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USABILITY OF SNOMED CT FOR SECONDARY USE OF DATA IN NURSING

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Nursing SIG IHTSDO

# Usability of SNOMED CT for secondary use of data in nursing

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Introduction

- SNOMED CT supports secondary use of data
- Use case University Hospitals of Leuven, Belgium
- Mapping of SNOMED CT to Belgian MNDS to support (semi)-automatic coding
  - Problem: SNOMED CT is comprehensive
  - Solution: Collection of nursing concepts in SNOMED CT?
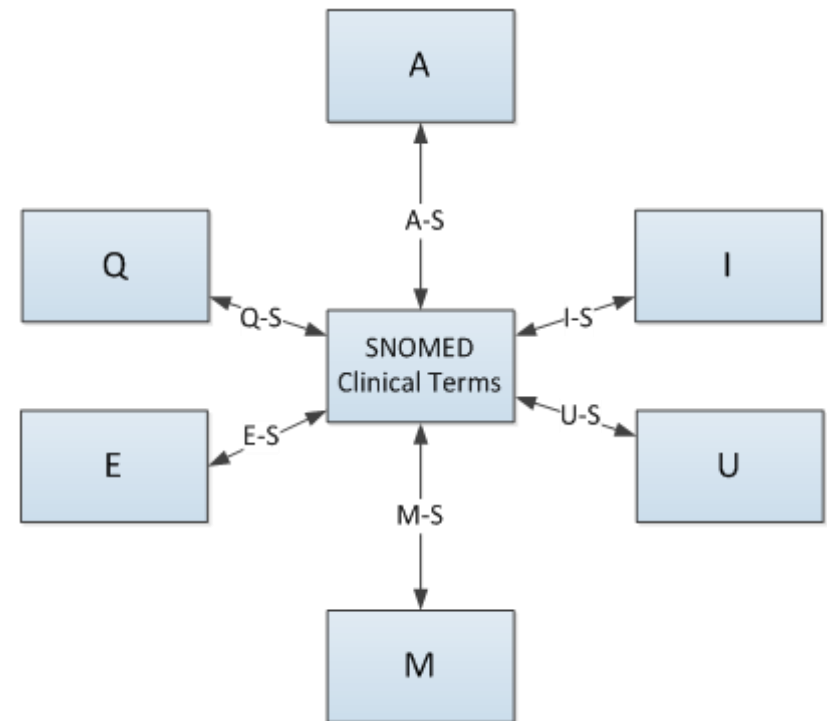
Objective

