
Health informatics — Semantic network framework of traditional Chinese medicine language system

*Informatique de santé — Cadre de réseau sémantique du système de
langage de la médecine traditionnelle chinoise*

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Foreword

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The committee responsible for this document is ISO/TC 215, *Health informatics*.

Introduction

This Technical Specification constitutes preparatory work for the development of a standard for semantic network framework of the Traditional Chinese Medicine Language System.

This Technical Specification is based on the needs of semantic networks of the Traditional Chinese Medicine Language System (TCMLS). This Technical Specification describes the semantic relations of traditional Chinese medicine associated with the semantic concepts, terminology, and the definition of semantic networks.

Historically, the application and development of traditional Chinese medicine (TCM) has continued for a long period of time and the terms used vary in different geographical contexts over time. In the past, it was less problematic for information processing because information exchange and integration were rare. But recently, there has been a greater need for information integration processing and exchange between different organizations, while still maintaining the accurate and unified meaning of messages. Automated machine-aided information processing is now becoming more important, and so the establishment of standardized concepts and relationships of TCM terms becomes important.

TCMLS consists of TCM terms, language translation, natural language processing, and language standardized tools. The core of TCMLS is the semantic network of TCM concepts, which facilitates machine processing.

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1 Scope

This Technical Specification defines the structure of the semantic network by describing the semantic types and semantic relations of TCM language system.

This Technical Specification is intended to:

- a) support establishment of Unified Semantic Modelling TCM Language System;
- b) support develop of standardized TCM concepts and relationships of concepts;
- c) provide a conceptual framework for the concept representation of TCM Language;
- d) support improvement in the processing of natural language by computer systems.

This Technical Specification has been developed for the first time. The initial content described below is intended to be used as a starting point for the application of the content in the information system.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1

traditional Chinese medicine

traditional medicine that originated in China, and is characterized by holism and treatment based on pattern identification/syndrome differentiation

Note 1 to entry: Adapted from WHO International Standard Terminologies on Traditional Medicine in the Western Pacific Region.

2.2

Traditional Chinese Medicine Language System TCMLS

language system that is designed to facilitate the development of computer systems that understand the meaning of the natural language of traditional Chinese medicine, containing two sections in TCMLS, TCM terms dictionary, and the semantic network

2.3

semantic networks

modelling framework that consists of (1) a set of broad subject categories, or semantic types, that provide a consistent categorization of all concepts represented in the TCMLS, and (2) a set of useful and important relationships, or semantic relations, that exist between semantic types

Note 1 to entry: The semantic network contains 96 semantic types and 58 relationships.

2.4

semantic type

node in the semantic network, which helps to organize concepts in hierarchy and assign at least one attribute for every concept

Note 1 to entry: A semantic type is mainly classified into entity and event.

2.5

semantic relationship

relationship that connects between semantic types, divided into two classes: hierarchy and correlation

Note 1 to entry: There are 58 semantic relationships in TCM domain, which forms the skeleton of TCM semantic networks.

3 Semantic networks

3.1 General

The TCMLS semantic network provides a consistent categorization of all concepts represented in TCM terms dictionary and to provide a set of useful relationships between these concepts. The current release of the semantic network contains 96 semantic types and 58 relationships.

3.2 Principles of terminology naming and definition

3.2.1 Marking with the letters TCM in superscript represents the terms which have the same nomenclature with conventional medicine but have the different definition.

3.2.2 Concept is defined by comprehensive description using well known terms.

3.2.3 Definition is given by using standardized terms.

3.2.4 Definition explains the concept, and does not include composition terms.

3.2.5 Each concept is expressed by hierarchical classification and property definition.

3.2.6 Each concept includes both Chinese and English terminology and annotation.

3.3 Semantic types

The semantic types (given in Table 1) are the nodes in the semantic network. The network defines semantic types for all concepts in TCM terms dictionary, both with textual descriptions and by means of the information inherent in its hierarchies. There are two major categories of semantic types: entity and events.

