Clinical Terminology and Clinical Classification Systems: A Critique Using AHIMA's Data Quality Management Model

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Abstract

Clinical coding constitutes one of the fundamental functions in the field of health information management. Clinical classification systems and clinical terminologies represent two distinct sets of coding schemes that are used in healthcare. In this context, it is critical to distinguish between clinical terminologies and clinical classification systems, identify how both sets of systems are utilized in healthcare settings, and acknowledge individual contributions of each system to providing data infrastructure for clinical as well as administrative data uses in the healthcare delivery system. The two sets of systems were designed to serve different purposes and therefore are intended to satisfy different user requirements. However, essential elements distinguish a clinical terminology from a classification system. Rather than concluding which system is "best" to accommodate healthcare needs and data structure, a critique of both systems will be presented in this article using AHIMA's Data Quality Management Model. SNOMED CT and ICD-10-CM/PCS will be utilized as examples of clinical terminologies and clinical classification systems, respectively.

Keywords: clinical terminology, clinical classification systems, coding, SNOMED CT, ICD-10-CM/PCS, data quality management, electronic health record

Introduction

Clinical coding constitutes one of the fundamental functions in the field of health information management (HIM).[1,2] It can be defined as "designating descriptions of diseases, injuries, and procedures into numeric or alphanumeric designations. It involves the use of a health record as the source for determining code assignment.."[3] Clinical classification systems and clinical terminologies represent two distinct sets of coding schemes that are used in healthcare. In reality, these concepts—clinical terminology and classification-—are often used incorrectly and interchangeably. The purpose of this article is distinguish between clinical terminologies and clinical classification systems, identify how both sets of systems are utilized in healthcare settings, and acknowledge individual contributions of each system to providing data infrastructure for clinical as well as administrative data uses in the healthcare delivery system.

Clinical Terminology

A reference terminology can be defined as "a set of concepts and relationships that provide a common reference point for comparisons and aggregation of data about the entire health care process, recorded by multiple different individuals, systems, or institutions."[4] Systematized Nomenclature of Medicine–Clinical Terms (SNOMED CT) represents an example of clinical terminologies used in healthcare. SNOMED CT is a standardized healthcare terminology that was originally developed from a pathology-specific nomenclature called Systematized Nomenclature of Pathology. SNOMED CT is a controlled medical terminology that encompasses diseases, clinical findings, etiologies, procedures, and health outcomes.[5,6] It can be used by physicians, nurses, allied health professionals, veterinarians, and researchers.

SNOMED CT is defined by the International Health Terminology Standards Development Organisation (IHTSDO) as "SNOMED CT is a comprehensive clinical terminology that provides clinical content and expressivity for clinical documentation and reporting. SNOMED CT contains concepts for both human and non-human medicine."[7] SNOMED CT is basically comprised of concepts, descriptions, and relationships in order to accurately represent clinical information in healthcare.[7]

The ownership, maintenance, and distribution of SNOMED CT was originally the responsibility of the College of American Pathologists, but this responsibility was transferred to the IHTSDO in 2007.[8] The current version of SNOMED CT is available at no charge through the National Library of Medicine (NLM). The US license for SNOMED CT was obtained by the NLM through the Unified Medical Language System project.[9] SNOMED CT can be used to support direct patient care, clinical audit, research, epidemiology, and service planning. Furthermore, "the global scope of SNOMED CT reduces geographical boundary effects arising from the use of different terminologies or coding systems in different organizations and countries."[10]

Clinical Classification Systems

A classification is "a system that arranges or organizes like or related entities."[11] Classification systems are intended for classification of clinical conditions and procedures to support statistical data analysis across the healthcare system. Classification systems can provide standards for comparisons of health statistics at national and international levels. Also, classification systems can be used to support other applications in healthcare, including reimbursement, public health reporting, quality of care assessment, education, research, and performance monitoring.[12,13] The *International Classification of Diseases, Tenth Revision, Clinical Modification* and *International Classification of Diseases, Tenth Revision, Procedure Coding System* (ICD-10-CM/PCS) represents an example of the clinical classification systems. It is the US clinical modification of the World Health Organization (WHO) *International Classification of Diseases, Tenth Revision* (ICD-10). ICD-10-CM/PCS replaced ICD-9-CM on October 1, 2015, in the United States.

