

*open*EHR

Terminology binding

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Problem overview

What is 'terminology binding'?

A formally expressible connection between information model representation and terminology representation of clinical statements recorded in the EHR

What is the 'binding problem'?

We need to know **how to control the use of terminology** within structured data so that it achieves what we want:

- Provides basis for querying
- Economically feasible

First, we need to know **how to structure data** so it:

- Doesn't violate ontological truths;
- Is mappable to ontological concepts;
- Supports data entry, storage, querying, reuse

Which 'structured' data?

Two kinds:

- Legacy proprietary: structures are all different
- Shared, standardised: agreed structures and information model, within a community of users (can be more than one such community).

The second kind we can standardise on.

Shared clinical data generally include structure and many data types.

Data are structured

Clinical statements are naturally structured, e.g.

- *lab results*: list / tree structure; normal ranges;
 - Microbiology is usually a large tree structure
- *vital signs*: timing and multiple data points;
 - BP: (2 data points + patient state) x time-series
- *physical examination*: structured by anatomy
 - E.g. Endoscopy of colon
- *assessments*: structured according to e.g. temporal model of disease course;
- *orders*: timing info, structured medication info;
- *actions*: timing, medication structured info

Other sources of structure

Data capture: at the user interface, the elements of a clinical statement are naturally distinct, e.g. procedure, site, protocol, time...

Document structures: reports, referrals etc are also structured, including audit info, sections.

For querying: data items that are queried for separately are usually separated, e.g. procedure type and body site.

Data have many types

Clinical statement data includes instances of:

- Text
- Coded terms
- Quantity, including units, proportions, counts, etc
- URIs
- Booleans
- Date, time, date/time, duration
- Parseable text, e.g. Units, medication timing
- Other more complex types

What *should* be SNOMED-coded?

- **Answers** which are:
 - textually expressible
 - whose value range is
 - Best modelled by as ontological description (i.e. discrete categorisation),
 - likely to be independently queried later on.
 - E.g. types of disease; blood types; but not general patient story (not expressible as just concepts)

I.e. a subset of textual data, which are a subset of all data

What *could* be SNOMED-coded?

- Questions which:
 - Need to be queried on using an *agreed reference coding standard*.

Example: 'serum sodium' (in context of blood film result of patient) does not need any coding to be 100% reliably queryable in *openEHR* environment. However, for the data to be re-usable by ANYONE later on, SNOMED-coding makes sense.

Understanding the binding problem

One thing complicates the task...SITUATION

Examples:

- list of body positions is not the same as list of body positions **pertinent to measuring BP**;
- valid Rh blood types differs depending on whether for **blood collection or transfusion**;
- almost all scales, e.g. Apgar, GCS, Borg, Barthel etc **define their own value sets** for common phenomena, which differ from contextless value sets of the same / similar phenomena in naming and number of divisions.

Value sets in scales

Figure 1. Modified Borg scale.

SCALE	SEVERITY
0	No Breathlessness* At All
0.5	Very Very Slight (Just Noticeable)
1	Very Slight
2	Slight Breathlessness
3	Moderate
4	Some What Severe
5	Severe Breathlessness
6	
7	Very Severe Breathlessness
8	FEEDING 0 = unable 5 = needs help cutting, spreading butter, etc., or requ 10 = independent
9	BATHING 0 = dependent 5 = independent (or in shower)
10	GROOMING 0 = needs to help with personal care 5 = independent face/hair/teeth/shaving (implements DRESSING 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.) BOWELS 0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent BLADDER 0 = incontinent, or catheterized and unable to manage alone 5 = occasional accident 10 = continent TOILET USE 0 = dependent

Score of 0	Score of 1	Score of 2	Component of Acronym
Skin colour			
blue all over	white at extremities body pink	pink all over	Appearance
Heart rate			
absent	slow	fast	Pulse
Reflex response			
no response to stimulation	grimacing when stimulated	crying and coughing	Grimace
Muscle tone			
limp	some bending or stretching of limbs	active movement	Activity
Breathing			
absent	weak or irregular	good and your baby is crying	Respiration

Binding and *open*EHR

Where is binding relevant in *openEHR*?

openEHR Archetypes - essentially, maximum data sets, i.e. all data points for a given domain 'recording' concept (not its ontological 'description').

- Examples:
 - Vitals signs: BP, Heart-rate etc
 - Labs – very structured, well understood
 - Physical exam – e.g. Pain, symptom....numerous!
 - Scales, e.g. GCS, Apgar, Barthel – ordinal data
- Terminology need: globally invariant mappings; broad value sets e.g. 'infectious agent'

Where is binding needed?

openEHR Templates - essentially, use-case specific content specifications; consist of data points from archetypes

- Examples:
 - Discharge summary
 - Lab report
 - Encounter note
- Terminology need: define local / region-specific or specialty-specific value sets and constraints, e.g. 'lung infection'
- NOT JUST TO SNOMED CT!

Kinds of binding - today

- Compositional expressions already used
- Direct binding to concept points
- Archetype local value sets → direct binding – value set specific to archetype
- Ref set binding for data points that correspond to reusable value sets
- Templates can have direct binding to SCT terms, with static value set defined in archetype or ref set reference

Kinds of binding - future

- Context-dependent bindings
- SCT Compositional constraints
- SCT Composition pattern mapping?

