Data Standards, Data Quality, and Interoperability - Retired

Save to myBoK

This practice brief has been updated. See the latest version here. This version is made available for historical purposes only.

In healthcare reporting, data quality and consistency are critical to ensuring patient safety and communicating health service delivery. Assessing the quality and consistency of data requires data standards.

The Institute of Medicine report "Patient Safety: Achieving a New Standard for Care" states, "At the most basic level, data standards are about the standardization of data elements: (1) defining what to collect, (2) deciding how to represent what is collected (by designating data types or terminologies), and (3) determining how to encode the data for transmission."[1] Without data standards and data quality, the future of interoperability is bleak. Data fields and the content of those fields need to be standardized.

This practice brief provides HIM professionals with a list of standards to reference in data dictionary development, evaluation of software applications for health data management, electronic health record tools, and general data management processes to ensure information integrity and reliability. Evaluation of data validity, reliability, completeness, and timeliness are accomplished through a combination of human and machine processes in healthcare, and this Internet-enabled list of data standard sources is a helpful tool to keep at hand when more detailed information is required.

Clinical Data Standards Development in Process

Semantic interoperability, the ability to exchange data with meaning, is essential as data move from place to place between those who provide, pay for, and benefit from healthcare. Problems arise when one term has multiple meanings or when two or more terms refer to the same concept but are not easily recognized as synonyms.

Harmonizing disparate information systems requires data standards and a regulatory framework that promotes their use. Examples of projects aimed at the commercialization of semantic interoperability include the World Wide Web Consortium's (W3C) Semantic Web Health Care and Life Sciences Health Group and the Health Information Technology Ontology Project.

These groups are working on a significant problem: data sharing. Every system has its own way of representing data. For example, relational databases have their own schema for defining tables and fields. Ontologies are one method of managing data and providing a mechanism for disparate systems to communicate. Although this is not a new term, it will be one that HIM professionals will hear in discussions related to interoperability and data standards. An ontology viewed with a data standards lens is a model of knowledge that serves as a semantic translator that is able to reconcile metadata standards, XML dialects, and database access methods.

Data Standards Tools Widely Used on the Internet

The Web ontology language, also known as OWL, is an extension of Resource Description Framework (RDF). RDF describes Web sites and their content with a focus on information exchange between software and system applications. An example of RDF use is Really Simple Syndication (RSS). W3C views the use of OWL and RDF as examples of semantic Web technology created from research to information management tools available on the open market. New tools from commercial vendors offer RDF and OWL tools, and Stanford University has an open source ontology editor called Protégé.

Extensible Markup Language (XML) is a simple, flexible text format derived from Standard Generalized Markup Language (SGML) (ISO 8879). W3C created, developed, and continues to maintain the XML specification. It is also the primary center for developing other cross-industry specifications based on XML. Both SGML and XML are meta languages because they are used for defining markup languages. These languages used for sharing information over the Internet have a specific

vocabulary (labels for elements and attributes) and a declared syntax (grammar defining the hierarchy and other features). Health information exchange systems rely on these tools to enable data sharing.

Data Standards Development Process for Health Information Exchange

There are also stakeholder groups hard at work on harmonization efforts to manage information in standardized processes that enable data sharing. The work of the Healthcare Information Technology Standards Panel is sponsored by the American National Standards Institute (ANSI) in cooperation with strategic partners such as the Healthcare Information and Management Systems Society, the Advanced Technology Institute, and Booz Allen Hamilton. Financial support for this work is being provided via the Office of the National Coordinator for Health Information Technology in the form of a contract from the US Department of Health and Human Services.

This group, representing a wide range of healthcare issues and perspectives, will assist in the development of the US nationwide health information network by addressing matters such as data content and data security standards within a shared health information system.

In Europe a consortium of sponsors and members interested in interoperability for health information exchange have formed the Clinical Data Interchange Standards Consortium. Health information exchange is one of the important factors in improving efficiency and reducing cost for health delivery, and global standards will make a difference in the way we capture and use health information worldwide. Other European organizations such as OpenClinical (www.openclinical.org) are advancing the use of IT tools and knowledge management resources.

Chosen by ANSI, the National Information Standards Organization (NISO) represents US interests in ISO's Technical Committee on Information and Documentation. Organizations such as the National Library of Medicine, the American Library Association, and ARMA International are included in the voting members of NISO. Although this nonprofit organization is not limited to the healthcare industry, many of the standards developed apply.