The semantic types structure is shown in [Annex A](#).

Table 1 — Semantic types description and definition

ID	Semantic types	Definition
1	Entity	A broad type for grouping physical and conceptual entities. (UMLS)
1.1	Physical and presentational object	An object perceptible to the sense of vision or touch. (UMLS)
1.1.1	Basic material in the human body in Chinese medicine	In Chinese medicine, the basic elements, constituents, or substances of which the human body is composed or can be made according to TCM theory.
1.1.1.1	Basic substance in the human body	The fundamental substance that maintains body function and keeps the physiological activity of the whole body in balance, such as qi, blood, and body fluid.

Table 1 (continued)

ID	Semantic types	Definition
1.1.1.1.1	Essence ^{TCM}	Essence means two things: (1) the fundamental substance that builds up the physical structure and maintains body function; (2) reproductive essence stored in the kidney. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.1.1.2	Blood ^{TCM}	The red fluid circulating through the blood vessels, and nourishing and moistening the whole body. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.1.1.3	Qi ^{TCM}	The basic element that constitutes the cosmos and, through its movements, changes and transformations, produces everything in the world, including the human body and life activities. In the field of medicine, qi refers both to the refined nutritive substance that flows within the human body as well as to its functional activities. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.1.1.4	Liquid and humor ^{TCM}	A general term for all kinds of normal liquid in the body, except the blood, also known as body liquids. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.1.2	Viscera and Bowels ^{TCM}	A collective term for internal organs, also called zang-organs and fu-organs.
1.1.1.3	Meridian and collateral	A system of conduits through which qi and blood circulate, connecting the bowels, viscera, extremities, superficial organs and tissues, making the body an organic whole, the same as channels and networks; meridians or channels, in short. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.1.4	Acupuncture point	The point where a needle is inserted and manipulated in acupuncture therapy. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.1.5	Body constituent and orifice of sense organ	A collective term for skin, vessels, flesh, sinews, bones and the external opening of sense organs.
1.1.1.6	Constitution	The characteristics of an individual, including structural and functional characteristics, temperament, adaptability to environmental changes and susceptibility to disease. It is relatively stable, being in part, genetically determined and in part, acquired. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.2	Medicinal animal plant and mineral	Generally refers to all animals, plants and minerals that can be used as drugs
1.1.2.1	Medicinal animal	Generally refers to those animals that have therapeutic function or can be used to prevent and treat the disease.
1.1.2.2	Medicinal plant	Generally refers to those plants that have therapeutic function or can be used to prevent and treat the disease.
1.1.2.3	Medicinal mineral	A naturally occurring, homogeneous inorganic solid substance having a definite chemical composition, and have therapeutic function or can be used to prevent and treat the disease.
1.1.3	Medicinal substance	A substance used in the treatment or prevention of pathologic disorders. This includes substances that occur naturally in the body and are administered therapeutically.

Table 1 (continued)