Type 1 binding – direct

Direct binding

- **WHEN:** we want to associate a terminology concept with a data item that we want to be able to query
- Ex: systolic BP
- Generally an archetype path → code binding
- Each path acts like a post-coordination
 - E.g. 24 hour average systolic pressure

Which SCT concept do we pick?

The screenshot shows a web interface for searching SNOMED CT concepts. The search term is 'systolic'. The results are organized into three columns:

- Search for "systolic" (17)**
 - Systolic
 - Systolic anterior movement of mitral
 - Systolic arterial pressure
 - Systolic blood pressure
 - Systolic blood pressure** (highlighted)
 - Systolic blood pressure on admission
 - Systolic blood pressure validity range
 - Systolic cardiac thrill
 - Systolic dysfunction
 - Systolic ejection sound
 - Systolic essential hypertension
 - Systolic flow murmur
 - Systolic heart failure
- Systolic blood pressure (9)**
 - Average systolic blood pressure** (highlighted)
 - Lying systolic blood pressure
 - Maximum systolic blood pressure
 - Minimum systolic blood pressure
 - Sitting systolic blood pressure
 - Standing systolic blood pressure
 - Systolic arterial pressure
 - Systolic blood pressure on admission
 - Target systolic blood pressure
- Average systolic blood pressure (4)**
 - Average 24 hour systolic blood pressure** (highlighted)
 - Average day interval systolic blood pressure
 - Average home systolic blood pressure
 - Average night interval systolic blood pressure

If we bind |systolic blood pressure| (usually means instantaneous),
SNOMED-driven queries would pick up 24h av, max, min etc

can 'systolic' be post-coordinated?

The image shows a screenshot of a medical ontology browser interface. It is divided into three main sections:

- Search for "blood pressure" (32):** This section on the left lists various terms related to blood pressure. The term "Blood pressure" is highlighted with a grey background and a plus sign icon to its left. Other terms include "Blood oxygen pressure", "Blood pressure abnormal - 1st recall", "Blood pressure abnormal - 2nd recal", "Blood pressure abnormal - 3rd recall", "Blood pressure apparatus", "Blood pressure cuff", "Blood pressure finding", "Blood pressure leaflet given", "Blood pressure monitoring", "Blood pressure procedure refused", and "Blood pressure recorded by patient".
- Blood pressure (15):** This middle section shows a list of sub-terms under the "Blood pressure" category. The term "Systemic blood pressure" is highlighted with a dark blue background and a plus sign icon to its left. Other terms include "24 hour blood pressure", "Arterial blood pressure", "Arterial pulse pressure", "Arterial wedge pressure", "Diastolic blood pressure", "Invasive blood pressure", "Lying blood pressure", "Mean blood pressure", "Post-vasodilatation arterial pressure", "Segmental pressure (blood pressure)", "Sitting blood pressure", "Standing blood pressure", "Systolic blood pressure", and "Venous pressure".
- Systemic blood pressure (1):** This rightmost section shows a single sub-term under "Systemic blood pressure", which is "Systemic arterial pressure", highlighted with a grey background.

|Bp| v |bp finding|

blood pressure

Search for "blood pressure" (32)

- Blood oxygen pressure
- + Blood pressure
- Blood pressure abnormal - 1st recall
- Blood pressure abnormal - 2nd recal
- Blood pressure abnormal - 3rd recall
- Blood pressure ABNORMAL - delete*
- Blood pressure abnormal but not dia*
- Blood pressure alteration
- + *Blood pressure apparatus*
- Blood pressure cuff
- Blood pressure cuff, device*
- Blood pressure fall*
- + **Blood pressure finding**
- Blood pressure leaflet given
- Blood pressure monitoring
- Blood pressure procedure refused
- Blood pressure recorded by patient

Blood pressure finding (12)

- + **Abnormal blood pressure**
- Blood pressure alteration
- + Decreased blood pressure, not hypoten
- Decreased pulmonary arterial wedge pr
- + Finding of arterial pulse pressure
- Finding of pulmonary arterial pressure
- + Finding of systemic arterial pressure
- Increased pulmonary arterial wedge pre
- Normal pulmonary arterial wedge press
- + O/E - blood pressure reading
- Unequal blood pressure in arms
- + Venous pressure - finding

/data/events[any event]/data/items[Systolic]
/data/events[any event]/data/items[Systolic]/value
/data/events[any event]/data/items[Diastolic]
/data/events[any event]/data/items[Diastolic]/value
/data/events[any event]/data/items[Comment]
/data/events[any event]/data/items[Comment]/value
/data/events[any event]/data/items[Mean Arterial Pressure]
/data/events[any event]/data/items[Mean Arterial Pressure]/value
/data/events[any event]/data/items[Pulse Pressure]
/data/events[any event]/data/items[Pulse Pressure]/value
/data/events[any event]/state
/data/events[any event]/state/items[Position]
/data/events[any event]/state/items[Position]/value
/data/events[any event]/state/items[Position]/value/defining_code
/data/events[any event]/state/items[Tilt]
/data/events[any event]/state/items[Tilt]/value
/data/events[any event]/state/items[Exertion]
/data/events[any event]/state/items[Sleep status]
/data/events[any event]/state/items[Sleep status]/value
/data/events[any event]/state/items[Sleep status]/value/defining_code
/data/events[any event]/state/items[Confounding factors]
/data/events[any event]/state/items[Confounding factors]/value
/data/events[24 hour average]
/data/events[24 hour average]/data
/data/events[24 hour average]/data/items[Systolic]
/data/events[24 hour average]/data/items[Systolic]/value
/data/events[24 hour average]/data/items[Diastolic]
/data/events[24 hour average]/data/items[Diastolic]/value

271649006 |systolic blood pressure|
OR
72313002|systolic arterial pressure|
OR
399304008|Systolic blood pressure
on admission|
OR....

