

Building an Ontology for Traditional Medicine by Comparing Traditional Medicine Information of Chapter 26 of ICD-11 with SNOMED CT

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Abstract. Chapter 26 of the 11th revision of the International Classification of Diseases (ICD-11-CH26) has introduced Traditional Medicine knowledge for use and integration with Western Medicine. Traditional Medicine is the use of beliefs, theories, and experiences to provide healing and care. The amount of information on Traditional Medicine in Systematized Nomenclature of Medicine – Clinical Terms (SCT), the world's most comprehensive health terminology, is unclear. The purpose of this study is to address this unclarity and investigate to which extent the concepts of ICD-11-CH26 can be found in SCT. If a concept from ICD-11-CH26 has a corresponding, or similar, concept in SCT, the hierarchical structure of the concepts has been compared. Then, an ontology of Traditional Chinese Medicine using the concepts of SCT will be developed.

Keywords. SNOMED CT, ICD-11, Medicine, traditional, Biomedical Ontologies

1. Introduction

Western Medicine (WM) refers to the use and application of community, science, and scientific results to create evidence-based healing, treatments, medications, and care [1–4]. This includes applying different scientific disciplines to understand the human body on all levels [1–3]. In WM, a popular belief is that the interaction between molecules is the creator of all living matter and that all matter consists of their own components [2,4].

One of the commonly used Traditional Medicine (TM) practices in the WHO member states is Traditional Chinese Medicine (TCM) [5]. TCM means TM practices that originate from ancient Chinese traditions, characterized by using experience-based and belief-based theories and treatments to create balance within the human body and in relation to its external environment [3,5]. It can be practiced for treatment and diagnosis without the need to scientifically understand the pathogenesis or cause of a health state [5]. Many of the practices and principles used in TCM derive from the view that natural

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phenomena can be categorized in two interdependent and opposite aspects of nature [5]: Yin and Yang. In TCM, an organism's material aspect is referred to as Yin and the function of the organism as Yang [5]. Body harmony is created when Yin and Yang are in balance [5]. TCM is also built on the five-element theory, which describes that the universe consists of the five elements: earth, fire, metal, water, and wood [5,6]. These describe the relationship of the human body and the external environment, and the internal interactions of the human organs [5,6].

1.1. Medical Documentation

Documentation is an important aspect of any medical approach [7]. For WM, medical documentation (MD) should contain relevant information and a professional language [8,9]. MD can aid in creating standard approaches to patient care, serve as records and be used in future work as references [7]. It is important that MD fulfill the purpose it has been designed for [7,8]. For information within the MD to be used efficiently, it needs to be provided in an appropriate format, when it is necessary and where it is needed [8]. One of the approaches to perform MD is by using medical terminologies and ontologies [9,10]. MD of TM differs from the MD of WM because much of the TM knowledge is native to the region where it is practiced and handed down in the local language through writing or oral communication [7,11,12].

1.2. Problem description and research aims

MD of TM does not always occur or follow a standardized procedure [11,12]. For much of the documented TM knowledge, the information of it is often scattered and presented using non-standardized formats [9]. Not following a standardized procedure for documentation of TM knowledge may hinder the preservation of it [13]. Standardization of TM documentation can provide many societal benefits, particularly to the societal parts related to health [13]. It could promote education, improve the safety and quality of healthcare as well as allow for evidence-based research on TM and its effects [13].

This study carries two aims: 1) To provide an overview of the concepts of ICD-11-CH26 that are available in SCT; 2) To provide a simplified way of using TM concepts in WM practices by beginning the process of building an Ontology of Traditional Medicine using the concepts available in SCT.

2. Methods

The study was conducted from January 2022 to May 2022, using the ICD-11 browser version 02/2022, SCT browser version 28-02-2022, Cambridge dictionary, Medical Subject Headings controlled vocabulary thesaurus as well as the ontology development environment Protégé. The data collection consisted of having the information from ICD-11-CH26 and SCT available for use and referencing. The data has been analyzed using qualitative content analysis, which means analyzing the context and the participant of categories that are related [14]. The purpose of this analysis method is to identify any similarities or differences that may exist [14].

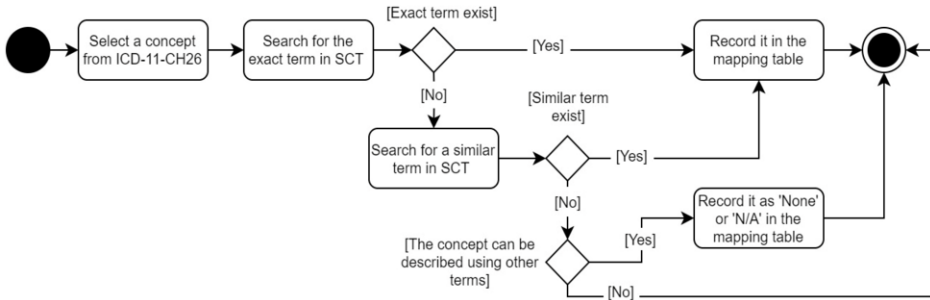


Figure 1. The term mapping method developed in this study, shown as Unified Modelling Language (UML) Activity Diagram (AD).

To employ the qualitative content analysis, the context was represented by the subject area of TM, and the participants were represented by ICD-11-CH26 and SCT concepts. A methodology based on the term mapping process described by Rodrigues et. al. [15] was developed for this study and has been described in Figure 1. An exact term was defined as where the wording of the terms is the same in both ICD-11-CH26 and SCT. A similar term was defined as using a different name, synonym(s) or phrasing that carries the same meaning as the original term.