ID	Semantic types	Definition
1.1.3.1	Chinese medicinal	Usually referring to those medicinal substances recorded in Chinese materia medica. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.1.3.2	Formula	A prescription that is formed from Chinese medicinals. TCM pharmacists typically combine various medicinals into in a formula or prescription after carefully considering the dosage, usage, and combination, according to the results of Pattern differentiation as well as therapeutic principles.
1.1.3.3	Chemical constituent of Chinese medicine	Molecular components that are extracted from Chinese medicinal after extraction, separation, identification, structure determination.
1.1.4	Food	Any substance generally containing nutrients, such as carbohydrates, proteins, and fats, that can be ingested by a living organism and metabolized into energy and body tissue. Some foods are naturally occurring, others are either partially or entirely made by humans.(UMLS)
1.1.5	Artificial device	Substances made or synthesized by human.
1.1.5.1	Research device	A manufactured object used primarily in carrying out scientific research or experimentation.
1.1.5.2	Medical device	A manufactured object used primarily in the diagnosis, treatment, or prevention of physiologic or anatomic disorders.
1.1.5.3	Pharmacologic device	A manufactured object used primarily in the medical experiment, Chinese medicinal identification, formulation analysis and pharmaceutical technology, etc.
1.2	Conceptual entity	A broad type for grouping abstract entities or concepts.(UMLS)
1.2.1	Traditional Chinese medicine theory	In Chinese medicine, a system of ideas formed from Chinese medical philosophy in combination with practical experiences on medicine, such as yin-yang theory, visceral manifestation theory, meridian and collateral theory, essential qi theory, and five-phase theory.
1.2.1.1	Yin-yang theory	An ancient Chinese philosophical concept, dealing with two opposite aspects of matters in nature which are interrelated with each other. Its principle is widely applied to traditional Chinese medicine. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.2.1.2	Five phase theory	One of the philosophical theories of medical practice in ancient China, concerning the composition and evolution of the physical universe, epitomized by the nature and the inhibition-generation relationships of the five phases, wood, fire, earth, metal and water, serving as the guiding ideology and methodology of physiology, pathology, clinical diagnosis and treatment, also known as five elements theory. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
1.2.1.3	Theories of schools of traditional Chinese medicine	Refers to a TCM theory that is from various factions.
1.2.1.3.1	Traditional Chinese Medicine Schools	The prolonged history of traditional Chinese medicine has witnessed a plurality of famous figures, who not only inherited theories and experiences from their antecessors, but also formed their own opinions and doctrines. The inheritance of academic tradition, achieved through apprenticeship training, in addition to the creativity of famous figures recognized for their outstanding works, gave rise to the different schools of traditional Chinese medicine.

Table 1 (continued)

ID	Semantic types	Definition
1.2.1.3.2	Medical specialist	The people who dedicated their lives to the development of (traditional Chinese) medicine from ancient times, particularly the ancestors who are symbolized as Huangdi and Shennong.
1.2.2	Traditional Chinese medicine subject	A subject that originated in China evolved a unique theoretical system, which is based on the Chinese people's long-term medical practice.
1.2.3	Related subjects of traditional Chinese medicine	Referring to a subject that is connected to Traditional Chinese Medicine.
1.2.3.1	Related nature physics subjects of traditional Chinese medicine	A subject that involves the study of natural phenomena or physical phenomena related TCM.
1.2.3.2	Traditional Chinese philosophy	Philosophical thought that was developed by ancient Chinese, through the generalization and summarization of their natural and social knowledge.
1.2.4	Traditional Chinese medicine organization	A social group organized for some end or tasks related to health care, education, and scientific research in traditional Chinese medicine .
1.2.5	Traditional Chinese medicine literatures	The body of written works (e.g. books, magazines) on the subject of traditional Chinese medicine .
1.2.6	Geographic area	Name that about geographical field.
2	Event	A broad type for grouping activities, processes and states.(UMLS)
2.1	Phenomenon and process	A process or state which occurs naturally or as a result of an activity. (UMLS)
2.1.1	Physiology phenomenon or process	Phenomena or process that organism itself have or due to some activity.
2.1.1.1	Traditional Chinese medicine physiological function	Study of human physiological state according to TCM Theory.
2.1.1.1.1	The function of essence	The function of essence includes construction of the body, generation of offspring, maintaining the vital activities and metabolism of the body.
2.1.1.1.2	The function of qi ^{TCM}	Qi is moving constantly inside the body to proper and stimulate the physiological functions of the body. The functions of qi include: promoting action, warming action, defending action, consolidating action, transforming action.
2.1.1.1.3	The function of blood ^{TCM}	Blood is a intravascular red liquid rich in nutrients. The main physiological function of blood is to nourish and moisten the whole body.
2.1.1.1.4	The function of fluid and humor ^{TCM}	The physiological functions of the body fluid and humor are to moisten and nourish the body.
2.1.1.1.5	The function of viscera	Five viscera have physiological function of producing and storing essence qi. Six bowels possess the functions of reception.
2.1.1.1.6	The function of meridian and collateral	Physiologically the meridian and collateral serve as the pathways for qi and blood to flow and circulate in the body. Pathologically the meridian and collateral transmit pathogenic factors into the body.
2.1.1.1.7	The function of acupuncture point	The functions of acupuncture point are transporting qi and blood, reflecting the condition of disease and syndrome, assisting diagnosis and preventing the disease.
2.1.1.1.8	The function of yin-yang	The general descriptive terms for the two opposite, complementary and inter-related cosmic forces found in all matter in nature. The ceaseless motion of both yin and yang gives rise to all changes seen in the world.

