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Re-use of SNOMED CT subset in development of the Danish national standard for home care nursing problems

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Abstract. SNOMED CT was chosen as reference terminology for standardisation of homecare nursing documentation to make reporting comparable across the 98 Danish municipalities. The method outlined in this paper for developing a Danish national homecare nursing SNOMED CT subsets is a pragmatic approach to build new SNOMED CT subsets drawing on existing and available SNOMED CT subsets. Combining this approach with awareness of hierarchical coherency in SNOMED CT subsets makes effective retrieval of data possible.

Keywords. SNOMED CT, Implementation, Subsets, Data retrieval

1. Introduction

Consistent and meaningful capture of clinical data that allows for retrieval and exchange of data across organizational borders is one of the overall purposes of clinical terminologies [1]. SNOMED CT is the worlds' most comprehensive clinical terminology, which encompass all types of clinical information at every level of clinical detail that needs to be captured in a clinical record [1]. The size and complexity of SNOMED CT requires constrained and tailored implementation to ensure meaningful and effective use. Defining subsets of SNOMED CT components is an acknowledged and recommended way of constraining the use of SNOMED CT to suite specific documentation needs [2-6].

Increased use and adoption of SNOMED CT across IHTSDO Member countries internationally will result in various subsets that cover specific needs for documentation. Earlier studies document various ways of developing subsets, for example by mapping existing classifications or interface terminologies [3-5] or by computing or hand-crafting subsets based on knowledge about information needs within a specific clinical context or domain [2]. However, studies also show that it is a challenge even among experts [7] to select SNOMED CT concepts [3, 6] appropriate to obtain coherency and consistency. The idea behind this research is to investigate how existing SNOMED CT subsets can guide development of new subsets.

The objective of this study was to use an existing SNOMED CT subset as reference in development of a Danish national subset for nursing problems. Hence, the

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aim of this paper is to present the four step approach to utilize existing SNOMED CT subsets for development of subsets that suite a specific clinical use case. The study contributes to a project headed by the Local Government Denmark on behalf of the municipalities and intended to standardize homecare nursing documentation to make reporting comparable across the 98 Danish municipalities.

2. Methods

Based on mapping guidelines developed in an earlier study [7], we selected subset members that suited a specific clinical domain and/or context. The method consisted of the following steps:

1. Understand the knowledge domain
2. Identify relevant subsets of reference
3. Generate query to retrieve candidate subset members
4. Select subset members from candidate subset

2.1. Understand the knowledge domain

We used the national guideline for nursing documentation to understand the scope of the concepts to be included in a new national homecare nursing problem subset. The guideline outlines twelve nursing problem areas and serves as a framework for nursing interventions in Denmark, but does not specify what information nurses have to collect within each of these areas. Furthermore, we used the Danish home care intervention catalogue (IC) to define the scope of the subset. The IC is the result of a consensus seeking process between representatives from homecare in all Danish municipalities and contains a set of nursing interventions in homecare categorized in groups according to the twelve nursing problem areas, with addition of one area: Medication. The IC is used to document/classify homecare-activities by the nurse in a citizen's home. The IC also contains a written description of each intervention and thus includes information about what kind of problems the specific intervention relates to. These descriptions are therefore valuable for development of a nursing problem subset.

2.2 Identify relevant subsets of reference

The Nursing Problem List Subset of SNOMED CT developed by the National Library of Medicine (NLM) was identified as a relevant subset of reference due to the following criteria:

Scope of subset of reference: To our knowledge, no subsets are available for nursing problems in a home care setting. However, the overall scope of the nursing problem list by the National Library of medicine (NLM) is comparable with the subset under development, as it is focused on nursing problems.

Quality of subset of reference: The NLM nursing problem list was developed through a systematic approach utilizing the UMLS Meta-thesaurus and was validated by experts with clinical knowledge as well as knowledge about SNOMED CT [4].

The January 2012 version of the NLM nursing problem subset includes 417 concepts to be used to document nursing problems used in care planning, in problem lists or at a summary level.

2.3 Generate query to retrieve candidate subset members

The authors mapped each heading for the twelve problem-areas outlined in the national guidelines and the heading "Medication" to concepts in SNOMED CT. The resulting 13 concepts served as points of departure for the design of queries to retrieve a number of subset member candidates. These candidates were derived by automatically extracting the descendants of the mapped concepts, and only including the concepts, which were also part of the NLM nursing problem list. This approach constrained the number of potential candidates by including only the concepts, which had been validated in a nursing context and resulted in a bounded set of concepts that were candidates for inclusion in the final subset. In the case that none or only few descendants were retrieved from one of the thirteen overall concepts an alternative mapping was suggested or a coarse grained concept was selected as point of departure for the query.

2.4 Select subset members from candidate set

The authors assessed each of the automatically derived candidates by two criteria to determine what concepts should be included in the final subset:

- Is the candidate concept relevant in a "home care" setting?
- Does the candidate concept represent an appropriate level of granularity? If not, the subtypes and supertypes of the specific concept were assessed to select a concept at an appropriate level of granularity, see Figure 1.