314449000| Average 24hour
systolic blood pressure|

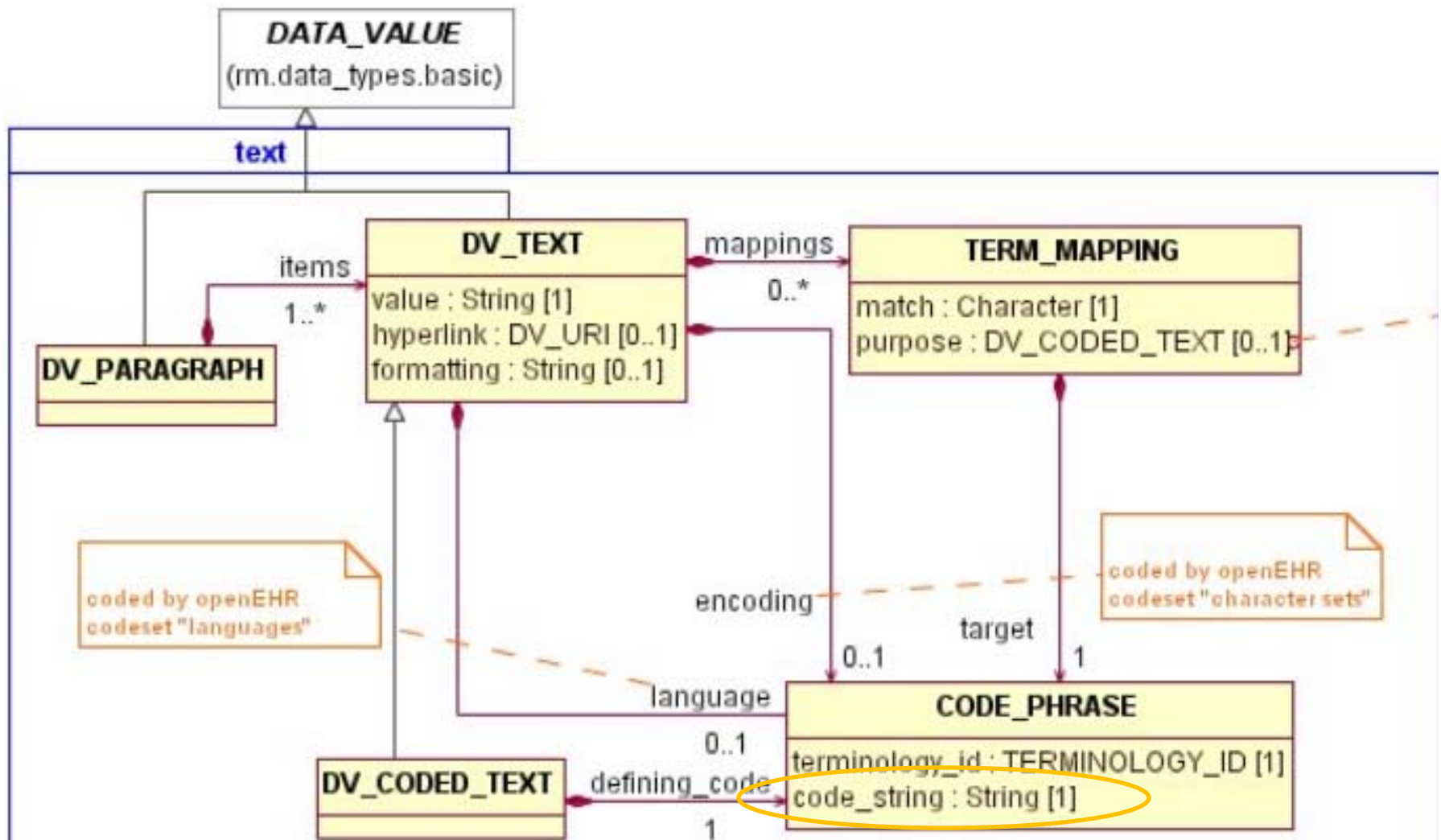
Considerations

Many parts of SNOMED, excessive precoordination makes it difficult to know what to choose

Basic problem: whatever binding modeller chooses, **query author might choose a different concept**, and the results may not be correct.

Type 2 binding – Compositional expressions

openEHR supports expressions



260686004=129304002,363704007=66754008

=procedure:{method = excision – action, procedure site = appendix structure}

Considerations

What if information system uses pre-coordinated term? A different post-coordination? Will querying work?