The National Center for Health Statistics and the Centers for Medicare and Medicaid Services (CMS) are the US governmental agencies responsible for overseeing all changes and modifications to the ICD-10-CM/PCS.[14]

Coding Clinical Expressions

The two sets of systems were designed to serve different purposes and therefore are intended to satisfy different user requirements. SNOMED CT is designed for input into electronic health record (EHR) systems and other clinical applications, while ICD-10-CM/PCS is basically designed for providing outputs in terms of reports and statistics. Therefore, each system has a unique hierarchical structure to serve the purposes for which it was originally intended.[15-19] Table 1 provides a brief description of how to code the clinical expression "pain in right leg" using a clinical terminology (SNOMED CT) and a classification system (ICD-10-CM). Additional examples can be found in Table 2.

Table 1: Coding of Natural Language Clinical Phrases Using SNOMED CT and ICD 10-CM

SNOMED CT	ICD-10-CM
Composed of a wide set of concepts and relationships that connect these concepts together to fully cover the presented clinical expression. Each concept is represented by a unique numeric identifier and a Fully Specified Name (FSN), which is a unique description of that specific concept. SNOMED CT is designed for clinical applications; therefore, clinical expressions are automatically coded in the background without user intervention. For example, to code the clinical expression "pain in the right leg," the user needs to input the clinical phrase, and SNOMED CT will generate the code 287048003 ("Pain in the right leg" = "pain" + "right" + "leg").	A classification system organized into chapters as well as categories and subcategories in each chapter. ICD-10-CM coding has not been fully automated yet, so the process of coding requires human intervention. For example, to code the clinical condition "pain in the right leg," a coder is required to search the alphabetic index and follow a specific set of coding conventions and instructions to assign the correct code from the tabular list. The corresponding code for "pain in the right leg" is M79.604. However, with increasing use of technology, computer-assisted coding applications can be used to connect suggested codes to text entries in an electronic health record system.

Table 2: Examples of Natural Language Expressions Coded in SNOMED-CT and ICD-10-CM

Natural Language Clinical Phrase	SNOMED-CT	ICD-10-CM
Pain in right leg	287048003 Pain in right leg	M79.604 Pain in right leg

Metabolic acidosis	59455009 Metabolic acidosis	E87.2 Acidosis
Respiratory acidosis	12326000 Respiratory acidosis	E87.2 Acidosis
Diverticulitis of sigmoid colon	427910000 Diverticulitis of sigmoid colon	K57.32 Diverticulitis of large intestine without perforation or abscess without bleeding
G6PD anemia	62403005 Glucose-6-phosphate dehydrogenase deficiency anemia	D55.0 Anemia due to glucose-6-phosphate dehydrogenase [G6PD] deficiency
Polyp in cervix	65576009 Polyp of cervix	N84.1 Polyp of cervix uteri
Otitis media in the right ear	194289001 Acute right otitis media	H66.91Otitis media, unspecified, right ear
E. coli pneumonia	51530003 Pneumonia due to Escherichia coli	J15.5 Pneumonia due to Escherichia coli
Ovale malaria	19341001 Ovale malaria	B53.0 Plasmodium ovale malaria
Vitamin A deficiency	72000004 Vitamin A deficiency	E50.9 Vitamin A deficiency, unspecified

However, coding in SNOMED CT is different from conventional coding using ICD-10-CM/PCS. Coding using SNOMED CT is always automated: end users cannot view the codes assigned by the system. For this reason, SNOMED CT is being used by software developers and EHR vendors in order to facilitate communication between different applications through creating a standard language. In fact, we can think of SNOMED CT as a programing language; users utilize applications that apply SNOMED CT without knowing what is at work in the background. For example, SNOMED CT has been combined with natural language processing (NLP) to improve EHR capabilities. In this case, SNOMED CT could identify where a condition exist or not or when it should be ruled out because of the set of concepts and attributes that could further clarify a certain case. If such capabilities are enabled, SNOMED CT could be used for generating alerts and reminders or as part of the decision-support system to identify contradictory notes and improve the quality of patient care.

