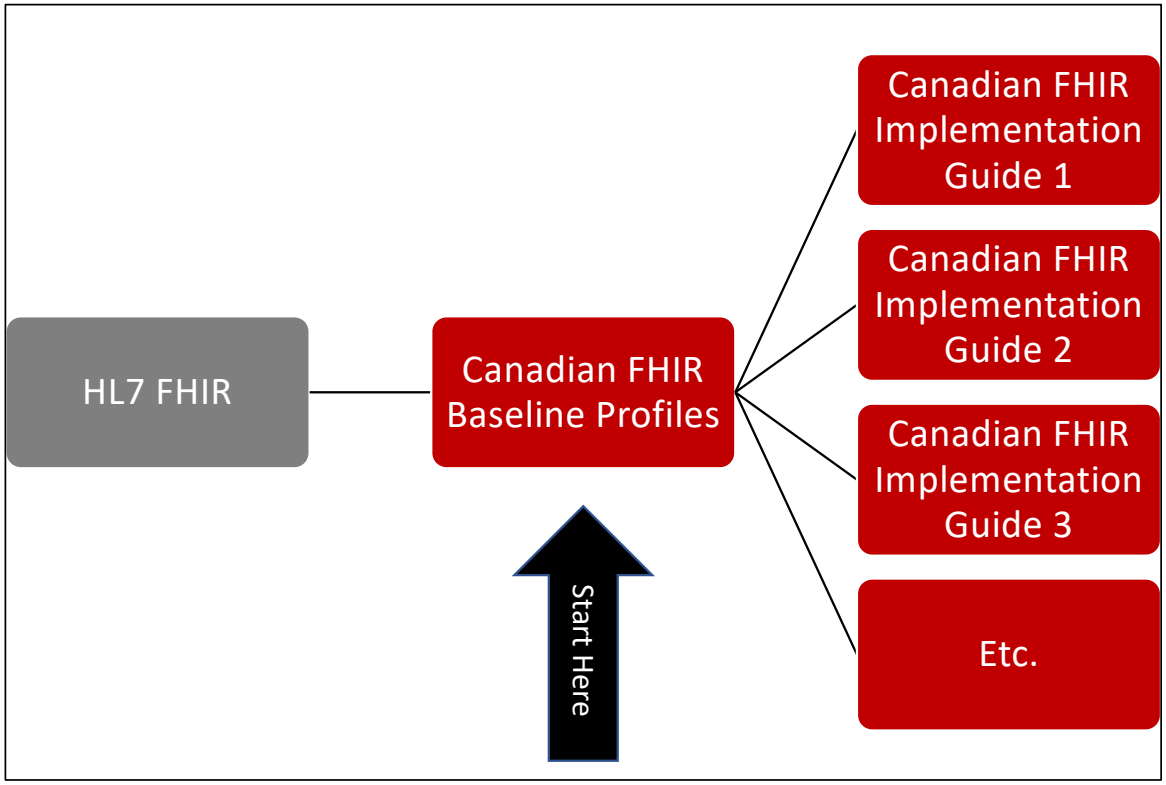



First step in reducing burdens on IGuide authors and unnecessary system customization across jurisdictions and healthcare domains

# What is the Difference between a Baseline & Core?

The international FHIR community is evolving towards further differentiation between the use of Base, Baseline, and Core terminology to categorize implementation guides - readers should be aware that the definitions below may be refined as formal definitions are provided by HL7 International. At the time that this implementation guide was authored, the following patterns were discerned and proposed by the CA FHIR Baseline Community:

| Category | Baseline | Core |
|---|---|---|
| What support is needed from jurisdictions? | Public access to jurisdiction's FHIR Implementation Guides, use of the Canadian Baseline profiles as a starting point for jurisdictional implementation guides | Policy requirements, contract language, or incentives attached to use of the Core profiles, Jurisdictions need to identify and agree on the use cases / workflows supported by the Core profiles |
| Will implementers align to this without financial / jurisdictional / policy incentives? | Yes, minimal constraints with presence in existing implementations is a natural incentive in aligning new implementation guides to the baseline profiles & their minimum expectations | No. Restrictive constraints that require considerable configuration to be compliant can be a stumbling block in adoption to the profiles if incentives/disincentives are not present. |
| Origin | Community, Essentially "here are the constraints that are out there in FHIR implementations right now" | Policy, "These 10 use cases MUST be supported by every digital health product in the province, country" |
| Frequency / strength of constraints (re: both structure definition and business rules / usage notes) | Few strong constraints, only where deemed that any possible use of a concept would do it in the same way | More constraints, Tighter constraints, Each Core profile is designed to support a specific use case, so more constraints can be expected of implementers |

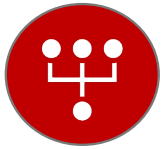
http://build.fhir.org/ig/HL7-Canada/ca-baseline/branches/master/developmentprocess.html#comparing-a-baseline-to-a-core-implementation-guide

# CA Baseline Approach to Profiling

# CA Baseline Approach to Profiling

Realm-specific Baseline that Canadian profiles will use– needs to be use case & implementation agnostic

Expose implementation guide and vendor community to what concepts can be expected to be supported across jurisdictions today



Drive consistency and harmonization through socialization and profile derivation

- Concepts that were common across existing implementations become ubiquitous in future implementations.