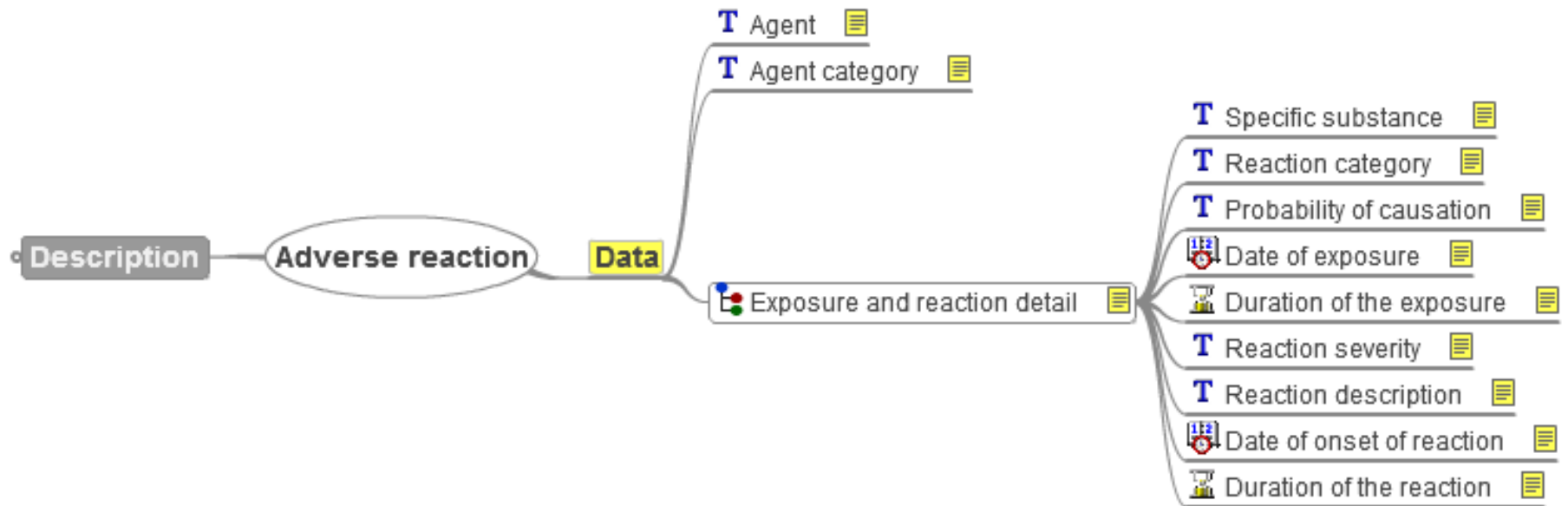
Relies heavily on normal form & equivalence working correctly.... and being economic to implement!

Type 3 binding – archetype internal value set

Internal value set

- **WHEN:** *situationally* dependent values,
 - e.g. Position of patient *for blood pressure measurement*
 - E.g. Set of breathing values *for Apgar*
- **WHEN:** poor/no matches available in SCT
- **OR:** good matches available, but no refset/subset available or desired, e.g. local use only
- Currently **VERY COMMON** in archetypes, including for scales

Adverse reaction (mindmap view)



Attribute view

Archetype: Adverse reaction (openEHR-EHR-EVALUATION.adverse.v1)

Header Data

unorderea)

T

Specific substance

Text
Occurrences: 0..1 (optional)

The specific substance that caused the reaction if different from the agent (e.g. brands or members of a class).

Free or coded text

T

Reaction category

Coded Text
Occurrences: 0..1 (optional)

The type of reaction experience by the person as determined by the clinician.

- **Intolerance** [Leads to unpleasant symptoms which are sufficient to avoid use in the future.]
- **Sensitivity** [Leads to morbidity which is potentially threatening to the wellbeing of the person.]
- **Allergy** [Leads to an IgE mediated reaction.]
- **No reaction** [Person has been exposed with no reaction.]

T

Probability of causation

Coded Text
Occurrences: 0..1 (optional)

Degree of certainty that the agent was the cause of the reaction.

- **Certain/Highly likely** [A reaction to the agent is deemed to be or have been present by the clinician.]
- **Probable** [The reaction is deemed to be the probable cause of the reaction.]
- **Possible** [The agent is deemed to be a possible cause of the reaction.]



Date of exposure

Date/Time
Occurrences: 0..1 (optional)

The date (+/- time) when the person became exposed to the agent.



Duration of the exposure

Duration
Occurrences: 0..1 (optional)

The duration of the exposure to the agent.

T

Reaction severity

The category of the reaction.

- **Mild** [A reaction which causes little

ADL view

```
EVALUATION[at0000] matches { -- Adverse reaction
  data matches {
    ITEM_TREE[at0002] matches { -- structure
      items cardinality matches {1..*; unordered} matches {
        ELEMENT[at0003] matches { -- Agent
          value matches {
            DV_TEXT matches {*}
          }
        }
      }
    }
  }
  ELEMENT[at0010] occurrences matches {0..1} matches { -- Agent category
    value matches {
      DV_CODED_TEXT matches {
        defining_code matches {
          [local::
            at0011, -- Food
            at0012, -- Animal
            at0013, -- Medication
            at0014, -- Other chemical or substance
            at0031, -- Non-active ingredient of medication
            at0033, -- Imaging dye or media
            at0034] -- Environmental
          }
        }
      }
    }
  }
}
CLUSTER[at0019] occurrences matches {0..*} matches { -- Exposure and reaction detail
  items cardinality matches {1..*; unordered} matches {
    ELEMENT[at0032] occurrences matches {0..1} matches { -- Specific substance
```



```
}  
ELEMENT[at0015] occurrences matches {0..1} matches { -- Reaction category  
  value matches {  
    DV_CODED_TEXT matches {  
      defining_code matches {  
        [local::  
          at0016, -- Intolerance  
          at0017, -- Sensitivity  
          at0018, -- Allergy  
          at0030] -- No reaction  
        }  
      }  
    }  
  }  
}
```

```
}  
ELEMENT[at0004] occurrences matches {0..1} matches { -- Probability of causation  
  value matches {  
    DV_CODED_TEXT matches {  
      defining_code matches {  
        [local::  
          at0005, -- Certain/Highly likely  
          at0006, -- Probable  
          at0007] -- Possible  
        }  
      }  
    }  
  }  
}
```

```
}  
ELEMENT[at0020] occurrences matches {0..1} matches { -- Date of exposure  
  value matches {  
    DV_DATE_TIME matches {*}  
  }  
}
```

```
}
}
ELEMENT[at0021] occurrences matches {0..1} matches { -- Duration of the exposure
  value matches {
    DV_DURATION matches {*}
  }
}
ELEMENT[at0023] occurrences matches {0..1} matches { - Reaction severity
  value matches {
    DV_CODED_TEXT matches {
      defining_code matches {
        [local::
          at0024, -- Mild
          at0025, -- Disabling
          at0026] -- Life threatening
        }
      }
    }
  }
}
}
ELEMENT[at0022] matches { -- Reaction description
  value matches {
    DV_TEXT matches {*}
  }
}
ELEMENT[at0027] occurrences matches {0..1} matches { -- Date of onset of reaction
  value matches {
    DV_DATE_TIME matches {*}
  }
}
ELEMENT[at0028] occurrences matches {0..1} matches { -- Duration of the reaction
```

