Data Standards, Data Quality, and Interoperability. Appendix A: Data Standards Resource

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

Working independently, standards development organizations (SDOs), associations, government agencies, and nongovernmental organizations have developed an array of data standards that address multiple areas in healthcare. Different standards are required to implement electronic health records (EHRs) and facilitate interoperability.

Standards are developed both nationally and internationally. The American National Standards Institute (ANSI) coordinates the development and use of standards within the United States and represents the needs and views of US stakeholders in standardization forums around the globe. ANSI facilitates the development of American National Standards by accrediting the procedures of standards development organizations. ANSI accreditation signifies that the procedures used by the SDO meet ANSI's essential requirements for openness, balance, consensus, and due process.

This table outlines a sample of some of the common standards used today. Placing a standard in one category is difficult because various standards can be classified in more than one way, so in some instances, standards are repeated in multiple categories.

Structure and Content Standards

Standards establish definitions for data elements in an EHR system. They specify the type of data to be collected in each data field and the attributes and values of each field, all of which are captured in data dictionaries.

Resource	Description	Source
ASTM Continuity of Care Record (CCR) Designation: E 2369-05	Data content and document standard for relaying a patient's core data set upon transfer	www.astm.org
ASTM Standard Practice for Content and Structure of the Electronic Health Record (EHR) Designation: E 1382-02a	Identifies the content and structure for EHRs. The scope of this standard is intended to cover all types of healthcare services, including acute care hospitals, ambulatory care, skilled nursing facilities, home healthcare, and specialty environments.	www.astm.org
Health Level Seven (HL7) Clinical Document	CDA Release 2.0 provides an exchange model for clinical documents such as discharge summaries and progress notes. By leveraging the use of XML, the HL7 Reference Information Models (RIMs), and coded vocabularies, the CDA makes	www.hl7.org/Library/standards.cfm

Architecture (CDA) Release 2.0	documents both machine-readable (so they are easily parsed and processed electronically) and human-readable (so they can be easily retrieved and used by the people who need them). CDA documents can be displayed using XML-aware Web browsers or wireless applications such as cell phones.	
HL7 Continuity of Care Document (CCD)	The CCD was developed as a collaborative effort between ASTM and HL7. It is intended as an alternate implementation of the ASTM Continuity of Care Record for those institutions or organizations implementing the HL7 Clinical Document Architecture.	www.hl7.org/
HL7 Communication Standard, Version 3	Version 3 of the HL7 Communication Standard uses a methodology based on a teference information (i.e., data) model. HL7's primary goal for Version 3 is to offer a standard that is definite and testable and provides the ability to certify vendor conformance.	www.hl7.org/Library/standards.cfm
National Council for Prescription Drug Programs (NCPDP) Data Dictionary	Data dictionary and data content standards for pharmacy data, developed by NCPDP.	www.ncpdp.org/PDF/Basic_guide_to_standards.pdf

Functional EHR Standards

Standards that define the components an EHR needs to support the functions for which it was designed.

Resource	Description	Source
HL7 EHR System Functional Model	A reference list of functions that may be present in an EHR system. The function list is described from a user perspective with the intent to enable consistent expression of system functionality. Through the creation of functional profiles, this model enables a standardized description and common understanding of functions sought or available in a given setting (e.g., intensive care, cardiology, office practice in one country, or primary care in another country).	www.hl7.org/ehr/

Technical/Interoperability Standards

Standards that complement other types of standards and make interoperability possible by providing the roles, or protocols, of how these data are actually transmitted from one computer system to another.

