What's the Difference? SNOMED CT and ICD Systems are Suited for Different Purposes

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By Mike Stearns, MD, CPC, CFPC, and Jan Fuller, MBA, RHIA, CPHIMS, FAHIMA

The International Classification of Diseases (ICD) and SNOMED CT are similar in that both systems have alphanumeric codes associated with clinical concepts. But the systems differ in their purpose and structure, and are best used in different ways in healthcare. For starters, ICD is a classification system, while SNOMED CT is a terminology system.

History of SNOMED and ICD

The United States began to use the ICD system for reimbursement purposes in 1983. Most recently, this system has been used for recording diagnoses in health information system databases. For many years, the healthcare industry has relied upon the ICD-9-CM vocabulary system, designed as a statistical classification for mortality and morbidity reporting, to classify diagnoses and procedures. The deadline for the implementation of the most recent version of this system, ICD-10-CM, for US healthcare providers is October 1, 2015. This most recent version offers significant advantages over ICD-9-CM as a classification vocabulary for administrative reporting.

The higher level of clinical specificity in SNOMED CT, and consequent value in population health management and clinical research, has made it a focus of government and informatics efforts to improve population health management and clinical research. SNOMED CT is not a classification system, but rather a reference terminology that is designed to represent clinical information through codified concepts. With its broad coverage of healthcare concepts, ability to express different levels of detail, and unique structure, SNOMED CT can be differentiated from other classification systems such as ICD in significant ways.

At a high level, these differences include:

- A unique code for over 300,000 clinical concepts, allowing for the exact concept to be represented. This includes hierarchies that contain unique concept codes for body structures, clinical findings, geographical location, events, organisms, drugs, physical objects, physical forces, procedures, social context, specimens, units of measure, substances, and others. These additional concepts allow for markedly more detailed capture, storage, sharing, and retrieval of codified data for patient care (i.e., clinical decision support applications) than ICD, which is primarily limited to diseases.
- Clearly defined hierarchical relationships between concepts referred to as "is-a" relationships as opposed to the less rigorous hierarchical system in ICD-10.
- The ability to have an unlimited number of hierarchical layers, as high as 20 or more sublevels in some sections of the SNOMED CT terminology. ICD-10 supports a maximum of three levels.
- The ability to place concepts in more than one hierarchy within the terminology (referred to as a "polyhierarchy"). For example, bacterial meningitis is both an infectious disorder and a nervous system disorder. In SNOMED CT this concept can be placed in the proper location under each parent term.
- True synonyms, referred to as descriptions in SNOMED CT. Truly synonymous terms are assigned the same concept ID code. Each description is assigned a specific description code. ICD-10 employs a classification system where related, subordinate, and superordinate terms are frequently assigned the same ICD-10 code.
- Modifiers that allow for post-coordination of clinical concepts enabling representation of complete clinical expressions. Highly important modifiers for clinical care, such as "mild, recurrent, acute, doubtful, etc.," exist as unique concepts codes in SNOMED CT and can be used in conjunction with other codes (i.e., the code for "severe" can be joined with the code for "headache" to create the clinical expression "severe headache"). In ICD only the core concept headache can be represented as codified data, stripping off what may be essential data for clinical care and research.
- Over 50 clearly defined concept relationship types. These allow for additional context to be assigned to concepts, such as "causative agent" pneumococcal organism for pneumococcal pneumonia. Pneumococcal pneumonia, "causative

agent," and pneumococcus all represent unique clinical concepts. The "causative agent" relationship attribute allows two concepts in the database to be tied together in a way that is clearly defined, and that offers improvements in information retrieval and processing.

- The ability to recognize equivalence between identical concepts stored as one or more concept codes. For example, the diagnosis "chronic pelvic pain" may be expressed as one concept code or as two codes joined together via an attribute like "clinical course" (i.e., the modified code "chronic" and the code for "pelvic pain"). Regardless of how this information is stored, SNOMED CT allows for recognition of equivalence between identical concepts.

ICD Serves Many Administrative Purposes

ICD was designed as a classification system in which diseases and procedures were grouped based on ways in which they share similar characteristics from an epidemiologic standpoint. Lack of granularity, failure to define individual concepts and their relationships, and complex rules for code selection diminish the value of ICD as a tool for clinically oriented healthcare initiatives. This system is sometimes known as an "administrative terminology" since it is used for administrative purposes such as reimbursement, statistical, and epidemiological analyses.[1]

The original versions of ICD are produced and managed by the World Health Organization (WHO). The WHO has stated that they are in the process of integrating the next version of ICD—ICD-11—with SNOMED CT to form a version of ICD that will be compatible with electronic health record systems. This suggests that, over time, the differences between ICD and SNOMED CT will eventually be minimized. For the next several years, however, SNOMED CT and ICD in the US will remain markedly different in their purpose and use.