Agent category binding...

Archetype term	SCT candidates
at0011 food	406465008 food allergen , 255620007 Foods Note 149 top-level concepts containing 'food'
at0012 animal	39866004 animal Note 241 top-level concepts containing 'animal'; no 'animal allergen'
at0013 medication	119 top-level terms containing 'medication' (heavily pre-coordinated), but no medication ...!
at0014 Other chemical or substance	33565001 chemical agent ??? 167 top-level concepts containing 'chemical'
at0031 Non-active ingredient of medication	Nothing with 'ingredient'
at0032 imaging dye or media	Nothing suitable
at0033 environmental	Some approximate matches...

Considerations

- Should we bind to SNOMED at all?
 - Codes could be useful, since we might want to find adverse reactions caused by ‘environment’ or ‘food’
- How to bind, or model?
 - Currently, the archetype defines the value set
 - Could bind each internal code to an SCT code
 - Difficulties finding candidate concepts
 - Could we use a ref set instead?
 - This archetype has 4 internal coded value sets...what happens with 2000 archetypes?

Type 4 binding – ref set

Ref set binding

This is for data points that correspond to context-independent domain concepts, e.g.

- Pain character
- Infectious agent

The archetype or template can include an ac-code that binds to an external resource, such as a ref-set id/URI.

Problem/diagnosis

Diagnosis (v1)

Archetype: Diagnosis (openEHR-EHR-EVALUATION.problem-diagnosis.v1)

Header Data Protocol

Structure: Tree
Occurrences: 1..1 (mandatory)
Cardinality: 1..* (mandatory, repeating, ordered)

T	Diagnosis Coded Text Occurrences: 1..1 (mandatory)	The index diagnosis	Any term that 'is_a' diagnosis (Any term that is a diagnosis in an accepted terminology)
T	Status Coded Text Occurrences: 0..1 (optional)	The status of the diagnosis	<ul style="list-style-type: none">• provisional [provisional diagnosis considered likely and a basis for proceeding with management]• working [working diagnosis considered very likely but not yet confirmed]
(4)	Date of initial onset	The date that the problem began causing	

Diagnosis (v1)



```
data matches {
  ITEM_TREE[at0001] matches { -- structure
    items cardinality matches {1..*; ordered} matches {
      ELEMENT[at0002.1] matches { -- Diagnosis
        value matches {
          DV_CODED_TEXT matches {
            defining_code matches {[ac0.1]} -- Any term that 'is_a' diagnosis
          }
        }
      }
    }
  }
}
```

```
["en"] = <
  items = <
    ["ac0.1"] = <
      text = <"Any term that 'is_a' diagnosis">
      description = <"Any term that is a diagnosis in an accepted terminology">
    >
    ["ac0000"] = <
      text = <"Any term that describes a body site">
      description = <"An anatomical structure with qualifiers">
    >
  >
>
```

```
constraint_bindings = <
  ["SNOMEDCT"] = <
    items = <
      ["ac0.1"] = <http://www.terminology.org?refsetid=20293847593>
    >
  >
>
```


All Infectious Agents ref set

The screenshot displays a software interface with two main panels. The top panel, titled 'AllInfectiousAgents', shows 'Query Details' for a query named 'AllInfectiousAgents'. The details include: Service: Default; Terminology: Snomed; Language: en-GB; Prune: false; Storage Mode: Permanent. The bottom panel shows a hierarchical tree of results. The left pane shows 'Top Level (2)' with 'Bacteria' and 'Infectious agent'. The middle pane shows 'Bacteria (27)' with a list of categories including 'Fastidious bacterium', which is highlighted in blue. The right pane shows 'Fastidious bacterium (2)' with sub-items 'Fastidious bacteria' and 'Fastidious Gram Negative Rods'. A large arrow labeled 'Definition' points from the right towards the query details, and another large arrow labeled 'Result' points from the left towards the results pane.

