edenceHealth RxNorm Builder

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Background

The integration of standardized drug vocabularies is essential for harmonizing healthcare data across diverse sources. RxNorm, developed by the U.S. National Library of Medicine, provides a structured terminology for clinical drugs, facilitating interoperability in the U.S. healthcare system. However, its scope is limited to U.S.-approved medications, creating challenges for international data standardization [1]. To address this gap, OHDSI introduced the RxNorm Extension, which expands RxNorm's framework to include global drug vocabularies not yet present in the system. To support this effort, the OHDSI BuildRxE SQL script is used to create new concepts for drugs when no existing concept is available in the OHDSI Vocabularies [2]. In the RxNorm Builder, we leverage the BuildRxE SQL script as a mapping engine to identify existing RxNorm concepts based on ingredients, strengths, dose forms, and other attributes from the drug source data. This approach ensures consistency in drug mapping across healthcare systems, enabling accurate data analysis and facilitating cross-national research on medication use and outcomes.

Methods

The RxNorm Builder is designed to generate precise and comprehensive drug mappings by integrating various components of source information. It achieves this by leveraging mappings of individual drug components, such as ingredients, dose, route, and units, along with the relationships in the OMOP vocabulary. The process begins with two input files: the source input file (*med_row*) and the mapping file (*med_mapping*). These files contain essential drug-related elements, including ATC codes, substances, dose forms, doses, and units. Each unique combination of these elements is assigned a corresponding source code. The Builder then maps these elements to their respective RxNorm concept IDs, utilizing a custom eH Builder process to generate structured input tables (*drug_concept_stage*, *relationship_to_concept, internal_relationship_stage* and *ds_stage*), the OHDSI BuildRxE SQL script from OHDSI as the engine to identify existing drug concepts [3] and a post process step to generate useful output files.

The *med_row* file contains drug records, with each row representing a unique combination of drug attributes such as ingredient, dose form, dose, and unit. If a drug has multiple ingredients, each ingredient is listed separately while keeping other attributes constant. The file follows

strict dosage rules, ensuring appropriate mappings for fixed-dose drugs, solutions, inhalers, and patches based on numerator and denominator values.

The *med_mapping* file serves as the mapping reference for distinct drug components found in *med_row*. Each unique ingredient, dose form, dose unit, and brand name from *med_row* must have a corresponding entry in *med_mapping*. This file links source values to standard RxNorm or RxNorm Extension concept IDs, defining precedence in cases of ambiguous mappings.

In cases where a direct RxNorm mapping is unavailable, the RxNorm Builder incorporates the RxNorm Extension vocabulary from OHDSI. This extension expands RxNorm coverage by adding standardized concepts for drugs that are missing in the official RxNorm database, particularly for non-U.S. drugs, custom formulations, and local drug codes. By leveraging RxNorm Extension concepts, the Builder ensures a more complete and accurate representation of drug mappings while maintaining compatibility with OMOP's standardized data model.

Results

The RxNorm Builder allowed us to generate multiple output files depending on the user desire, providing different mapping levels (all mappings, direct mappings, first-level, and second-level mappings) using the qa_result table. These outputs enabled our Data Analysts to review and validate mappings efficiently, ensuring accurate drug standardization. By utilizing these structured outputs, we could propose the most appropriate mappings to our Data Partners, improving consistency and interoperability across sites.

References

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[3] OHDSI, "International Drug Vocabulary Implementation Process - Creation of the input tables," 2024. [Online]. Available: https://github.com/OHDSI/Vocabulary-v5.0/wiki/International-Drug-Vocabulary-Implementation-Process#drug_concept_stage.