Avoid overly prescriptive constraints before an incentive/governance structure is in place

- Absence of united front with vendors = configuration costs passed down to implementing systems to ensure presence of concepts & use of prescribed coding systems

# CA Baseline Approach to Profiling

- Similar to implementation-specific profiles, our CA Baseline profiles are a resource definition that applies constraints and extensions (to a base resource) for the purposes of mechanically enforcing rules about what is expected

- Changes we apply in CA Baseline Profiles:
  - Must Support Flags
  - Cardinality
  - Extensions
  - Invariants
  - Slices
  - Terminology & Binding Strength

# Approach For: Must Support Flags

- Must Support (MS) Flags - property that can be applied within a profile that, if true, means the system claiming to conform to the profile must support the element
- Every guide defines the meaning of must support
- MS flags are inherited into derived profiles, but those profiles can further constrain the meaning of must support


**CA Baseline Must Support Approach**

**Query Scenario:**

- Queried server shall send/relay the element (if available and permitted)
- The querying client can assume it will be received if available

**Create/Update Scenario:**

- Client creating resourced shall be capable of sending/relaying element
- Server shall be capable of receiving/relaying/storing the data element

*Business rules, data regulations, additional implementation guides should determine what the server and/or querying client will do with the data it receives (i.e., store, persist, display, etc.)*

https://www.hl7.org/fhir/profiling.html#mustsupport
http://build.fhir.org/ig/HL7-Canada/ca-baseline/branches/master/general-guidance.html

# Approach For: Cardinality

- A profile inherits cardinality and can restrict the cardinality of an element within the limits of the structure it is constraining

| | | Derived Cardinality | | | | |
|---|---|---|---|---|---|---|
| | | 0..0 | 0..1 | 0..* | 1..1 | 1..* |
| Base Cardinality | 0..1 | yes | yes | no | yes | no |
| | 0..* | yes | yes | yes | yes | yes |
| | 1..1 | no | no | no | yes | no |
| | 1..* | no | no | no | yes | yes |

- Cardinality inheritance can have <u>significant impact</u> to downstream implementors
- CA Baseline keeps cardinality changes minimal – mostly occur in child elements (like requiring system and code be present if CodeableConcept supplied)

https://www.hl7.org/fhir/profiling.html#cardinality

# Approach For: Terminology

- A profile inherits terminology & binding strength from the structure it's constraining
- Looser binding strength = greater flexibility for derived profile to make implementation-driven changes to terminology or strength

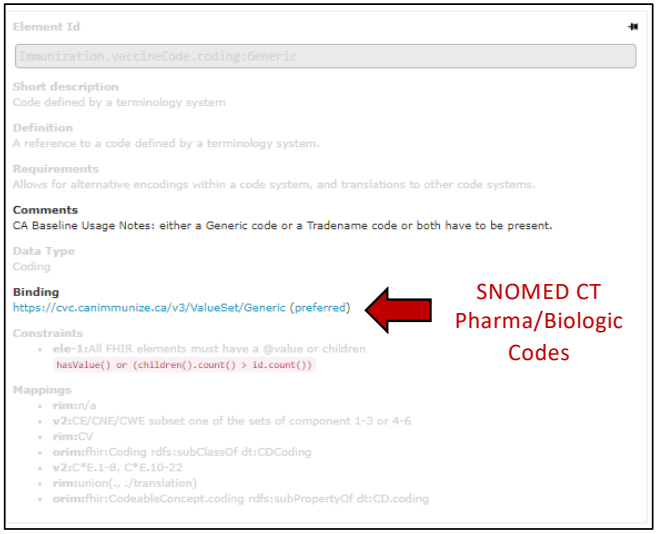
| Binding Strength | Definition | Can Profile Change Terminology? | Can Profile Change Binding Strength? |
|---|---|---|---|
| **required** | The concept in this element SHALL be from the specified value set. | No, bound terminology is required to be the same | No, must remain required. |
| **extensible** | The concept in this element SHALL be from the specified value set if any of the codes within the value set can apply. If the value set does not cover the concept (based on human review), alternate codings may be included instead. | Derived profiles may state rules on which codes can be used, but cannot select new or additional codes for these elements (unless no codes with appropriate meanings are found) | Can remain extensible, or tighten to required. |
| **preferred** | Instances are encouraged to draw from the specified codes for interoperability purposes but are not required to do so to be considered conformant. | Implementors should consider adopting the preferred value set wherever possible, but derived profiles may bind the element to any value set they choose | Can remain preferred, or tighten to extensible or required. |
| **example** | Instances are not expected or even encouraged to draw from the specified value set. The value set merely provides examples of the types of concepts intended to be included. | Derived profiles may bind the element to any value set they choose | Can remain example, or tighten to preferred, extensible, or required. |

