

Post-Coordination in the Mapping of Interface Terms of a Clinical Wound Documentation System to SNOMED CT

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Objectives

- Development of a HL7-CDA level 3 conformant representation for a clinical wound documentation system in dermatology
 - Map SNOMED CT to clinical items/ values
 - Map LOINC to structuring entities
- Understand the SNOMED CT post-coordination rules, syntax and semantics
 - formalize them with DL

Web based clinical wound documentation system (dermatology)

Anamnese | **Photos** | **Wunde 1** | **Wunde 2** | **Wunde 3** | **Wunde 4** | **Gesamtbeurteilung und Prozedere**

Lokalisation
Lokalisation: Körperhälfte:
Kommentar:

Befund
Fläche: cm² max. Tiefe: mm
Exsudation: Geruch:
Wundgrund: Epithelisation:
Wundrand: unauffällig flach unterminiert stufenförmig lippenförmig Epithelsaum mazeriert trocken
 schuppig atroph-fragil dermatoliposklerotisch Ödem Überwärmung entzündl. Rötung
Infektion: Kommentar:
Freitext:

Photo
Übersicht:


Detail:


Beurteilung
Wundstatus: (im Vergleich zur letzten Vorstellung)

Methods

- Wound documentation: 15 sections, 44 items with 130 values (after reduction: total of 154 terms)
- Independent assignment of LOINC and SNOMED CT codes or expressions by 2 persons
 - Consent on divergent or ambiguous assignments
- CliniClue-Browser version 5.6 with expression builder
- LOINC version 2.19 and SNOMED CT versions 0607CORE and 0701CORE
- SNOMED CT documentation from IHTSDO (Nov. 2006 version)

Results

- N = 154
- 33 LOINC codes
- 140 SNOMED CT codes or expressions
 - 91 pre-coordinated
 - 49 post-coordinated
- Very high coverage in this clinical domain

N=154	none	LOINC	LOINC & SNOMED CT	SNOMED CT
	1	13	20	120
pre-coordinated			91	
post-coordinated			49	
			140	

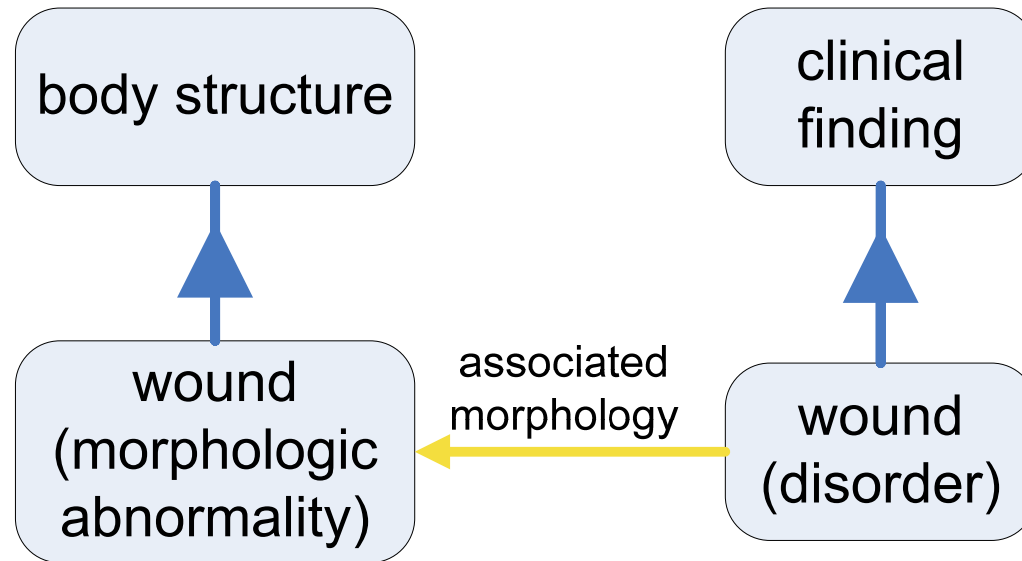
Refinement of individual attribute values

- “A defining relationship of the base *concept* can be refined by applying a value that is a subtype of the defining value.”

