Semantic and Structural Differentiation of Findings

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Clinical Information Modeling Initiative (CIMI)

- Mission: Improve the interoperability of healthcare systems through shared implementable clinical information models.
- Deliverables:
  - Shared repository of detailed clinical information models
  - One single formalism
  - A common set of base data types
  - Formal bindings of the models to standard coded terminologies
  - Open Repository and models that are free for use at no cost
  - Models that support multiple contexts

Formal bindings of the models to standard coded terminologies

- Disambiguate model classes and elements for human review
  - Clinicians
  - Standards Developers
  - System & Interface Designers
- Define semantics to support automatic inference
  - Future goal; not a dependency
  - Value in clinical decision support
  - Acid test for human disambiguation, too

Condition & Observation: Characteristics

- Observation
  - Objective
  - Point-in-time
  - Evidence for condition
  - Question & answer
  - SBP = 155 mmHg
- Condition
  - Judgment
  - Persistent
  - Object of concern
  - Unary assertion
  - Hypertension

Note: whether a condition is a “finding” or a “disorder” is not addressed here.

Condition & Observation: Designs

- FHIR
  - Condition: unary
  - Observation: binary
- V2
  - PRB: unary
  - OBX: binary
- openEHR
  - Observation: binary
  - Problem/Diagnosis: unary
- RIM
  - Observation (code/value): binary
  - Observation (assertion): unary
  - Observation (presence): unary
  - Observation (qualification): fractal
- CIMI
  - Assertion: unary
  - Evaluation result: binary

All models are wrong. Some are useful.

Question

- Many facts will usually be assigned to one pattern.
- Some facts will often be assigned to either.

- How do we support predictable identification of semantically similar but structurally different facts?

Option 1: Convention

1. Recommend standard representations for common facts.
   - SBP = 155 mmHg
   - Hypertension

- Extensional **catalog** of examples.
  - Measurements
  - Diagnoses
  - Physical exam results
  - Labs
  - Complaints

Useful, but not categorical.

Option 2: Qualifying information

- Assertion
  - key = “blue skin (finding)”
- Evaluation result
  - key = “Problem”
  - result = “blue skin (finding)”

- Issue: “Problem” adds semantics not present in the Assertion. No round trip available.

Option 3: Null values

- Assertion
  - key = “blue skin (finding)”
- Evaluation result
  - key = NULL
  - result = “blue skin (finding)”

- Question of how to represent an implementable NULL in a logical semantic specification

Option 4: Assertion & Finding

- Assertion
  - key = “blue skin (finding)”
- Evaluation result
  - key = “Assertion”
  - result = “blue skin (finding)”

- “Assertion” is not quite null but semantically very slender
- Value is aligned with other questions that may have a Finding as an answer
- Aligned with TermInfo recommendation

This is actually the pattern CIMI uses for Assertion.

Option 5: Ignorable Label

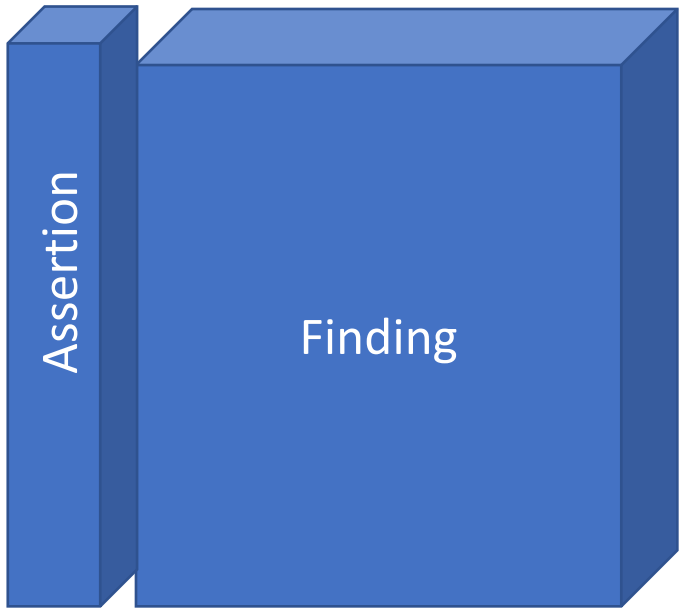
- Assertion
  - key = “blue skin (finding)”
- Evaluation result
  - key = “skin color (observable entity)”
  - result = “blue skin (finding)”

- The observable entity serves as context for scoping the valid value range, but it is itself moot in any expression construction.
  - Unless a finding can be qualified by an observable entity.