SNOMED CT Designed for Clinical Systems

SNOMED CT was designed for use in clinical health information systems and supports a high degree of granularity, well-defined relationships between concepts, true synonymy, and an ability to be modified for local use as needed. This system facilitates data collection at the point of care and allows concepts to be associated with codes that markedly improve the integrity of data. Codified data that accurately and precisely represents specific concepts and their supporting context dramatically improves the quality of information obtained for use in patient care and clinical research. It enables clinicians to document at the level of detail they prefer."[2]

The three core components of SNOMED CT are concept codes, descriptions, and relationships:

- Each concept code has one code per meaning, one meaning per code. For example, the code 22298006 has only one meaning, "myocardial infarction," and the code 399211009 means only "past history of MI." There are over 300,000 active concepts in SNOMED CT.
- Descriptions are terms (synonyms) used to express alternate ways of stating the name of an identical concept. For example, "Wilson's Disease" is synonymous with "Hepatolenticular Degeneration." Both of these terms will be given a single concept ID (SNOMED CT Concept ID 88518009), but each will have a unique Description ID. Regardless of whether data is stored as "Wilson's Disease" or "Hepatolenticular Degeneration," the system will know that these represent the same disease. This allows for the accurate input, retrieval, and analysis of data at the concept level. There are nearly one million English descriptions (synonyms) in the International Release of SNOMED CT.
- Relationships link each concept to other concepts that have a related meaning. SNOMED CT offers more than 50 different types of relationships that allow for a rich semantic network of interrelated concepts. The most important relationship type is called "is-a," which basically represents hierarchical relationships between concepts. For example, "viral pneumonia" has an "is-a" relationship to the more general concept of "viral lower respiratory infection."[3]

SNOMED CT and ICD-10-CM Differences in Practice

Below are three clinical examples illustrating the differences between SNOMED CT and ICD-10-CM.

Example #1

Patient record states Impetigo, Otitis externa. Using ICD-10-CM, the coder would likely use the following combination of codes:

- I01.00 Impetigo Unspecified
- H62.41 Otitis externa in other diseases classified elsewhere, right ear

The otitis may or may not be caused by the impetigo so a causal relationship is not stated, but only inferred. SNOMED CT would allow for the relationship between the two to be defined through one of SNOMED CT's 50 different relationship types:

- [Otitis Externa] AND [Causative Agent] AND [Impetigo]

The relationship type "causative agent" is actually a concept in SNOMED CT and has its own concept code. These three concepts (otitis externa, has etiology, and impetigo) can now be stored in a database that maintains their relationship to each other.

SNOMED CT Hierarchies

Hierarchy	Example
Clinical finding/disorder	Clear sputum, normal breath sounds
Procedure/intervention	Removal of ureteral catheter, appendectomy
Observable entity	Observables are entities that could be used to code elements on a checklist or any element where a value can be assigned. Color of nail (observable entity) is an observable. Gray nails (finding) is a finding.
Body structure	Mitral valve structure, uterine structure
Organism	Streptococcus pyogenes
Substance	Insulin, dental porcelain material
Pharmaceutical/biologic product	This hierarchy was introduced as a top-level hierarchy in order to clearly distinguish drug products (products) from their chemical constituents (substances).
Specimen	Urine specimen obtained by clean catch procedure
Special concept	Special concept is Inactive concept, which is the supertype for all concepts that have been retired and point to an active concept in the terminology.

Physical object	Implant device, latex rubber gloves
Physical force	Spontaneous combustion, alternating current
Event	Flood, earthquake
Environment or geographical location	Canary Islands, intensive care unit
Social context	Ethnic group, occupation
Staging and scales	Glasgow coma scale, Dukes staging system

Source: International Health Terminology Standards Development Organisation. "SNOMED CT Hierarchies."
www.ihtsdo.org/snomed-ct/snomed-ct0/snomed-ct-hierarchies/.

Example #2

Another example demonstrating the ability to code clinical knowledge at the concept level rather than at the classification level are the conditions metabolic acidosis, respiratory acidosis, and lactic acidosis.

ICD-10 only offers one "category" code:

- E87.2 Acidosis for all types

SNOMED CT offers three distinct codes for each condition:

- 59455009 Metabolic acidosis
- 12326000 Respiratory acidosis
- 91273001 Lactic acidosis

Example #3

Diagnosis of recurrent left kidney stone (calcium oxalate) in ICD-10-CM has one code:

- N20.0 Calculus of kidney

In SNOMED CT the following codes apply:

- 255227004 Recurrent
- 7771000 Left laterality attribute
- 444717006 Kidney stone – calcium oxalate

SNOMED allows for the capture of modifiers that impart extremely useful clinical information about a condition, such as whether or not the condition is acute, chronic, severe, or mild. Each of these modifiers is given a concept ID, allowing for more complex clinical expressions to be fully codified.

Notes

1. Bowman, Sue. "Coordination of SNOMED-CT and ICD-10: Getting the Most out of Electronic Health Record Systems." *Perspectives in Health Information Management* Spring 2005 (May 25, 2005).
2. Ibid.
3. International Health Terminology Standards Development Organisation. "SNOMED CT." www.IHTSDO.org/SNOMED-CT.

Michael Stearns (mcjstearns@gmail.com) is a physician informaticist and coding professional. He also served as director of SNOMED International and played a central role in the formation of SNOMED CT. He currently provides health information technology and compliance consulting services. Jan Fuller (fuller@latech.edu) is an associate professor of health informatics and information management at Louisiana Tech University.

Article citation:
Stearns, Mike; Fuller, Jan C.. "What's the Difference? SNOMED CT and ICD Systems are Suited for Different Purposes" *Journal of AHIMA* 85, no.11 (November 2014): 70-72.

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