Resource	Description	Source

Digital Imaging and Communications in Medicine (DICOM)	Messaging standard for digital images. DICOM is produced and managed by the DICOM standards committee, which consists of vendors, user organizations, government agencies, and trade associations.	http://medical.nema.org/dicom/
HL7 Arden Syntax for Medical Logic Systems	This specification addresses the sharing of computerized health knowledge bases among personnel, information systems, and institutions. The scope has been limited to those knowledge bases that can be represented as a set of discrete modules. Each module, referred to as a Medical Logic Module (MLM), contains sufficient knowledge to make a single decision.	www.hl7.org/Library/standards.cfm
HL7 Clinical Document Architecture (CDA) Release 2.0	CDA Release 2.0 provides an exchange model for clinical documents (such as discharge summaries and progress notes). By leveraging the use of XML, HL7 Reference Information Models (RIMs), and coded vocabularies, the CDA makes documents both machine-readable (so they are easily parsed and processed electronically) and human-readable (so they can be easily retrieved and used by the people who need them). CDA documents can be displayed using XML-aware Web browsers or wireless applications such as cell phones.	www.hl7.org/Library/standards.cfm
HL7 Continuity of Care Document (CCD)	The CCD was developed as a collaborative effort between ASTM and HL7. It is intended as an alternate implementation of the ASTM Continuity of Care Record for those institutions or organizations implementing the HL7 Clinical Document Architecture.	www.hl7.org/
HL7 Clinical Context Management (CCOW)	The CCOW standards specify technology-neutral architectures, component interfaces, and data definitions as well as an array of interoperable technology-specific mappings of these architectures, interfaces, and definitions.	www.hl7.org/Library/standards.cfm
HL7 Version 3 Communication Standard	Version 3 uses a methodology based on a reference information (i.e., data) model. HL7's primary goal for Version 3 is to offer a standard that is definite and testable and provides the ability to certify vendors' conformance.	www.hl7.org/Library/standards.cfm
HL7 Version 2.5 Communication Standard	HL7 Version 2.5 introduced a number of new events, segments, and messages, as well as an expanded chapter on control.	www.hl7.org/Library/standards.cfm
HL7 Version 2.4 Communication Standard	HL7 Version 2.4 introduces conformance query profiles in chapter 5 and adds messages for laboratory automation, application management, and personnel management.	www.hl7.org/Library/standards.cfm

HL7 Version 2.3.1 Communication Standard	HL7 Version 2.3.1 includes an updated timing/quantity data type to manage order occurrences, updates to facilitate public health surveillance reporting, segments and data types to accommodate international paradigms for reporting names and pharmacy orders, and the addition of a new field to satisfy the CMS Medical Necessity requirements for outpatient services and federal requirements for Level 2 modifiers.	www.hl7.org/Library/standards.cfm
IEEE 1073 Point of Care Medical Device Communication	A family of medical device communications standards which allows hospitals and other healthcare providers to achieve plug-and-play interoperability between medical instrumentation and computerized healthcare information systems, especially in a manner that is compatible with the acute care environment.	www.ieee1073.org
NCPDP Batch Transaction Standard	The NCPDP Batch Transaction Format provides practical guidelines and ensures consistent implementation throughout the industry of a file submission standard to be used between pharmacies and processors, or pharmacies, switches, and processors.	www.ncpdp.org/PDF/Basic_guide_to_standards.pdf
NCPDP Billing Unit Standard	Due to the number of processors, fiscal intermediaries, plan administrators, and Medicaid programs, the NCPDP Billing Unit Standard was created to promote a “common billing unit language” for the submission of prescription claims.	www.ncpdp.org/PDF/Basic_guide_to_standards.pdf
NCPDP Formulary and Benefit Standard	This NCPDP Formulary and Benefit Standard provides a standard means for pharmacy benefit payers (including health plans and pharmacy benefit managers) to communicate formulary and benefit information to prescribers via technology vendor systems.	www.ncpdp.org/PDF/Basic_guide_to_standards.pdf

Vocabulary, Terminology, and Classification Systems

Systems that facilitate the organization, storage, and retrieval of healthcare data.

