University of Minnesota Nursing Big Data

Nursing Documentation Mapping Rules/Heuristics

Foundational Document

Mapping and Encoding Working Group
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Introduction

Clinicians have historically used clinical terminologies that varied from user to user and location to location, making it difficult to share data, drive consistent clinical decision support, engage in national data reporting and analysis as well as other secondary uses of nursing documentation. Ultimately, the goal of the University of Minnesota Nursing Big Data Group terminology initiatives is native standardization where external mappings are eliminated by integrating current standard terminologies into the electronic health record (EHR). Until that time, healthcare organizations need to rely on comprehensive mappings which include existing value sets, mapping workflows, procedures, and checklists, mapping style guides, and complete mapped data sets

The mapping rules contained in the heuristics document will help to support the ability to consistently represent nursing documentation with clinical terminology standards. Achieving the ultimate goal of semantic interoperability will enable multifaceted healthcare improvements in the Unites States, including significant positive effects on patient and population outcomes.

Use Case

The use case for a data mapping project is the core upon which the guidelines and heuristics, or rules, for creating the map are specified. Guidelines and heuristics must be very detailed, because all data maps must be reproducibile. Meaning, once a map has been created, others not involved in the creation of the map should be able to verify the accuracy of mappings by following its guidelines and heuristics to reproduce the mappings to clinical reference terminologies.[1]

The purpose of this document is to define the heuristics/rules for mapping local clinical terminology to standardized clinical terminologies. These rules will help to support the ability to consistently represent nursing tasks with documentation standards.

For project specific heuristics document, a use case will be defined in this section. This section will contain details on stakeholders and how intended users will use the mappings. Examples of different use cases include mapping nursing documentation to clinical terminologies for clinical decision support, quality measure reporting, nursing research and interoperability.

Scope

This document is intended to be used by terminologists to map source terms, such as a nursing value set to a defined target terminology. Mapping rules contained in this document follow best practices for mapping established by the American Health Information Management Association.

Mapping projects must carefully consider the data source and the intended use of the data for both primary and secondary purposes in order to ensure accuracy. Poorly designed and out-of-date mappings create significant data integrity problems in health information systems. Undetected errors in data maps have the potential to introduce many problems, including patient safety. This document provides the

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[1] Bronnert J, Clark J, Cook J, Fenton S, Scichilone R, Williams M, Wilson P., Data mapping best practices. J AHIMA. 2011 Apr;82(4):46-52.

groundwork for mapping nursing documentation to standardized clinical terminologies as defined by The Office of the National Coordinator for Health Information Technology (ONC)[2,3,4,5]. When initiating a new mapping project, the value set will be reviewed, and a mapping pilot will ensure mapping rules comprehensively address all source terms. A project-specific heuristics document will be developed for each new mapping project. The project-specific heuristics document will contain the mapping rules from this foundational document as well as any new rules (tested by a pilot mapping project) necessary for mapping that specific value set.

All maps require an investment of time and resources, and some mapping projects may require more than others. When the source data and the target data are similar in structure with a high percentage of exact matches in content and meaning, the time needed for validation will be minimal. However, when the source and target do not result in an exact match, time must be spent to determine which of the choices are appropriate based on the map's use case. Unless the mapping is a one-to-one match from source to target, decisions must be made to meet the intent of the map.

Data Governance

Mapping an identified value set to standards will not reconcile or correct any duplicate, ambiguous terms, or terms of no value to nursing. Prior to mapping, the value set will be analyzed to ensure the values are semantically consistent without ambiguity. Once analysis is complete, the value set should be considered final and locked, with no further edits.

The principles of data governance:

- Recognize data as an asset to the nursing profession
- Value set ownership and accountability must be clearly defined. This will insure integrity of the value set and associated mappings.
- Data follows standardized rules for naming convention, mapping rules and maintenance.
- Data quality must be managed. This includes periodic audit to check for retired contact from target terminologies.
- Change management. It is important to track changes to the value set and associated mappings over time.

Target Terminologies

SNOMED CT[6]

SNOMED Clinical Terms (SNOMED CT) is a standardized terminology used for clinical documentation in electronic health information systems. SNOMED CT is the most comprehensive, multilingual clinical healthcare terminology in the world. The terminology covers a wide range of clinical specialties, disciplines and requirements. This range of coverage allows for wider sharing and reuse of structured clinical information. With over 2 million components in SNOMED CT, domains such as nursing are generally well-

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[2] https://www.healthit.gov/isa/representing-clinicalnursing-assessments
[3] https://www.healthit.gov/isa/representing-nursing-interventions
[4] https://www.healthit.gov/isa/representing-outcomes-nursing
[5] https://www.healthit.gov/isa/representing-patient-problems-nursing
[6] https://www.nlm.nih.gov/research/umls/Snomed/nursing_terminology_resources.html

covered with concepts specific for nursing diagnoses, interventions, and patient outcomes. Specifically in the US, the US Edition of SNOMED CT must be used for reporting and problem lists in the patient summary record. One way that NLM has provided assistance with this criterion is with the Clinical Observations Recording and Encoding (CORE) Problem List Subset of SNOMED CT. Additionally the Nursing Problem List Subset of SNOMED CT may be beneficial. Its primary purpose is to facilitate the use of SNOMED CT for coding terminology related to diagnoses. The Nursing Problem List Subset is updated regularly.

