

# Mapping Concepts in Medical Error Taxonomies

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**Background:** Developing a domain ontology is a complex task. It is necessary to clarify domain concepts and the relationships between and among the concepts. Several taxonomies exist for the medical error domain. However, these taxonomies are divergent in granularity and asymmetry (assigning terms under different categories in different taxonomies). It is difficult to map concepts in different taxonomies to each other [1, 2]. Our research team selected the following listed eight taxonomies in published literature to merge into a medical error ontology.

1. The JCAHO patient safety event taxonomy
2. NCC MERP Taxonomy of Medication Errors
3. Taxonomy of Nursing Errors (TNE)
4. A Preliminary Taxonomy of medical errors in Family Practice<sup>3</sup> (PTFP)
5. Cognitive Taxonomy of Medical Errors<sup>23</sup> (COG)
6. Taxonomy of Medical Errors for Neonatal Intensive Care<sup>24</sup> (NIC)
7. Australian Patient Safety Foundation Taxonomy (APSF)
8. Pediatric Patient Safety Taxonomy (PED)

In this poster, we report on the solutions to the problems of granularity and asymmetry found in these taxonomies when mapping concepts within the ontology.

**Method:** The goal is to keep the mapping process complete and consistent. We started NCC MERP and paired its concepts with the other 7 taxonomies one by one. We then selected the JACHO from the 7 taxonomies and paired its concepts with the rest six taxonomies one by one. We continued this process until all taxonomies had been paired with each other. We put all concepts of the source taxonomies into Protégé as classes. We examined each paired taxonomies and selected relevant classes. We found the relevant classes were mostly in the sections of Error Type, Location-Service, and Patient Outcome.

We classified relevant classes as perfect matches, unmatched with granularity issue and/or asymmetry issue. If the definition of the source class was the same as the definition of target class, we judged these two classes were perfect match and used the property `isEquivalentTo` to link them. For example, '23.7.18, Sub-acute Care' in NCC MERP is equivalent to '3.01.01.04 Subacute Care' in JACHO.

We took the pair NIC and NCC MERP as an

example of the granularity problem in the taxonomies. NIC represents '(2) 1 Neonatal intensive care unit' and '(2) 2 Intermediate care or step-down unit' as two classes, while NCC MERP used '23.7.4.3 Neonatal ICU/Step Down (Infant Transitional)' as one class.

After discussion, we addressed granularity issue by one-way mapping. We created a new property `isCoveredBy` to relate more granular items to less granular ones, this was a unidirectional relationship. '(2) 1 Neonatal intensive care unit' and '(2) 2 Intermediate care or step-down unit' in NIC were separately covered by '23.7.4.3 Neonatal ICU/Step Down (Infant Transitional)' in NCC MERP.

An asymmetry example occurs where '70 Type' which means error type in NCCMERP involved 14 sub categories, while '2 type' in JACHO involved 3 sub categories and ASPF only had a simple class '1.1 Medication'.

To solve the asymmetry issue, we used ' $\exists$ (some value) `isCoveredBy` (Property) Type(Class Name)' to link relevant classes as asserted conditions which means some value in the current class can be covered by the linked class.

**Conclusion:** This approach to mapping works linked the eight source taxonomies together with our ontology for better interoperability.

**Future work:** We are collecting medical error cases to test the ontology development work. Some cases have been coded in one of these taxonomies. We will then use our medical error ontology as framework to integrate these cases and evaluate the precision and accuracy of this mapping work. When the ontology is accomplished, we will develop a medical error reporting system based on our ontology to collect, organize and analyze medical error data.

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## References:

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