- Relationship with the nursing process, the plan of care:
  - The plan of care includes problem issues (nursing diagnoses), expected healthcare outcomes, implementable interventions and actions, and evaluation of progress toward outcomes based on follow up assessment.
  - ANA's six "Standards of Practice" describe a competent level of nursing care as demonstrated by the critical thinking model known as the nursing process. The nursing process encompasses all significant actions taken by registered nurses, and forms the foundation of the nurse's decision making.
  - The nursing process includes the components of
    - Assessment
    - Diagnosis
    - Outcome identification
    - Planning
    - Implementation
    - Evaluation
- ANA determined 12 terminology sets supporting nursing practice and recognized as interface terminologies for nursing
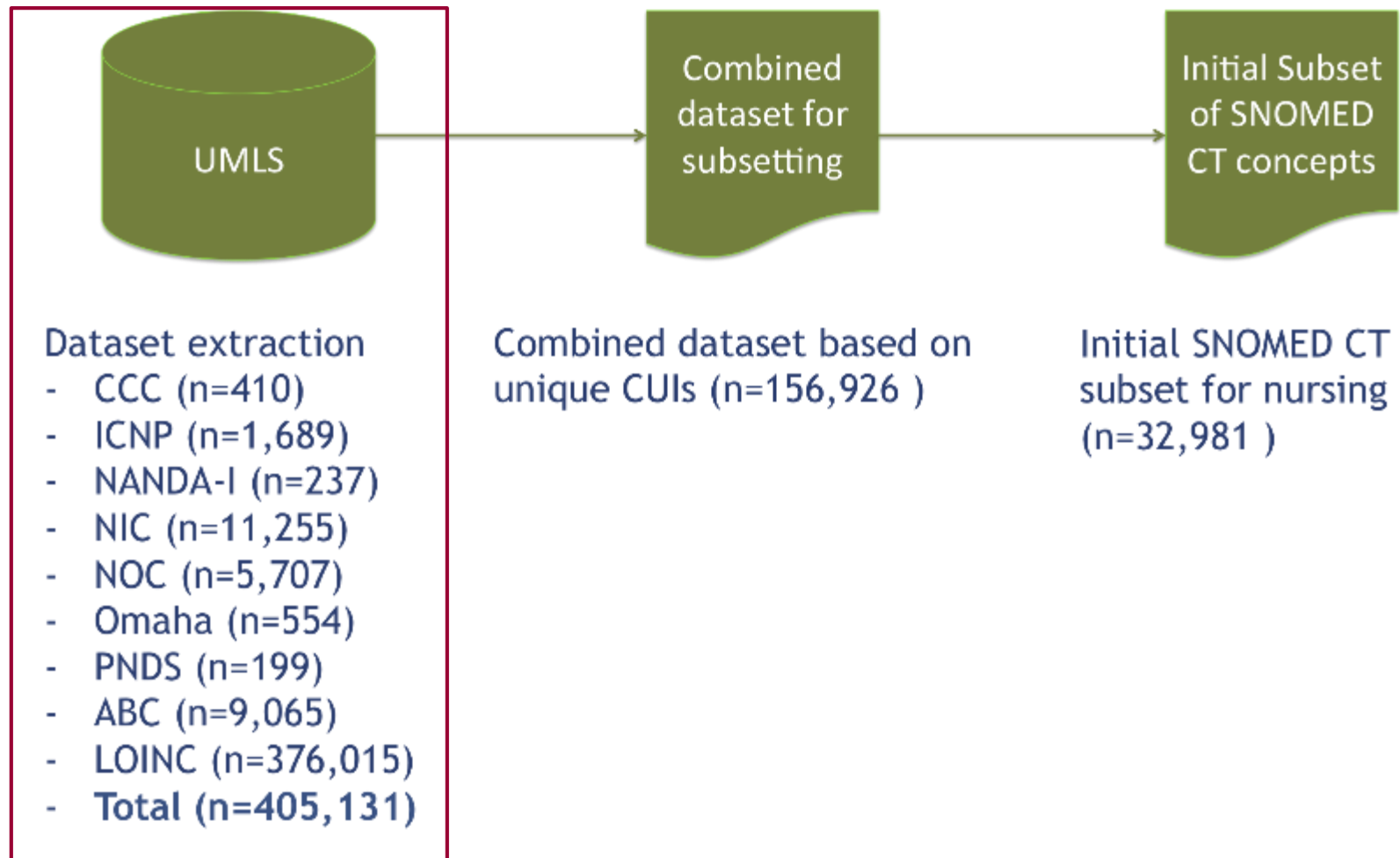
Design

- 4 steps
  - Step 1: Determine the sources
  - Step 2: Extract a dataset of nursing concepts for each source
  - Step 3 Create a combined dataset based on unique concepts (unique meanings)
  - Step 4 Create an initial SNOMED CT "subset"

Results

- Step 1: Determine the sources
  - 12 terminology sets supporting nursing practice and recognized by the American Nursing Association (ANA) as interface terminologies for nursing.
    - Clinical Care Classification (CCC; formerly Home Health Care Classification),
    - International Classification for Nursing Practice (ICNP)
    - NANDA-International (NANDA- I; Nursing Diagnosis Classification)
    - Nursing Intervention Classification (NIC)
    - Nursing Outcome Classification (NOC)
    - Omaha System
    - Perioperative Nursing Data Set (PNDS)
    - ABC Coding Solutions
    - Logical Observation Identifiers Names and Codes (LOINC)
    - Systematic Nomenclature of Medicine Clinical Terms (SNOMED CT)
    - Nursing Minimum Data Sets (NMDS)
    - Nursing Management Minimum Data Sets (NMMDS).