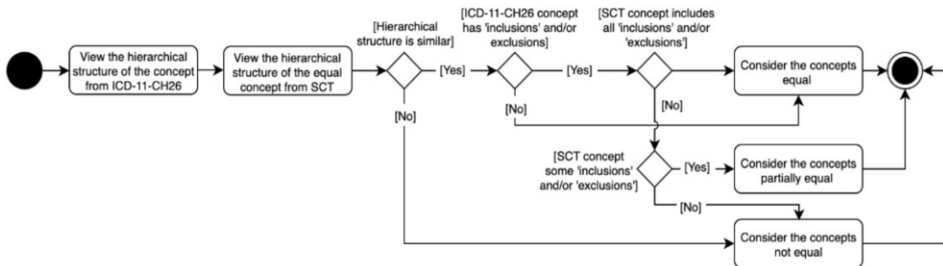


Figure 2. The semantic and hierarchical assessment method developed in this study, shown as UML AD.

For the concepts from ICD-11 that had an equal or similar concept in SCT, the semantic network and hierarchical structure of those concepts were assessed. Figure 2 gives a detailed description of the semantic and hierarchical assessment done in the study.

The ontology of this study, the Ontology of Traditional Medicine (OTM), has been developed based on a SNOMED CT Clinical Finding ontology developed by Tania Tudorache in 2014 [16], henceforth referred to as the ‘Tudorache ontology’ (TO). This ontology was selected due to the following reasons: 1 - To re-use existing SCT knowledge instead of creating a new and possibly overlapping knowledge. This allowed the development of the OTM to prioritize the representation of TM knowledge; 2 - The concepts identified through the term matching and the hierarchical assessment existed in the SCT domain ‘Clinical Finding’, either as a ‘(finding)’ or as a ‘(disorder)’. Because of this, only using a Clinical Finding ontology, instead of an ontology representing the entire SCT knowledge, allowed the development of the OTM to only consider the

relevant Clinical Finding concepts; 3 – The TO was not up to date with the SCT version 28-02-2022, but contained many of the concepts identified during the data analysis.

3. Results

3.1. Disorders of ICD-11-CH26 in SNOMED CT

Of the 218 disorders represented in ICD-11-CH26, 84 had an equal or similarly named main, inclusion or exclusion concept in SCT. The list of 84 concepts and 218 disorder codes of ICD-11-CH26 can be provided upon request.

61 of the 84 concepts were considered equal to their identified SCT counterparts. These accounted for 27 percent of the total number of disorder concepts in ICD-11-CH26. For these 61 concepts, the hierarchical structures were similar and the main concepts, as well as any inclusions or exclusions, were fully representable with SCT concepts.

17 of the 84 ICD-11-CH26 concepts were considered partially equal to their identified SCT counterparts. In these cases, either the main concept was representable in SCT, but any number of inclusions or exclusions were not, or vice versa.

Six of the ICD-11-CH26 concepts were considered not equal to their equally or similarly named SCT counterparts. These concepts were not considered equal due to the ICD-11-CH26 concept and its equally or similarly named SCT concept either had entirely different hierarchical structures or an identified difficulty to represent a single ICD-11-CH26 concept with a single SCT concept.

3.2. Patterns of ICD-11-CH26 in SNOMED CT

Of the 260 patterns in ICD-11-CH26, one pattern concept had a considered equal concept in SCT. The ICD-11-CH26 pattern concept was “SE91 Qi stagnation pattern (TM1)” and the SCT equal concept entity was named “370533008 | Stagnation of chi (finding) |”. The representable pattern corresponded to 3 percent of the total number of patterns in ICD-11-CH26. The other 259 ICD-11-CH26 pattern concepts were not considered fully or partially representable using SCT concepts.

3.3. Ontology of Traditional Medicine (OTM)

The OTM was designed as an adaptation of the TO. In total, there were 62 main ICD-11-CH26 concepts considered equal to their SCT counterpart. 61 of these were disorder concepts and one was a pattern concept. There were 65 SCT concepts used in this study to equally represent the corresponding ICD-11-CH26 concepts. These have been modeled and represented in the OTM. Of these, 60 existed in the TO. For 20 of these concepts, their hierarchical structure was updated according to the SCT version used. The OTM, as well as a graphical representation of it, has been uploaded in a publicly available GitHub repository [17], created and owned by the principal investigator, under the GNU General Public License v3. The TO originally had 106621 classes represented in the Clinical Finding SCT category. The total number of classes in the ontology is 106642.

4. Discussion and Conclusions

This study has compared the information of TM available in ICD-11-CH26 with the TM information available in SCT and investigated how an ontology of Traditional Medicine can be built upon this information. The results show that only a minority of the TM disorders and patterns information in ICD-11-CH26 are representable in SCT. Particularly, SCT currently does not contain much information related to the five-element theory which is a cornerstone of TCM, which makes the representation of the pattern concepts of ICD-11-CH26 difficult. The OTM that has been developed shows how some of the TM concepts of ICD-11-CH26 can be represented in SCT. Because of the design of the OTM, reusability and future development of TM knowledge is encouraged. Future work consists of analyzing how all TM knowledge of ICD-11-CH26 can be represented in SCT and a mapping between the TM concepts and Herbal Anatomical Therapeutic Chemical (ATC) codes, to better model the traditional medicine practice.

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