# Impacts of Terminology Binding

# Approach For: Terminology – Impacts of Binding

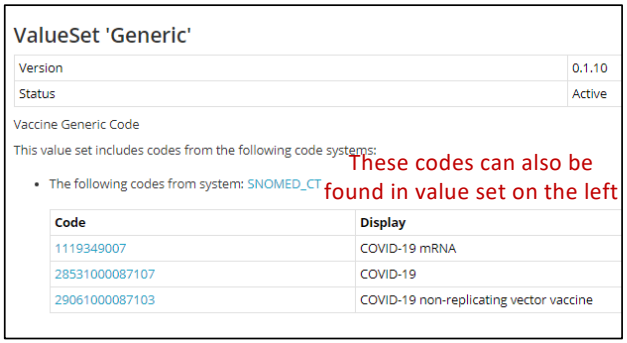
Preferred Value Set in Baseline– Different Value Sets in Potential Derived Profiles

**CA Baseline Immunization.vaccineCode Generic Value Set**



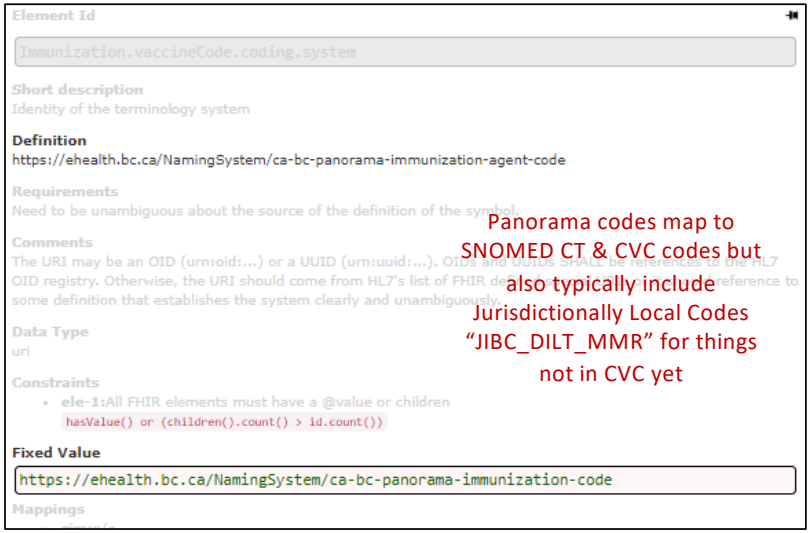

SNOMED CT Pharma/Biologic Codes

**COVaxON Immunization.vaccineCode Generic Value Set**




These codes can also be found in value set on the left

**BCY Imms Citizen Access Immunization.vaccineCode**

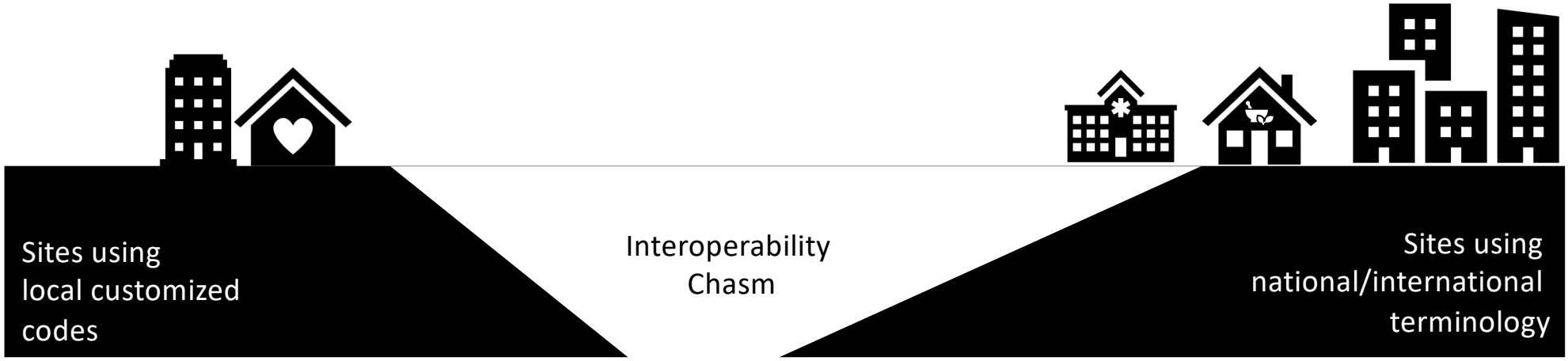



Panorama codes map to SNOMED CT & CVC codes but also typically include Jurisdictionally Local Codes "JIBC_DILT_MMR" for things not in CVC yet

# Approach For Terminology

Rigid binding strengths force implementors to use standardized code systems (LOINC-PCLOCD, SNOMED CT-CA, DIN, etc.)