The myths and realities of standards found on its Web site definitely ring true for healthcare, including the leading statement for myth 1: "Shaping good standards takes time but this investment is not any longer than other important strategic activities your company engages in."[2] The time required to develop a standard includes creating the necessary industry consensus.

HIM professionals can make a difference by participating in the standards development processes, including Health Level Seven or the work under way in many states with the Health Information Security and Privacy Collaboration evaluation and recommendations. There has never been greater need for the HIM perspective in the domain of data standards.

Data Standards and Documentation of Health Services

Documentation describes the methods and activities of collecting, coding, ordering, storing, and retrieving information to fulfill future tasks.[3] Whether the information is collected, stored, and read on paper or discrete data elements are recorded, electronically stored, and then displayed as traditional documents on a computer monitor, data content requirements remain the same. The appropriate recording of data for patient records is required for continuous treatment of patients. The quality and safety of medical decision making during the course of providing a health service relies on timeliness and accuracy of the information available.

Documentation objects are observations, assessments, and plans made during the care of individual patients.[4] There are a variety of messaging and data content standards related to clinical documentation capture, storage, retrieval, and use. Data structure and content standards create the framework for an optimal health record and effective information exchange between healthcare providers. A data content standard often leverages a terminology standard to simplify and unify the data presentation.[5] Common terminology standards in electronic health records include those to be used within:

- Continuity of Care Record/Document (from ASTM and Health Level Seven)
- National Council for Prescription Drug Programs (NCPDP)
- Digital Imaging and Communications in Medicine (DICOM)
- SNOMED CT
- Logical Observation Identifiers Names and Codes (LOINC)

- ICD
- RxNorm (a nomenclature for drugs produced by the National Library of Medicine)
- Current Procedural Terminology (CPT)

The National Library of Medicine's Unified Medical Language System links more than 100 terminologies available for a variety of use cases in healthcare.[6]

The AHIMA Model for Data Quality is available at www.ahima.org/infocenter/models. The October 2006 position statement "Quality Healthcare Data and Information" provides additional definitions valuable for clinical data management. It is available in the Body of Knowledge.

Notes

1. Institute of Medicine. *Patient Safety: Achieving a New Standard for Care*. National Academies Press, 2004, p. 127. Available online at www.nap.edu/books/0309090776/html.
2. National Information Standards Organization. "Standards: Myths and Realities." Available online at www.niso.org/about/Myths_real.html.
3. Liener, Florian, et al. *Medical Data Management: A Practical Guide*. New York, NY: Springer–Verlag, 2003.
4. Ibid.
5. AHIMA. "Guidelines for Developing a Data Dictionary." *Journal of AHIMA* 77, no. 2 (February 2006): 64A–64D.
6. US National Library of Medicine. "Fact Sheet: Unified Medical Language System." Available online at www.nlm.nih.gov/pubs/factsheets/umls.html.

References

Clinical Data Interchange Standards Consortium. Available online at www.cdisc.org.

Health Information Ontology Project. Available online at http://colab.cim3.net/cgi-bin/wiki.pl?HealthInformationTechnologyCommunityofPractice.

Health Information Technology Standards Panel. Available online at www.ansi.org/hitsp.

National Information Standards Organization. Available online at www.niso.org/members/members.cfm.

World Wide Web Consortium (Semantic Web). Available online at www.w3.org and www.w3.org/2001/sw/hcls.

Glossary of Selected Terms

Data comparability: the standardization of vocabulary such that the meaning of a single term is the same each time the term is used in order to produce consistency in information derived from the data.

Data content standards: clear guidelines for the acceptable values for specified data fields; a type of data exchange standard.

Data dictionary: a descriptive list of the data elements to be collected in an information system or database whose purpose is to ensure consistency of terminology.

Data exchange standards: protocols that help ensure that data transmitted from one system to another remain comparable.

Data modeling: the process of determining user information needs and identifying relationships among the data.

Extensible Markup Language (XML): standardized computer language that allows the interchange of data as structured text. It is a W3C universal format standard for structured documents and data on the Internet.[1]

Interoperability: the ability, generally by adoption of standards, of systems to work together. Interoperability is not just the ability to exchange health information but includes the ability to understand what is being exchanged. The National Alliance for

Health Information Technology defines interoperability as "the ability of different information technology systems and software applications to communicate, to exchange data accurately, effectively, and consistently, and to use the information that has been exchanged."

Messaging standard: standards that support the uniform format and sequence of data during transmission from one healthcare entity to another. Also called a transmission standard. It is also a type of data exchange standard.