The criteria were used with reference to the national guidelines and the IC. To ensure that the subset included all of the problems described in the IC, the authors selected concepts from SNOMED CT. Figure 1 illustrates two examples where sub- or supertype concepts were chosen, instead of using the concepts, which are included in the NLM Nursing Problem List subset.

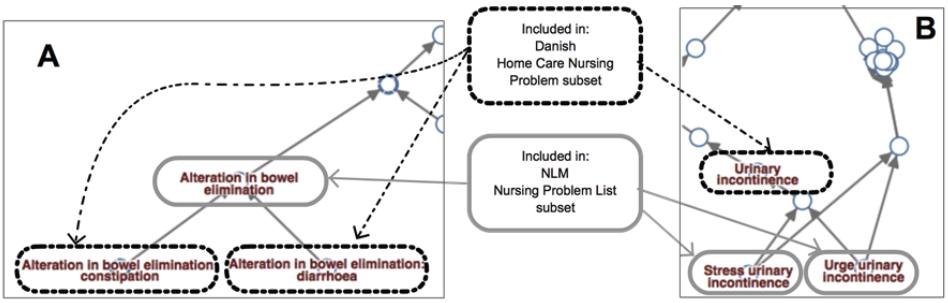

Figure 1. Two examples of deviation from the NLM nursing problem List subset. In Example A two more granular concepts were chosen. In example B a parent concept was chosen.

To facilitate retrieval and to accommodate the query design the selection of concepts were focused on hierarchical coherency between concepts of the same type as described in the mapping guidelines [8].

3. Results

The resulting Danish home care nursing problem list subset includes 80 concepts, which are all types of "clinical finding" concepts. Table 1 shows how the subset members are divided according to the 13 nursing problem areas.

Table 1. Distribution of subset members within the 13 nursing problem areas

Nursing problem area	Number of subset members
Functional ability	3
Musculoskeletal system	3
Nutrition	8
Skin and mucosa	13
Communication	4
Psychological, behavior, psychosocial condition	9
Cardiovascular and pulmonary	8 (5/3)
Sexuality	1
Pain and sensation	10 (4/6)
Sleep and rest	7
Healthcare knowledge	2
Elimination	10
Medication	2
Total	**80 concepts**

67 of these concepts (84 %) were derived from the NLM Nursing Problem List, either as a full-match (26 concepts), where the exact concept from the NLM Nursing Problem List was included in the subset, or as partial-match, where one of the sub- or supertypes was selected (17 and 24 concepts respectively), see Figure 1. 13 concepts included in the subset are not part of the NLM Nursing Problem List. Figure 2 shows an example of concepts in the Danish subset that are neither part of nor hierarchical related to concepts within the NLM nursing Problem List. These concepts are related to

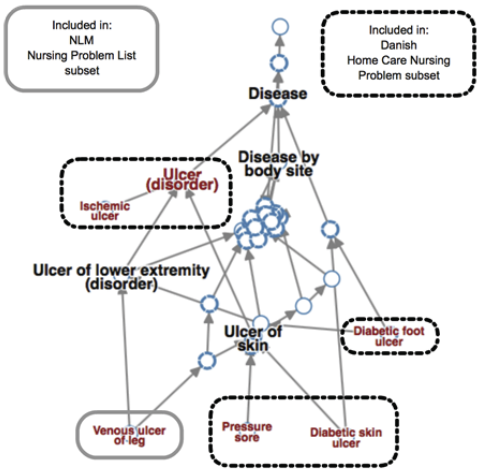

Figure 2 Illustration of the various ulcer findings included in the Danish home care nursing problem list. These concepts are not part of the NLM Nursing Problem List subset.

different types of ulcers, as this area is described at a very granular level in the IC.

4. Discussion

The Danish national homecare nursing subset has been developed reusing the content of the NLM Nursing Problem List supported by the available written material about nursing documentation in Denmark. The candidate concepts derived from the query were descendants of the thirteen overall concepts. This means that all concepts included within each of the thirteen problem areas are descendants of the same subtype concept. Thus, this method ensures effective retrieval of data within each problem area.

No direct clinical involvement was included in the initial selection of SNOMED CT concepts, but the content of the resulting subset will be reviewed by homecare nurses representing all Danish municipalities. From this review the final and clinically validated subset will be made available for implementation in the Danish municipalities as the Danish national standard for documentation of homecare nursing.

The method outlined in this paper for developing SNOMED CT subsets is a pragmatic approach to build new SNOMED CT subsets drawing on existing and available SNOMED CT subsets. Combining this approach with awareness of hierarchical coherency in SNOMED CT subsets makes effective retrieval of data possible.

The strength of the methods is that retrieval of data across municipalities to make comparisons and learning from clinical practice is made possible. The weakness is the lack of direct clinical involvement in selection of concepts, but further research will imply new ways of including clinicians when reusing existing subsets.

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