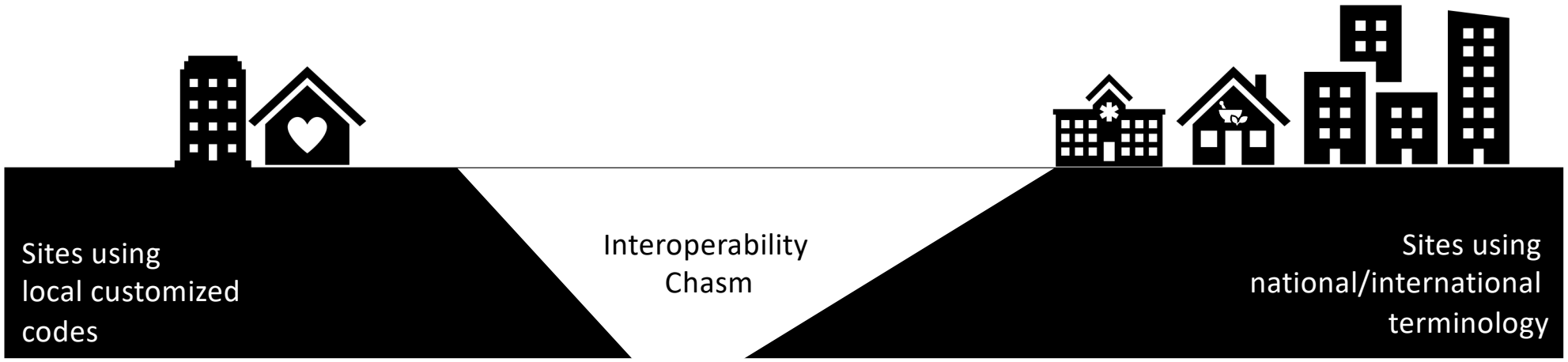
- Mapping & customization costs for systems that are using legacy and local codes = blocker for adoption
- No financial incentives/disincentives for implementors to commit to change their systems



# Approach For Terminology

Extensible binding strengths are effective in theory but aren't computably enforceable

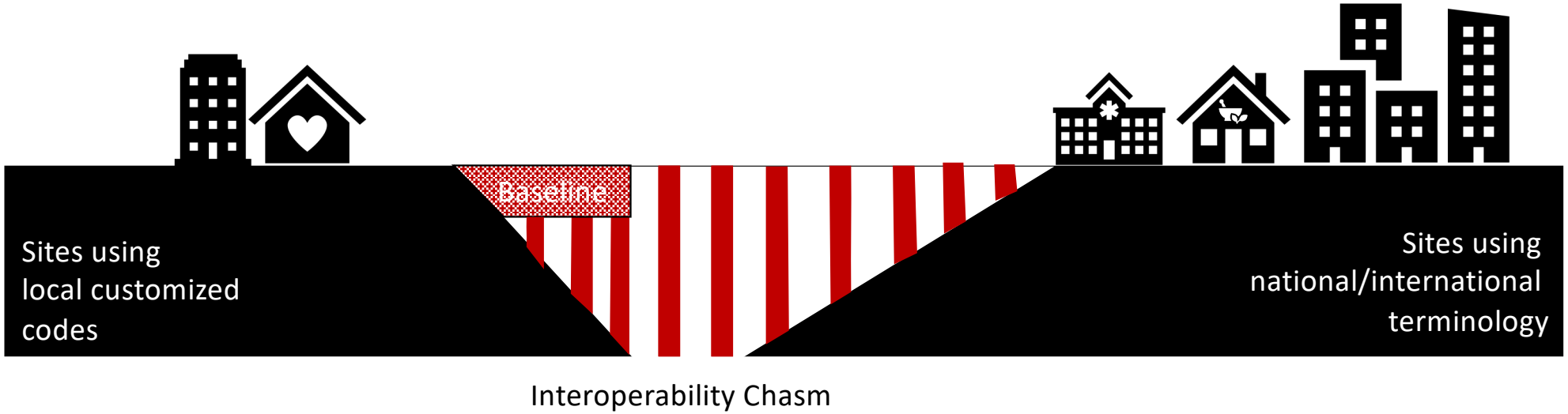
- Require human review to determine if codes could've mapped to value set
- Systems can continue to send their local codes – counterproductive to interoperability



