SNOMED CT® AND 3M™ HDD: THE SUCCESSFUL IMPLEMENTATION STRATEGY

Federal Health Care Agencies Take the Lead

The United States government has taken a leading role in the use of health information technologies to enhance the quality of patient care.

Considered by leaders in health care technology to be a necessary step towards the enhancement of patient care, a 5-year, nationwide license for **SNOMED Clinical Terms® (SNOMED CT®)** was purchased by agencies of the **Department of Health and Human Services** for perpetual use by any governmental or eligible public, for-profit and non-profit organization located, incorporated and operating in the U.S. A comprehensive, widely accessible **controlled medical vocabulary (CMV)** such as this is deemed a required part of any integrated clinical information system that provides the communication of accurate, detailed patient information.

In January 2004 the **National Library of Medicine (NLM)** of the **National Institutes of Health** will make SNOMED CT® available via the **Unified Medical Language System® (UMLS)**. This comprehensive set of encoded medical concepts will work within a framework of interoperability standards for the electronic exchange of clinical health information. SNOMED – CT® will be incorporated into this common set of health care information technologies to support numerous efforts within the health care industry. Projects - such as the **National Health Information Infrastructure (NHII)** and the paperless electronic health record - have been outlined through collaborations between industry leaders, health care associations, and the U.S. government. The widespread use of an integrated set of health information standards is considered to be essential for the success of such projects, which have the potential for improving the quality of health-related services through the seamless exchange of accurate information. Although the license agreement provides the SNOMED CT® Core content free of charge for eligible users, the true cost of implementation lies in the intellectual resources required to integrate it in existing clinical systems.

3M™ Health Information Systems (HIS) is the recognized leader in practical healthcare terminology integration and implementation in the real world. Using the services and content provided by the **3M™ Healthcare Data Dictionary (HDD)** staff, individual institutions and health care enterprises have integrated their legacy information systems with CMVs such as SNOMED CT®. The goal of the **3M™ HDD** and the **3M™** vocabulary mapping services is to enable standardized encoding of patient information, so that the data can be used for decision-support as well as data exchange, comparison and aggregation at varying levels, from facility to enterprise to national, and even international levels.

What does SNOMED CT® do?

SNOMED CT® and other CMVs play essential roles in making health information systems compatible. A clinical information system relies on an accepted standard terminology – a common language - that supports the structured, precise, reliable methods to store and communicate patient data. CMVs such as SNOMED CT® fulfill this role, so that users, developers, and even the electronic components of the system can share and understand information. Using SNOMED CT®, patients,

providers, analysts, and researchers can communicate with the detail and accuracy necessary for representing medical and scientific information.

Can I use it right out of the box?

SNOMED CT® is not software – it is content only. In order to use the content provided by the current agreement, SNOMED CT® must be loaded into an application, such as a database management system (DBMS) or an existing dictionary such as the 3M™ HDD. Some systems rely on different dictionaries for each department, whereas others are designed to rely on a single data dictionary.

SNOMED CT Core terminology contains:
- 344,000 concepts
- 913,000 English descriptions
- 660,000 Spanish descriptions
- 1.3 million relationships.

SNOMED CT® is an enormous code set. The vast content covered by SNOMED CT® is far more than many clinical applications can practically use. The 3M HDD has experienced personnel who advise clients and help create meaningful and useful subsets of the CMV for the clinical applications under consideration.

SNOMED CT® content is divided into multiple axes. The structure and content may be difficult for inexperienced users to understand. Once loaded into a system dictionary, software tools are required to navigate and view the terms. Whether developed in-house or purchased from third-party vendors, such tools should provide specific functionality to the users. The staff and researchers that support the 3M™ HDD have developed tools for CMV browsing, mapping, loading, and quality assurance. Such tools have also been created for clients and development partners.

SNOMED CT® cannot cover all needs of a clinical application. The legacy system terminologies evolve over time in response to the particular needs of its users. Thus, institutions may need to continue using their existing legacy codes or may wish to extend the core content of a CMV to include the preferred expressions of its users. 3M™ HDD staff has years of experience mapping legacy codes to CMVs and to the local needs of its government and commercial clients.

SNOMED CT® will be updated during the term of the license. Dynamic version maintenance is a complicated issue. Both CMVs and legacy terminologies grow according to changing needs and advances in biomedical science. Even after the initial implementation of SNOMED CT® and other standard vocabularies, continuing resources are required to maintain, update, and validate the content and links between the CMVs. The ever-changing versions of CMVs are maintained within the 3M HDD by vocabulary experts, who also participate in the development of clinical standards such as HL7 and LOINC.

SNOMED CT® supports the creation of new concepts and terms. One of the exciting features about CMVs – particularly SNOMED CT® is the ability to combine existing concepts to create new ones. Such extensions allow the CMV to accommodate changes in health care practice and user preferences in terminology. Such additions to any universally accepted terminology need to be monitored, in order to minimize the likelihood of corrupting the standard content of the CMV. Without oversight, the content may no longer be compatible with other systems. A substantial portion of the 3M™ HDD vocabulary content is that of customized terminologies to suit individual client's needs. The mediation of differences between legacy content and CMVs is a regular activity of the 3M HDD vocabulary engineers.

