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SNOMED CT-Enabling Systamatic Interoperablity Throught Clinical Terminology

Author

Theo Bosma

is Vice President of Global

Sales at Health Language,Inc., which services the

worldwide healthcare industry through innovative software

infrastructure technology and expertise.

For cited references, please contact office@hitm.eu

What is Semantic Interoperability?

Selvage, Wolfson, Zurek and Kahan (2006) tell us that semantic interoperability indicates that the meaning of data can be comprehended unambiguously by both humans and computer programs, and that the information can be processed in a meaningful way. Aguilar (2006) informs us that semantic interoperability defines the ability of information that is shared by systems to be understood at the level of formally defined domain concepts, so that the information can be processed by the receiving computerised systems. It is essential for the development of automatic computer processing for healthcare applications and decision support systems. Mead (2006) states that semantic interoperability guarantees that the meaning of a structure is unambiguously exchanged between humans. Documents such as progress notes, referrals, consults and others rely on the specificity of medical vocabularies and common practice to guarantee semantic interoperability at a clinician-to-clinician level.

So, why is semantic interoperability important? In today's world, global business is booming and, thus, sending people to live and work in multiple countries is becoming a common business practice.

These people are confronted, on a day-to-day basis, with different languages, cultures and healthcare practices. Suppose that Mr. Smith, who lives in the UK, is assigned to a project in Spain for two years. Mr. Smith's patient record is located on a computer somewhere in a hospital in the UK in the English language. Mr. Smith, who now lives in Spain, is involved in an accident and breaks his right leg. Mr. Smith is hurried to the nearest hospital. Today, the Spanish hospital would probably not be interoperable at any level with Mr. Smith's UK hospital. In other words, there is no possibility of retrieving Mr. Smith's patient history. Conversely, if these hospitals were interoperable in a semantic fashion, they would be able to retrieve Mr. Smith's patient history in Spanish with standard clinical terms. Mead _states that data is not semantically interoperable from a computational perspective unless all systems are informed of the semantics of the specific tag set before receiving the data. According to Mead, any set of locally defined XML tags, such as metadata, can be easily transmitted between machines and rendered in virtually any operating environment through the use of Web browsers, thus providing an apparent demonstration of semantic interoperability. However, if the tag set was initially locally defined, its semantics most likely will be either unknown or in conflict with other locally defined tags on a receiving machine. For Mead, semantics is meaning (versus syntax, which is structure). He illustrates the difference between the two concepts by setting forth the following sentences as an example: "The patient was given pain medication" vs. "The patient was given medication for pain." The two sentences obviously do not have the same syntax. Depending on your level of clinical experience, they may or may not have the same meaning. The example illustrates that syntax alone is often not a reliable determinant of semantics.

Currently, several countries are looking at SNOMED CT® (Systematized Nomenclature of Medical Clinical Terms) for a specific tag set as a foundation to semantic interoperability. Van Beek (2006) informs us that SNOMED CT® enables interoperability, i.e. it allows data to be exchanged between systems and to be interpreted automatically according the meaning of the encoded clinical data, regardless of the technology used. Without standardisation, custom interfaces and other workarounds become necessary. An even greater barrier occurs when the clinical information remains locked within textual statements that cannot be fully interpreted by a computer. This makes sharing, comparing, and retrieving patient or population-based data within and among different settings and information systems difficult at best and error prone at worst (Van Beek). In Mr. Smith's scenario, the SNOMED code for a broken leg is the same in both the English and Spanish versions of SNOMED. However, in the clinical information system, the clinician in the UK would see "broken leg" and the clinician in Spain would see "pierna rota."

The evolution of clinical information systems has progressed rapidly. The first stage was to convert from paper based information systems to computerised clinical information systems. Many major hospitals are taking that one step further with the implementation of next generation Electronic Health Records (EHRs).

On a broader scale, governments and organisations like the European Commission are evaluating clinical terminologies to yield semantic interoperability in a region, country or cluster of countries. In fact, the National Programme for IT in the UK stated that the use of SNOMED CT® would be a mandatory element of their interoperability efforts. To achieve that objective, Health Language, Inc. was asked to supply the tools and content to achieve the desired semantic integration with the clinical systems suppliers.

Schwend, President and CEO of Health Language, Inc., stated (2006) that the UK has established the most comprehensive healthcare IT (HIT) system under development. This system includes an integrated care record service, an electronic appointment system and an electronic prescription transmission service that will be accessible to all major healthcare providers by 2014. Schwend added that Australia, Canada, Germany, Norway and the UK all began their HIT with fragmented and incremental processes that lacked interoperability. They realised the need for a national standard and mandates to move forward. Governments are also now using public funds as incentives to encourage providers to rapidly deploy HIT. In the U.S., President Bush is trying to motivate the industry to move in the right direction, while several European countries have already received their marching orders.

It is now up to the hospital information systems suppliers to make their systems compatible with clinical terminologies like SNOMED CT® . One option for healthcare organizations in their goal to attain semantic interoperability functionality is to evaluate Health Language, Inc., the world's leading manufacturer and marketer of language engine technology, which is designed to automate the incorporation of controlled medical vocabulary and coding standards into healthcare IT applications.

The flagship product, Language Engine (LE), provides all of the terminology needed to practice, communicate, document, and analyse in the modern world of electronic healthcare. LE is a database of medical terms that functions beneath an existing electronic medical records system to integrate patient medical data on an enterprise-wide basis. It creates a "master-catalogue" of common terms for medical professionals and researchers throughout the healthcare industry. On the clinical side, LE helps to eliminate errors, confusion and ambiguity that arise in clinical documentation, as well as address risk management issues by bringing consistency to patient care. In today's world of national e-Health initiatives, there is an ongoing need for applications to access standardised vocabularies for administrative and specialty systems. LE's aligned data model allows one to logically incorporate all of the terminologies in an enterprise, while providing tools that facilitate mapping of proprietary, local content. Such custom modelling allows users to continue to use the terms and codes they prefer, while aligning the data captured to a reference standard. Given the disparate information systems utilised by healthcare providers, interoperability through standardisation is essential for any exchange of information.

In conclusion, standardised clinical terminology is the key component to ensuring interoperability in an Electronic Health Record (EHR) by reducing the variability in the way data is captured, encoded and used in patient care and medical research. At this time, we cannot yet close the door and throw away the key. There are still barriers that prevent widespread adoption of this critical technology that engenders systems interoperability and the sharing of data to facilitate effective communication within and across healthcare settings.

These barriers include:

+ Many healthcare facilities have limitations on which aspects of information they can electronically exchange within their facility or with other facilities.

+ There is a lack of electronic patient record information, which impedes the deliverance of quality patient care.

Nonetheless, we are making progress in many areas. An increasing number of governments, hospital information systems suppliers and hospitals have declared semantic interoperability as one of their strategic imperatives for 2007.

A growing number of countries are now also organising awareness programs around clinical terminologies and semantic interoperability. Hospital universities are inviting subject matter experts to share their knowledge and experience so that future clinicians are not new to the subject when they begin their work in the field. These combined efforts will result in the realisation of improved patient care on a global basis.

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