# Approach For Terminology

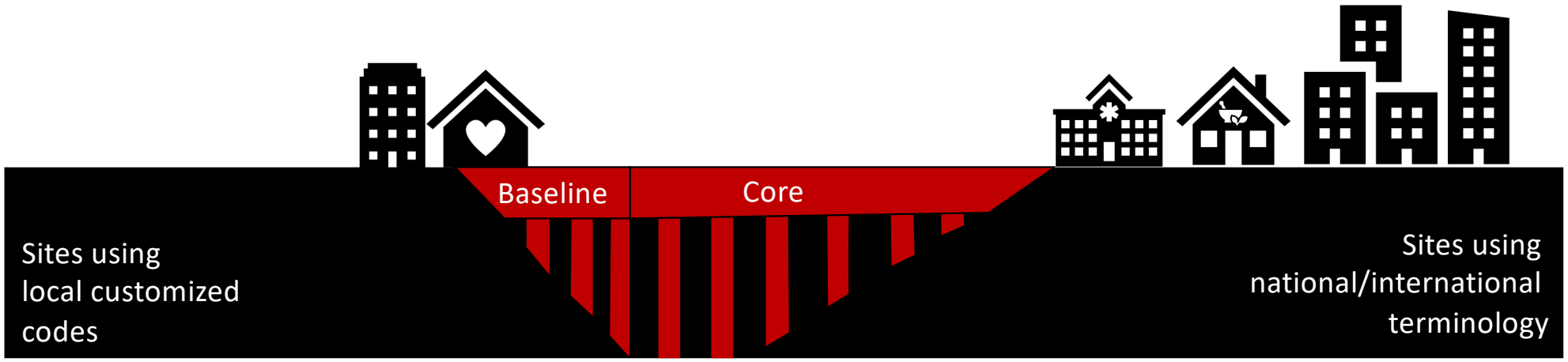
CA Baseline uses preferred binding strengths to align to existing standards

- Use Canadian versions of the terminology wherever possible
  - Need to balance socialization of the value sets with becoming the maintainers of the value sets
- Allows for derivative profiles to vary if their particular use case requires it
- Lays groundwork for the CA Core by showing implementors and vendors where we are going



# Approach For: Terminology

- Gaining pan-Canadian endorsement and use of the Baseline lays crucial, but more support will be required for National FHIR IGuides and programs (e.g., CA Core) to bridge the Interoperability Chasm
- These initiatives are expected to close the remaining gap by applying more rigid terminology constraints on a select set of pan-jurisdictional use cases
- Collectively defined contractual requirements and jurisdictional procurement practices used as drivers for vendors to make Canadian standard code systems readily useable to sites



# How Can You Get Involved?

1

**Join the CA Baseline Workstream**

Calls Every Friday https://infocentral.infoway-inforoute.ca/en/collaboration/wg/fhir-implementations

2

**Use the CA Baseline and in your projects**

Canadian Baseline CI Build http://build.fhir.org/ig/HL7-Canada/ca-baseline/branches/master/artifacts.html

3

**Publish FHIR Value Sets & Advocate for Terminology Services**

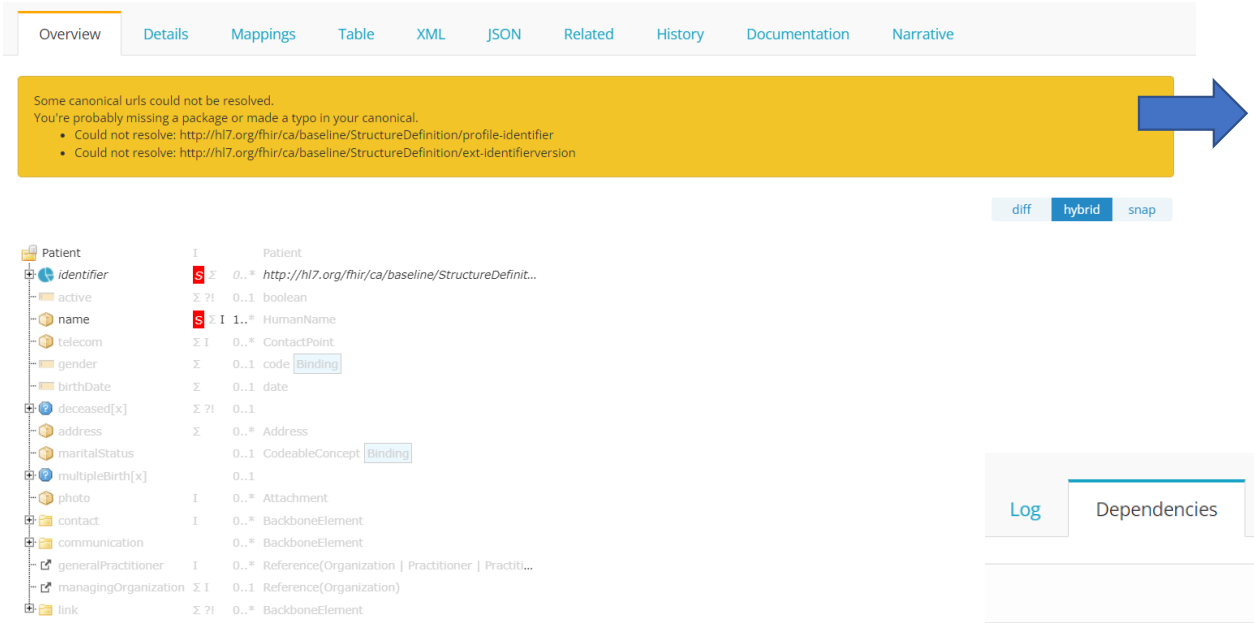
Canadian FHIR Registry https://simplifier.net/organization/canadianfhirregistry