Resource	Description	Source
Alternative Billing Concepts (ABC) Codes	ABC Codes contain more than 4,000 codes that describe what is said, done, ordered, prescribed, or distributed by providers of alternative medicine. Disciplines covered by this system include acupuncture, holistic medicine, massage therapy, homeopathy, naturopathy, ayurvedic medicine, chiropractors, and midwifery.	www.alternativelink.com/ali/home
Clinical Care Classification (CCC)	A classification system consisting of two interrelated taxonomies: the CCC of Nursing Diagnoses and	www.sabacare.com

System	Outcomes, and the CCC of Nursing Interventions and Actions. Both taxonomies are classified by care components, or clusters of elements that represent behavioral, functional, physiological, or psychological care patterns.	
Current Dental Terminology (CDT)	CDT is a coding system developed to report services performed by the dental profession. CDT was formally called the Uniform Code on Dental Procedures and Nomenclature.	www.ada.org/ada/prod/catalog/cdt /index.asp
Current Procedural Terminology (CPT)	CPT is a comprehensive list of descriptive terms and codes published by the American Medical Association (AMA) and used for reporting diagnostic and therapeutic procedures and other medical services performed by physicians.	www.ama-assn.org/ama/pub/category /3113.html
Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)	The DSM-IV is a nomenclature to standardize the diagnostic process for patients with psychiatric disorders. It includes codes that correspond to ICD-9-CM codes.	www.appi.org/dsm.cfx
Global Medical Device Nomenclature (GMDN)	The GMDN is a collection of internationally recognized terms used to describe and catalog medical devices, in particular, products used in the diagnosis, prevention, monitoring, treatment, or alleviation of disease or injury in humans.	www.gmdn.org/index.xalter
International Classification of Diseases for Oncology (ICD-O)	The ICD-O is the standard tool for coding diagnoses of neoplasms in tumor and cancer registrars and in pathology laboratories. ICD-O is a dual classification with coding systems for both topography and morphology. The topography code describes the site of origin of the neoplasm and uses the same three-character and four-character categories as in the neoplasm section of chapter II, ICD-10.	www.who.int/classifications/icd/ adaptations/oncology/en/
International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)	Classification system used in the United States to code and classify diagnoses from inpatient and outpatient records and to code inpatient procedures. ICD-9-CM is managed by the National Center for Health Statistics.	www.cdc.gov/nchs/icd9.htm

International Classification of Functioning, Disability and Health (ICF)	The ICF is a health and health-related classification system that reports body functions and structures, activities, and participation.	www3.who.int/icf/icftemplate.cfm?myurl=homepage.html&mytitle=Home%20Page
International Classification of Primary Care (ICPC)	ICPC is a reliable classification system for primary care physicians that enable the labeling of the most prevalent conditions that exist in the community as well as symptoms and complaints.	www.globalfamilydoctor.com/wicc/ sensi.html
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10)	The ICD-10 version of the disease classification system was developed by the World Health Organization and is used to report morbidity and mortality information worldwide. Effective with deaths occurring in 1999, the US replaced ICD-9 with ICD-10 for mortality report.	www.who.int/classifications/icd/en/
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Clinical Modification (ICD-10-CM)	ICD-10-CM is the future US coding classification system for healthcare professionals and institutions to report morbidity and mortality data.	www.cdc.gov/nchs/about/otheract/icd9/abticd10.htm
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Procedure Coding System (ICD-10-PCS)	ICD-10-PCS is the future US coding classification for institutions to report procedure information.	www.cms.hhs.gov/ICD9ProviderDiagnosticCodes/08_ICD10.asp
Logical Observation Identifiers, Names and Codes (LOINC)	The LOINC coding system electronically exchanges laboratory and clinical information	www.regenstrief.org/ medinformatics/loinc
MEDCIN	MEDCIN is a terminology and presentation engine. It includes more than 250,000 clinical data elements encompassing symptoms, history, physical examination, tests, diagnoses, and therapy.	www.medicomp.com
Medical Dictionary for Regulatory Activities (MedDRA)	MedDRA is a global standard medical terminology. It is expected to supercede or replace terminologies currently in use with the medical product development process.	www.meddramsso.com/MSSOWeb/term_maint/index.htm