Query: AllInfectiousAgents, Snomed, en-GB, Prune = false

Concept: Infectious agent, Select

Iterator: Maximum Depth Unlimited

Related Concepts: -Is a, Select

Tree: -Part of; Root = Navigate; Bacteria; Default = N

Query Details

Service: Default

Query Name: AllInfectiousAgents

Terminology: Snomed

Language: en-GB

Parent Query:

Base Query:

Prune: false

Storage Mode: Permanent

Top Level (2)

- Bacteria
- Infectious agent

Bacteria (27)

- Anaerobic bacteria
- Bacterial serotype
- Budding and Appendaged Bacteria
- Capnophilic bacteria
- Cocci
- Cocci bacilli
- Cytophaga-like bacteria
- Diplococci
- Enteric bacterium
- Facultative anaerobic bacteria
- Fastidious bacterium**
- Fluorescent bacteria
- Form-bacillus

Fastidious bacterium (2)

- Fastidious bacteria
- Fastidious Gram Negative Rods

← Definition

Result →

Future approaches

1 Compositional constraints

- **WHEN: we already agree on using single post-coordinated code phrase**
- E.g. Want to force information capture of site to include laterality, where it is defined.
- Can express a SNOMED constraint for this that forces laterality to exist.
- This capability does not yet exist in *openEHR*, but is very easy to add into the `C_CODE_PHRASE` constraint class
- **Requires a solid definition of SNOMED constraint grammar**

2 Context-dependent bindings

- **WHEN:** terminology codes incorporate contextual value, e.g. patient sex, pathology challenge, time, etc
 - E.g. Bindings to LOINC codes can depend on 'protocol', i.e. LOINC 'challenge'
 - Some SNOMED concepts are specific to patient gender or other attributes

E.g. Lying systolic bp

The following not legal ADL today, but it could be....

```
/data/events[at0006|any event|]/data/items[Systolic]  
  WHEN /data/events[at0006|any event|]  
    /state /items[at0008|Position|] = at1003|Lying|  
  → 407556006|Lying systolic blood pressure|
```

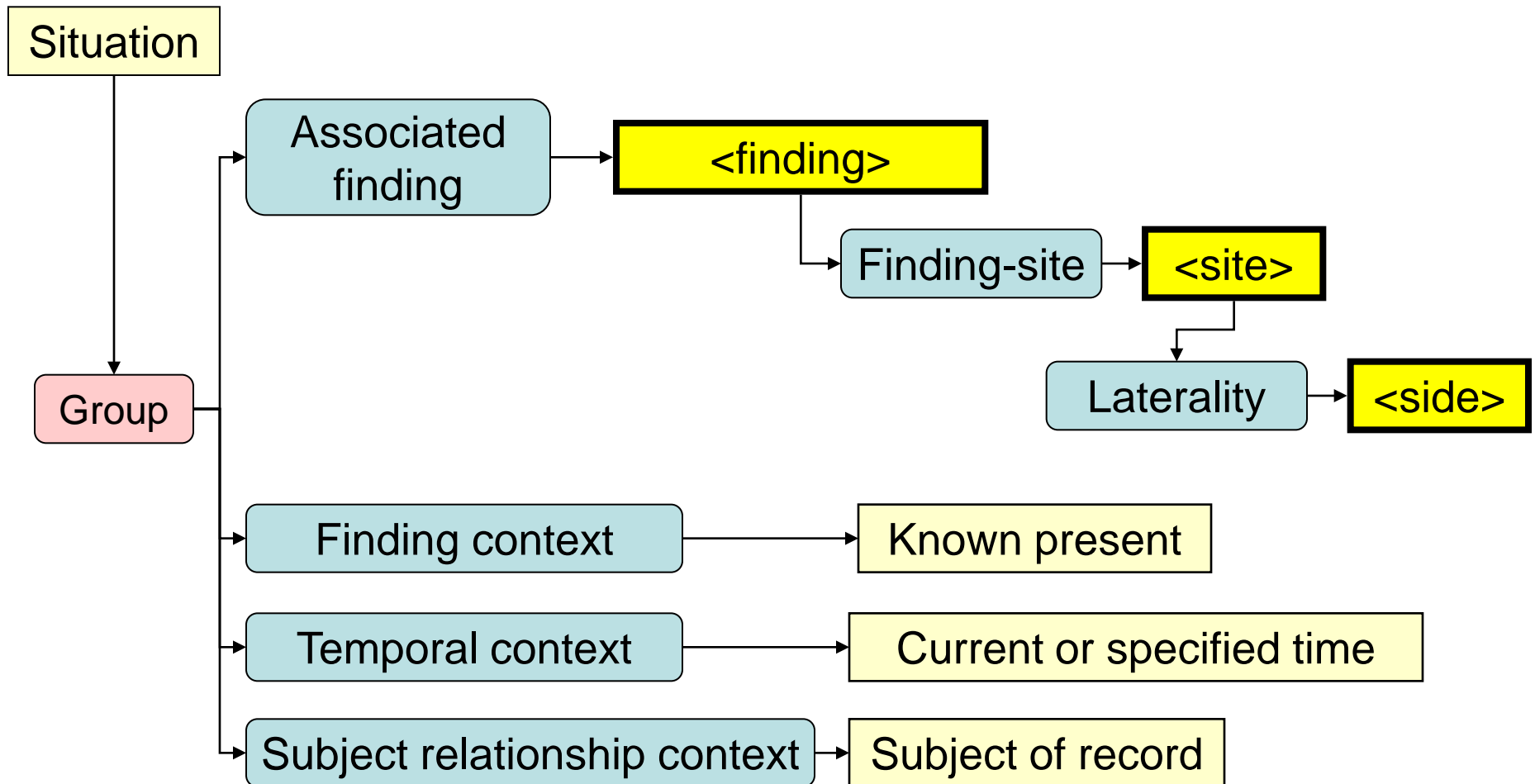
2 Context-dependent bindings

- Would need small syntax addition in ADL to connect a condition (FOPL expression on archetype data) to a concept in terminology.
- Considerations for SNOMED:
 - Excessive precoordination makes concept selection difficult; query author might select another concept