Questions?

# Demo

https://simplifier.net/test20171383

Test project loaded in Simplifier showing how IGuide Dependencies and re-profiling impact patient & medication profiles.

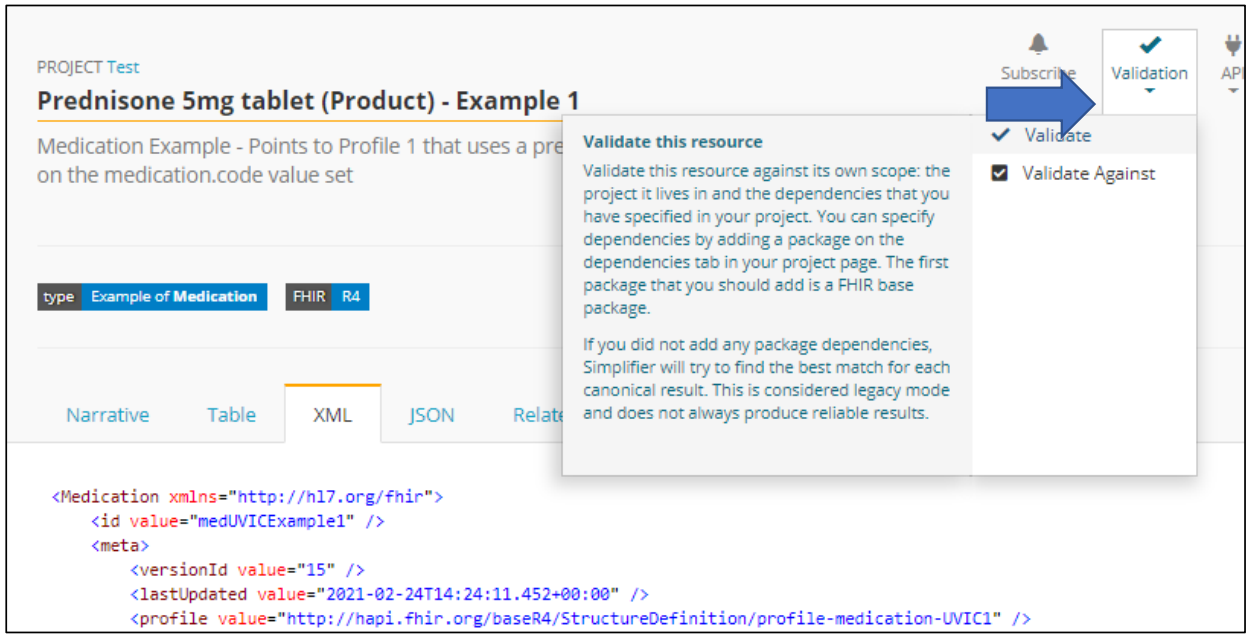



- Review the Patient & Medication Profile examples
- Go back project page and click the Dependencies tab - click manage.
- Search & add the CA Baseline package and version to add it as a dependency to your project.
- Review the changes to the Patient & Medication Profiles