Results

UMLS

Dataset extraction
- CCC (n=410)
- ICNP (n=1,689)
- NANDA-I (n=237)
- NIC (n=11,255)
- NOC (n=5,707)
- Omaha (n=554)
- PNDS (n=199)
- ABC (n=9,065)
- LOINC (n=376,015)
- **Total (n=405,131)**

Combined dataset for subsetting

Combined dataset based on unique CUIs (n=156,926)

Initial Subset of SNOMED CT concepts

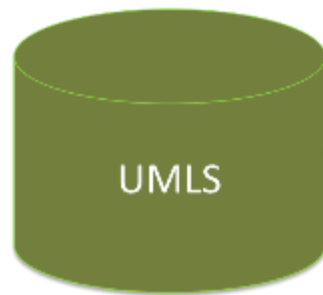Initial SNOMED CT subset for nursing (n=32,981)

Results

- Step 2: Extract a dataset of nursing concepts for each source
  - UMLS Metathesaurus (2014AA)
  - Local MySQL database, database load scripts and indexing
  - Repeated SQL-queries for selecting nursing concepts were executed against UMLS.
    - In it's simplest form:
      - for each of the interface terminologies, the entire concept structure was retrieved:
        - Including concept names, their identifiers, and key characteristics of these concept names (e.g., language, vocabulary source, name type).
        - UMLS aims at linking all the names from all of the source vocabularies that mean the same thing (the synonyms) through the Concept Unique Identifier

Results

CUI	LAT	TS	LUI	STT	SUI	ISPREF	AUI	SAUI	SCUI	SDUI	SAB	TTY	CODE	STR	SRL	SUPPRESS	CVF
C0006434	ENG	S	L0006428	PF	S0021046	N	A0033348	NULL	NULL	NULL	NOC	ID	191304	Burns	3	N	256
C0009806	ENG	P	L0009806	PF	S0027713	N	A0042281	NULL	NULL	NULL	NOC	ID	020402	Constipation	3	N	256
C0015967	ENG	P	L0015967	PF	S0041286	N	A0058980	NULL	NULL	NULL	NOC	ID	020409	Fever	3	N	256
C0027497	ENG	P	L0027497	PF	S0065335	N	A0090391	NULL	NULL	NULL	NOC	ID	120322	Nausea	3	N	256

Results

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Combined dataset based on unique CUIs (n=156,926)

Initial SNOMED CT subset for nursing (n=32,981)

Results

- Step 3 Create a combined dataset based on unique CUIs
  - The dataset is reduced to include unique CUIs.
    - Regardless of the source, if concepts are semantically identical, the same concept unique identifier (CUI) is assigned while maintaining the unique code from the source vocabulary.
    - A combined dataset can thus be created based on the unique CUIs resulting from the intersection of the datasets made for each source.

Results

CUI	LAT	TS	LUI	STT	SUI	ISPREF	AUI	SAUI	SCUI	SDUI	SAB	TTY	CODE	STR	SRL	SUPPRESS	CVF
C0006434	ENG	S	L0006428	PF	S0021046	N	A0033348	NULL	NULL	NULL	NOC	ID	191304	Burns	3	N	256
C0009806	ENG	P	L0009806	PF	S0027713	N	A0042281	NULL	NULL	NULL	NOC	ID	020402	Constipation	3	N	256
C0015967	ENG	P	L0015967	PF	S0041286	N	A0058980	NULL	NULL	NULL	NOC	ID	020409	Fever	3	N	256
C0027497	ENG	P	L0027497	PF	S0065335	N	A0090391	NULL	NULL	NULL	NOC	ID	120322	Nausea	3	N	256

CUI	LAT	TS	LUI	STT	SUI	ISPREF	AUI	SAUI	SCUI	SDUI	SAB	TTY	CODE	STR	SRL	SUPPRESS
C0006434	ENG	S	L1029480	PF	S12509146	Y	A19410278	NULL	10029737	NULL	ICNP	PT	10029737	Burn Wound	3	N
C0009806	ENG	P	L0009806	PF	S0027713	N	A13381780	NULL	10000567	NULL	ICNP	PT	10000567	Constipation	3	N
C0015967	ENG	P	L0015967	PF	S0041286	N	A22720509	NULL	10041539	NULL	ICNP	PT	10041539	Fever	3	N
C0027497	ENG	P	L0027497	PF	S0065335	N	A13382337	NULL	10000859	NULL	ICNP	PT	10000859	Nausea	3	N

Results

UMLS
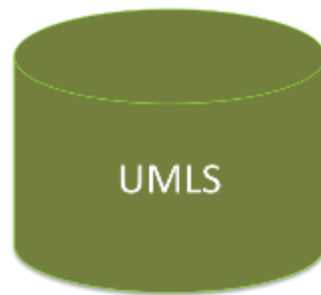
Combined dataset for subsetting

Initial Subset of SNOMED CT concepts

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Combined dataset based on unique CUIs (n=156,926)

Initial SNOMED CT subset for nursing (n=32,981)

Results

- Step 4 Create an initial SNOMED CT "subset"
  - The combined dataset was reduced to include those SNOMED CT concepts that had a corresponding CUI.
    - For the CUIs withheld within the combined dataset, the ones assigned to a SNOMED CT concept were retained, resulting in a "subset" of SNOMED CT concepts for nursing.

