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HL7 Standards for Computerized Clinical Data in Healthcare Information Systems

Engineering

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ABSTRACT

Use of an electronic health record (EHR) will help us to realize the full potential of modern medical care. To optimize the functionality of a "virtual" record, universal informatics standards are needed. This paper explains about the universal standards for coded medical terminologies and common representation of clinical data which allows patient information to be transmitted clearly and unambiguously between different computers and different software applications in a secure form which is easily searched, interpreted, and manipulated and thus most useful.

I. INTRODUCTION

As practicing clinicians in the 21st century, we have become used to change. Just a few years ago, many of us discovered the value of applying to our practice the concepts and terminology taught in business school: "seamless," "Total Quality Management," and "transparent." Now we find ourselves confronted with a set of unfamiliar terms from a new branch of medicine, medical informatics a field created to study and advances the science of efficiently recording and retrieving medical information.

An increasingly familiar creation of medical informatics is the electronic health record (EHR) containing medical data, i.e., information from patient charts, laboratory reports, and radiology reports. To ensure optimal functionality of this electronic record, it must be unambiguous, universally available, transmissible, exchangeable with other EHRs, searchable and researchable, manipulable, secure, and must conform to governmental requirements set forth in regulations. These features can be achieved by development and implementation of universal standards for medical informatics. A new vocabulary of acronyms has been developed to represent medical informatics standards in an abbreviated form. This paper briefly explains some of the most important medical informatics terms and concepts in the context of clinical practice (Table 1).

II. EHR AND MEDICAL INFORMATICS STANDARDS

We are rapidly progressing beyond handwritten medical information—and even beyond medical reports typed from dictation. Medical information such as medical records, laboratory results, and radiology reports is increasingly being generated and stored on computers—and this trend can be expected to continue. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) is federal legislation which requires formation and acceptance of standards for clinical terminology used in each EHR to impose order and uniformity in health information as well as to assure adequate security and confidentiality of this information. Standards for electronic records can be expected to incorporate logical systems such as these. Soon, the EHR will be simultaneously created and computerized. Records will be directly input via keyboard devices; structured data entry will be automated by use of templates; and manual input will be by passed through use of optical character recognition scanning, automatic voice recognition, direct transmission from laboratory machines, and other means.

A. Health Level 7 (HL7)

Accredited by the American National Standards Institute (ANSI), Health Level Seven (HL7) is an organization whose mission is to develop standards (not software) for unambiguous transmission of clinical and administrative health care information between computers **[1].** According to the organization's mission statement, HL7 works "to provide standards for the exchange, management, and integration of data that support clinical patient care and the management, delivery, and evaluation of health care services. Specifically, to create flexible, cost-effective approaches, standards, guidelines, methodologies, and related services for interoperability between health care information systems."

III. TOOLS FOR STANDARDIZING ELECTRONIC MEDICAL DATA

A. The Reference Information Model (RIM)

The most widely used standard being developed by HL7 is a messaging standard that enables disparate software applications to exchange clinical and administrative health care data. While interpreting medical communications as multiple discrete messages, HL7 will assign varied types of data (e.g., laboratory test results) to predefined locations to show clearly the type of information intended by the user. HL7 will also define relations between data; thus, a given laboratory value can remain correctly linked with a specific patient. HL7 has recognized that designing a complete and usable standard requires regulated criteria for establishing vocabulary and for transmitting data.

As part of its development process, HL7 has created an object model the HL7 Reference Information Model (RIM) to represent clinical data pictorially and to identify the life cycle of events carried by a message or by groups of related messages. The RIM thus is used to create a messaging standard. Stated simply, the RIM defines fields (blank areas) that are designed to contain standardized vocabularies meeting certain requirements.

The RIM encompasses the entire domain of health care services, including laboratory and pharmacy services as well as patient admission, discharge, and transfer to and from health care facilities. The RIM has been applied most widely to laboratory data allowing information to be clearly and precisely located so that each laboratory result is clearly associated with a specific laboratory test and with a specific patient: For example, a practitioner must be certain that the potentially ambiguous phrase "patient X's potassium" designates a laboratory result and not a prescription and that it refers to the laboratory value of patient X and not someone else's. HL7 has expanded the RIM to allow unambiguous transmission of more types of information within messages and clinical documents.