National Drug Code (NDC)	NDC is a coding system for pharmacies to report services, supplies, drugs, and biologic information.	www.fda.gov/cder/ndc/index.htm
North American Nursing Diagnosis Association (NANDA) International Taxonomy II	Organization of the NANDA-International nursing diagnoses has evolved from an alphabetical listing in the mid-1980s to a conceptual system that guides the classification of nursing diagnoses in a taxonomy.	www.nanda.org/html/taxonomy.html
Nursing Interventions Classification (NIC)	NIC is a comprehensive, research-based, standardized classification of interventions that nurses perform.	www.nursing.uiowa.edu/centers/cncce/nic
Nursing Outcomes Classification (NOC)	NOC is a comprehensive, standardized classification of patient/client outcomes developed to evaluate the effects of nursing interventions.	www.nursing.uiowa.edu/centers/ cncce/noc
Omaha System	The Omaha System is a research-based, comprehensive taxonomy designed to generate meaningful data following usual or routine documentation of client care.	www.omahasystem.org
RxNorm	RxNorm is a clinical drug nomenclature that provides standard names for clinical drugs (active ingredient, strength, and dose form) and for dose forms as administered.	www.nlm.nih.gov/research/umls/rxnorm/index.html
Systematized Nomenclature of Dentistry (SNODENT)	SNODENT is a systematized nomenclature of dentistry containing dental diagnoses, signs, symptoms, and complaints.	www.ada.org
Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT)	SNOMED CT is a comprehensive clinical terminology and infrastructure that enables a consistent way of capturing, sharing and aggregating health data across specialties and sites of care.	www.snomed.org
Universal Medical Device Nomenclature System (UMDNS)	UMDNS is a standard international nomenclature and coding system used to facilitate identifying, processing, filing, storing, retrieving, transferring, and communicating data about medical devices.	www.ecri.org

Standards Development Organizations

Private or government organizations involved in the development of healthcare informatics standards at a national or international level.

Resource	Description	Source
AIIM	AIIM is an ANSI (American National Standards Institute) accredited standards development organization. AIIM also holds the Secretariat for the ISO (International Organization for Standardization) committee focused on information management compliance issues, TC171.	www.aiim.org
Accredited Standards Committee (ASC) X12	ASC X12 is a designated committee under the Designated Standard Maintenance Organization (DSMO), which develops uniform standards for cross-industry exchange of business transactions through electronic data interchange (EDI) standards. ASC X12 is an ANSI-accredited standards development organization.	www.x12.org
American Dental Association (ADA)	The ADA is an ANSI-accredited standards developing organization that develops dental standards that promote safe and effective oral healthcare.	www.ada.org/prof/resources/standards/index.asp
ASTM International	Formerly the American Society for Testing and Materials, ASTM International is an ANSI-accredited standards development organization that develops standards for healthcare data security, standard record content, and protocols for exchange of laboratory data.	www.astm.org
European Committee for Standardization (CEN)	CEN contributes to the objectives of the European Union and European Economic Area with voluntary technical standards that promote free trade, the safety of workers and consumers, interoperability of networks, environmental protection, exploitation of research and development programs, and public procurement.	www.cenorm.be/cenorm/index.htm
Clinical and Laboratory Standards Institute (CLSI)	A global, nonprofit, standards development organization that promotes the development and use of voluntary consensus standards and guidelines within the healthcare community. Its core business is the development of globally applicable voluntary consensus documents for healthcare testing.	www.clsi.org
Clinical Data Interchange Standards Consortium (CDISC)	CDISC is an open, multidisciplinary, nonprofit organization that has established worldwide industry standards to support the electronic acquisition, exchange, submission and archiving of clinical trials data and metadata for medical and biopharmaceutical product development.	www.cdisc.org/
Designated Standard Maintenance	The DSMO was established in the final HIPAA rule and is charged with maintaining the standards for electronic	www.hipaa-dsmo.org

