Health Informatics Standards: A User's Guide

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From code sets to data sets to developing organizations, how much do you really know about technical standards? This article provides a handy reference guide.

The vision is clear: a longitudinal, or lifetime, health record for each person that is computer-based, secure, readily accessible when needed, and linked across the continuum of care. In reality, we are a long way from that efficient model.

As the management of health information becomes increasingly complex, standards are essential to meet varying data processing needs. For many HIM professionals, a working knowledge of standards is key. In this article, we'll take a brief look at types of standards and how standards are developed. For easy reference, the article also includes an overview of some of the key standards development organizations, coding systems, and data sets.

What Are Standards and Why Do We Need Them?

Standards are models approved by an authority or by general consent. In health informatics, a standard is a specification for hardware or software that is either widely used and accepted (a de facto standard) or endorsed by a standards development organization (a de jure standard).

In health informatics, a standard defines a commonly agreed-upon manner of collecting, maintaining, or transferring data between computer systems. Until healthcare providers collect and maintain data in a standard format according to widely accepted definitions, it is nearly impossible to link data from one site to another. The lack of health informatics standards is one barrier to broad implementation of computer-based patient records.

Standards are essential in the complex healthcare environment because data processing needs vary widely. Because no single vendor or in-house development group can meet an organization's needs, most groups use a variety of information systems. Data must be transferred between these systems, but interfaces are expensive and time-consuming because systems use different platforms, programming languages, and data formats.

Types of Standards

Standards needed to exchange health information can be divided into four categories.
Vocabulary standards establish common definitions for medical terms to encourage consistent descriptions of an individual's medical condition by all practitioners. Using different terms and codes for the same condition or procedure makes it difficult to retrieve data and reduces data reliability and consistency.

Structure and content standards give a clear description of the data elements that will be included in electronic health records. This requires identifying essential data elements, such as temperature and blood pressure, and standardizing the field length, data type, and content of each data field.

Messaging standards facilitate the electronic exchange of data between two or more disparate computer systems. To do this, the standards establish a format and sequence of data during transmission. For example, a medical message standard might require the first segment of a message to identify the sending and receiving systems, the type of message, and the name, date of birth, and unique identifier of the individual who is the subject of the message.

Security standards ensure that an individual's health information remains confidential and is protected from unauthorized or inadvertent disclosure, alteration, or destruction. These standards are especially important because electronic health records make information accessible to multiple users in multiple locations.

Access to health information is a sensitive issue that requires standards to balance an individual's right to privacy with the legitimate needs of public health officials, health services researchers, and others.

Despite the work of several standards development organizations (SDOs) during the past decade, no recognized single standard integrates all the security components required by the Health Insurance Portability and Accountability Act (HIPAA) of 1996. These components include administrative procedures, physical safeguards, technical security services, and technical mechanisms. Thus, the Department of Health and Human Services (HHS) has developed a comprehensive new security standard for electronic health information. Because security technology is changing so rapidly, the new standard will not advocate specific technology, other than requiring electronic signature (if used) to be a cryptographically based digital signature.

For more information on HIPAA and the standards promulgated by HHS, please see "Next Steps? First Steps? Getting a Grip on HIPAA Security Standards," and "Getting Ready for HIPAA Privacy Rules," in this issue, as well as the "HIPAA on the Job" insert.

How a Proposal Becomes a Standard

In the United States, many standards are developed through a voluntary consensus process coordinated by the American National Standards Institute (ANSI). ANSI does not develop standards. Instead, it helps standards developers and users from government and industry to reach agreement on the need for standards. ANSI also represents US interests in international standards development efforts and represents the US in the International Standards Organization (ISO).

The federal government may also become involved in standards development. If voluntary organizations do not develop needed standards in a timely manner, federal agencies with statutory authority can develop their own. The National Institute of Standards and Technology (NIST), part of the Department of Commerce, works with both public and private sectors to develop standards.

How does the voluntary consensus process work? When the need for a standard is identified, volunteers from industry, professional associations, consumer groups, government agencies, and system vendors come together under the auspices of one of several SDOs. They develop a concept, debate issues, and draft proposed standards. Consensus on a standard's content is usually reached through a lengthy comment and revision process, and the SDO publishes the final standard.

Standards produced through this process are usually of high quality, because the process relies on input from a broad group of participants. But the process is expensive and time consuming. A complex standard typically takes five to seven years to evolve from a concept to publication. In addition, a standard is not considered complete until it is validated through use, but such acceptance may take even longer than the actual development process.