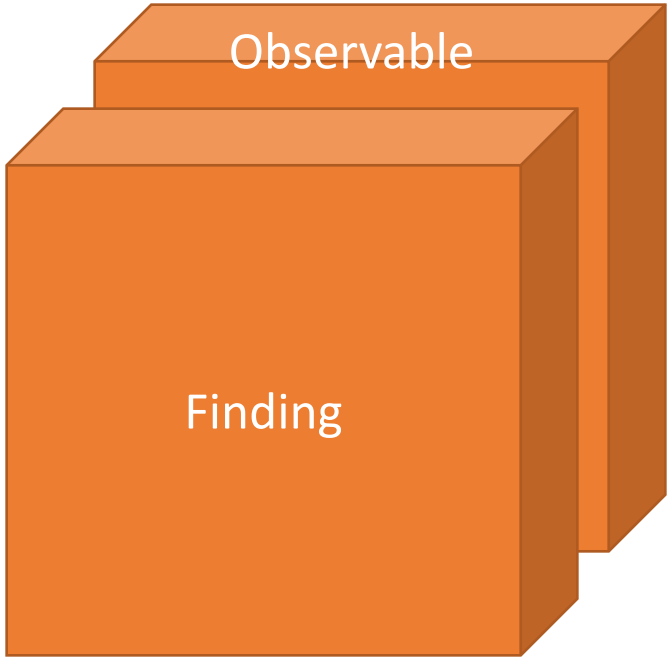
Summary of Patterns

Option	
1. Convention	Consistent (4-6)
2. Qualifying Information	Inconsistent
3. Null values	Problematic
4. Assertion & Finding	Consistent
5. Ignorable Label	Optional pattern for # 4
6. Semantic Composition	Consistent