3 Compositional pattern approach

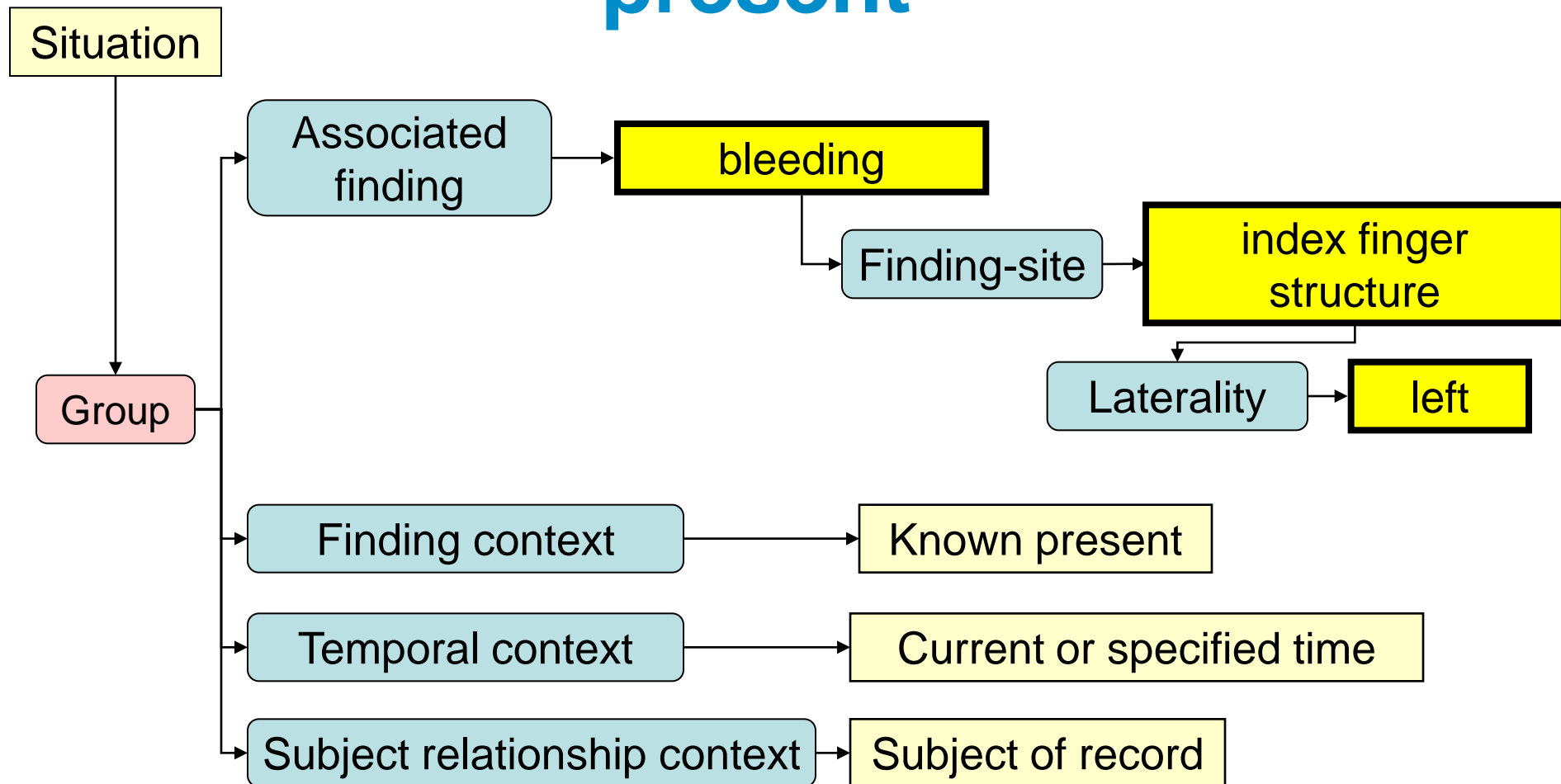
- **WHEN:** there are multiple attributes in IM (some may be post-coordinated), that we want to code together rather than separately
- The emergence of patterns for Compositions of complex clinical statements may be useful in solving the binding problem
- Beginning looks promising
- Questions:
 - how will this work evolve?
 - HOW MUCH COMPOSITION IS ENOUGH?

