

Expressing Health Care Objects in XML

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1. Introduction

Information about patients is critical for delivery of high quality service, but this information currently exists in representations that make access difficult or impossible. A single point of care, such as a hospital or clinic, may draw patient information from distributed heterogeneous sources such as: laboratories, scheduling and billing systems, imaging archives, and many sources of paper records including records of care from other sites and organizations.

The patient medical record has been entirely focused on being in a form that is human readable and has ignored the requirements for machine processing. Health care information transaction standards, such as HL7 (Health Level 7) and EDI X12 (Electronic Data Interchange), have been almost entirely focused on machine interaction and have ignored the paper-based medical record. We need to reach a middle ground. Documents need to be in a form in which humans are able to locate, read and analyze and one in which machines are able to process. XML, combined with distributed object technologies has the potential to reach this middle ground; however, there are some challenges. These challenges relate to the state of clinical information in health care today.

2. Background: Clinical Information

Information concerning an individual patient is a composite. It is generated from a variety of sources. It is maintained by many different applications and it is created in different media formats. The systems that create and maintain the information are often legacy systems, which were designed to manage the financial and material resources of healthcare organizations, not clinical information relevant to the patient

care process. In the service of bringing patient information onto the computer, much work has been done to categorize, schematize, correlate, and standardize this information. Despite the real benefit derived from these efforts, a single, standard for representation of all clinical information (such as a single object model) currently remains beyond the realistic scope of any single system of definitions.

2.1 Standards

A dimension of clinical information includes the use of standards. HL7 (Health Level 7), ASTM (American Society for Testing and Materials) Committee E31 on Health Care Informatics, and CEN (Comite Europeen de Normalisation) have developed object models for healthcare settings. However, despite these standardization efforts, a single comprehensive object model for health care does not exist.

Standards that describe the structure of the information or the syntax of the information include HL7, X12, ASN.1, and ASTM.

Standards for the distribution of healthcare information through well-defined interfaces include efforts by the Object management Group's Domain Task Force, CORBAmed, CEN and HL7.

3. XML Efforts in Health Care

The use of XML and/or SGML for healthcare has only recently begun. XML efforts to date may be categorized into the following areas: frameworks, services, and electronic documents.

3.1 Frameworks

Frameworks are standardized definitions for the XML syntax of communication between two trading partners. Frameworks for information exchange include efforts by HL7 and XML-EDI. The framework category includes using XML as the syntax for messages, transactions, and SGML/XML architectures to request and send healthcare information. The messages within a framework may be derived from an object model, but most, until recently have not been. The major focus of framework activities has been expressing current message syntax in XML.

3.2 Services

Services for healthcare information are object models from which the interfaces and interface definitions are derived. Services specify a mechanism to find request, send, filter, and query distributed healthcare information that may be represented in XML. Efforts include standardization efforts by CEN, HL7, and CORBAmed.

3.3 Electronic Documents

Electronic documents in health care may be generated by many sources such as transcription, scanned from paper, created by and structured reporting software systems. Document types found in health care include paper-based forms and documents, which include regulatory forms. Deriving such an electronic representation for the paper-based documents in healthcare requires developing standard formats for different document types (DTDs or Document Type Definitions) and accompanying stylesheets.

An electronic representation of the medical record includes some type of patient record repository. Once an XML document is submitted to a remote patient record repository, access to the document and its components can be performed through patient record repository services.

A standard set of document types for health care does not exist nor does a commonly defined service for accessing the XML documents. The ASTM E31.25 committee is developing a standard set of DTDs for healthcare documents. A remaining challenge is the development of a service to locate, access and store these

documents. Some aspects of this service have been addressed by the recommendations of CORBAmed for clinical observations and for transcription.

3.4 Challenges

It is the intersection of XML activities that are creating the challenges in healthcare. Efforts in the framework category are creating transactions or messages that are encoded in XML. Efforts in the service category are concerned with the location, transfer, exchange and access capabilities of XML content as well as deriving interfaces or interface definition language specification for particular services. Electronic document activities are focused on representing paper-based information in an electronic form.

4.0 Conclusion

In healthcare, important or meaningful data can be easily identified by XML markup or tags and stored as electronic documents. Electronic documents map nicely to current paper-based documents found in a patient medical record.

But XML alone is not enough. Electronic documents need a standard structural representation of the content so that questions of the information can be asked, and answers easily found. For example, a mechanism for asking "What was the diagnosis?" or "How many physical exams were performed?" is needed. In order to locate and answer the questions, some type of marshalling technology such as distributed object technology is needed. The service would provide the needed interface to the XML documents.