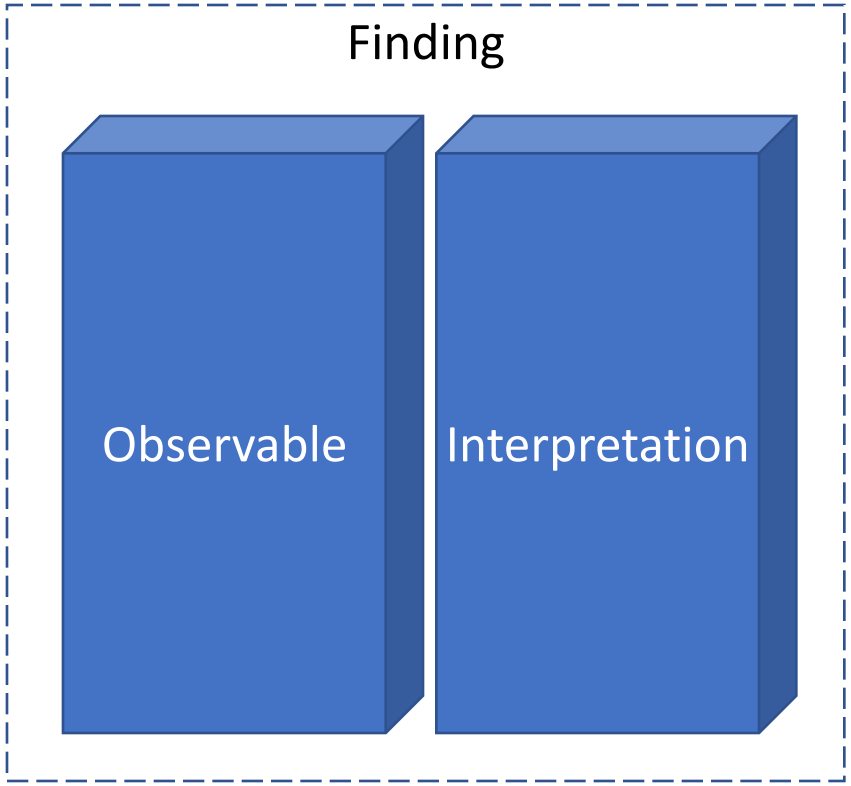
Pattern 4



Pattern 5



Pattern 6

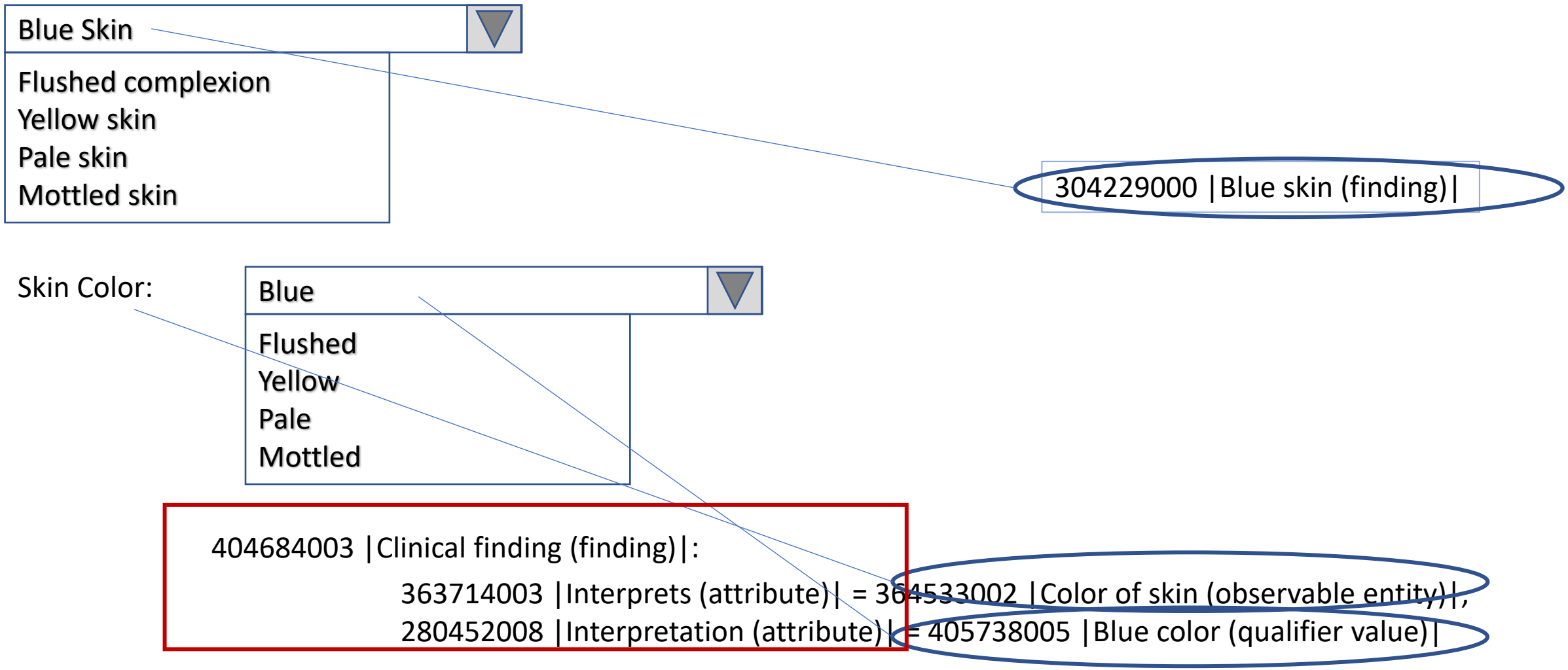


Option 6: Semantic Composition

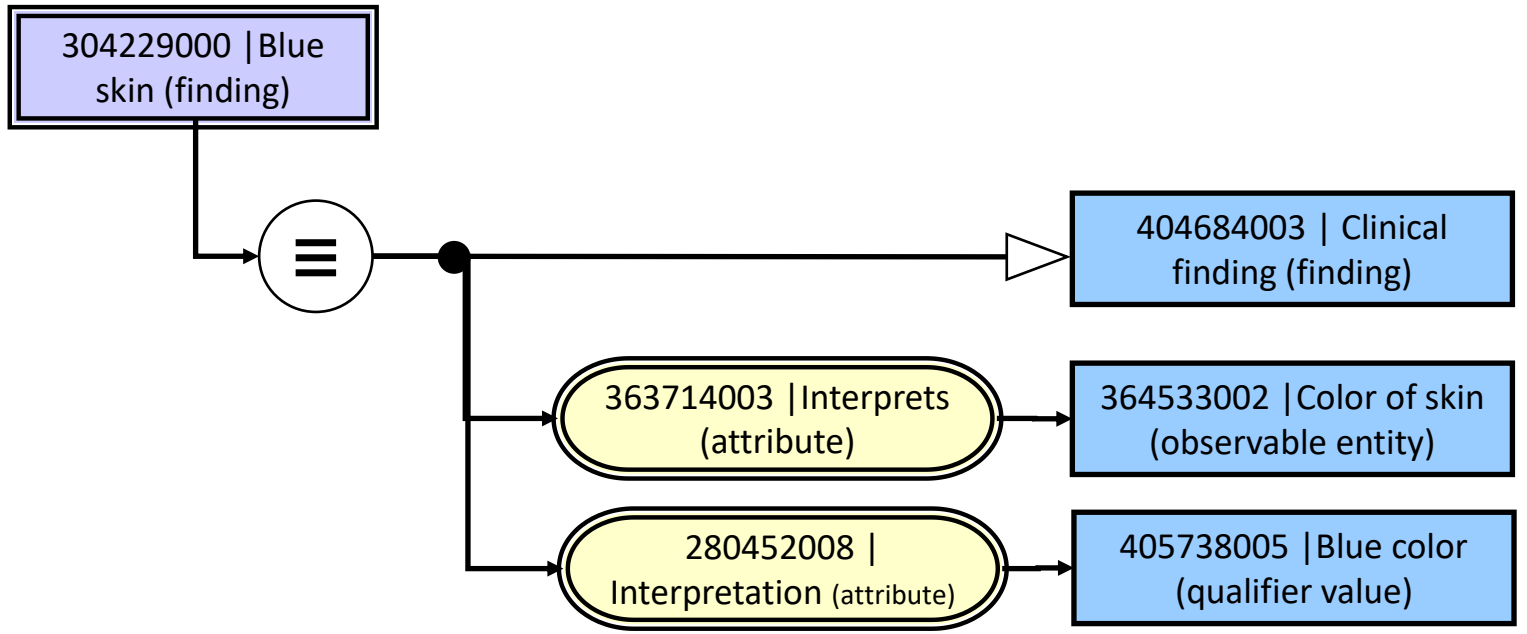
- Assertion
  - key = “blue skin (finding)”
- Evaluation result
  - key = “skin color (observable entity)”
  - result = “blue (qualifier value)”

- These can be held equivalent using concept definitions.