Additionally, SNOMED International[7] and the International Council for Nurses (ICN)[8], producers of the International Classification of Nursing Practice (ICNP), are collaborating to harmonize nursing terminology and emphasize interoperability between health information systems. Currently, SNOMED International and ICN are developing an equivalence table of nursing diagnoses and interventions between SNOMED CT and ICNP.

LOINC[9]

Logical Observation Identifiers Names and Codes (LOINC) is a clinical terminology for clinical and laboratory observations. LOINC provides the formal names and standardized codes for laboratory and other clinical observations. The data covers laboratory terminology, vital signs, hemodynamics intake/output, EKG, obstetric ultrasound, cardiac echo, urologic imaging, gastroendoscopic procedures, pulmonary ventilator management, and selected survey instruments such as the Braden Scale. LOINC, along with SNOMED CT, is part of a suite of designated standards for use in US Federal Government systems for electronic exchange of clinical health information.

The version of the target terminology to be used throughout the mapping project will be defined here.

Allowable Hierarchies

Attribute	Definition	LOINC	SNOMED CT Hierarchy
Assessment Question		Yes	
Values		No	Clinical finding, Events or Qualifier value
Assessment Scale Values		Yes – LOINC Answers (LA codes)	No
Body Location		No	Body Structure
Nursing Intervention		No	Procedure
Nursing Diagnosis		No	Clinical Findings, Situation with Explicit Context
Nursing Outcome		No	Observable Entity

Mapping

Mapping will always be done from the source term (e.g. nursing documentation terms) to the target terminology (SNOMED CT or LOINC). This is known as forward mapping. Mapping will *not* be done from the target term to the source term.

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[7] http://www.snomed.org/
[8] https://www.icn.ch/
[9] https://www.nlm.nih.gov/research/umls/Snomed/nursing_terminology_resources.html

Mapping Rules

Source terms will be mapped to a target term with an exact meaning match. Source terms that cannot be mapped to the target vocabulary with an *exact mapping* will be marked as "Unmappable".

Inexact term matches ('source is broader than target' or 'source is narrower than target') mappings will be avoided as these are potential patient safety issues. Information is lost when mapping a source term to a broader target term. When mapping a source to a target that contains additional information not stated in the source term, or 'source is narrower than target' adds information that may or may not be true. In addition, 'source is broader than target' or 'source is narrower than target' require maintenance with each new release of the target terminology to ensure an exact match target term has not been added with the new release. If an exact match is found in the new release, the mappings must be updated to include the new exact match and the audience using these mappings notified of changes.

When a close or inexact match is found where the 'source is broader than target' or 'source is narrower than target', the mapper may decide to add the close target term in another defined field within the spreadsheet to assist in identification of parent target term if a new concepts/terms will be requested.

Listed below is a foundational set of mapping rules. Depending on the source data and map use case, these rules may or may not apply to the mapping project. Additional rules may be added to cover project-specific mapping circumstances.

Rule ID	Rule	Mapping Rule
Rule1	Target Terminology Version	All terms will be mapped first and preferentially using the most current version available for SNOMED CT International Edition. LOINC mapping will be completed in the most recent release. The version of the target terminology will be defined at the beginning of the mapping project. If a new release is available during the mapping project, the defined version will continue to be used until the mapping is complete and the mappings will be updated to the changes from the new release. Conversely, the previously mapped content will be remapped to the new release and the project will continue to map to the newest release of the target terminology available.
Rule2	Mapping Specificity	Source terms will be mapped to the exact equivalent in the target terminology
Rule3	Mapping Cardinality	Single-target mapping will be performed. One term will be mapped to only one SNOMED CT concept or LOINC code
Rule4	Target Term Status	Mapping will be done to active SNOMED CT concepts or Active and Trial Use LOINC codes. Retired, inactive, deprecated, discouraged statuses from target terminologies will not be considered for mapping.
Rule5	Nominal value	Nominal values are defined as variables, or dropdown list items simply "named" or labeled, with no specific order Mappings will come from SNOMED CT or LOINC, as defined by the project specific mapping rules
Rule6	Qualitative vs Quantitative terms	Unmappable Qualitative content that references ordinal answers for commonly used questions (e.g. urine glucose = 1-4+, wound discharge = scant to large, etc.) should reference an authoritative source that provides unambiguous (e.g. quantitative) meanings for the content. If there are no such sources, then the content ideally should be somehow annotated to give unambiguous, definite meanings to the concepts. Example - Wound exudate qualitative amount refset

Mapping Pilot

Large value sets may benefit from a mapping pilot to test that agreed upon mapping rules cover all target terms. The purpose of a mapping pilot is to test a subset of the value set to be mapping, ensuring the established mapping rules are consist and mapping rules cover of all mapping scenarios. It is not best practice to change or add new rules during a mapping project, as this may introduce an inconsistent mapping strategy across the value set. This may introduce mapping error or place increased burden on mapping maintenance. It is also not best practice to change to a different version of source terminology during a mapping project.

