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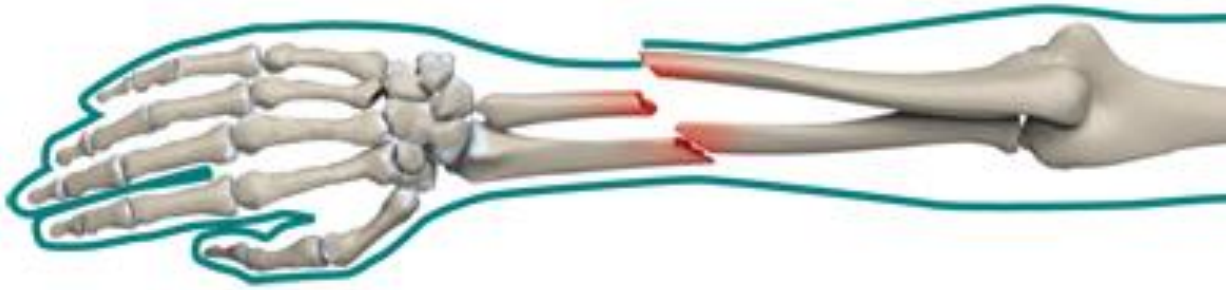
IHTSDO group „Event, Condition, Episode“

ICBO 2015

Lisbon, Portugal, July 27-30, 2015

Formal representation of disorder associations in SNOMED CT

Disorder association example



SCTID: 75857000

Fracture of radius **AND** ulna (disorder)

	'after'	'and'	'caused by'	'due to'	'with'	'without'	Σ	Σ_{abs}
Body Struct.	.0	2.5	.0	.0	.6	.0	3.1	951
Clin. Finding	.1	3.0	.1	2.7	4.7	1.3	11.9	11,974
Event	.6	8.1	12.0	1.9	9.6	3.1	44.3	1,627
Obs. Entity	.3	2.3	.0	.0	.5	.0	3.1	257
Product	.0	1.5	.0	.0	.0	.0	1.5	259
Phys. Object	.0	2.3	.0	.0	5.4	1.2	9.0	408
Procedure	.1	5.8	.0	.0	5.8	.3	12.1	6,497
Qual. Value	.2	1.1	.0	.0	.4	.0	1.8	162
Situation	.3	1.8	.0	.2	3.9	.4	6.6	243
Substance	.0	1.1	.0	.0	.4	.0	1.5	353
Others	.0	1.2	.0	.0	.1	.0	1.3	584
ALL	.0	2.9	.2	1.0	3.0	.5	7.7	23,039

Co-ordinating expressions: no clear patterns

Diabetic retinopathy subclassOf
'associated with' some *Diabetes mellitus*

Paraneoplastic neuropathy subclassOf
'due to' some *Neoplastic disease* using

Dermatomycosis associated with AIDS subClassOf
'associated with' some AIDS

AIDS with dermatomycosis (disorder) subclassOf *AIDS*

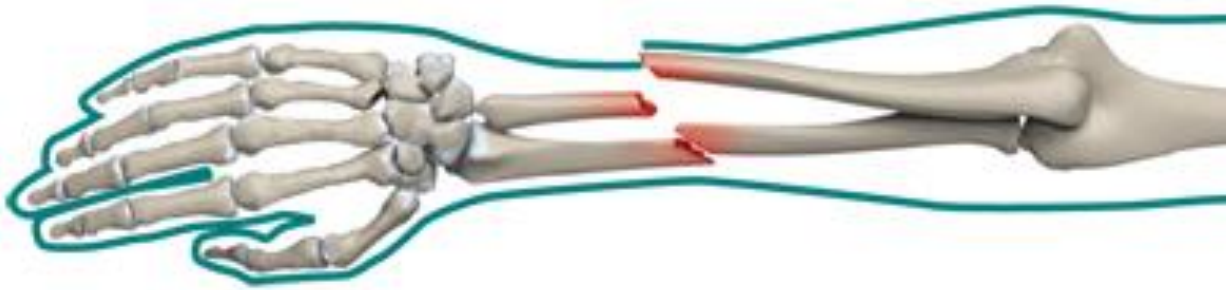
C#1: Chips and Fish

C#2: Fish and Chips

Methods

- Random selection of SNOMED CT concepts labelled by co-ordinated expressions
- Collaborative identification of recurring patterns done by the IHTSDO group Event, Condition, Episode
- Using BioTopLite2 as domain upper ontology
- Scope limited to of the investigation to the SNOMED CT hierarchy *Clinical Finding* / *Disorder*
- Interpreting SNOMED CT disorders and findings as Clinical Life Phases (aka Clinical Situations)

“A and B” : Current SNOMED pattern



Parents

- Fracture of radius (disorder)
- Fracture of ulna (disorder)