See "US Standards Development Organizations," for key players in this arena.

Some professional organizations also sponsor standards development efforts in their areas of expertise. The American Dental Association has a standards program for dental materials, instruments, and equipment. The American Nurses Association evaluates nursing classification schemes and uniform nursing data sets and builds national data sets for clinical nursing practice. The Health Industry Business Communications Council develops health informatics standards for data transfer using bar code labeling. Other professional organizations involved in standards development include AHIMA, the American Medical Informatics Association, and the College of Healthcare Information Management Executives

Standard Coding and Classification Systems

The development of code and vocabulary standards is another item on the "to-do" list on the road to the electronic medical record. Clinical coding classifies data and assigns a numeric or alphanumeric representation for those data, using codes from either a nomenclature or a classification system.

A **nomenclature** is a systematic listing of proper names. A disease nomenclature is a listing of the proper name for each disease entity with its specific code number. The most widely known nomenclature currently used in the US is the Systematized Nomenclature of Human and Veterinary Medicine (SNOMED).

A **classification** groups similar things together. In a classification of diseases and operative procedures, similar disease conditions or procedures are grouped together under a single code. The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) is the most widely used classification system in the US.

Members of the health informatics community have debated the need for coding systems to support electronic health records and the best system to do so. In an evaluation done by the Computer-based Patient Record Institute, SNOMED was found to best describe the clinical concepts tested, but it is unclear if a single coding system can meet the complex needs of data capture and retrieval for electronic health records.

The most commonly used clinical coding systems are listed below.

Standard Data Sets

Designed to encourage healthcare providers to collect and report data in a standardized format, data sets usually describe core data elements to be collected for each individual receiving health services. The most widely used data sets are shown below.

References

Bowman, E.D. "Coding and classification systems," in *Health Information: Management of a Strategic Resource*, ed. M. Abdelhak et al. Philadelphia: WB Saunders, 1996, p. 215.

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US Standards Development Organizations

Organization	Type of Standards	Description
Accredited Standards Committee X12 Data Interchange Standards Association (DISA) 333 John Carlyle St., Suite 600 Alexandria, VA 22314 Telephone: (703) 548-7005 www.disa.org	Electronic data interchange for billing transactions	Chartered in 1979 by ANSI, the X12N subcommittee develops and maintains X12 standards, interpretations, and guidelines. X12N is one of the standards specified in HIPAA regulations for electronic data interchange.

American College of Radiology-National Electrical Manufacturers Association (ACR-NEMA) 1891 Preston White Dr. Reston, VA 20191 Telephone: (703) 648-8900 www.acr.org National Electrical Manufacturers Association 1300 N. 17th St., Suite 1847 Rosslyn, VA 22209 Telephone: (703) 841-3200 www.nema.org	Exchange of digitized images	The Digital Imaging and Communications in Medicine (DICOM) standard promotes a digital image communications format and facilitates American College of Radiology the development of picture archive and communications systems. DICOM may be used for electronic exchange of x-rays, computerized tomography, magnetic resonance imaging, ultrasound, nuclear medicine, and other radiology images. Work is under way to expand DICOM to support other diagnostic images.
American Society for Testing and Materials (ASTM) 100 Barr Harbor Dr. West Conshohocken, PA 19428 Telephone: (610) 832-9585 www.astm.org	Multiple health informatics standards, including clinical content of patient records, exchange of messages about clinical observations, data security and integrity, healthcare identifiers, data modeling, clinical laboratory systems, Arden syntax, and system functionality	Organized in 1898, ASTM is one of the largest SDOs in the world. It provides a forum for vendors, users, consumers, and others to develop standards for a wide range of materials, products, systems, and services. Since 1990, Committee E31 on Healthcare Informatics has developed standards for health information and health information systems.
Health Level Seven (HL7) 3300 Washtenaw Ave., Suite 227 Ann Arbor, MI 48104 Telephone: (734) 677-7777 www.hl7.org	Electronic interchange of clinical, financial, and administrative information among disparate health information systems	HL7 is an ANSI-accredited SDO. "Level 7" refers to the highest level of the Open System Interconnection (OSI) model of the International Standards Organization. The HL7 standard addresses issues that occur within the seventh, or application, layer.
Institute of Electrical and Electronics Engineers (IEEE) 445 Hoes Lane, PO Box 1331 Piscataway, NJ 08855-1331 Telephone: (732) 981-0060 www.ieee.org	Medical device information and general informatics framework	IEEE's Medical Data Interchange standard (MEDIX) is a standard set of hospital system interface transactions based on the ISO standards for all seven layers of the OSI model. Another IEEE standard for a medical information bus (MIB) links instruments in critical care.
National Council on Prescription Drug Programs (NCPDP) 4201 N. 24th St., #365 Phoenix, AZ 85016 Telephone: (602) 957-9105 www.ncpdp.org	Data interchange and processing standards for pharmacy transactions	NCPDP has defined standards for transmitting prescription information from pharmacies to payers for prescription management services and and for receiving approval and payment information back in near-real time.