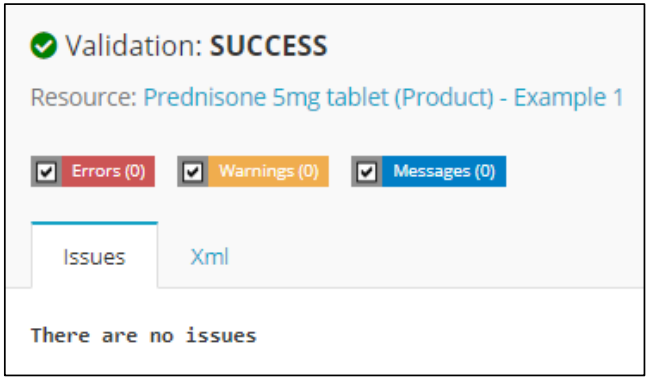
# Terminology Binding Strength Exercise

https://simplifier.net/test20171383

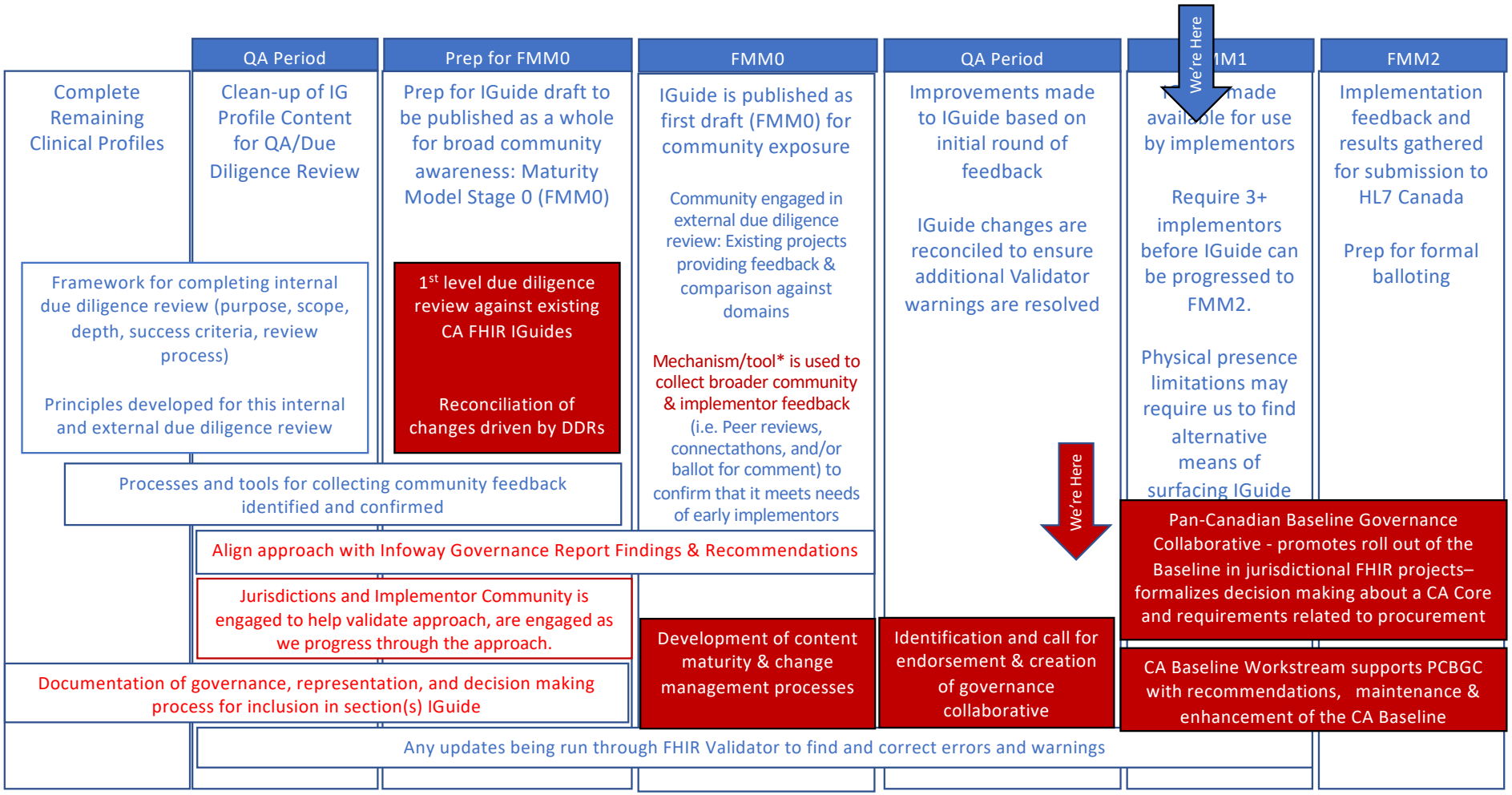
Test project loaded in Simplifier with 3 medication profiles (vary in binding strength), 1 value set, and 3 example medication resources that point to the profiles




- Go to each of the examples
- Click the validation button and select "Validate"
- different validation outcome will display depending on binding strength in profile that the example points to
- Try it out with your own examples