Unmappable Terms[10]

An organization may encounter a source term where no mapping is available. In such instances, it is recommended that the unmappable term be examined to determine:

1. *Can the question/answer set or source term or be clarified or reworded such that it can be mapped?*

2. *If the source term is concatenated or overly complex, can it be broken apart without losing context?*

3. *Does the source term really need to be mapped? If so, why? And what are the downstream effects or secondary uses of this term which are affected if the source term is not mapped? (Other than interoperability)*

4. *Prior to requesting a new code from LOINC or SNOMED CT, a use case and reference supporting the new code request from the SDO must to be created by the requesting organization[11].*

AHIMA mapping best practices brief clearly states that content that has a low rate of mappability should not be mapped. Are you trying to add a code to a source term because you can?

Quality Assurance

Because of a potential impact upon patient outcomes, the possibility of clinical errors resulting from decisions based upon poorly mapped data cannot be taken lightly. When mapping any clinical data, this is a prime data integrity issue. All mappings must be subject to quality controls and validation during the creation and updating processes. Quality assurance takes place throughout the entire mapping process. The quality assurance process describes how the delivered product will be reviewed to ensure quality mappings.

Each mapping heuristic document will define the quality assurance steps taken to ensure an accurate map to the target terminology. It is recommended that that this section contain at a minimum:

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[10] This section is out of scope for a mapping heuristic/rules document and has been added for the benefit of education of working group members. This section will be removed from subsequent versions of mapping heuristic documents.

[11] This list is not meant to be complete, just a list of considerations when an organization encounters an unmappable term. Source terms should not be mapped just because someone thinks it needs a code. This section is to be removed when creating a project specific mapping heuristics document.

1. The mapped value set will be reviewed to ensure each source term has a mapping to the identified target terminology or is labeled as unmappable.

2. Each mapping target term will be independently reviewed by a second mapper to ensure the code is correct and that the target concept is active and has not been retired. This includes a technical quality assurance review that the final map contains no leading or trailing spaces of the target terminology code which may interfere with ETL processes during implementation and no copy/paste errors

3. A top down review of the mapped content will ensure that the source term has been mapped to the allowable SNOMED CT hierarchy, as applicable.

Maintenance Strategy

Finally, the data map must be maintained and updated. This is an often-overlooked part of data mapping. Many believe that once a map is created it is valid forever. This is not true, since data reporting requirements, standards, databases, and terminology and classification systems are dynamic and are constantly updated. Inadequately maintained mapped data is sometimes worse than no mapping because it has the potential to transmit the wrong information, subsequently introducing error or a patient safety issue.

It is essential that each value set, or database has an assigned owner who will be accountable to preserve the integrity of mapped data while providing timely and complete updates of new, deleted, or changed source and target terms. The data standardization process is dynamic in nature as both source data and standard vocabularies are not static. Standardized vocabularies require regular maintenance and are continually updated.

SNOMED CT and LOINC each release updates twice a year. As part of overall data governance, it is suggested that with each update of the source terminology, the owner each value set will review the mappings to the source terminology updates to ensure that no source terms are mapped to retired or deprecated SNOMED CT or LOINC terms. These source terms must then be remapped to the target terminology. Next, unmappable source terms are reviewed to determine if semantically exact matches were added to the target terminology. New mappings or changes to mappings will be tracked in a separate log indicating who made the changes, what the changes where, and when the changes were made as part of Change Management.

The process of maintaining the maps is as follows:

- If updates are identified when terminology maps are produced, the target standard will be updated. A check between the updates and the current 'in process' target standard occurs and changes will be made as needed. These changes will be tracked in a separate log indicating who made the changes, what the changes where, and when the changes were made as part of Change Management.

- Any updates to the map based on SDO releases will be communicated to the nursing community in the same manner as the respective mappings were originally communicated.

Both processes will continue to follow the defined quality assurance review process, prior to submission.

Mappings provided by a third-party terminology vendor will provide this information. Maintenance of mappings will continue to follow the defined quality control and quality assurance review process.

Value set Provenance

This section will describe how a value set was created, how it was validated and by whom. This offers provenance for those tasked with data governance and mapping maintenance. It is recommended that a provenance section be included as part of each mapping document.