Clinical finding present + site + side



Clinical-finding-present-with-site-and-side (<finding>,<site>,<side>)




Bleeding of left index finger present











Clinical-finding-present-with-site-and-side (bleeding, index finger structure, left)

Inspection archetype

Inspection (v1)

Archetype: Inspection (openEHR-EHR-CLUSTER.inspection.v1)			
Header		Items	
Structure: Cluster Occurrences: 1..1 (mandatory) Cardinality: 0..* (<i>optional, repeating, unordered</i>)			
	Normal statements Cluster Occurrences: 0..1 (optional) Cardinality: 0..* (<i>optional, repeating, unordered</i>)	An optional group of statements about the normality of the inspection	
T	Normal statement Text Occurrences: 0..* (<i>optional, repeating</i>)	A specific statement about the normality of inspection	Free or coded text
T	Clinical Description Text Occurrences: 0..1 (optional)	Clinical description of the findings on inspection	Free or coded text
	Findings Cluster Occurrences: 0..1 (optional) Cardinality: 0..* (<i>optional, repeating, unordered</i>)	Specific findings on inspection	
T	Colour description Text Occurrences: 0..1 (optional)	The colour of the object under inspection	Free or coded text
	Location Cluster Occurrences: 0..1 (optional) Cardinality: 0..* (<i>optional, repeating, unordered</i>)	The location of any findings	

Inspection (v1)

Archetype: Inspection (openEHR-EHR-CLUSTER.inspection.v1)			
Header		Items	
	Shape or distribution Cluster Occurrences: 0..1 (optional) Cardinality: 0..* (<i>optional, repeating, unordered</i>)	The shape or distribution of the object inspected	
	Description Text Occurrences: 0..1 (optional)	Description of the	Free or coded text
	Symmetrical Boolean Occurrences: 0..1 (optional)	Whether the distribution is symmetrical	
	Contour Text Occurrences: 0..1 (optional)	The contour of the object of inspection	Free or coded text
	Overlying skin or surface Text Occurrences: 0..1 (optional)	A description of the surface	Free or coded text
	Surrounds Text Occurrences: 0..1 (optional)	Description of immediate surrounds to object	Free or coded text
	Edge Cluster Occurrences: 0..1 (optional) Cardinality: 0..* (<i>optional, repeating, unordered</i>)	Findings about the edge of the object under inspection	
	Description Text	Description of the edge or border of the object of inspection	Free or coded text

Inspection (v1)

Archetype: Inspection (openEHR-EHR-CLUSTER.inspection.v1)

Header Items

unordered



Description

Text
Occurrences: 0..1 (optional)

Description of the edge or border of the object of inspection

Free or coded text



Definition

Coded Text
Occurrences: 0..1 (optional)

The nature of the edge of the object of examination

- Well defined [The edge is clearly defined]
- Moderately defined [The edge is defined but less clear in places]
- Poorly defined [The edge is not defined clearly in many places]



Translucent

Boolean
Occurrences: 0..1 (optional)

Is the object of inspection translucent?



Detail

Cluster
Occurrences: 0..1 (optional)
Cardinality: 0..* (*optional, repeating, unordered*)

Detailed examination of a finding on inspection



Cluster: Exam

Slot (Cluster)
Occurrences: 0..1 (optional)

Exam details

Include:

openEHR-EHR-CLUSTER.exam.v1

Included



Drawing























Multimedia
Occurrences: 0..1 (optional)

A drawing of the findings on inspection

image/cgm, image/gif, image/png, image/tiff, image/jpeg



All archetypes

-  Device details (v1)
-  Diagnostic synthesis - lymphoma
-  Dimensions (v1)
-  Environmental conditions (v1)
-  Examination (v1)
 -   Examination of a named body
 -  Examination of bone (v1)
 -  Examination of mouth (v1)
 -  Examination of nose (v1)
 -  Examination of the abdomen
 -  Examination of the cervix (v1)
 -  Examination of the chest (v1)
 -  Examination of the ears (v1)
 -  Examination of the face (v1)
 -  Examination of the fetus (v1)
 -  Examination of the uterus (v1)
 -  Examination of thyroid (v1)
-  Free text (v1)
-  Gait (v1)
-  Health event (v1)
-  Hydration (v1)

Binding

- Archetype(s) are far more detailed (but mostly optional data points)
- Two data points match:
 - /items[Clinical description] = Finding
 - /items[Findings]/items[Location]/items[Description] = Site
- Mismatches:
 - Second is 0..* - e.g. a burn could be in multiple locations → pattern only allows 1 location
 - Archetype location assumes laterality included – needs variant pattern?

Possible general approach

- Map pattern *parameters* to content model *data points*; add following to archetype:

```
Concept_bindings = <
  ["SNOMEDCT"] = <
    patterns = <
      ["clinical finding"] = <
        name = <[1213124|clinical finding present|]>
        mappings = <
          [02020202|finding|] = </items[at0004|Clinical description|]>
          [33333222|site|] =
            </items[Findings]/items[Location]/items[Description] >
        >
      >
    >
  >
<
```

Potential?

Could this work generally?

- Could avoid full Compositional code strings in data, and instead map pattern parameters to IM data points
 - → reduces dependence
 - But how stable are the parameters?
 - Will there be enough patterns?

Summary

- *openEHR* archetype/template approach provides a semantic framework for capturing, representing and querying any data
- **BIG ADVANTAGE:** bindings are expressed in archetypes and templates, **NOT THE DATA;** can be added **AFTER** initial deployment
- Initial binding approaches are working, but are incomplete, and may be out of date, e.g. Internal value sets → Ref sets in the future?

Challenges

- When to code and not
- How to ensure binding assumption matches query authors (there will be many of the latter)
- How to choose SCT concepts.... pre-coordination problem
- Need for SCT post-coordination expression equivalence to work
- Solution that handles ICDx, LOINC, local terminologies

Questions?

Resources

<http://www.openEHR.org/knowledge> - archetypes

Other – see e.g. D Markwell's CFH report 2009

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