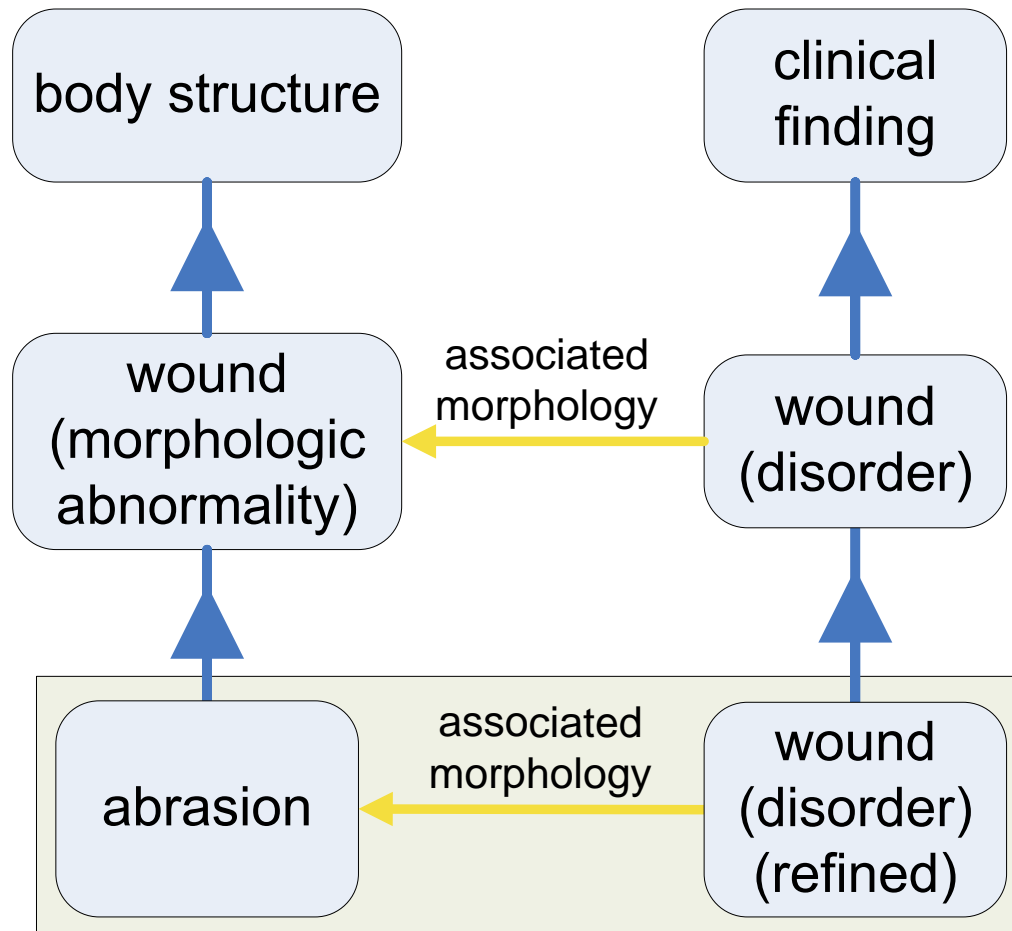
(SNOMED CT Abstract Logical Model and Representational Forms)

$$(A \sqsubseteq B) \rightarrow (\exists r.A \sqsubseteq \exists r.B)$$

Refinement of individual attribute values (example)



Refinement of individual attribute values (example)



Refinement of individual attribute values (normal form)

```
416462003|wound (disorder)|  
  116680003|is a|=64572001|disease|  
    ,116676008|associated morphology|=  
      13924000|wound (morph. abnormality)|
```

```
64572001|disease|:  
  116676008|associated morphology|=  
    400061001|abrasion|
```

Refinement of attribute names

- “A defining relationship of the base concept can also be refined by applying a name that is a subtype of the defining attribute name. For example, if the defining relationship specifies a "procedure site" this may be refined to "procedure site – direct" or "procedure site – indirect”.