Table 1 (continued)

ID	Semantic types	Definition
2.1.1.1.9	The function of five phases	The function of five phases refers to the movement of five phases, which is mainly characterized by inter-generation, inter-restriction, over-restriction, counter-restriction and mutual interaction between mother-organ and child-organ. The movement of five phases shows the inter-relationship of all things, using it to illustrate the existence and changes of the entire material world.
2.1.1.2	Traditional Chinese medicine psychology	Study of human psychological state according to TCM Theory.
2.1.1.2.1	Seven emotions	A collective term for joy, anger, thought, anxiety, sorrow, fear and fright, taken as endogenous factors causing diseases if in excess. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
2.1.1.2.2	Mind ^{TCM}	Mental activities, referring to mind, consciousness, thinking and feeling. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
2.1.2	Etiology, pathogenesis and disease ^{TCM}	Study of the etiology, development and mechanism of disease according to TCM theory.
2.1.2.1	Etiology and pathogenesis ^{TCM}	Study of the cause, development, and mechanism of disease according to the basic theory of TCM.
2.1.2.2	Disease ^{TCM}	A condition of being (more or less seriously) out of health; illness, sickness. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
2.1.2.3	Pattern	(1) diagnostic conclusion of the pathological changes at a certain stage of a disease, including the location, cause, and nature of the disease as well as the trend of development; (2) conditions suggesting appropriate treatment; (3) condition specific to the individual. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
2.1.2.4	Symptom	A (bodily or mental) phenomenon, circumstance, or change of condition arising from and accompanying a disease or other pathological condition, and constituting an indication or evidence of it; a characteristic sign of a particular disease. Especially, in modern use, a subjective indication, perceptible to the patient. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
2.1.3	Property and function of Chinese medicinal	Refer to the property, flavour, meridian entry, upbearing, downbearing, floating and sinking, toxin, and function of traditional Chinese drugs.
2.1.3.1	Nature of Chinese medicinals	The basic properties of a medicinal mainly includes four qi, five flavours, meridian entry, upbearing, downbearing, floating, sinking, toxin, etc.
2.1.3.1.1	Four qi and five flavours	A collective term of four qi and five flavours. The four basic properties of medicinals, cold, hot, warmth, and coolness. The five tastes of medicinals, pungency, sweetness, sourness, bitterness, and saltiness, representing the basic actions of the medicinals. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
2.1.3.1.2	Meridian entry	Orientation of the medicinal action according to the meridian/channel on which the therapeutic action is manifested, also called meridian tropism. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)
2.1.3.1.3	Toxin ^{TCM}	Any virulent pathogen that causes a fulminating disease. (WHO INTERNATIONAL STANDARD TERMINOLOGIES ON TRADITIONAL MEDICINE IN THE WESTERN PACIFIC REGION)

Table 1 (continued)