Fracture of radius AND ulna (disorder) ☆

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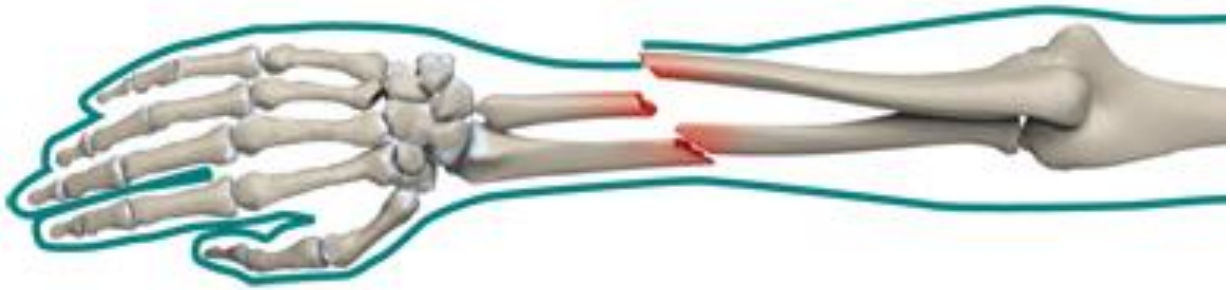
Fracture of radius AND ulna (disorder)
Fracture of radius AND ulna

Finding site → Bone structure of radius
Associated morphology → Fracture

Finding site → Bone structure of ulna
Associated morphology → Fracture

“A and B” : Current SNOMED pattern



'*Fracture of Radius and Ulna*' equivalentTo

RoleGroup some

('**Finding site**' some '*Bone structure of ulna*' and

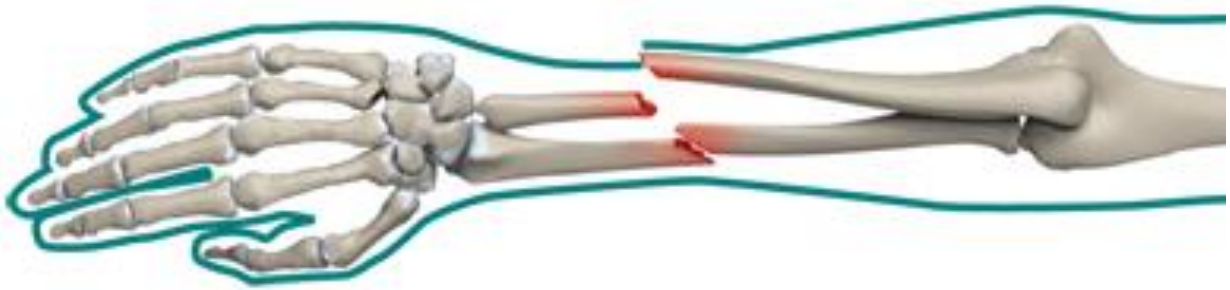
'**Associated morphology**' some *Fracture*) and

RoleGroup some

('**Finding site**' some '*Bone structure of radius*' and

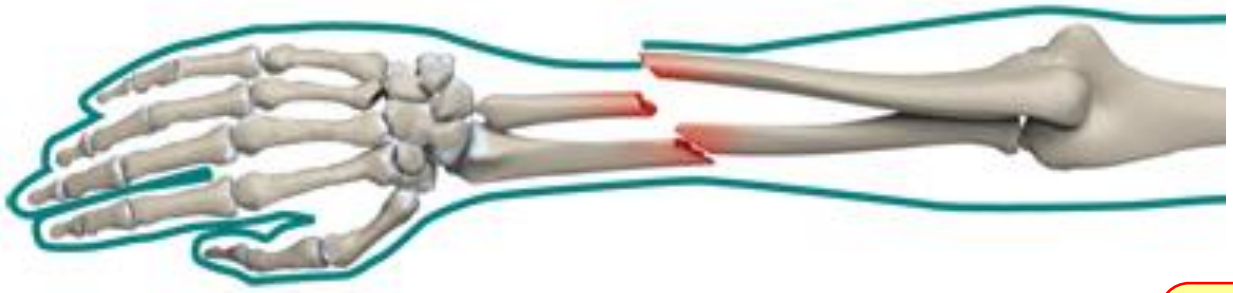
'**Associated morphology**' some *Fracture*)

Re-interpretation as “Clinical Life Phase”



'*Fracture of Radius and Ulna*' equivalentTo
  '**has Condition**' some
    ('**Finding site**' some '*Bone structure of ulna*' and
     '**Associated morphology**' some *Fracture*) and
  '**has Condition**' some
    ('**Finding site**' some '*Bone structure of radius*' and
     '**Associated morphology**' some *Fracture*)

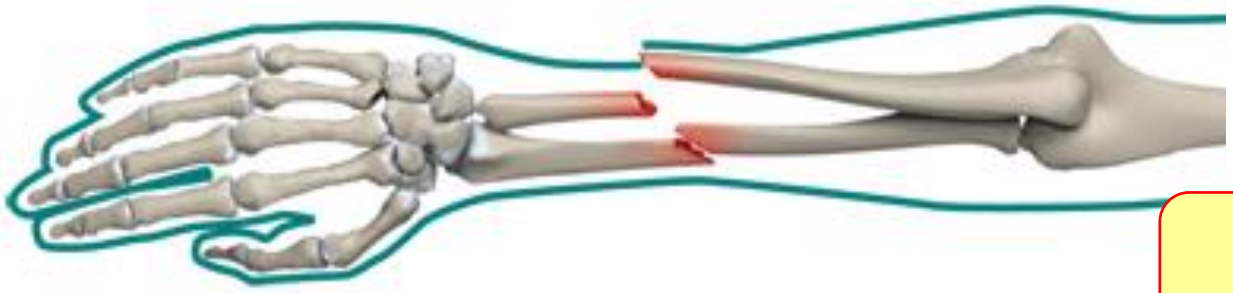
Re-interpretation as “Clinical Life Phase”