(SNOMED CT Abstract Logical Model and Representational Forms)

$$(r_1 \sqsubseteq r_2) \rightarrow (\exists r_1.A \sqsubseteq \exists r_2.A)$$

Refinement of defining relationship groups

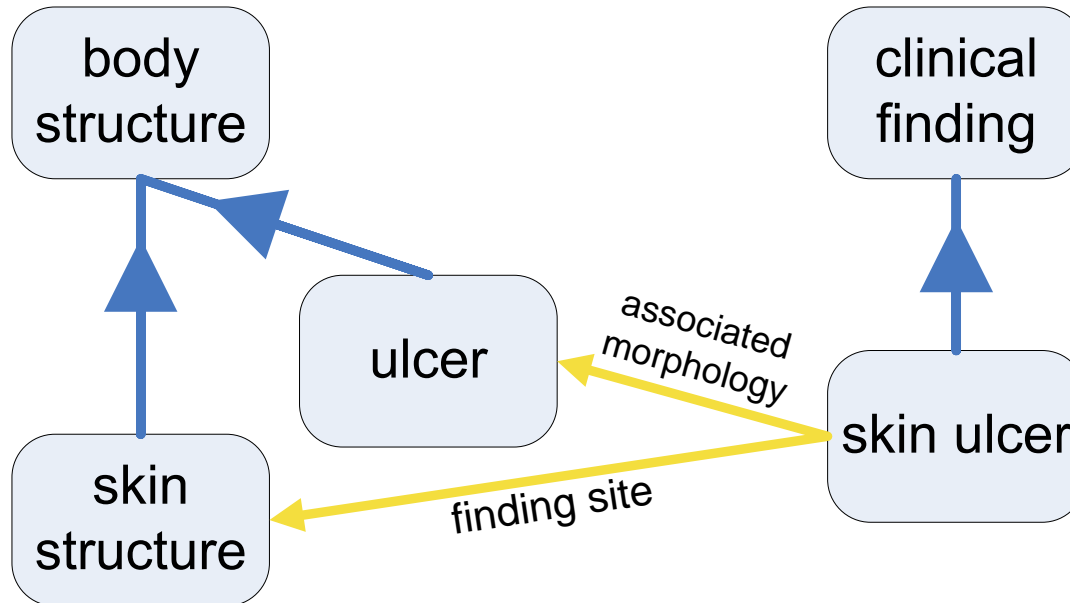
- “If a refinement is applied to one of the defining relationships within a relationship group, it is the group as a whole that is refined.”

(SNOMED CT Abstract Logical Model and Representational Forms)