ID	Semantic types	Definition
2.1.3.2	The function of Chinese medicinal	Refers to the effect that Chinese medicinal produced on the body.
2.1.3.2.1	Chinese medicinal combination	Use various medicinals jointly in a formula or prescription for producing the desired therapeutic effect and reducing toxic or side effects.
2.1.4	Natural phenomenon or process	A phenomenon or process that occurs irrespective of the activities of human beings.(UMLS)
2.1.4.1	Related natural phenomenon of five phases	A natural phenomenon or process related five phases.
2.1.4.1.1	Five seasons	A collective term for spring, summer, later summer, autumn, and winter .
2.1.4.1.2	Five directions	A collective term for east, south, central, west and north.
2.1.4.1.3	Five varieties	A collective term for generation, growth, transformation, harvest and storage.
2.1.4.1.4	Five colours	A collective term for blue, red, yellow, white and black.
2.1.4.1.5	Five notes	A collective term for Jiao, Zhi, Gong, Shang and Yu.
2.2	Activity	An operation or series of operations that an organism or machine carries out or participates in.(UMLS)
2.2.1	Traditional Chinese diagnostics	Determination of the nature of a diseased condition; identification of a disease by careful investigation of its symptoms and history; also, the opinion (formally stated) resulting from such investigation.
2.2.1.1	Diagnostic method	The basic method of collecting data to determine the disease condition.
2.2.1.2	Pattern differentiation	The process of overall analysis of clinical data to determine the location, cause and nature of a patient's disease and achieving a diagnosis of a pattern/syndrome, also called pattern differentiation.
2.2.2	Traditional Chinese medicine treatment	Treat the disease with the idea and method of Pattern differentiation and treatment.
2.2.2.1	Therapeutic principle	A general rule that should be followed in treating disease.
2.2.2.2	Therapeutic methods	Any specific intervention derived from a principle of treatment, e.g. diaphoresis, emesis, purgation, mediation, warming, clearing, tonification and resolution.
2.2.2.2.1	Chinese medicinal therapy	Under the guidance of the basic TCM theory, prescribe Chinese medicinal to treat the disease.
2.2.2.2.2	Acupuncture therapy	Treatment of disease by inserting needles into the human body along specific pathways or meridians. The placement varies with the disease being treated. It is sometimes used in conjunction with heat, moxibustion, acupressure, or electric stimulation.
2.2.2.2.3	Massage	Rubbing, kneading, or percussion of the soft tissues and joints of the body with the hands, usually performed by one person on another, esp. to relieve tension or pain.
2.2.2.2.4	Qigong therapy	Qigong is a therapeutic method used to prevent and cure disease by means of bringing the consciousness of the patient into full awareness.
2.2.2.2.5	Diet therapy	Also known as the food therapy. It is a way that will regulate the body and treat disease according to the different nature of food flavours and acting on different organs. Use nutritious food or medicinal food products to reinforce the healthy qi and strong physique.
2.2.3	Chinese medicine prevention	Under the guidance of TCM theory to prevent the occurrence and development of disease.

Table 1 (continued)

ID	Semantic types	Definition
2.2.4	Traditional Chinese life nurturing and rehabilitation	Concerned with promotion of health, prevention of disease, longevity, and also concerned with the restoration of function after injury or illness.
2.2.5	Chinese medicine management	System management of TCM institution and organization.
2.2.6	Chinese medicine education	In Chinese medicine, a formal process through which the TCM knowledge and skills are transferred from one generation to another.
2.2.7	Pharmaceutical techniques	It refers to the process of using modern technique to process Chinese medicinal materials.
2.2.7.1	Processing of Chinese medicinal	A general term for treating of medicinal substances by various means before their medical use.
2.2.7.2	Chinese medicinal pharmaceutical engineering	By using the principles and methods of chemical engineering to study and explore the method and processing of raw materials, semi-finished and finished products of Chinese medicinal.
2.2.7.3	Chinese medicinal preparation	It is a comprehensive technical science that on the basis of TCM theory and modern science and technology to research the content of preparation theory, production technology, quality control and rational application.
2.2.7.4	Analysis of Chinese medicinal preparation	It is an applied science that on the basis of TCM theory and modern analysis theory and methods to research the quality of Chinese medicinal preparation.
2.2.8	Chinese medicinal research	Process of studying the Chinese medicinal.
2.2.9	Chinese medicine research	Creative work undertaken systematically to increase the knowledge assets in TCM domain, and the use of these knowledge assets to devise new applications in health care and drug discovery.