In contrast, ICD-10-CM/PCS coding is performed by professional coders, who used to manually assign codes to patients' diagnoses and procedures. With the advancement of technology, coders have been using special encoders or computer-assisted coding (CAC) applications. CAC applications can facilitate accurate and efficient coding by automatically suggesting codes based on the clinical documentation in the EHR system. Thus, ICD-10-CM/PCS coding is semi-automated at best and requires human intervention to either assign or validate selected codes.

However, essential elements distinguish a clinical terminology from a classification system. Before concluding which system is "best" to accommodate healthcare needs and data structure, a critique of both systems will be presented in the following section using the American Health Information Management Association (AHIMA) Data Quality Management (DQM) model. The AHIMA DQM model was chosen as a framework for assessment for the following reasons:

1. AHIMA's DQM model can provide a standard for comparison as well as an objective assessment of totally different systems with varying scopes and applications.
2. AHIMA's DQM model was developed to accommodate complexity of healthcare data by providing a way to quantify the quality of healthcare data and the attributes of the data.
3. No other relevant models can replace the AHIMA's DQM model in this capacity, making it a long-established health information standard.

SNOMED CT and ICD-10-CM/PCS will be utilized as examples of clinical terminologies and clinical classification systems, respectively.

AHIMA's DQM Model

DQM is defined in AHIMA's DQM Practice Brief (2015) as "the business processes that ensure the integrity of an organization's data during collection, application (including aggregation), warehousing, and analysis."[20-22] The purpose of DQM is continuous improvement of health data quality. DQM model consists of 10 characteristics to monitor data quality in four different domains: data application, collection, warehousing, and analysis. Table 3 provides a description of the four

domains that constitute the AHIMA's DQM model and the characteristics of data integrity that should be applied in each domain.

Table 3: Data Quality Management Domains and Characteristics with Definitions

DQM Domains	**Definition**
Application	The purpose of the data collection
Collection	The processes by which data elements are accumulated
Warehousing	Processes and systems used to archive data and data journals
Analysis	The process of translating data into information utilized for an application
DQM Characteristic	**Definition**
Accessibility	Data items that are easily obtainable and legal to access with strong protections and controls built into the process
Accuracy	The extent to which the data are free of identifiable errors
Comprehensiveness	All required data items are included—ensures that the entire scope of the data is collected with intentional limitations documented
Consistency	The extent to which the healthcare data are reliable and the same across applications
Currency	The extent to which data are up-to-date; a datum value is up-to-date if it is current for a specific point in time, and it is outdated if it was current at a preceding time but incorrect at a later time
Definition	The specific meaning of a healthcare-related data element
Granularity	The level of detail at which the attributes and values of healthcare data are defined
Precision	Data values should be strictly stated to support the purpose
Relevancy	The extent to which healthcare-related data are useful for the purposes for which they were collected
Timeliness	Concept of data quality that involves whether the data is up-to-date and available within a useful time frame; timeliness is determined by manner and context in which the data are being used

Accessibility: SNOMED CT contributes to semantic interoperability across a wide range of clinical applications between healthcare providers in different clinical settings and therefore can improve the capabilities of health information exchange.[23,24] Semantic interoperability can be defined as "ensuring that precise meaning of exchanged information is understandable by any other system or application not initially developed for this purpose."[25] However, such high-level of information exchange is not quite feasible utilizing a classification system like ICD-10-CM/PCS that is too general to serve this purpose.[26] Therefore, SNOMED CT can greatly improve data accessibility as opposed to ICD-10-CM/PCS. In addition, applications that use SNOMED CT make the data accessible at the point of care, while ICD-10-CM/PCS data are accessible only after codes are assigned by the coders.