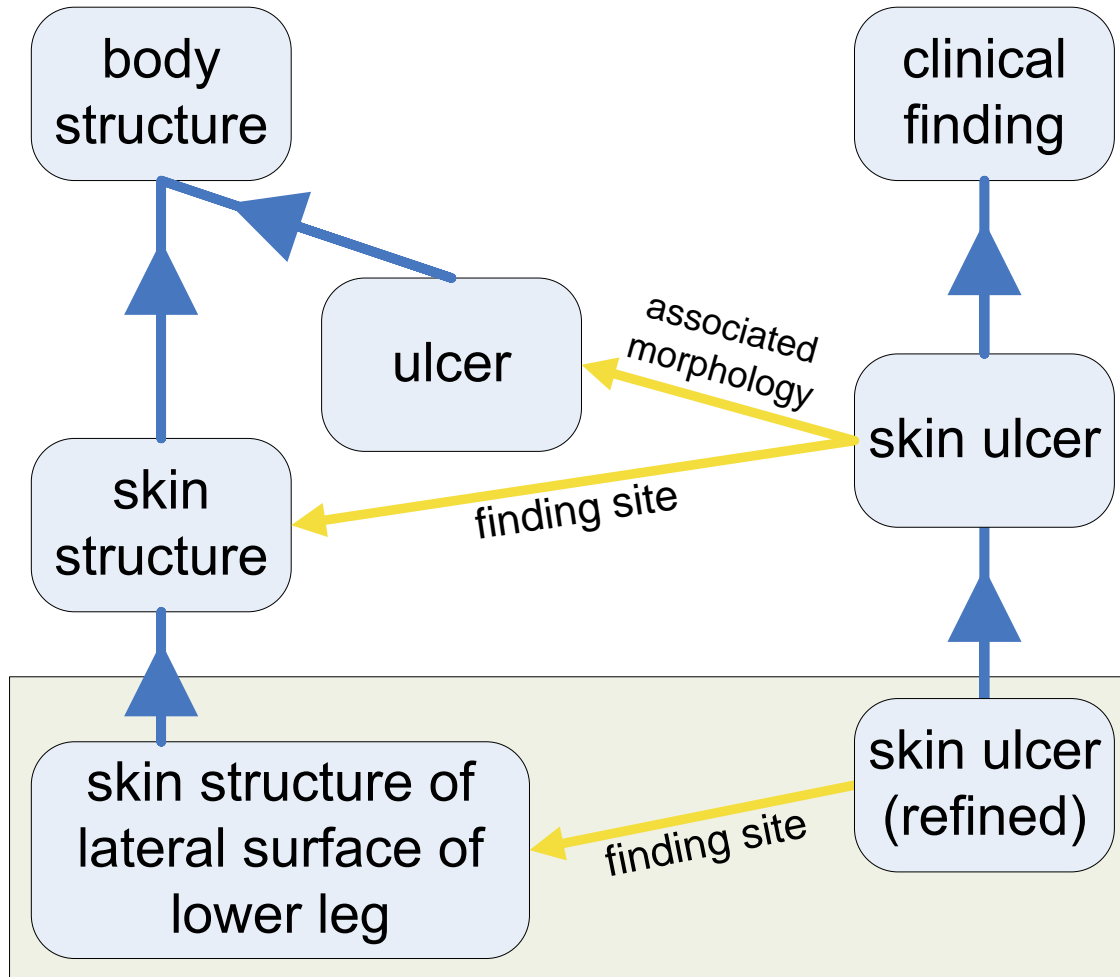
$$(A \sqsubseteq B) \rightarrow (\exists \text{has part.}(\exists r_1.A \sqcap \exists r_2.C) \sqsubseteq \exists \text{has part.}(\exists r_1.B \sqcap \exists r_2.C))$$

$$(r_1 \sqsubseteq r_2) \rightarrow (\exists \text{has part.}(\exists r_1.C \sqcap \exists r_3.D) \sqsubseteq \exists \text{has part.}(\exists r_2.C \sqcap \exists r_3.D))$$

Refinement of defining relationship groups (example)



Refinement of defining relationship groups (example)



Refinement of defining relationship groups (normal form)

```
19429009|chronic ulcer of skin|
  116680003|is a|=64572001|disease|
    {116676008|associated morphology|=
      405719001|chronic ulcer|
      ,363698007|finding site|=
      39937001|skin structure|}
```