3.4 Semantic relationship

3.4.1 General

Semantic relationships (given in Table 2) are the relationships between the semantic types, that is links between semantic nodes in the network. Each concept in TCMLS is logically defined through its relationships to other concepts, and every concept has at least one IS_A relationship to a supertype concept.

The semantic relationship structure is shown in [Annex B](#).

3.4.2 Classification of semantic relationship

There are two types of semantic relationships: is_a and associated with. TCMLS uses semantic relationships to realize the logic definition of the concept in TCM terms dictionary.

Table 2 — Semantic relationship description and definition

ID	Semantic relationship	Definition
1	Is_a	The basic hierarchical link in the Network. If one item “isa” another item then the first item is more specific in meaning than the second item.(UMLS)
2	Associated with	Has a significant or salient relationship to. (UMLS)
2.1	Physically related to	Related by virtue of some physical attribute or characteristic. (UMLS)

Table 2 (continued)

ID	Semantic relationship	Definition
2.1.1	Tributary of	Merges with. For example, the confluence of meridian and collateral.
2.1.2	Part of	Composes, with one or more other physical units, some larger whole. This includes component of, division of, portion of, fragment of, section of, and layer of.(UMLS)
2.1.3	Branch of	Arises from the division of. For example, the arborization of meridian and collateral.
2.1.4	Consists of	Is structurally made up of in whole or in part of some material or matter. This includes composed of, made of, and formed of.(UMLS)
2.1.5	Ingredient of	Is a component of, as in a constituent of a preparation.(UMLS)
2.1.6	Contains	Holds or is the receptacle for fluids or other substances. This includes is filled with, holds, and is occupied by.(UMLS)
2.1.7	Connected to	Directly attached to another physical unit as tendons are connected to muscles. This includes attached to and anchored to.(UMLS)
2.2	Spatially related to	Related by place or region. (UMLS)
2.2.1	Location of	The position, site, or region of an entity or the site of a process.(UMLS)
2.2.2	Adjacent to	Close to, near or abutting another physical unit with no other structure of the same kind intervening. This includes adjoins, abuts, is contiguous to, is juxtaposed, and is close to. (UMLS)
2.2.3	Surrounds	Establishes the boundaries for, or defines the limits of another physical structure. This includes limits, bounds, confines, encloses, and circumscribes. (UMLS)
2.2.4	Traverses	Crosses or extends across another physical structure or area. This includes crosses over and crosses through. (UMLS)
2.3	Functionally related to	Related by the carrying out of some function or activity. (UMLS)
2.3.1	Affects	Produces a direct effect on. Implied here is the altering or influencing of an existing condition, state, situation, or entity. This includes has a role in, alters, influences, predisposes, catalyses, stimulates, regulates, depresses, impedes, enhances, contributes to, leads to, and modifies. (UMLS)
2.3.1.1	Manages	Administers, or contributes to the care of an individual or group of individuals. (UMLS)
2.3.1.2	Treats	Applies a remedy with the object of effecting a cure or managing a condition. (UMLS)
2.3.1.3	Disrupts	Alters or influences an already existing condition, state, or situation. Produces a negative effect on. (UMLS)
2.3.1.4	Complicates	Causes to become more severe or complex or results in adverse effects. (UMLS)
2.3.1.5	Prevents	Stops, hinders or eliminates an action or condition. (UMLS)
2.3.1.6	Engendering	The relationship in which each phase and its associated phenomena give rise to or promote another sequential phase, also the same as generating .
2.3.1.7	Restraining	The relationship in which each phase and its associated phenomena restrict/check/control another phase .
2.3.1.8	Overwhelming	Abnormally severe restraining of the five phases in the same sequence as normal restraining, also known as over-acting
2.3.1.9	Rebellion	Restraining opposite to that of the normal restraining sequence of the five phases, also known as insulting
2.3.1.10	Mutual reinforce	Two medicinals with similar properties used in combination to reinforce each other's action