Accuracy: SNOMED CT is an automated clinical terminology scheme in which clinical representations are automatically encoded using a variety of coding applications that utilize Natural Language Processing NLP.[27,28] In fact, SNOMED CT is agnostic, that is, it can capture all codes regardless of context. Therefore, incorrect data resulting from human errors are unlikely, in contrast to ICD-10-CM/PCS coding systems, in which human judgement is an important element of the coding process. However, clinical applications have a higher risk of systematic errors as opposed to human errors, which tend to be randomly distributed in most cases.[29-32] The human judgment component of coding has also contributed to coding variations and issues with the accuracy of coded data. Complexity of resource grouping schemes as well as unclear documentation can lead to inaccurate coding.[33] Furthermore, accuracy requires familiarity with medical terminology, surgical techniques, and complex coding systems.[34]

For example, coding accuracy can vary greatly across medical specialties. Some specialties, such as otolaryngology, encompass a wide range of procedures that are performed in "close anatomical proximity," which ultimately affects coding

accuracy.[35] Similar results have been found in other medical specialties, such as urology,[36] neurosurgery,[37] and surgery.[38]

Comprehensiveness: SNOMED CT has better clinical coverage than ICD-10-CM/PCS. The number of codes representing concepts in clinical findings alone is 100,000 concepts, compared with the 68,000 diagnosis codes in ICD-10-CM.[39-41] Thus, more than one ICD-10-CM code may be needed to represent one concept in SNOMED CT (see Table 4). New concepts in SNOMED CT (post-coordinated expressions) can be created, which contributes to the extensibility of the system extensibility to cover all concepts related to the medical domain.[42] On the other hand, ICD-10-CM/PCS is updated periodically to revise or add new diagnosis or procedure codes.

Table 4: Example of Comprehensiveness of SNOMED-CT and ICD-10-CM

SNOMED CT	ICD-10-CM
72854003 Aspiration pneumonia due to near drowning	J69.8 Pneumonitis due to inhalation of other solids and liquids Y21.8XXA Other drowning and submersion, undetermined intent (initial encounter)
283647006 Sewing needle in hand	S61.449A Puncture wound with foreign body of unspecified hand (initial encounter) W27.3XXA Contact with needle (sewing) (initial encounter)
275434003 Stroke in the puerperium	O99.43 Diseases of the circulatory system complicating the puerperium I63.9 Cerebral infarction, unspecified
15781000119107 Hypertensive heart AND chronic kidney disease with congestive heart failure	I13.0 Hypertensive heart and chronic kidney disease with heart failure and stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease N18.9 Chronic kidney disease, unspecified I50.9 Heart failure, unspecified
111570005 Anemia due to infection	B99.9 Unspecified infectious disease D64.89Other specified anemias

Consistency: Concepts in SNOMED CT are consistent among different users and across all clinical applications.[43] In contrast, studies have shown issues of coding reliability that contribute to inconsistent code assignments among coders and across medical specialities.[44-46] In addition, ICD systems in general are influenced by coding conventions that are subject to interpretation by coders and can vary across settings (e.g., inpatient vs. outpatient clinical context).[47-49] For examples, coding symptoms and signs such as "shortness of breath" can have different guidelines in acute-care hospitals and ambulatory care settings.

Currency: SNOMED CT in its current form was developed in 2007,[50] while ICD-10 was first introduced in 1990s and has been used to collect mortality statistics in the United States. However, the first field test of ICD-10-CM was conducted in 2003. Both systems are updated biannually to reflect contemporary medical knowledge and medical technology.[51,52]

Definition: Because of its logical structure, SNOMED CT makes more sense and is easier for clinicians to understand.[53-56] However, ICD-10-CM can be impeded with coding conventions and sometimes clinically irrelevant details needed for reimbursement of healthcare services (initial encounter, delayed healing, NOS [not otherwise specified], NEC [not elsewhere classifiable]). These instructions are designed for professional coders and therefore make it hard for clinicians to adopt the system for direct care purposes.[57-59] (See Table 5.)

Table 5: Examples of Different Language Used in SNOMED-CT and ICD-10-CM (Data Definition)

Clinical Expression	SNOMED CT	ICD-10-CM
Apert syndrome	20528009 Apert syndrome	Q87.0 Congenital malformation syndromes predominantly affecting facial appearance.

