

# Turn and Face the Changes: SNOMED CT Change Management

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## ABSTRACT

SNOMED CT is a dynamic reference terminology with multiple releases per year including international and national extensions. New concepts, edited concepts and emerging changes in the concept model (e.g., Observables and Investigation Model) represent substantial clinical information system maintenance tasks necessary to ensure integrity of SNOMED CT encoded clinical data and consistent data retrieval of historical information. NoSQL technologies, specifically graph databases, provide a novel and practical method to manage change within and between SNOMED CT releases.

## EXAMPLE PROBLEM

### Patient population identification:

Of the 454,945 patient records in the UNMC EHR and clinical data warehouse (CDW), 4906 patients have active diagnoses linked to 72 inactive SNOMED CT concepts. Locating these patients in the EHR or CDW using current SNOMED CT release content is not possible or produces inconsistent query results.

Example: 708248004|End stage liver disease (disorder)  
active on 20150131  
434031000124107|End stage liver disease (disorder)  
inactive on 20150301

To identify the population of patients characterized end stage liver disease between two points in time (T1 and T2) will return erroneous results depending on search method due to changes in classification of the concepts between T1 and T2.

Note: This phenomenon is not restricted to SNOMED CT and presents issues in temporal query quality and repeatability using any terminology.

## Classification Changes

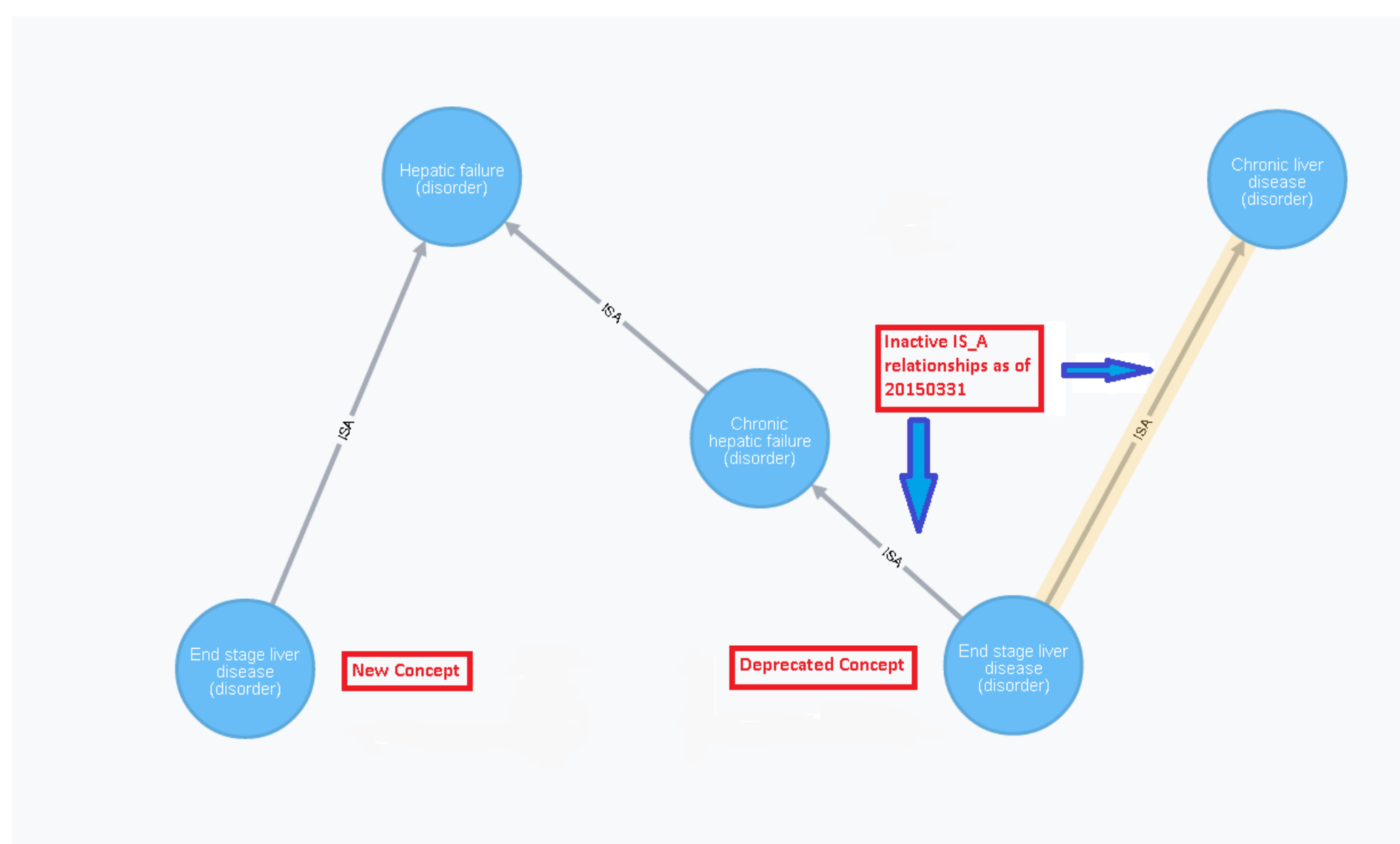


Figure demonstrates classification differences between deprecated and new SNOMED CT concepts. A temporal query between time points for all concepts subsumed by |Chronic liver disease| will not return patients with |End stage liver disease|.

Meticulous management of terminology changes and patient records required to avoid the problem. SNOMED CT maintenance is difficult (1).

## Graph Database Solution

Using a graph database platform (Neo4j, San Mateo, CA) with all versioned SNOMED CT releases provides underpinnings to address temporal query issues. All classified relationships (attributes and ISA) are retained with history of all changes for each concept and relationship for all SNOMED CT releases (2). This feature permits subsumption testing of concepts at any point in time based on effective dates of concept and relationships.

Use of the Historical association refset provides the mechanism to bind SNOMED CT concepts between releases. In combination with the graph model, temporal subsumption testing is possible.

## References

- (1) Lee D, Cornet R, Lau F, de Keizer N. A survey of SNOMED CT implementations. J Biomed Inform 2013 Feb;46(1):87-96.
- (2) Campbell WS, Pedersen J, McClay JC, Rao P, Bastola D, Campbell JR. An alternative database approach for management of SNOMED CT and improved patient data queries. J Biomed Inform 2015 Oct;57:350-7.

## Conclusion

Investigators at UNMC continue to investigate and validate methods to address changes in terminology, specifically SNOMED CT, that occur between versioned releases. The use of the Historical association refset and historicity of concepts and relationships retained in the graph database provide a promising approach to support consistent and reliable results for temporal queries.

## Acknowledgements

Funding for this research is provided in part by US NIH grant# 1 U01 HG009455-01 and the UNMC Departments of Pathology/ Microbiology and Internal Medicine