		Other standards address adverse drug reactions and utilization review.

Coding Systems

Name	Sponsoring Organization	Use
Arden Syntax for Medical Logic Modules	ASTM	Encoding medical knowledge. Each module contains logic for a single medical decision.
Current Procedural Terminology	American Medical Association	Billing for medical services and procedures performed by physicians.
Diagnostic and Statistical Manual of Mental Disorders (DSM)	American Psychiatric Association	Psychiatric diagnoses.
International Classification of Diseases, Ninth Edition, Clinical Modification	World Health Organization	Statistical classification of morbidity and mortality information and for indexing hospital records by diagnoses and procedures. Also used to determine Diagnosis-Related Groups (DRGs) on which payment for many inpatient healthcare services is based.
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10)	World Health Organization	A new version of ICD-9-CM currently being used outside the US. A new modification for the US is being developed by the National Center for Health Statistics.
Logical Observation and Identifier Codes (LOINC)	Regenstrief Institute and the Logical Observation and Identifier Codes Committee	Universal names and codes for identifying laboratory and clinical observations.
National Drug Codes (NDC)	Food and Drug Administration	More than 170,000 codes used to identify pharmaceuticals.
North American Nursing Diagnosis Association (NANDA)	North American Nursing Diagnosis Association	Describe a patient's reactions to disease organized around nine "human response patterns."

Read Codes	National Health Service Centre for Coding and Classification (UK)	Intended for used by all healthcare professionals to describe patient care and treatment.
Systematized Nomenclature of Human and Veterinary Medicine (SNOMED)	College of American Pathologists	Used for detailed description of diseases. This multiaxial coded medical nomenclature includes axes for topography, morphology, living organisms, chemical drugs, function, disease, procedure, occupation, social, physical agents, and general linkages and modifiers.
Unified Medical Language Systems (UMLS)	National Library of Medicine	For use by health professionals and researchers to retrieve and integrate electronic biomedical information from different sources, including patient record systems, bibliographic databases, factual databases, and expert systems.

Data Sets

Name	Sponsoring Organization	Use
Uniform Hospital Discharge Data Set (UHDDS)	National Committee on Vital and Health Statistics	Core data elements collected on all Medicare and Medicaid patients discharged from a hospital. Adopted in 1986.
Uniform Ambulatory Care Data Set	National Committee on Vital and Health Statistics	Recommended for use in all ambulatory care patient records. Adopted in 1989.
Minimum Data Set for Long Term Care and Resident Assessment Protocols		Mandated by the Omnibus Reconciliation Act of 1987. Used for comprehensive functional assessment of patients in long term care facilities.
Data Elements for Emergency Department Systems (DEEDS)	Centers for Disease Control and Prevention (CDC)	Recommended data set designed to support the uniform collection of data in hospital emergency departments.

Essential Medical Data Set (EMDS)	National Information Infrastructure Health Information Network Program	Recommended data elements to help practitioners improve the quality of care during emergency encounters.

Where to Learn More

For more information on health informatics standards, these Web sites are helpful:

- Duke University Medical Center Healthcare Informatics Standards page. Available at www.mcis.duke.edu/standards/guide.htm. This site catalogs health informatics standards. It offers an introduction to standards as they pertain to specific clinical specialties and provides links to standards developers, coding systems, data sets, Internet and middleware standards, other informatics organizations, other standards organizations, and government agencies.
- "American National Standards Institute and Healthcare Informatics Standards Board Inventory of Health Care Information Standards Pertaining to the Health Insurance Portability and Accountability Act." Available at http://aspe.os.dhhs.gov/datacncl/hisbinv0.htm. This page is sponsored by the American National Standards Institute.

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