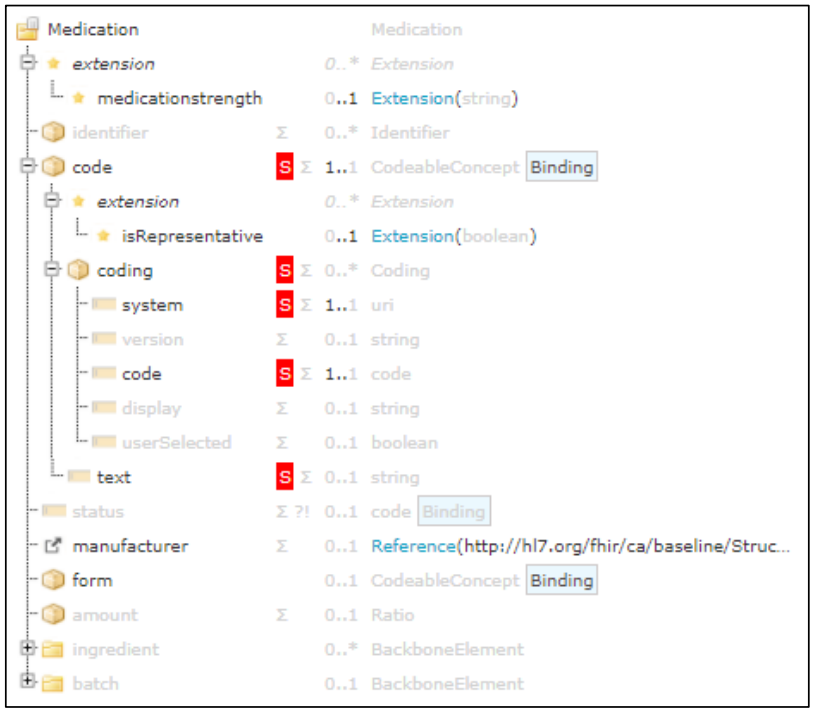


# Where are we in our CA Baseline Maturity Roadmap?

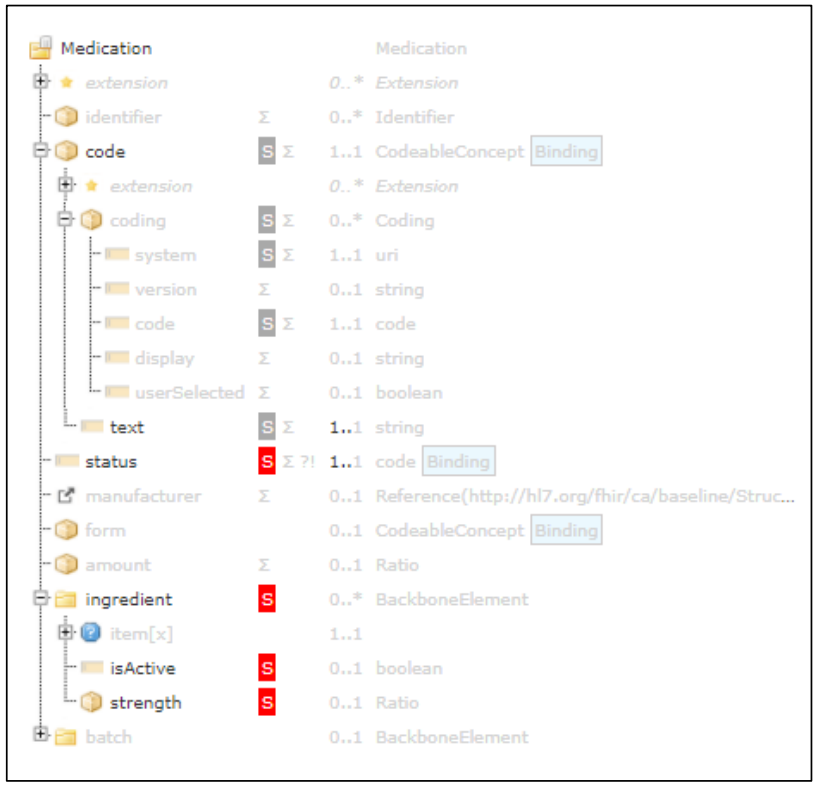


# Profile Derivation Example

**CA Baseline – Medication Profile**




**Example Profile – Derived from CA Baseline**



# What are the Options for Adopting the Canadian FHIR Baseline Profiles?

**End Goal:** Pan-Canadian Collaborative enforcement of CA Baseline profiles as the starting point for prospective Canadian FHIR profiles, while offering alternative mechanisms for showing harmonization for previously published guides & profiles where re-profiling isn't appropriate

This adoption approach is heavily impacted by profile maturity & stability

FHIR offers a variety of mechanisms that can be used in meantime to assist early implementors in alignment and testing against the CA Baseline Profiles