Hashimoto thyroiditis	21983002 Hashimoto thyroiditis	E06.3 Autoimmune thyroiditis
Feather picker's disease	11944003 Feather-pickers' disease	J67.8 Hypersensitivity pneumonitis due to other organic dusts
Airport malaria	240631007 Airport malaria	B54 Unspecified malaria
Adhesion of penis due to circumcision	435311000124103 Post-circumcision adhesion of penis	N99.89 Other postprocedural complications and disorders of genitourinary system
Family history of Sickle cell anemia	160321003 Family history of Sickle cell trait	Z83.2 Family history of diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism
Syphilitic parkinsonism	38523005 Syphilitic parkinsonism	A52.19 Other symptomatic neurosyphilis
Fragile X syndrome	205720009 Fragile X chromosome	Q99.2 Fragile X chromosome
Kabuki syndrome	313426007 Kabuki make-up syndrome	Q89.8 Other specified congenital malformations
Drug abuse - antidepressant	191928000 Abuse of antidepressant drug	F19.10 Other psychoactive substance abuse, uncomplicated

Granularity: SNOMED CT is in general is more specific than ICD-10-CM/PCS.[60] Furthermore, SNOMED CT has a unique characteristic that enables extensibility and creation of new concepts (post-coordinated expressions) by end users.[61] In contrast, less common diseases in ICD-10-CM are grouped together in "catchall" categories (e.g., J15.8 Pneumonia due to other specified bacteria), which can lead to loss of information.[62,63]

Precision: Concepts have the same values in SNOMED CT; studies have shown up to 93 percent precision of SNOMED CT for identifying clinical expressions.[64,65] However, the presence of some codes with *unspecified* (not specified in documentation) and *other specified* (present in medical record but not enough details to code it) can affect the ability of the ICD system to collect data related to certain conditions, such as rare conditions. Therefore, caution is advised when administrative data are utilized for less common conditions, such as Down syndrome, eosinophilic esophagitis, congenital heart disease, genetic blood disorders, and surgery.[66-70]

Relevancy: A clinical terminology such as SNOMED CT could be more useful in clinical applications, information retrieval, and research. SNOMED CT is regarded as a global standard because of its wide acceptance and application worldwide, which makes it a safe and accurate alternative for clinical communication among healthcare providers.[71-74] In contrast, classification systems such as ICD-9-CM or ICD-10-CM/PCS are intended for classification of clinical conditions and procedures for use in other applications, including statistical reporting and reimbursement.[75-78] Both systems are relevant with respect to the purposes for which they were originally designed.

Timeliness: SNOMED CT is designed to be used at the point of care by clinicians, while ICD-10-CM/PCS codes are usually assigned by professional coders after the patient's episode of care is complete.[79-84]

Table 6 presents a model that was developed based on AHIMA's DQM to illustrate the fundamental differences between clinical terminologies (represented by SNOMED CT) and clinical classification systems (represented by ICD-10-CM).

Table 6: Use of AHIMA's Data Quality Management Model to Compare the Data Quality of SNOMED-CT and ICD-10-CM

Factor	SNOMED CT (Clinical Terminology)	ICD-10-CM (Classification System)
Accessibility	Semantic interoperability enables sharing and exchange of information by different providers in different healthcare settings.	Technical interoperability between coding applications and other local applications, but no semantic interoperability to enable high-level exchange of health information.
Accuracy	SNOMED CT was originally designed to be used by computers. Data are automatically encoded and therefore errors in data entry caused by humans are eliminated.	Coding is a semiautomated process at best and therefore is susceptible to human errors. Coding conventions that require interpretations by coders are a major cause of coding variations.
Comprehensiveness	SNOMED CT has more content coverage: 100,000 concepts in clinical findings. SNOMED CT can be expanded by creating new concepts (post-coordinated expressions).	ICD-10-CM is limited to a set of codes that cannot be expanded. New medical conditions cannot be incorporated by end users but rather are added through frequent updates of the system. Number of codes in ICD-10-CM is 68,000.
Consistency	Concepts each have a unique numeric identifier and a unique description (Fully Specified Name, or FSN). Therefore, the same codes are generated for all users across different applications.	Coding is subjective to coding variability among coders. In addition, coding conventions can vary between inpatient and outpatient settings.
Currency	SNOMED CT in its current form was developed in 2007 and it is updated biannually by the International Health Terminology Standards Development Organisation.	WHO's ICD was used in 1990s, and in 2003 the first field test of ICD-10-CM was conducted. Reviewed biannually.
Definition	SNOMED CT follows a logical structure that makes it easier for clinicians to understand. Every concept has a unique identifier and FSN, which results in standard definitions of data elements that are not susceptible to interpretation.	ICD-10-CM/PCS can be impeded with coding conventions and guidelines as well as irrelevant details that are important to coders but not clinicians. Also, some codes are not clearly defined.
Granularity	Greater granularity and specificity means that every piece of information can be covered through pre-coordinated and postcoordinated expressions.	Less specific than SNOMED CT, which can lead to loss of important details; ICD-10-CM systems are unable to capture some details documented in the electronic health record.
Precision	SNOMED CT has shown higher precisions in information retrieval (up to 93 percent) because of its standardized structure.	ICD-9-CM and ICD-10-CM have shown lower precision in identifying rare diseases and clinical conditions. Coding variability has significantly affected precision of the ICD systems.
Relevancy	Relevant for its intended purpose. SNOMED CT is an input system that is widely accepted, which makes it suitable for standard health information sharing and information retrieval.	Statistically focused: expanded to include reimbursement. Relevant for its intended purpose: output system designed for general reporting and reimbursement when used for resource grouping.
Timeliness	Used at point of care by clinicians in different applications: clinical decision supports and in generating alerts and reminders.	Codes are usually entered by coding professionals after the episode of care is completed.