What is wrong with computerized medical systems today?

Despite rapid advances in information technology, the health care industry remains fragmented – due in part to the inability of legacy information systems to communicate easily with one other. Historically, hospital departments and clinics have purchased or developed separate systems for their particular needs. Each system uses a proprietary set of codes that serves as its internal medical vocabulary. Without a common language, extra components – even within an individual institution – are required to serve as interpreters between these disparate parts. Without these **interfaces**, health care workers must make significant efforts to access, collect, and organize the patient information needed for medical reasoning. Thus, more time is spent on manual information management and less is available for making decisions and delivering care.

Furthermore, patients and providers speak different languages, intelligent computer patient record systems cannot read information handwritten by physicians in paper charts, and trained medical staff is required to manually review patient records in order to generate billing and mandatory reporting codes. These data incompatibilities directly result in increased effort and cost, thus reducing the resources available for quality improvement and the enhancement of patient care.

How does a CMV help with system incompatibilities?

CMVs are used as common languages for clinical information systems. The widely accepted CMVs contain both human-friendly terms and encoded forms to meet the needs of both health care workers and systems. Thus, CMVs contain concepts and codes that can be used for both clinical workstations and computer interfaces. In this sense, the health data dictionaries that manage these concepts and codes serve as the foundations of clinical information system integration efforts.

Concepts and Codes

The purpose of medical coding schemes and CMVs is to define and describe unique **concepts** found in medicine. A medical concept is a “mental model” of any singular idea encountered or experienced in medicine: a symptom, a sensation, a body part, a drug, a diagnosis. The strength of any CMV is its ability to define and describe these individual concepts, in both human-friendly and encoded forms.

Isn’t SNOMED CT® just another CMV?

Leaders in the healthcare industry anticipate that SNOMED CT® will be widely embraced by information technology developers and vendors.

The most comprehensive CMV available today is SNOMED CT®. When integrated with other standard medical terminologies, SNOMED CT® provides the breadth necessary to represent specific patient findings, clinical results, diagnoses, and treatment plans. SNOMED CT® is not only broad, but also deep. Information gathered during a medical encounter can now be collected at a high-level of detail and precision; precise and granular information is required to capture the “full-story” in the patient record. With this level of completeness and detail, specific information about patient observations and events can be evaluated for real-time decision support and retrospective analysis of patient outcomes. Plus, SNOMED CT® has structured methods to link these concepts together in ways that are meaningful for both health care workers and computer systems

What do you mean by links inside of SNOMED CT®?

Many types of links exist within SNOMED CT®, and each type represents a real-world relationship between two concepts in medicine. These relationships can serve as paths for interpreting the numeric concept codes into human-friendly versions, for interpreting medical Spanish terms into English terms, or for interpreting technical terms into colloquial, patient-friendly terms. This method of linking concepts can also be used to represent knowledge in a way that can be understood by computer systems.

How is medical knowledge stored within SNOMED CT®?

The meaningful links that are used to represent medical knowledge are organized within SNOMED CT® in a way that computer systems can understand. Concepts are organized into a tree-like structure, much like a hierarchy. Unlike a tree, however, many links connect information from one branch of knowledge to another. These links also serve as "cross-mappings" between concepts. The 3M™ HDD can be used to create and maintain these cross-mappings, to facilitate the automatic interpretation of codes between CMVs.

Through the cross-mappings, detailed patient information can be grouped into classifications such as those provided through **ICD-9-CM**. In this fashion, reimbursement codes can be generated and validated using the computer-stored data that was routinely collected during patient care. Plus, patient cases can be aggregated into meaningful groups for the purposes of analysis and improving methods of care.

Is SNOMED CT® all that I need to cover my health information needs?

SNOMED CT® is only one part of a uniform set of health care technology standards. Several standard vocabulary and messaging standards in combination form a national integrated health care terminology set. (Table 1) This set of nationally recognized standards have been selected by U.S. government health care agencies, for the development of an information framework to meet the data-intensive needs of the health care industry. By adopting this framework –the **NHII** - and its selected standards, federal and public health care organizations will be able to engage in unprecedented collaborations.

Exchange Standard	Purpose
Health Level 7	Structured electronic messages
National Council on Prescription Drug Programs	Structured retail pharmacy orders
Institute of Electrical and Electronic Engineers 1073	Patient monitoring devices
Digital Imaging Communications in Medicine	Exchange of diagnostic images
Logical Observation Identifier Names and Codes	Transfer of clinical laboratory results
Systematized Nomenclature of Medicine – Clinical Terms	Common language for medicine

Table: Uniform set of standards by US health agencies (DHHS).

Are the different CMVs in the national e-health standard set linked together?