Table 2 (continued)

ID	Semantic relationship	Definition
2.3.1.11	Assist	Two or more medicinals used in combination, one being the principal substance while the others play a subsidiary role to reinforce the action of the former.
2.3.1.12	Suppress	Property of a medicinal to neutralize the toxicity of another.
2.3.1.13	Restrain	Toxicity or side effects of a medicinal being counteracted by another.
2.3.1.14	Inhibit	Property of a medicinal to weaken the action of another.
2.3.1.15	Antagonize	Antagonistic combination of two medicinals, if used together, one may prevent the therapeutic effect of the other and/or there may be adverse effects.
2.3.2	Brings about	Acts on or influences an entity. (UMLS)
2.3.2.1	Produces	Brings forth, generates or creates. This includes yields, secretes, emits, biosynthesizes, generates, releases, discharges, and creates. (UMLS)
2.3.2.2	Causes	Brings about a condition or an effect. Implied here is that an agent, such as for example, a pharmacologic substance or an organism, has brought about the effect. This includes induces, effects, evokes, and etiology. (UMLS)
2.3.3	Performs	Executes, accomplishes, or achieves an activity. (UMLS)
2.3.3.1	Exhibits	Shows or demonstrates. (UMLS)
2.3.4	Occurs in	Takes place in or happens under given conditions, circumstances, or time periods, or in a given location or population. This includes appears in, transpires, comes about, is present in, and exists in. (UMLS)
2.3.4.1	Process of	Action, function, or state of. (UMLS)
2.3.5	Uses	Employs in the carrying out of some activity. This includes applies, utilizes, employs, and avails. (UMLS)
2.3.6	Manifestation of	That part of a phenomenon which is directly observable or concretely or visibly expressed, or which gives evidence to the underlying process. This includes expression of, display of, and exhibition of. (UMLS)
2.3.7	Indicates	Gives evidence for the presence at some time of an entity or process. (UMLS)
2.3.8	Result of	The condition, product, or state occurring as a consequence, effect, or conclusion of an activity or process. This includes product of, effect of, sequel of, outcome of, culmination of, and completion of. (UMLS)
2.3.9	Inter_exterior and interior with	The relationship between viscera and meridians, and could show the way that viscera and meridians influence each other.
2.3.10	Opening at	A special relationship between five viscera and five apertures, which be related by meridian and collateral. For example, kidney opening at ear, liver opening at eye.
2.4	Temporally related to	Related in time by preceding, co-occurring with, or following. (UMLS)
2.4.1	Co-occurs with	Occurs at the same time as, together with, or jointly. This includes is co-incident with, is concurrent with, is contemporaneous with, accompanies, coexists with, and is concomitant with. (UMLS)
2.4.2	Precedes	Occurs earlier in time. This includes antedates, comes before, is in advance of, predates, and is prior to. (UMLS)
2.5	Conceptually related to	Related by some abstract concept, thought, or idea. (UMLS)
2.5.1	Evaluation of	Judgment of the value or degree of some attribute or process. (UMLS)
2.5.2	Analyses	Studies or examines using established quantitative or qualitative methods. (UMLS)
2.5.3	Issue in	Is an issue in or a point of discussion, study, debate, or dispute. (UMLS)
2.5.4	Measures	Ascertains or marks the dimensions, quantity, degree, or capacity of. (UMLS)

Table 2 (continued)

ID	Semantic relationship	Definition
2.5.5	Diagnoses	Distinguishes or identifies the nature or characteristics of. (UMLS)
2.5.6	Property of	Characteristic of, or quality of. (UMLS)
2.5.7	Derivative of	In chemistry, a substance structurally related to another or that can be made from the other substance. This is used only for structural relationships. This does not include functional relationships such as metabolite of, by product of, nor analog of.
2.5.8	Method of	The manner and sequence of events in performing an act or procedure. (UMLS)
2.5.9	Conceptual part of	Conceptually a portion, division, or component of some larger whole. (UMLS)