Discussion

Users and Applications

Healthcare terminology and classification systems can be used by consumers, healthcare providers, quality and utilization management personnel, researchers, and other administrative staff (accounting, billing, and coding personnel). They are also used to facilitate communication between healthcare providers and consumers at the point of care for data collection purposes. A more organized system of data collection and retrieval can be provided by utilizing healthcare terminology. This system can promote quality of care by providing a link between published research and clinical care. Furthermore, such systems can support integration of care by allowing effective exchange of clinical information among healthcare providers in different settings. Although terminologies such as SNOMED CT can be utilized to support real-time decision making and retrospective reporting for research and management, such utilization can hindered by complexity of these systems. Classification systems are utilized by wider spectrum of users in healthcare. They can be used to provide data to consumers on costs, treatment options, and outcomes. Also, classification systems provide a less complex system for data collection and reporting that can be further used for research purposes. Information provided by such systems can be used to improve clinical, financial, and administrative performance by enabling effective payment systems, identifying potential fraud and abuse, and ensuring accurate reporting.

ICD-10-CM/PCS

The ICD coding system was originally created to code death certificates, but its use has expanded to encompass a wide range of statistical reporting. In fact, ICD-10 has been used since the 1990s to collect mortality statistics around the globe. The WHO defines coding as "the translation of diagnoses, procedures, co-morbidities and complications that occur over the course of a patient's encounter from medical terminology to an internationally coded syntax."[85] In this definition, the WHO acknowledges the capability of the ICD system that is used for clinical coding and classification to enable international comparisons with respect to mortality as well as morbidity statistics.

ICD-9-CM had been used since 1978 as the foundation of the reimbursement system in the United States and is used by the Center for Medicare and Medicaid Services for inpatient and ambulatory resource grouping. The Medicare Severity Diagnosis Related Group (MS-DRG) system constitutes the foundation of Medicare's Inpatient Prospective Payment System (IPPS), which is used to reimburse acute-care and short-term hospitals for services rendered to Medicare beneficiaries. ICD-9-CM was replaced by ICD-10-CM/PCS in October 1, 2015, and it will continue to serve as a base for healthcare reimbursement. For outpatient encounters, reporting of diagnosis codes in ICD-10-CM is required to establish medical necessity.

Also, ICD-10-CM is now used in place of ICD-9-CM for public health reporting (i.e., reporting the leading cause of death and morbidity on the national level). ICD-10-CM/PCS can also be used to assess clinical outcomes and improve quality of care provided for individual patients. For example, ICD-10-CM/PCS data are utilized for clinical documentation improvement initiatives to educate physicians on effective clinical documentation in EHR systems.

However, the process of clinical classification itself is prone to variation because of the complex coding schemes and conventions that are subjected to interpretation by coders, which makes it difficult for clinicians to assign the codes by themselves. Thus, ICD-10 in general and ICD-10-CM/PCS in particular lacks the standardization needed for electronic communication and clinical documentation.

