Implementing rules to the control modeling with SNOMED CT

Hernan Navas [a], Alejandro Lopez Osornio[b], Laura Gambarte[a], Adrian Gomez[a], Analía Baum[a], Daniel Luna[a], Fernan Gonzalez Bernaldo de Quirós[a]

[a] *Department of Health Informatics, Hospital Italiano de Buenos Aires, Argentina*
[b] *TermMed, Buenos Aires, Argentina*

Abstract and objective

SNOMED CT utilization as the reference standard terminology makes interoperability between clinical systems. SNOMED CT provides the creation of post-coordinated terms by the users, according to each local need. Even though the creation of these terms is free, there are a number of rules defined in the User Manual of SNOMED CT that must be performed. The Hospital Italiano of Buenos Aires (HIBA) has a Terminology Server for encoding medical terms using SNOMED CT as the reference vocabulary. The Hospital Italiano of Buenos Aires performed an interoperability test with the Nebraska Medical Center and found a high error rate in the post-coordinated terms (26%). Then it was decided to implement an automatic system of rules within the agreed Terminology Server defined in the User Manual of SNOMED CT. After the rules implementation, the error rate decreased from 26% to 2%. The aim of this paper is to describe the effectiveness of the control rules modeling to the post-coordination of terms.

***Keywords**:*

SNOMED-CT, Rules modeling, Control modeling, Terminology server.

Methods

The Clinical Terminology area at HIBA created a local terminology interface for physicians where they could choose an appropriate description for a patient problem or procedure. At the Hospital Italiano, the modeling tool was developed as "in house" project and did not include control logic modeling.

The rules from the semantic model were encoded in a relational model of databases, using a table of valid types of relation, a table for the hierarchy identified by their high-level concepts and a target chart. The HIBA vocabulary is also stored in a relational database, including its concepts, descriptions and relations. The rules that area entered in the Terminology Server were: it can be only one relation "*it is a mapping*", if the relation used is "*it is a mapping*" the concept cannot be "primitive, there must be at least one relation "*it is a*" or "*it is a mapping*", so the concept must belong to only one hierarchy. In order to verify the effectiveness of the control system modeling, two samples of post-coordinated concepts were extracted from the Hospital Italiano vocabulary. The sample includes 34,253 post-coordinated terms. The second sample was evaluated in 2008 after the implementation of the system of rules and included 9015 terms. An expert that classified the concept as "right" or "wrong" reviewed each list of concepts. The classification of errors was the following: failure in the definition of the hierarchy, failure on the type of the relation, failure on the target of the relation, inappropriate use of an anatomical structure as an entire structure and other errors.

Results

In the first sample of 34,253, a total of 300 terms were analyzed. 74% had no errors. The remaining 26% was composed by 0.67% failure on the definition of the hierarchy, 3% failure in the type of the relation, 6.67% failure in the target of the relation, 5% the use of the entire part is not allowed, and 10.67% other errors. In the second sample of 9015 there were analyzed 300 words. 97.3% had no errors. The remaining 2.7% is formed by 0.3% failure in the target of the relation and 2.4% remaining by other kind of errors/ failures. From the analysis of the accuracy performance arose on the first sample that 77% of the terms possess an adequate representation (points 1 and 2 on the scale), the 10.67% were poorly represented (items 4 and 5) and 12.3% could not be determined. In 2008 sample, it was found that 96.33% of terms were properly represented, 2% were poorly represented and 1.67% could not be determined.

Conclusion

Implementing an automatic system of rules for the post-coordination of terms, improves its performance, whether the proper use of the relations of SNOMED CT, as well as the adequate representation of medical concepts. Clearly a system of rules will improve interoperability with other health centers that achieved in 2006 with the Nebraska Medical Center.

It also has positive impact in education area, to improve the training of coders in charge of modeling the terms, and to limit them to following consistent rules to enhance the terms performance. This system of rules could reduce the variability between coders at the time they are making decisions to generate post-coordinated expressions, increasing consensus.