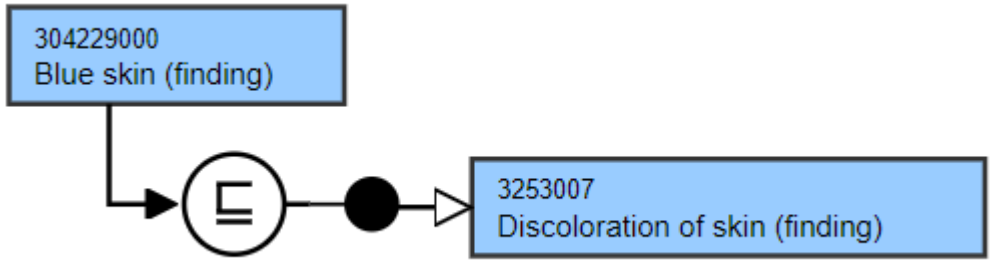
Isosemantic models & expressions



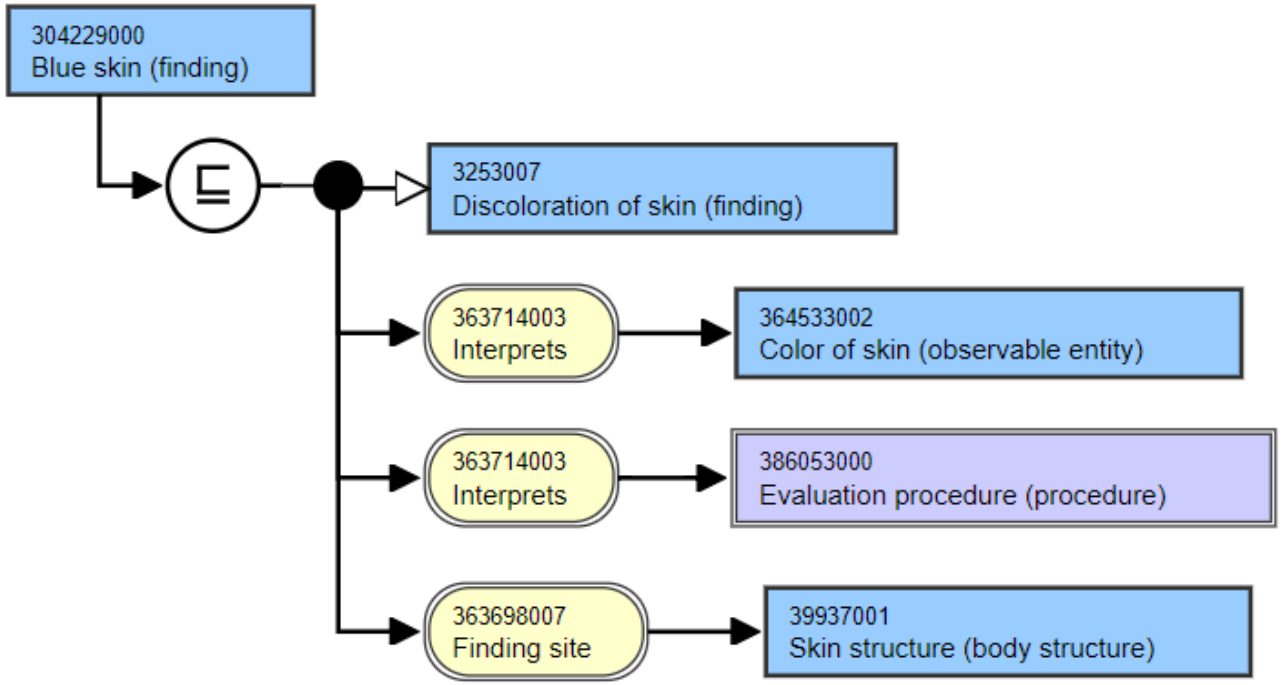
Our Definition



Current Stated Definition

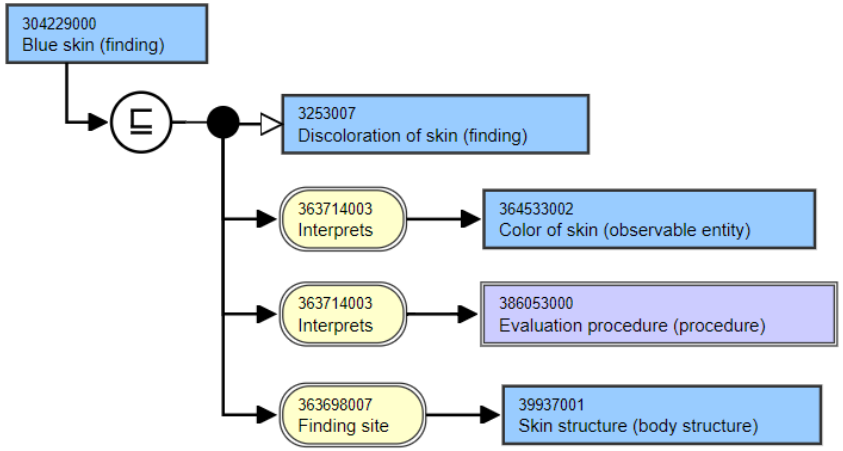


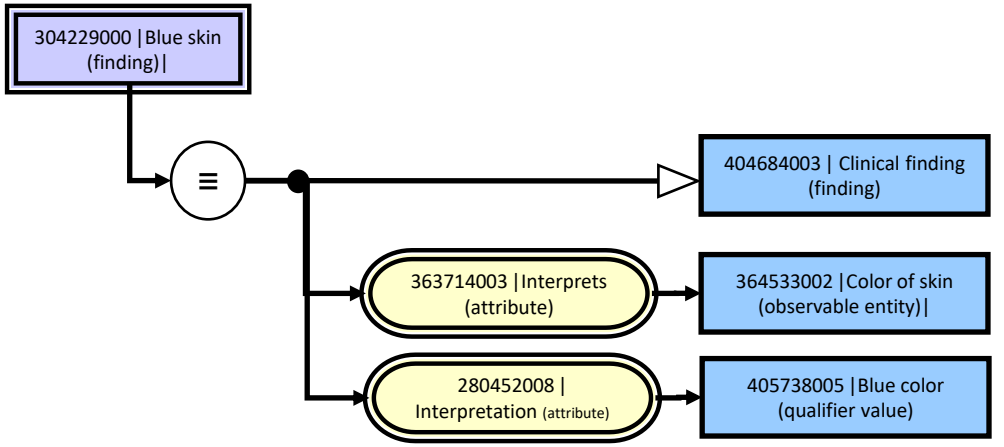
Current Inferred Definition



How to proceed

- Request changes to core definition
- Replace definition in extension
- Add definition in extension
  - Pending multiple definitions (only one sufficient)