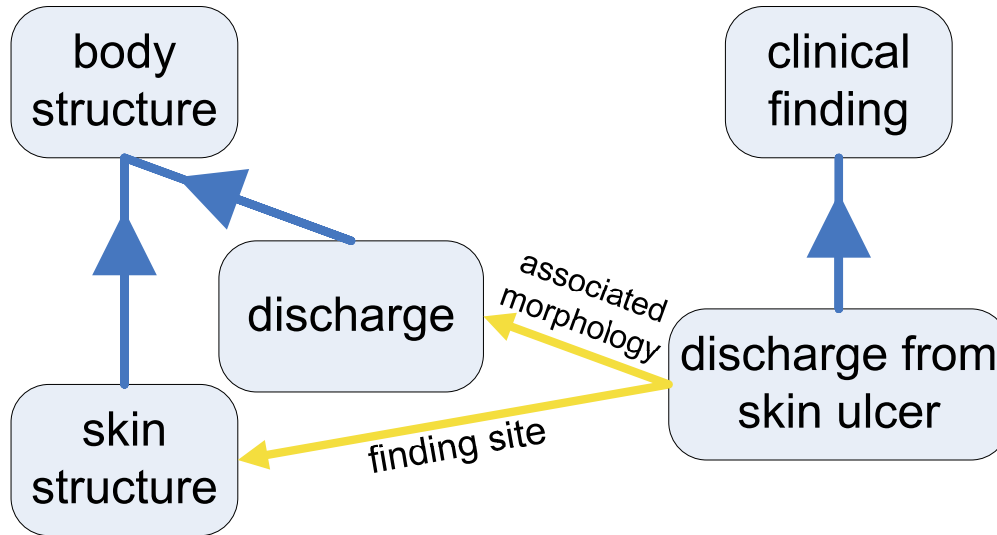
```
64572001|disease|:
  {116676008|associated morphology|=
    405719001|chronic ulcer|
    ,363698007|finding site|=
    15651003|skin structure of lateral
      surface of lower leg|}
```

unsanctioned use of “Concept Model attributes”

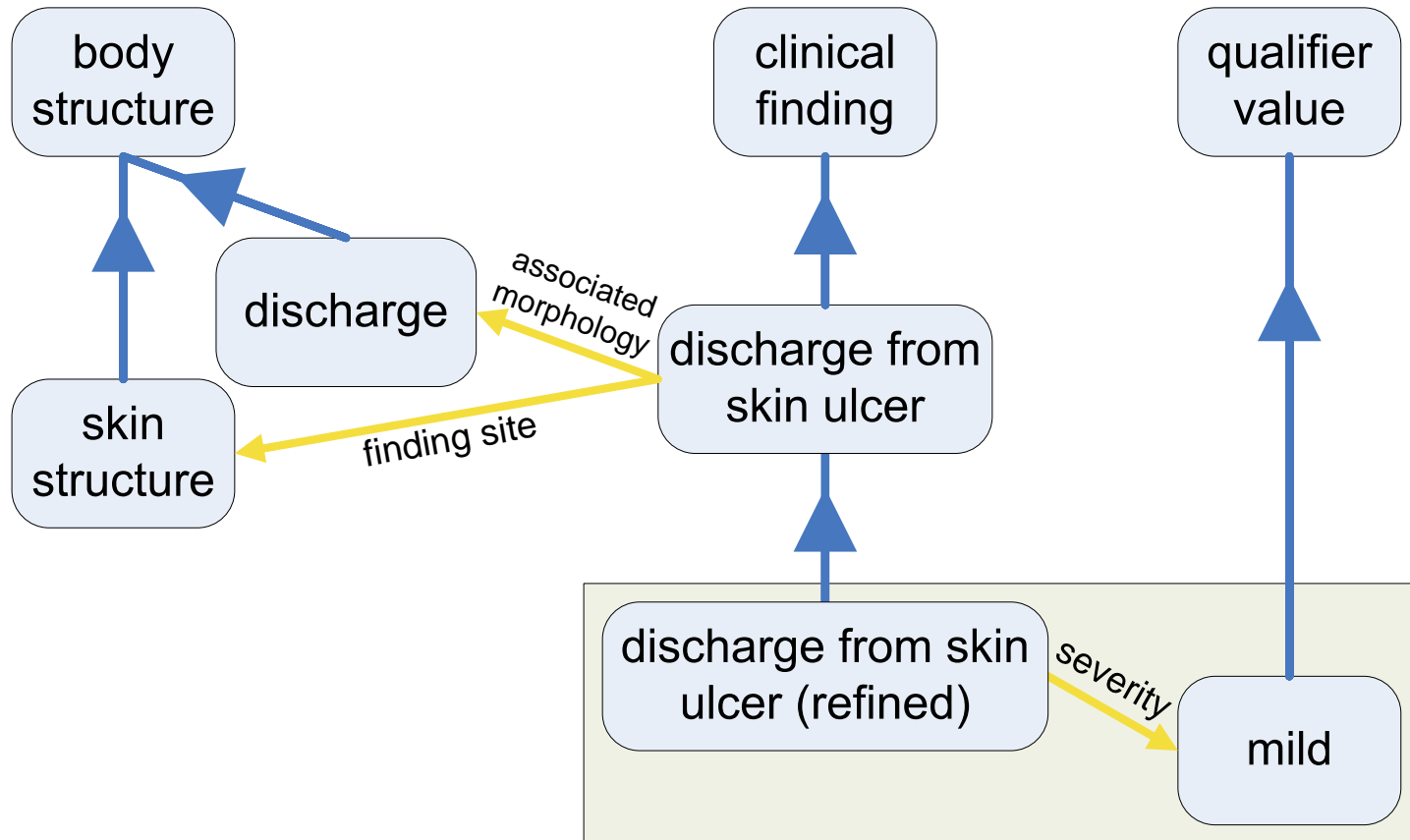
- “In some situations it may seem to be useful to use one of the attributes used in the SNOMED CT Concept Model to refine a *concept* that does not have a defining relationship or qualifier named by this attribute. Provided that this is limited to qualifications that the Concept Model specifies for *concepts* of the same general type this approach can be applied.”
(*SNOMED CT Abstract Logical Model and Representational Forms*)

