# HL7 Overview

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*by John Quinn*

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As one of the co-developers of Health Level Seven (HL7), I am very close to the issue. So in describing it, I'm going to start with the basics, beginning with the current definition that has evolved over HL7's brief existence:

"The Health Level Seven (HL7) Standard, an ANSI approved American National Standard for electronic data exchange in healthcare, enables disparate computer applications to exchange key sets of clinical and administrative information. Comprised of standard formats, which specify the implementation of interfaces between different computer applications, HL7's protocols provide the flexibility needed to allow compatibility for specialized data sets that have facility-specific needs. Developed by HL7 members and designed to be applicable in numerous settings, HL7 ultimately saves time, money, and work for its users."[1]

We use the name Health Level Seven to describe what we do. First of all, we are a standards organization that works exclusively in the healthcare industry. Second, "Level Seven" indicates that we work at the seventh (or highest) level of the International Standards Organization open systems communication model. The seventh level is concerned with things like security checks, participant identification, availability checks, exchange mechanism negotiations, and, most important, data exchange structuring.

## A Little History

HL7 was created by a group of individuals united in their desire to simplify the implementation of message-based data interfaces between healthcare information systems, which in turn makes it less expensive. Information systems (IS) in the healthcare industry are dominated by some basic facts of life:

- As IS professionals, we seldom develop our own information systems solutions. This becomes common sense when looking at the healthcare market and economics of developing and maintaining information systems. Most healthcare providers and many payers use "packaged solutions" from vendors who specialize in one or more particular functional area of the healthcare spectrum of services and needs (e.g., scheduling, registration, pharmacy, microbiology, blood chemistry)

- No one vendor of these packaged solutions seems to dominate the others when it comes to providing what buyers see as the best solution to each functional area

- Buyers within a provider environment are not typically centralized (e.g., the lab department buys -- or at least selects -- the various lab automation applications). Yet some organization (usually the IS department) must be responsible for the integration of the purchased packaged solutions and, in most cases, operate them

Regardless of these organizational facts, there remains a need to integrate these systems. It is not reasonable to expect staff to manually enter patient demographic and insurance information into each individual information system within the healthcare facility. Any institution -- from a large academic medical center containing hundreds of information systems to a small physician's office -- needs integrated business and clinical systems in order to provide accurate and efficient services at a reasonable cost. If there must be multiple, individual systems, they must be integrated. HL7 establishes guidelines on the standard way for systems to communicate in this integrated environment.

Traditionally, HL7 has focused on the back end of healthcare information systems (e.g., the exchange of messages between systems). At this time, the standard addresses a number of functional areas with messaging standards. Recently HL7 has also started to address the middle (e.g., software components) and front end (e.g., visual integration) of healthcare applications.

## What Does HL7 Cover?

The current version of the HL7 standard is version 2.3.1.2 It covers messages that exchange information in the general areas of:

- patient demographics
- patient insurance and guarantor
- encounters including registration, admission, discharge, and transfer
- patient charges and accounting
- orders for clinical services (tests, procedures, pharmacy, dietary, and supplies)
- clinical observations
- observation reporting, including test results
- the synchronization of master files between systems
- medical records document management
- scheduling of patient appointments and resources
- patient referrals -- specifically messages for primary care referral
- patient care and problem-oriented records

All of these areas have an HL7 technical committee associated with it, each of which is responsible for authoring and updating its designated area -- reflected in the standard. In addition, a technical committee exists to support activities in the following areas:

- architectural review board
- Arden syntax
- data warehousing
- education
- implementation
- modeling and methodology
- vocabulary

HL7 also has a number of special interest groups (SIGs). These are created by groups of individuals interested in working with the technical committees to advance typically new areas in HL7. If it is determined that a special interest area needs to become a functional part of the HL7 standard, an SIG may transform into a technical committee. SIGs currently exist in the following areas:

- accountability, quality, and performance
- automated data
- blood bank
- claims attachments
- conformance
- government projects
- home health/long term care
- image management
- laboratory automation
- MPI mediation
- object brokering technologies
- secure transactions
- SGML/XML
- visual integration

Finally, HL7 has informative documents that are not a part of the standard but have been voted on by the HL7 membership. The most significant of these are the HL7 Implementation Guide, the HL7 version 3 Statement of Principles, and the HL7 Message Development Framework (methodology for development of HL7 V3.0).