Results

CUI	LAT	TS	LUI	STT	SUI	ISPREF	AUI	SAUI	SCUI	SDUI	SAB	TTY	CODE	STR	SRL	SUPPRESS	CVF
C0006434	ENG	S	L0006428	PF	S0021046	N	A0033348	NULL	NULL	NULL	NOC	ID	191304	Burns	3	N	256
C0009806	ENG	P	L0009806	PF	S0027713	N	A0042281	NULL	NULL	NULL	NOC	ID	020402	Constipation	3	N	256
C0015967	ENG	P	L0015967	PF	S0041286	N	A0058980	NULL	NULL	NULL	NOC	ID	020409	Fever	3	N	256
C0027497	ENG	P	L0027497	PF	S0065335	N	A0090391	NULL	NULL	NULL	NOC	ID	120322	Nausea	3	N	256

CUI	LAT	TS	LUI	STT	SUI	ISPREF	AUI	SAUI	SCUI	SDUI	SAB	TTY	CODE	STR	SRL	SUPPRESS
C0006434	ENG	S	L1029480	PF	S12509146	Y	A19410278	NULL	10029737	NULL	ICNP	PT	10029737	Burn Wound	3	N
C0009806	ENG	P	L0009806	PF	S0027713	N	A13381780	NULL	10000567	NULL	ICNP	PT	10000567	Constipation	3	N
C0015967	ENG	P	L0015967	PF	S0041286	N	A22720509	NULL	10041539	NULL	ICNP	PT	10041539	Fever	3	N
C0027497	ENG	P	L0027497	PF	S0065335	N	A13382337	NULL	10000859	NULL	ICNP	PT	10000859	Nausea	3	N

CUI	LAT	TS	LUI	STT	SUI	ISPREF	AUI	SAUI	SCUI	SDUI	SAB	TTY	CODE	STR	SRL
C0006434	ENG	S	L0006428	VO	S0004707	Y	A2876833	473548016	125666000	NULL	SNOMEDCT_US	PT	125666000	Burn	9
C0009806	ENG	P	L0009806	PF	S0027713	N	A2880173	25076018	14760008	NULL	SNOMEDCT_US	PT	14760008	Constipation	9
C0015967	ENG	P	L0015967	PF	S0041286	N	A2881597	1480803010	386661006	NULL	SNOMEDCT_US	PT	386661006	Fever	9
C0027497	ENG	P	L0027497	PF	S0065335	N	A11729317	2643930014	422587007	NULL	SNOMEDCT_US	PT	422587007	Nausea	9

Conclusion

- The concepts need to be classified using the components of the nursing process. It needs to be checked if the concepts with regards to the nursing process, including nursing diagnoses, interventions, actions, outcomes, assessments, problem identification, and goal development present are well represented.
  - PPoC (IHE)? ->to provide a mechanism for electronic exchange of data related to creating and managing individualized patient care between and among HIT systems.
- It needs to be checked if the subset meets the needs of the ISO reference terminology for nursing.
  - ISO 18104:2014
  - Categorial structures for representation of nursing diagnoses and nursing actions in terminological systems

Conclusion

- It is important to determine whether the language used in the EHR can be represented using the initial subset.
  - The subset may be expanded or reduced through the evaluation of nursing concepts stored within the EHR and everyday concepts used by nurses.
  - Usability as interface terminology
- It is expected that the use of this initial subset will save effort in the terminology development for nursing in SNOMED CT.
  - Study approval
    - UMLS Metathesaurus
    - Presentation of the study to the Nursing SIG of the IHTSDO.
      - Determine the willingness to approve the concept
      - Once the concept is approved, to develop an approved project plan.
    - Possibly: Obtain a vendor perspective of the usability of the list in EHR software.
      - Opportunities for validation of the SubSet
    - Obtain a technical perspective of the usability of the list for information exchange (message structur), E-Health Belgium