Mapping SNOMED-CT to the WHO-ICF Classification, a use case on low back pain

Cruyt, E.[1], De Baets, S.[1], Ameye, F.[2], Roumier J.[2], Van Hecker, O.[2], De Sá e Silva, B.[2], Schrans, D.[2], Coorevits, P.[2], Vander Stichele R[2]., Van de Velde D.[1]

Abstract

- Ghent University, commissioned by the Belgian government (**Belgian Health Terminology Center**), is mapping three classifications systems. One of them is SNOMED CT (**SCT**) to the WHO's **International Classification of Functioning, Disability and Health (ICF)** to improve semantic interoperability in healthcare data. Using **low back pain** as a representative case due to its widespread impact, the project seeks to align SNOMED CT concepts with ICF categories and qualifiers through a combination of automated tools and expert review. This integration aims to support **more comprehensive, person-centered clinical documentation** and enhance the use of functional health data in care planning, decision-making, and outcome evaluation. Ultimately, the effort contributes to global initiatives promoting interoperable, biopsychosocial health information systems.

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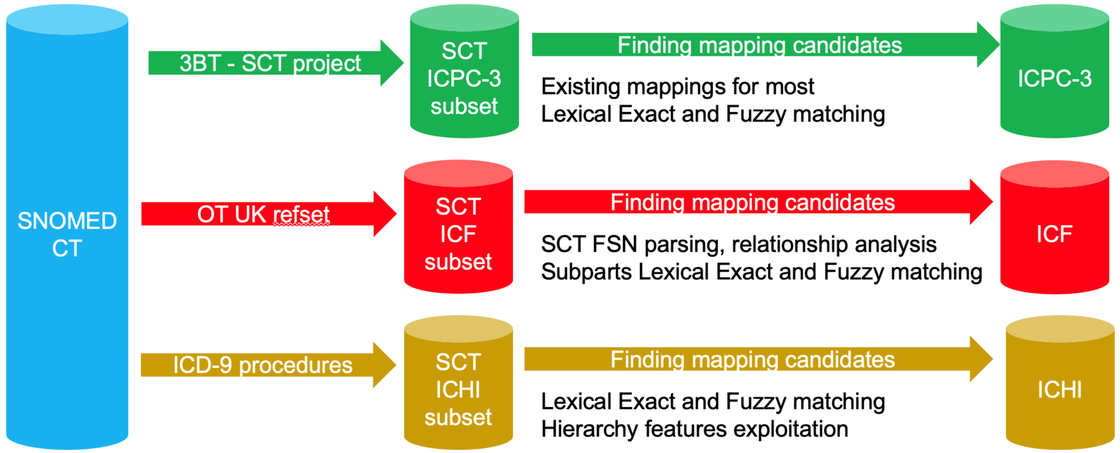
Aims

- Focused on the use case of low back pain (LBP), the project aims to align relevant SNOMED CT concepts with corresponding ICF categories, including body functions and structures, activities and participation, and environmental factors.
- Through automating and expert-drive methods, the ultimate goal is to enhance semantic interoperability between clinical and functional health information systems, enabling the integrated use of SNOMED CT and ICF in clinical documentation, electronic health records, and health information exchange.



Three mappings, ICF follows the red line.

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Methodology

Step 0: Exploration

- Literature study
- Use of AI tools
- Writing the use case
- Selecting SCT subsets targeting relevant concepts for each classification domain

Step 1: Defining the matching level

- Cardinality

Step 2: Defining mapping rules

- Automatically identifying mapping candidates:
  - Exact Match
  - Fuzzy Match
  - Business Rules

Step 3: Mapping

- Mapping candidates are selected based on lexical exact and fuzzy match, concept properties, and business rules
- Domain expert coders validate mappings

Step 4: Use case

Results

- Step 0: Exploration
  SCT >370 000 concepts
  ICF >1500 classes
- Step 1 & 2: Defining the matching level and mapping rules

In general: 167 exact matches identified between SCT and ICF (10%)
But: different semantic tags in SNOMED-CT
Solution: parsing (= Rule based mapping)

Qualifier mapping	Subject mapping
Does not	Ride a bicycle
Difficulty performing	Gardening activities
Able with difficulty	To walk

In the ICF there is a distinction between:

- The CAPACITY (what a person can do)
- The PERFORMANCE (what a person does)
- PARTICIPATION (involvement in a life situation)