$$(\exists r_1.A \sqcap \exists r_2.B) \sqsubseteq \exists r_1.A$$

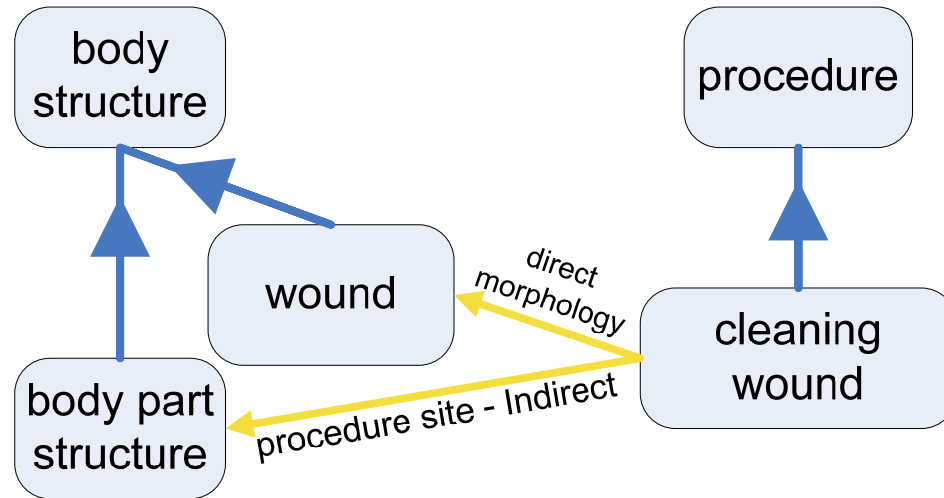
unsanctioned use of “Concept Model attributes” (example)



