What Makes Data Meaningful? The Important Role of Data Structures

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Healthcare is striving for meaningful health data—something well noted in many recent industry articles and presentations. But how will the cultivation of meaningful data be accomplished in the healthcare industry's complex environment?

Healthcare data comes from a wide variety of sources. There are numerous classifications, terminologies, nomenclatures, vocabularies, and code sets being used in healthcare today. These data sources all serve varying purposes and have different requirements for collection.

The *AHIMA Pocket Glossary for Health Information Management and Technology* defines some of these data sources:[1]

Classification: A clinical vocabulary, terminology, or nomenclature that lists words or phrases with their meanings, provides for the proper use of clinical words as names or symbols, and facilitates mapping standardized terms to broader classifications for administrative, regulatory, oversight, and fiscal requirements.

Terminology: A set of terms representing the system of concepts of a particular subject field; a clinical terminology provides the proper use of clinical words as names or symbols.

Nomenclature: A recognized system of terms used in a science or art that follows pre-established naming conventions. For example, a disease nomenclature is a listing of the proper name for each disease entity with its specific code number.

Clinical vocabulary: A formally recognized list of preferred medical terms—also called a medical vocabulary.

Code Set: Under HIPAA, this means any set of codes used to encode data elements, such as tables of terms, medical concepts, medical diagnostic codes, or medical procedure codes. A code set includes the codes and the descriptors of the codes.

To better understand how data sources work together, it's important to examine those most frequently used in healthcare and how they are used in information systems. These include ICD-10-CM/PCS, CPT, HCPCS, SNOMED CT, LOINC, NDC, and RxNorm.

ICD-10-CM/PCS

For a number of years now, ICD-10 codes have been used for the reporting of epidemiological data by many countries. As of October 1, 2015, ICD-10 codes are also mandatory for use by providers in the United States. ICD-10-CM is the 10th revision of the disease classification system developed and used by the World Health Organization to track morbidity and mortality information worldwide.[2] ICD-10-CM/PCS supports diagnosis coding across all healthcare settings and coding of inpatient procedures and services.

The Centers for Medicare and Medicaid Services (CMS) and the National Center for Health Statistics (NCHS) developed the ICD-10-CM/PCS diagnosis classification system for coding and reporting in the healthcare environment, and it consists of two parts: ICD-10-CM and ICD-10-PCS. NCHS, the federal agency responsible for use of the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) in the United States, developed a clinical modification of the classification for morbidity purposes. ICD-10 is used to code and classify mortality data from death certificates, having replaced ICD-9 for this purpose. ICD-10-CM replaced ICD-9-CM, effective October 1, 2015. ICD-10-

PCS has 16 sections and contains significantly more procedure codes than those contained in ICD-9-CM, providing the ability to code procedures with a greater level of specificity.

ICD-10 has proven to be a better classification system than ICD-9 for mortality coding. The level of detail offered by the ICD-10 code set has increased, giving statisticians access to richer data sets.[3]

CPT and HCPCS

At this point, physicians and outpatient facilities are not affected by the new ICD-10-CM/PCS codes as the use of CPT codes will continue for those services. CPT describes medical, surgical, and diagnostic services provided by physicians and other healthcare professionals.[4]

Likewise, HCPCS codes can identify products, supplies, and services that are not included in CPT codes, and these codes can also be found in claims for outpatient, home health, and carrier services, and the use of medical equipment.[5]

SNOMED CT

Since meaningful healthcare data does not only include data on provided services, SNOMED CT, a controlled medical terminology, allows standardization of the clinical findings for the electronic health record (EHR). It is designed to fully describe clinical circumstances of a healthcare encounter in a machine-readable format.

Even though SNOMED CT has a relatively complex editorial process, and requires license fees and participation in the International Health Terminology Standards Development Organization, it supports the effective clinical recording of patient data in order to provide excellent patient care. The SNOMED CT International Release is meant to contain the “common denominator” of drugs across the world. However, every country that uses SNOMED CT for drugs still needs to develop a national extension separate from the international release.[6]

LOINC

Another code system, LOINC, was designed to identify laboratory and clinical observations, and is maintained by the Regenstrief Institute with over 70,000 standard codes. LOINC has not only been identified as an essential part of the “meaningful use” EHR Incentive Program but also for the Health Level Seven (HL7) Clinical Document Architecture as part of the Consolidated Health Informatics (CHI). This code system is able to increase the specificity of clinical documentation in the EHR, which makes it more meaningful.[7]

Both the Clinical Data Interchange Standards Consortium (CDISC) and US Food and Drug Administration (FDA) act as a liaison to the major pharmaceutical manufacturers, who use LOINC codes in new drug submissions to specify laboratory tests and EKG results. HL7 messages can include LOINC codes for laboratory results of patients who have reportable conditions, and the information can be sent to public health departments.[8]

For more than a decade, large healthcare institutions such as the Kaiser Foundation or Partners Healthcare in Boston, MA, have used LOINC as a tool to standardize information from a number of independent sources—such as individual practices, facilities, and laboratories. This makes it easier for healthcare providers, facilities, and insurance companies to organize, combine, and analyze the results for clinical management of patients automatically without manual data entry, which will likely make fewer data entry errors.