Acronym	Expansion	Definition
ANSI	American National Standard Institute	
CDA	Clinical Document Architecture	A standardized representation of clinical

Acronym	Expansion	Definition
		documents (e.g. physical examination,
		progress notes)
EHR/ EMR	Electronic Health/ Medical Record	Medical record stored in electronic form
HIPPA	Health Insurance Portability and	Federal regulations
	Accountability Act	
HL7	Health Level 7	An ANSI-accreted standards
		organization that develop methods for
		electronically transmitting medical data
LOINC	Logical Observation Identifier Names	A standardized set of codes for
	and Codes	representing laboratory result terms
RIM	Reference Informational Model	A clinical data object model produced
		by HL7
SNOMED	Systemized Nomenclature of Medicine	A standardized, logically interrelated
		medical vocabulary
W3C	World Wide Web Consortium	The standards organization that
		developed XML
XML	Extensible Markup Language	A standardized syntax used to tag
		information for transmission over the
		internet

Table.1: Glossary of computer science terms relevant to medical informatics

B. The Clinical Document Architecture (CDA)

The expanded capability of the RIM includes use of the Clinical Document Architecture (CDA), a model for exchanging clinical documents (i.e., medical records). Derived from the RIM, the CDA converts documents into a format which can be read by machines (i.e., for electronic processing) as well as by humans. The CDA standards being developed by HL7 can be used to represent clinical documents such as progress notes, discharge summaries, and results of physical examinations **[2]**. It is hoped that computerized medical records (i.e., the EHR) will be designed to use the CDA standard. The CDA organizing framework can be used to ensure clear, unambiguous representation of all patient information which is input into a computer and displayed via any software (i.e., an EHR developed by the same or a different vendor) adhering to the same standard (i.e., HL7's CDA). Thus, by following the HL7 CDA, any programmer will be able to design an EHR which can be transmitted over computer networks such as the Internet and which can be automatically integrated into any other EHR written to the HL7 CDA standard.

IV. XML: A TOOL FOR ENHANCING DATA TRANSMISSION OVER THE INTERNET

To be widely available, information must use syntax, or rules governing construction of a machine language, which allows transmission over the Internet. The World Wide Web Consortium (W3C) created XML (Extensible Markup Language) a data representation standard (or open-standard meta structural computer language) which allows information transmitted over the Internet to be clearly interpreted by the receiver of that information **[3]**. XML is also a proper, easier-to-use subset of the Standard Generalized Markup Language (SGML), which is used to create Hypertext Markup Language (HTML) the programming code used to encode material for visual presentation as Web pages. ("Surfing the Web" thus involves transparent interaction with SGML.) A standardized syntax like XML enables transmission of HL7 information over the Internet. Computer Meta structures such as XML extend the capabilities of computer languages, enhance representation of structured messages, and improve syntactic interoperability **[4]**. Meta structures embed data "tags" (field names) into the data so that they are hidden from the clinician. These tags automatically instruct the computer where and in what format to place the data to be received by the person using the information (e.g., laboratory test results or radiology reports). These meta structure tags enable Web browser software to display information clearly and unambiguously (e.g., as text headings) (Figure 1).

VII. CONCLUSION

Our goal is for each patient to have an EHR which can be used across computer platforms. The combination of clear definitions and interrelations of medical terms (as in LOINC and SNOMED **[5, 6]**) used to populate an HL7 standardized "message" or document using standardized syntax (e.g., XML) will allow medical information to be transmitted to and retrieved from any telecommunication system connected to the World Wide Web. In turn, this achievement could enable a clinician to retrieve any patient's medical chart, laboratory and radiology reports, and other necessary information anywhere, anytime, given proper security--if, that is, we can all agree on and use these same standards. Information represented in this format will allow manipulation of data to facilitate advanced functions, including record searches, patient-specific guidelines, outcomes research, or other functions. Clinicians along with a wealth of clinical data that promises to have great impact on our ability to enhance patient care.

REFERENCE

[1] "Health Level Seven", Available on the World Wide Web (accessed May 5, 2000): www.hl7.org/ | | [2] Dolin RH, Mattison JE, Alschuler L, et al. "The HL7 Clinical Document Architecture", J Am Med Inform Assoc 2001 Nov-Dec; 8(6):552-69. | [3] "W3C", World Wide Web Consortium. About the World Wide Web Consortium. Available on the World Wide Web (accessed Oct 11, 2000): www.w3.org/Consortium/. | | [4] Walsh N. "A technical introduction to XML", Available on the World Wide Web (accessed Oct 18, 2000) | www.isgmlug.org/n4-2-49.htm. | | [4] Lukoff JY, Dolin RH, McKinley CS, Fuller LM, | "Validation of an XML-based process to automatically | Web-enable clinical practice guidelines", Proc AMIA | Symp 1999:311-4. | | [5] "Logical Observation Identifier Names and Codes. (LOINC)", Available on the World Wide Web www.mcis.duke.edu/standards | | [6] Spackman K, Campbell K, Côté R. "SNOMED RT: a reference terminology for health Care", Proc AMIA Symp 1997:640-4. |