Methods

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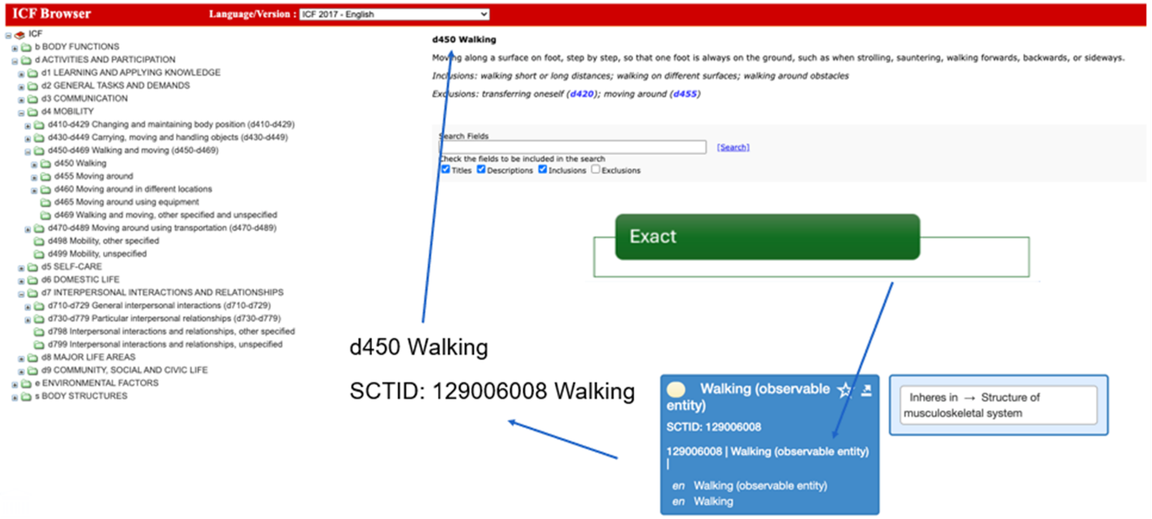
- Example of an exact match between SCT and ICF:



- Example of the use of qualifiers within SCT concept

- Business rules on qualifiers

IF:	Snomed parsing	THEN	Interprets_Capacity	Interprets_Value_Capacity	Interprets_Performance	Interprets_Value_Performance	Attribute1_Value_Participate	Attribute_2_Value
	Does not participate						Ability to participate	does not (717896003)
	Does participate						Ability to participate	does (385640009)
	Difficulty participating						Ability to participate	able with difficulties (371157007)
	Able to participate						Ability to participate	able (371150009)
	Unable to participate						Ability to participate	unable (371151008)
	Able to		ability to...	able (371150009)				
	unable to		ability to...	unable (371151008)				
	does				ability to...	does (385640009)		
	does not				ability to...	does not (717896003)		
	difficulty ...		ability to...	able with difficulty (371157007)				
	Deficit		Ability to	Deficient (260372006)				

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Use case (short example)

- A 52-year-old patient presents with **chronic low back pain** that significantly affects daily functioning and quality of life. The pain limits the patient's ability to perform physically demanding tasks such as **lifting** and **gardening**, while basic self-care activities like **undressing** remain unaffected. The patient is currently employed **full-time** in a construction company as a contractor.

Item	SNOMED CT CONCEPT, ID	ICF CATEGORY ICF qualifier
Chronic low back pain	Low back pain (finding), 279039007	Pain in back (b28013)
Lifting	Unable to lift (finding), 288332005	Lifting and carrying objects (d430) Capacity Qualifier 4 (complete problem)
Gardening	Unable to perform gardening activities (finding),300751003	Taking care of plants, indoors and outdoors (d6505) Performance Qualifier 4 (complete problem)
Undressing	Able to undress (finding), 284985004	Dressing (d540) Capacity Qualifier 0 (no problem)
Full-time employed	Employed (finding), 224363007	Remunerative employment (d850), No Qualifier

Conclusions

The mapping between SNOMED CT and the ICF demonstrates both the potential and the complexity of achieving semantic interoperability between clinical and functional health classifications. While a number of exact matches were identified, differences in semantic tags and conceptual granularity required a combined manual and computational mapping approach. The integration of ICF qualifiers represents a new and promising direction, though current SNOMED CT refsets, particularly for environmental factors, remain limited. Further research is ongoing to refine mapping rules, extend coverage to qualifiers, and implement the mappings in practical use cases such as low back pain, thereby advancing the use of interoperable, function-oriented health information systems.

Future Directions

The SNOClass project has entered the mapping validation phase, focusing on the low back pain use case. Future work will aim to consolidate the mapping methodology by leveraging terminological structures to better navigate hierarchies and enhance mapping precision. In addition, estimating the time and resources required to complete the mappings will be essential to ensure sustainable implementation and scalability. These next steps will support the establishment of a robust framework for integrating SNOMED CT and ICF within interoperable health information systems.