Organization (DSMO)	transactions, developing or modifying an adopted standard.	
Health Industry Business Communications Council (HIBCC)	HIBCC is an industry-sponsored and supported nonprofit organization. As an ANSI-accredited organization, its primary function is to facilitate electronic communications by developing standards for information exchange among healthcare trading partners.	www.hibcc.org/
Health Level 7 (HL7)	An ANSI-accredited standards development organization that develops messaging, data content, and document standards to support the exchange of clinical information.	www.hl7.org
Institute of Electrical and Electronic Engineers (IEEE)	A national organization that develops standards for hospital system interface transactions, including links between critical care bedside instruments and clinical information systems.	www.ieee.org
International Organization for Standardization (ISO)	ISO is a nongovernmental organization and network of national standards institutes from 157 countries.	www.iso.org/iso/en/ISOOnline.frontpage
National Council for Prescription Drug Programs (NCPDP)	A designated committee under the Designated Standard Maintenance Organization (DSMO) that specializes in developing standards for exchanging prescription and payment information.	www.ncpdp.org
National Information Standards Organization (NISO)	An ANSI-accredited, nonprofit association that identifies, develops, maintains, and publishes technical standards to manage information. NISO standards address areas of retrieval, re-purposing, storage, metadata, and preservation.	www.niso.org
National Uniform Billing Committee (NUBC)	A designated committee under the Designated Standard Maintenance Organization (DSMO) that is responsible for identifying data elements and designing the CMS-1500.	www.nubc.org
National Uniform Claim Committee (NUCC)	The national group that replaces the Uniform Claim Form Task Force in 1995 and developed a standard data set to be used in the transmission of noninstitutional provider claims to and from third-party payers.	www.nucc.org

Coordinators and Promoters of Standards Development

Resource	Description	Source

AHIMA	AHIMA is the premier association of HIM professionals. AHIMA's 51,000 members are dedicated to the effective management of personal health information needed to deliver quality healthcare to the public. Founded in 1928 to improve the quality of medical records, AHIMA is committed to advancing the HIM profession in an increasingly electronic and global environment through leadership in advocacy, education, certification, and lifelong learning.	www.ahima.org
American National Standards Institute (ANSI)	ANSI coordinates the development and use of voluntary consensus standards in the United States and represents the needs and views of US stakeholders in standardization forums around the globe. It oversees the creation, promulgation and use of thousands of norms and guidelines that directly affect businesses in nearly every sector. ANSI is also actively engaged in accrediting programs that assess conformance to standards including globally recognized cross-sector programs such as the ISO 9000 (quality) and ISO 14000 (environmental) management systems.	www.ansi.org
Healthcare Information and Management Systems Society (HIMSS)	A membership organization exclusively focused on providing global leadership for the optimal use of healthcare information technology and management systems for the betterment of healthcare.	www.himss.org
Medical Records Institute (MRI)	MRI;s mission is to promote and enhance the journey towards electronic health records, e-health, mobile health, and related applications of information technologies.	www.medrecinst.com
National Alliance for Health Information Technology (Alliance)	A partnership of government and private sector leaders from various healthcare organizations working to use technology to achieve improvements in patient safety, quality of care and operating performance.	www.nahit.org
Workgroup for Electronic Data Interchange (WEDI)	A subgroup of Accreditation Standards Committee X12 that has been involved in developing electronic data interchange standards for billing transactions.	www.wedi.org

Data Standards Initiatives and Resources

Resource	**Description**	**Source**
American Health Information Community	A federally chartered commission that provides input and recommendations to HHS on how to make health records digital and interoperable and ensure that the privacy and security of those records are protected in a smooth, market-led way.	www.hhs.gov/healthit/ahic.html