Metadata: descriptive data that characterize other data to create a clearer understanding of their meaning and to achieve greater reliability and quality of information. Metadata consists of both indexing terms and attributes.

Ontology: A controlled vocabulary that defines the terms used to describe and represent an area of knowledge.[2] It is organized by meaning, allowing for an understanding of the structure of descriptive information that facilitates interoperability.[3] Recognized grammar is required for effectively using the vocabulary terms. Ontological commitments are agreements between entities to use the vocabulary in a consistent way for knowledge sharing.

Resource Development Framework (RDF): a universal format for data on the Web. Using a simple relational model, it allows structured and semistructured data to be mixed, exported, and shared across different applications. RDF data describe all sorts of things, and where XML schemas just describe documents, RDF and OWL schemas ("ontologies") talk about the actual things. This enables greater reuse. Where XML provides interoperability within one application (e.g., bank statements) using a given schema, RDF provides interoperability across applications (e.g., import your bank statements into your calendar).[4]

Schema: a structured framework or plan, often used in the context of data management or modeling.

Semantic Data Model (SDM): a natural application modeling mechanism that can capture and express the structure of an application environment; LOINC is an example of a semantic data model.

Semantics: the meaning of a word or term; sometimes refers to comparable meaning, usually achieved through a standard vocabulary.

Standard: 1. a scientifically based statement of expected behavior against which structures, processes, and outcomes can be measured; 2. a model or example established by authority, custom, or general consent or a rule established by an authority as a measure of quantity, weight, extent, value, or quality.

Standards development organization (SDO): a private or government agency involved in the development of healthcare informatics standards at a national or international level.

Syntax: a term that refers to the comparable structure or format of data, usually as they are being transmitted from one system to another.

Web Ontology Language (OWL): language designed for use by software applications that process the content of information instead of just presenting information to humans. There are three sublanguages currently available: OWL Lite, OWL DL, and OWL Full.[5]

Unless otherwise referenced, definitions are reproduced from: AHIMA. Pocket Glossary of Health Information Management and Technology. Chicago, IL: AHIMA, 2006.

Notes

1. World Wide Web Consortium (W3C). "Extensible Markup Language (XML)." Available online at www.w3.org/XML.
2. W3C. "OWL Web Ontology Language: Use Cases and Requirements." Available online at www.w3.org/TR/webont-req/#onto-def.
3. Giannangelo, Kathy. *Healthcare Code Sets, Clinical Terminologies, and Classification Systems.* Chicago, IL: AHIMA, 2006.
4. W3C. "Frequently Asked Questions about RDF." Available online at www.w3.org/RDF/FAQ.
5. W3C. "Web Ontology Language: Overview." Available online at www.w3.org/TR/owl-features.

Additional Reading

AHIMA. "E-HIM Strategic Initiative: Core Data Sets. Appendix A: Core Data Sets as Standards for the EHR (pt. 1)." *Journal of AHIMA* 75, no. 8 (September 2004): Web extra. Available online in the FORE Library: HIM Body of Knowledge at www.ahima.org.

AHIMA. "Data Standard Time: Data Content Standardization and the HIM Role." *Journal of AHIMA* 77, no. 2 (February 2006): 26–32.

AHIMA. "Guidelines for Developing a Data Dictionary." *Journal of AHIMA* 77, no. 2 (February 2006): 64A–D.

Amatayakul, Margret. *Electronic Health Records: A Practical Guide for Professionals and Organizations,* third edition. Chicago, IL: AHIMA, 2007.

Giannangelo, Kathy. *Healthcare Code Sets, Clinical Terminologies, and Classification Systems*. Chicago, IL: AHIMA, 2006.

Johns, Merida, ed. *Health Information Management Technology: An Applied Approach*, second edition. Chicago, IL: AHIMA, 2006.

Kallem, Crystal, and Susan H. Fenton. "Needed: Data Content Standards." *Journal of AHIMA* 78, no. 1 (January 2007): 60–61.

"Time to Raise Your Standards" *AHIMA Advantage* 10, no. 5 (August 2006): 1.

Prepared by

Susan Fenton, MBA, RHIA
Kathy Giannangelo, MA, RHIA, CCS
Crystal Kallem, RHIT
Rita Scichilone, MHSA, RHIA, CCS, CCS-P, CHC

Article citation:
Fenton, Susan H.; Giannangelo, Kathy; Kallem, Crystal; Scichilone, Rita A. "Data Standards, Data Quality, and Interoperability - Retired" *Journal of AHIMA* 78, no.2 (February 2007): extended online edition.