Although significant overlap does exist between CMVs, not all established links are made available through the existing license agreement with the NLM. Medical

concepts found in LOINC – the laboratory code set – do exist within SNOMED CT®; however, the links (i.e. cross-mappings) between the SNOMED CT® codes and the LOINC codes are not part of the current agreement. SNOMED CT® codes do include pharmaceutical content - such as proprietary drug names; but these codes are not provided through the current NLM agreement. In order to fully-integrate the uniform set of CMVs, these links may have to be provided or created within a healthcare data dictionary.

Am I limited to using only the content represented by SNOMED CT®?

No CMV by itself or as a part of an integrated set can meet the entire needs of all the health care workers. The terminology within existing or legacy systems is shaped by the information needs of the users and the programs that rely on the system. CMVs such as SNOMED CT® have the built-in capability to allow the construction of new encoded concepts, using other existing SNOMED CT® concepts. Such methods to extend the content of SNOMED CT® provide the ability to meet the particular needs of an institution; however, without oversight and guidance during the implementation of SNOMED CT® and other CMVs, the content may become non-standard and incompatible.

Overcoming the barriers to implementing CMVs

The use and maintenance of a CMV presents many technical and intellectual challenges. Many providers and agencies considering the use of SNOMED CT® and other CMVs will face significant barriers to implementation and integration with other clinical information systems. A CMV such as SNOMED CT® is dynamic content, in that it grows through updates and new versions to accommodate advances in medical science and health care. For years, 3M™ HIS has actively dedicated resources and staff to support the 3M™ HDD and to meet these implementation and maintenance issues. This investment in the HDD has made the interoperability between clinical information systems possible, providing reliable access to updated versions of industry-standard health care terminologies and mediating the differences between the content of each CMV.

Summary

National efforts are underway to improve the quality of patient care for all people residing in the United States. Improved distribution of resources, increased patient access to care, reduction in medical errors, and adequate surveillance of infectious disease – all of these performance measures require detailed, precise information that comes directly from the clinical examination room and the bedside. Thus, the quality of information must be maintained throughout all levels of the US health care system. Controlled medical vocabularies such as SNOMED CT® can help maintain the accuracy and precision of this clinical data, for use by provider, researcher, and administrator alike.

The 3M Healthcare Data Dictionary (HDD) is recognized in the industry for its rich content, its flexible data structure, and is considered the leading application for data mapping. The 3M Healthcare Data Dictionary (HDD) contains standard vocabularies and customer terms, extensively mapped (crossed referenced) to one another with supporting relationships that together form a knowledge base. The goal of the HDD is to enable standardized encoding of patient data, so that the data can be used for

decision support as well as data exchange, comparison and aggregation at varying levels, from facility to enterprise to national, and even international.

3M HIS has the trained, experienced staff and robust technologies that allows the collection of medical information directly from the patient encounter and its communication with those dedicated to enhancing quality of life through improved patient care.

References

Press Release: U.S. healthcare industry moves toward the reality of electronic health records. SNOMED International 07/01/2003.

Press Release: Federal government announces first federal eGov health information exchange standards. US Department of Health and Human Services. 03/21/2003.

About 3M™ Health Information Systems and the 3M™ Health Data Dictionary

3M HIS is the recognized industry authority in practical healthcare terminology integration and implementation in the real world. Using the services and content provided by the 3M Healthcare Data Dictionary, individual health care institutions and enterprises alike have successfully integrated their legacy information systems. Through the collection of interconnected medical vocabularies provided through the 3M HDD, legacy systems can share health data within an organization as well as exchange information across institutional boundaries for performance measurement, regional surveillance, and reporting of vital health statistics.

More than a minimum set of terms, the 3M HDD contains concepts, codes, and meaningful relationships that represent the breadth of medical practice and knowledge. The 3M HDD content, tools, and services have evolved through years of working side-by-side with client institutions and enterprises – including the Department of Defense (DoD) and Veterans Affairs (VA). In addition to the most recent versions of nationally-accepted coding schemes – such as ICD-9-CM, CPT®-4, LOINC, and HL7 code sets - the content of the HDD contains the full-range of medical concepts required by health care workers in their day-to-day care of patients.

Software
Vocabulary navigation and database search tools
Vocabulary loading and building tools
Quality assurance tools
Expertise
Participants in national standard and CMV development
Medical informaticists and knowledge engineers
Subject matter experts for each medical domain
Bilingual clinical vocabulary engineers
Database administrators and application designers
Trainers and educators
Processes
Guidance for coordinated terminology mapping
Updates and maintenance of content
Controls against concept redundancies and ambiguities
Organizational
Committed leadership
Support for research and development
Continuing education and training

3M
Health Information Systems

Division Headquarters
575 West Murray Boulevard
Salt Lake City, UT 84123
800-357-2447
www.3Mhis.com

Clinical Research Department
100 Barnes Road
Wallingford, CT 06492

Consulting Services
100 Ashford Center, North, Suite 200
Atlanta, GA 30338