Certification Commission for Healthcare Information Technology (CCHIT)	CCHIT is an independent, voluntary, private-sector initiative organized to accelerate the adoption of robust, interoperable healthcare information technology throughout the United States by creating an efficient, credible, sustainable mechanism for the certification of healthcare IT products.	www.cchit.org/
Consolidated Health Informatics (CHI) Initiative	A collaborative effort to adopt health information interoperability standards, particularly health vocabulary and messaging standards, for implementation in federal government systems.	www.hhs.gov/healthit/chi.html
Health Information Technology Ontology Project (HITOP)	The Health Information Technology Community of Practice and its Health Information Technology Ontology Project (HITOP) is a federal group that will make recommendations for systematically improving healthcare while reducing healthcare costs and help achieve semantic interoperability through the use of ontology software in high priority health IT projects that will both save money and improve the quality of care.	http://colab.cim3.net/cgi-bin/ wiki.pl?HealthInformationTechnologyCommunityofPractice#nid35Z7
Healthcare Information Technology Standards Panel (HITSP)	One of the Department of Health and Human Services (HHS) contracts charged with bringing US standards developers and other stakeholders together to develop, prototype, and evaluate a harmonization process for achieving a widely accepted and useful set of health IT standards that will support interoperability among healthcare software applications.	www.ansi.org/standards_activities/standards_boards_panels/hisb/hitsp.aspx?menuid=3
National Cancer Institute Cancer Biomedical Informatics Grid (caBIG)	The Cancer Biomedical Informatics Grid, or caBIG, is a voluntary network or grid connecting individuals and institutions to enable the sharing of data and tools, creating a World Wide Web of cancer research. The goal is to speed the delivery of innovative approaches for the prevention and treatment of cancer. The infrastructure and tools created by caBIG also have broad utility outside the cancer community.	https://cabig.nci.nih.gov/
National Center for Health Statistics (NCHS) Public Health Data Standards Consortium	The NCHS Public Health Data Standards Consortium is a national nonprofit member-based partnership of federal, state and local health agencies; national and local professional associations; and public and private sector organizations and individuals. It serves as health data collectors and data users who actively support the overall goals of developing, promoting, and implementing data standards for population health practice and research.	www.cdc.gov/nchs/otheract/phdsc/phdsc.htm
National Institute on Standards and	An agency of the Department of Commerce that creates many of the federal government's security standards, which	www.nist.gov

Technology, (formerly the Bureau of Standards) (NIST)	are mandated for use in government agencies and often by their contractors.	
National Resource for Global Standards	A search engine that provides users with standards-related information from a wide range of developers, including organizations accredited by the American National Standards Institute (ANSI), other US private sector standards bodies, government agencies and international organizations.	www.nssn.org/
Office of the National Coordinator for Health Information Technology (ONC)	The Office of the National Coordinator for Health Information Technology provides leadership for the development and nationwide implementation of an interoperable health information technology infrastructure to improve the quality and efficiency of healthcare and the ability of consumers to manage their care and safety.	www.hhs.gov/healthit/
Public Health Information Network (PHIN)	The Public Health Information Network (PHIN) is CDC's vision for advancing fully capable and interoperable information systems in the many organizations that participate in public health. PHIN is a national initiative to implement a multi-organizational business and technical architecture for public health information systems.	www.cdc.gov/PHIN/
Standards.gov	Maintained and operated by the National Institute of Standards and Technology (NIST), Standards.gov supports the requirements of the National Technology Transfer and Advancement Act (NTTAA), which became law in March 1996. The NTTAA directs federal agencies with respect to their use of private sector standards and conformity assessment practices. The objective is for federal agencies to adopt private sector standards, wherever possible, in lieu of creating proprietary, nonconsensus standards.	http://standards.gov/standards_gov/v/Standards/index.cfm
Unified Medical Language System (UMLS)	A multipurpose resource that includes concepts and terms from many different source vocabularies developed.	www.nlm.nih.gov/pubs/factsheets/umls.html
United States Health Information Knowledgebase (USHIK)	A metadata registry of health information data element definitions, values, and information models that enable browsing, comparison, synchronization and harmonization within a uniform query and interface environment.	www.ushik.org

Web Ontology Language (OWL)	A 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.	www.w3.org/TR/owl-features/

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Article citation:
"Data Standards, Data Quality, and Interoperability. Appendix A: Data Standards Resource." *Journal of AHIMA* 78, no.2 (February 2007): web extra.