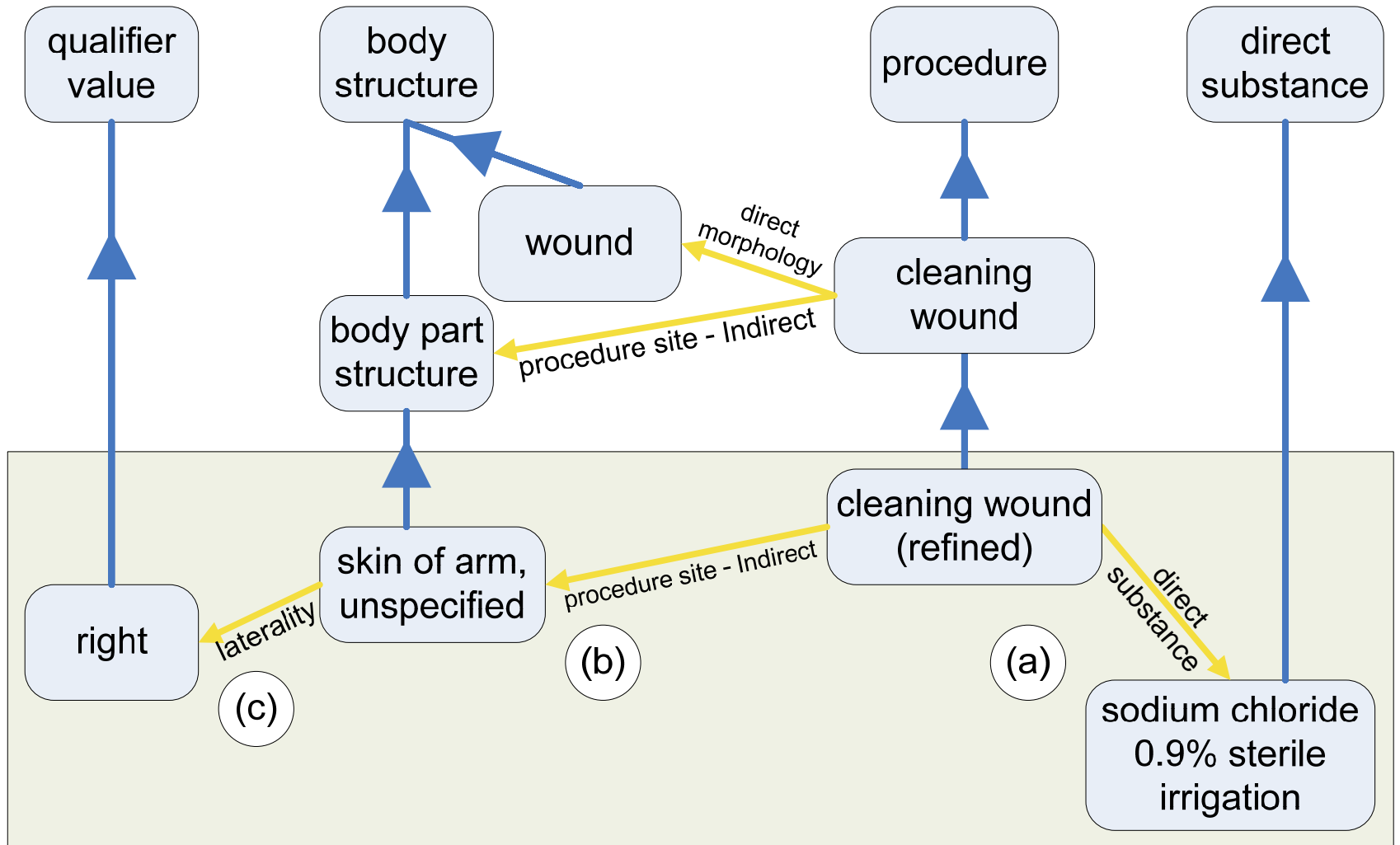
unsanctioned use of “Concept Model attributes” (example)



complex example



complex example



Lessons learned

- only 4 basic refinement rules in post-coordination
 - (1) Subconcept of individual attribute value
 - (2) Subrelation
 - (3) Introduction of new defining relations (allowed by the Concept Model)
 - (4) Use of (1)-(3) in role groups or nested usage
- Distributed SNOMED CT technical documentation on post-coordination over several documents
 - not standardized or formalized
- Tool support is poor

Suggestions for progress

- Update documentation on post-coordination
 - Convergence, Standardization, Formalization
- Provide SNOMED CT Browsers with graphical post-coordination features
- Provide classifiers to test on subsumption and equivalence of post-coordinated expressions

Conclusions

- High coverage of SNOMED CT (pre-/ post-coordination) in a specialized clinical area
- Post-coordination errorprone and inefficient without appropriate tools support
- Only four basic refinement (post-coordination) rules
- Need for improvements
 - Documentation (Convergence, Standardization, Formalization)
 - Tools (SNOMED CT browser with graphical post-coordination support)