RxNorm

RxNorm, a public domain drug vocabulary maintained by the National Library of Medicine (NLM), provides normalized names and unique identifiers for clinical drugs and links to many of the four drug vocabularies used in pharmacy management. As a result, RxNorm supports EHRs, decision support systems, and pharmacy inventory controls because of its capability to facilitate interoperability between drug knowledge bases and pharmacy terminologies.[9]

RxNorm allows for comprehensive reporting of drug usage because it corresponds directly to a prescriber's view of a drug, which would be "ingredient + strength + dose form." The dose form represents how the drug is actually administered (i.e., injectable suspension), but not necessarily the form as it is manufactured and delivered to a pharmacy (i.e., powder for suspension). Another useful aspect of RxNorm is the fact that it includes both over-the-counter drugs and prescription medications.

NDC

In contrast to RxNorm, NDC codes represent drugs from what might be called an "inventory" perspective. NDC codes identify the drug manufacturer, size of the package, and dosage formulation, and distinguish between a drug's generic name and brand name. A generic drug could be made by different manufacturers or provided in different package sizes. Furthermore, NDC codes require the use of a "representative NDC" in order to provide a single identifier for a single clinical drug, and identifying schemes of representative NDCs has proven to be more challenging. Another drawback is that NDCs are not centrally assigned or maintained. Each manufacturer/packager issues its own NDCs and therefore, there is no official list of all NDCs in the US.

While NDC codes focus on inventory purposes and can be reused, duplicated, and have a different meaning later on, the RxNorm nomenclature keeps the prescriber's clinical intent in mind, which allows the nomenclature to serve as a discreet and unique identifier—the meaning of which can never change.

In addition, the benefit of RxNorm is that the drugs are named consistently, the names and codes are centrally published and maintained by the NLM, improvements can be incorporated quickly, and the set of drugs is complete for the US. Therefore, the Office of the National Coordinator for Health IT specified the use of RxNorm codes to fulfill medication-related requirements in EHRs for the meaningful use program, as their meaning can never change and will remain meaningful for HIM and patient care purposes.[10]

Although using data in a meaningful way is important, the data by itself can only be meaningful if it provides sufficient and accurate information for patient care. It is imperative that data analysts know where to find both internal and external data during the analysis process. The use of standardized data sources helps healthcare providers to communicate clinical data effectively to others when needed to improve patient care and allow for continuity of care.

Notes

[1] AHIMA. *Pocket Glossary for Health Information Management and Technology*. Chicago, IL: AHIMA Press, 2014.

[2] World Health Organization. "International Classification of Diseases." www.who.int/classifications/icd/en/.

[3] Dimick, Chris. "Mortality Coding Marks 10 Years of ICD-10." *Journal of AHIMA* 80, no. 7 (July 2009): 30-33.

[4] American Medical Association. "Coding with CPT for Proper Reimbursement." www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt.page.

[5] Centers for Medicare and Medicaid Services. "HCPCS - General Information." December 20, 2015. www.cms.gov/Medicare/Coding/MedHCPCSGenInfo/index.html.

[6] International Health Terminology Standards Development Organisation. "SNOMED-CT." www.ihtsdo.org/snomed-ct.

[7] Sheide, Amy and Patricia S. Wilson. "Reading Up on LOINC: What Coders Need to Know." *Journal of AHIMA* 84, no. 4 (April 2013): 58-60.

[8] McDonald, Clement J. et al. "LOINC, a Universal Standard for Identifying Laboratory Observations: A 5-Year Update." *Clinical Chemistry* 49, no. 4 (2003): 624-633.

[9] McGinness, Doris, June Bronnert, Chip Masarie, and Frank Naeymi-Rad. "RxNorm's Drug Interface Terminology Supports Interoperability." *Journal of AHIMA* 84, no. 2 (February 2013): 44-47.

[10] Ibid.

Reference

Abhyankar, Swapna, Dina Demner-Fushman, and Clement J. McDonald. “Standardizing clinical laboratory data for secondary use.” *Journal of Biomedical Informatics* 45, no. 4 (August 2012): 642-650.

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