Clinical Condition

'*Fracture of Radius and Ulna*' equivalentTo
'**has Condition**' some
('**Finding site**' some '*Bone structure of ulna*' and
'**Associated morphology**' some *Fracture*) and
'**has Condition**' some
('**Finding site**' some '*Bone structure of radius*' and
'**Associated morphology**' some *Fracture*)

Re-interpretation as “Clinical Life Phase”



Clinical
Life Phase

'*Fracture of Radius and Ulna*' equivalentTo

'**has Condition**' some

('**Finding site**' some '*Bone structure of ulna*' and

'**Associated morphology**' some *Fracture*)

and

'**has Condition**' some

('**Finding site**' some '*Bone structure of radius*' and

'**Associated morphology**' some *Fracture*)

Results: Four Patterns identified

	Definition	Example
#1	Both *X* and *Y* are co-occurrent, but with no causality or manifestational relationship between *X* and *Y*	*Hay fever with asthma*
#2	*X* is due to *Y,* but *X* and *Y* are not necessarily co-occurrent	*Disorder of optic chiasm due to non-pituitary neoplasm*
#3	X temporally follows Y. This does not specify that *X* is due to *Y,* although causality is frequently implied	*Postvaricella encephalitis*
#4	X is due to *Y,* and both *X* and *Y* are co-occurrent	*Hernia, with intestinal obstruction*

Pattern #1 – "co-occurrent with"

Both *X* and *Y* are co-occurrent, but with no causality between *X* and *Y*.

XwithY$_{CLP}$ equivalentTo *X*$_{CLP}$ and *Y*$_{CLP}$

X$_{CLP}$ equivalentTo '**has condition**' some *X*
Y$_{CLP}$ equivalentTo '**has condition**' some *Y*

XwithY$_{CLP}$ equivalentTo '*Clinical life phase*' and
'**has condition**' some *X* and
'**has condition**' some *Y*

Corresponds to current Radius / Ulna pattern

Pattern #2 – "due to"

X is due to Y but X and Y are not necessarily co-occurrent

XcausedByY$_{CLP}$ equivalentTo *X*$_{CLP}$ and
'**due to**' some *Y*$_{CLP}$

Corresponds to current SNOMED CT representations

**XcausedByY*$_{CLP}$ equivalentTo '*Clinical life phase*'
and '**has condition**' some
(*X* and '**is caused by**' some *Y*)

Preferrable, currently infeasible

Pattern #3 – "follows"

X temporally follows Y. This does not specify that X is due to Y, although causality is frequently implied

XfollowsY$_{CLP}$ equivalentTo *X*$_{CLP}$ and

follows some *Y*$_{CLP}$

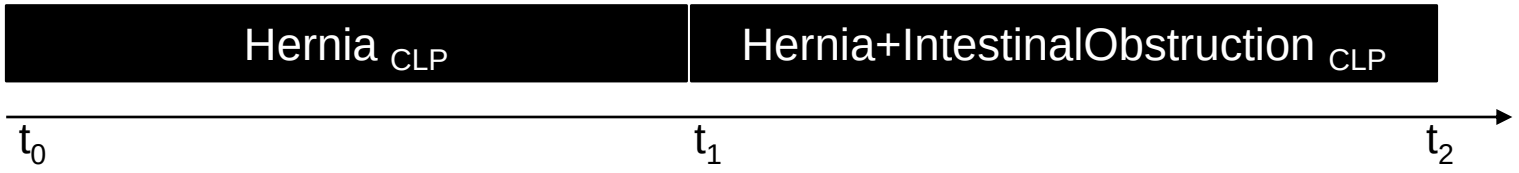
Corresponds to current SNOMED CT representations

Pattern #4 – "co-occurrent and due to"

X temporally follows Y. This does not specify that X is due to Y, although causality is frequently implied

XdueToCooccurringY$_{CLP}$ equivalentTo
X_{CLP} and Y_{CLP} and '**due to**' some Y_{CLP}

Y_{CLP} referenced twice – two different instances



Conclusion / Outlook

- SNOMED CT: Terminology in use, still having significant quality issues due to its legacy
- Therefore, graceful evolution instead of radical redesign:
  - Analysing the implicit meaning of content, e.g. disorders / findings as clinical life phases
  - Formulating design patterns based on recurring phenomena
  - Identifying SNOMED CT content matching these patterns
  - Fitting heterogeneously modelled content to patterns
  - Continuous Validation by modellers and users
- Goal: SNOMED CT as an ontology-based terminology, increasingly incorporating Applied Ontology good practices, together with consistent guidelines for content development

Thank You

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