SNOMED CT

SNOMED CT provides a unified language that can be used as a standard for communication among healthcare providers and across clinical applications. SNOMED CT can contribute greatly to semantic interoperability in healthcare applications.[86-88] Its standardized logical structure as well as its wide acceptance makes it more suitable than other terminologies or classification systems for high-level information sharing and information retrieval.[89-91] Thus, SNOMED CT can be used for health information exchange and clinical documentation in EHRs. SNOMED CT is an automated system, which makes it convenient to be used at the point of care for generating clinical alerts and reminders, serve as a part of a clinical decision-support system, and link providers to medical knowledge and current publications that can be used for outcome measurement. Furthermore, because of its fully automated scheme, SNOMED CT can be used for healthcare research, and it can be used for automated identification of patients for clinical trials because of its extensive granularity and content coverage.[92-96] In addition to its higher specificity, SNOMED CT has a unique feature that enables extension of concepts by end users, which can foster reliable communication among healthcare providers and across medical specialties and can facilitate health information exchange at national as well as international levels.[97] SNOMED CT has become one of the federal requirements

for health information technology; CMS mandates the use of SNOMED CT to code the problem list for Meaningful Use stage 2.[98,99]

Clinical Documentation in the EHR

However, the information provided above should not be take to suggest that SNOMED CT is superior to ICD-10-CM/PCS, as both coding schemes provide the necessary data structure needed to support healthcare clinical and administrative processes. Clinical terminology systems as well as clinical classification systems were originally designed to serve different purposes and different users' requirements. ICD-10-CM/PCS is an output system that was designed for general reporting purposes, public health surveillance, administrative performance monitoring, and reimbursement of healthcare services. In contrast, SNOMED CT was developed to serve as a standard data infrastructure for clinical application, which requires a greater degree of specificity. A classification system can be less detailed than a clinical terminology.[100] Therefore, the lower specificity of ICD-10-CM/PCS is an intrinsic feature rather than a shortcoming; SNOMED CT is too detailed to replace ICD-10-CM/PCS in this context. In fact, the systems complement each other and contribute to providing quality data for different domains of the healthcare system. For example, "If a researcher wants to know how many patients died with a diagnosis of heart attack last year, ICD-10 (WHO's) is enough. If they want more detail, such as what muscle of the heart was involved, they will need SNOMED CT."[101] Therefore, both systems can be used in research and education depending on which degree of specificity is required by circumstances: SNOMED is a better choice for identifying rare diseases, while ICD-10-CM/PCS is more efficient for general reporting, such as collecting the top causes of mortality and morbidity at the national level. Furthermore, ICD-10-CM/PCS will be needed to constitute the foundation of reimbursement in the United States.[102]

Mapping SNOMED CT to ICD-10-CM/PCS

The NLM, with participation of the National Center for Health Statistics, is working on a project to map SNOMED CT concepts to ICD-10-CM codes, called I-MAGIC (Interactive Map-Assisted Generation of ICD Codes). According to NLM, the purpose of mapping is to "is to support semi-automated generation of ICD-10-CM codes from clinical data encoded in SNOMED CT"[103] in order to fulfill the requirements of healthcare. Therefore, SNOMED CT cannot replace ICD-10-CM/PCS; both systems complement each other and equally contribute to quality data structure for the entire healthcare system. In fact, the WHO, together with the IHTSDO, has been working on similar projects that will enable mapping between SNOMED CT and ICD-10 (the WHO version) as well as ICD-11. However, because of the substantial differences between these coding schemes, it is not always possible to have one-to-one mapping. However, these mapping projects further emphasize the importance of future data infrastructure that encompasses characteristics of both systems to achieve the maximum benefits of information technology in healthcare.

Conclusion

Clinical classification systems and clinical terminologies represent two distinct coding schemes that are used in healthcare. Both sets of systems are utilized in healthcare settings and contribute to providing data infrastructure for clinical and administrative data uses in the healthcare delivery system. A critique of both systems was presented in this article using AHIMA's DQM model, using SNOMED CT and ICD-10-CM/PCS as examples of clinical terminologies and clinical classification systems, respectively. Each system is used for distinct clinical and administrative applications and has its own benefits and potential limitations. Classification systems such as ICD-10-CM/PCS and reference terminologies such as SNOMED CT are two complementary systems that are needed to provide data infrastructure in healthcare.

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Notes

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