General Concept Inclusion

(404684003 | Clinical finding (finding)

and

363714003 |Interprets (attribute) some 364533002 |Color of skin (observable entity)

and

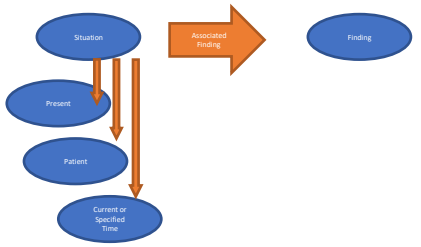
363713009 |Has interpretation (attribute) some 405738005 |Blue color (qualifier value))

subClassOf: 304229000 |Blue skin (finding)

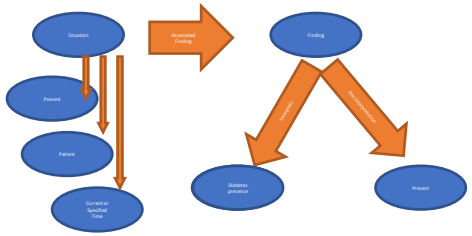
This will impute other properties to the finding, including finding site and evaluation procedure.

Algorithm for Constructing Expressions

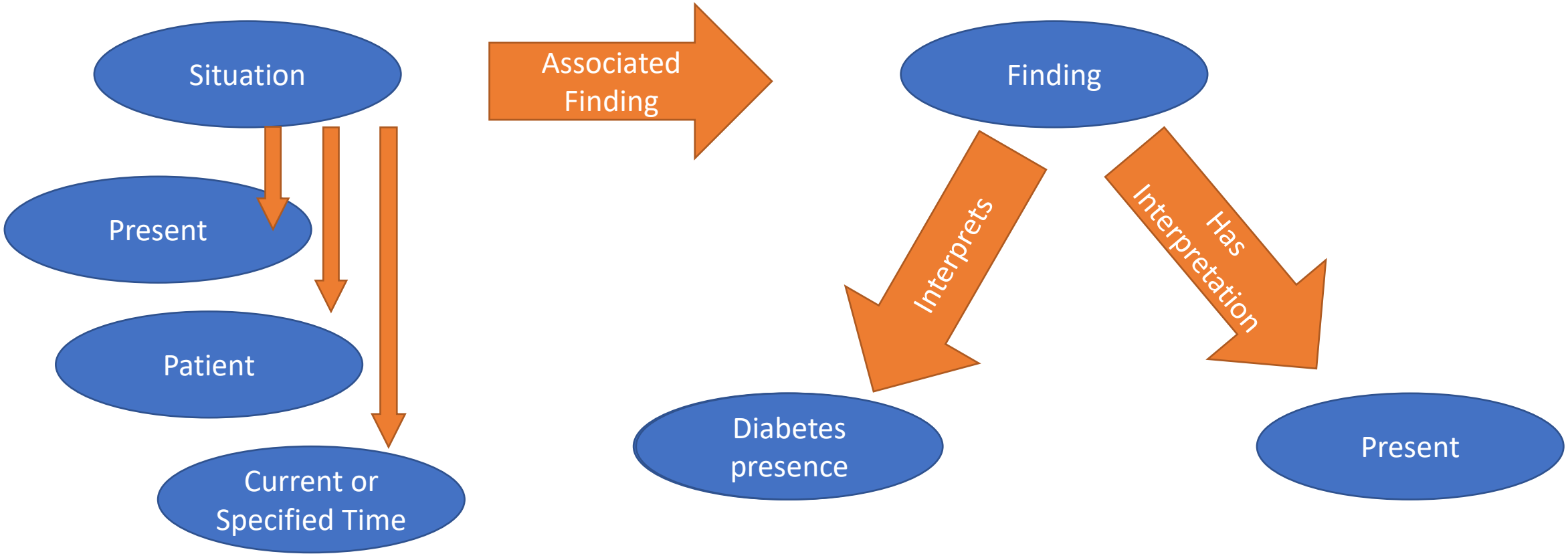
- If result is a Finding or an Observable Entity, use result as associatedFinding
  - key is ignored, whether it is “Assertion” (pattern 4) or Observable (pattern 6). It might even be Finding, if the pattern is specialization.



- If the result is a Qualifier and the key is an Observable, construct a Finding with interprets and hasInterpretation attributes.



Potentially redundant presence semantics



Questions

- How do we manage divergent definitions?
- How do we manage redundant presence elements?

Channels

- Jay Lyle: JayLyle@jpsys.com
- Susan Matney: Susan.Matney@imail.org

- Clinical Information Modeling Initiative (CIMI):
  - Conference call coordinates on HL7.org
  - Project notes on wiki.hl7.org