## What's New

HL7 meets three times a year, during which new initiatives are brought forward. Some of these initiatives become SIGs, which may subsequently lead to it becoming a technical committee. HL7 members keep up-to-date with these initiatives through postings on the "members-only" section of the HL7 Web site. There are always a number of new initiatives in progress. Following are four current issues:

## Version 3.0

HL7 version 2.x has been developed over a number of years and has evolved using a bottom-up approach -- addressing individual needs through an evolving ad hoc methodology. This has resulted in the lack of a consistent view of the data that HL7 moves, as well as that data's relationship to other data. As a result, Version 2.x is inconsistent at times in its description and use of data and duplicative in its definition of data as well (e.g., the same data element may be defined in a different way in two different chapters of the standard). Also, as it stands now, HL7 contains many optional data elements and data segments. While this optionality provides great flexibility, it also makes it impossible to maintain reliable conformance testing of any vendor's implementation. It also requires more time for those that implement systems to analyze and plan their interfaces to ensure that both parties using the systems have the same optional features.

To address these and other issues, HL7 embarked on an effort to create a new version -- version 3.0 -- that used a defined methodology based on a reference information model (e.g., data). Version 3.0 will be the most definitive standard to date. Using rigorous analytic and message-building techniques and incorporating more trigger events and message formats with, hopefully, very little optionality. HL7's primary goal for version 3.0 is to offer a standard that is definite, testable, and will enable users to certify that vendors conform to the standard.

Version 3.0 will use an object-oriented development methodology and a reference information model (RIM) to create messages. The RIM is an essential part of the HL7 version 3.0 development methodology, as it provides an explicit representation of the semantic and lexical connections that exist between the information carried in the fields of HL7 messages.

A draft RIM, incorporating 126 classes and about 800 attributes, was completed in 1997. It is currently being analyzed and confirmed by the HL7 technical committees, each of which is responsible for the appropriate subsets of the draft RIM based upon the domain of its message development. The HL7 Modeling and Methodology (M&M) Technical Committee oversees this process.

### SGML/XML

The SGML/XML SIG's work focuses on creating a representation of the HL7 standard in an electronic format (Structured General Markup Language). The eXtensible Markup Language (XML) is a subset of SGML and has been the focus of a development effort to encode documents that can be displayed through an advanced Web browser and contains valid HL7 version 3 messages. A demonstration of this showed a number of systems interacting through the use of HL7 V3.0 (prototype) encoded as XML documents. This approach gives HL7 the opportunity to transport information while also maintaining the display integrity of an original document. The XML based message could be displayed using standard XML tools and, at the same time, be parsed as an HL7 message using standard XML parsers (i.e., a piece of software that decomposes an XML document and identifies the elements that must be placed into the user's application database by name) and committed to the database.

### Claims Attachments

The Claims Attachments SIG works with the X12 Standards Organization and the Health Care Financing Administration to produce a working standard and an implementation guide for healthcare claims attachments. This is necessary to meet the requirements of the Health Insurance Portability and Accountability Act (HIPAA). This implementation guide, together with the X12 275 implementation guide, specifies how to include claims attachment information in HL7 unsolicited observational report messages (ORU) that are imbedded in X12 transactions. A draft of the guide was passed by HL7 members, and it is expected that this approach will be cited in a federal notice of proposed rulemaking as the means of satisfying the HIPAA requirement for an electronic claims attachment standard.

### Visual Integration

The Visual Integration SIG developed from the Clinical Context Object Workgroup (CCOW), formerly a stand-alone organization. This SIG focuses on the collaboration among visual (GUI-based) applications at a clinical workstation. It works to use software component technologies to reduce the reengineering costs in order to more quickly bring its benefits to the industry. Previous HL7 efforts (e.g., version 2.3.x) focus on back-end application integration, or on the data itself. This group, however, publishes standards for the visual integration of cooperative interaction among independently authored healthcare applications at the point of use. CCOW recently joined HL7 as the SIG on Visual Integration with the intent of revising its standard and publishing it as an HL7 standard. Plans are to turn it into a technical committee.

## Summary

HL7 is an organization with a short history and more activity now than ever before. Opportunities abound within HL7 to assist in the development of the automation of healthcare and the deployment of information systems that create and support the electronic medical record. Finally, the continual advances in information systems technology enable HL7 to do more to meet the healthcare industry's needs.

## Notes

1. HL7 Web site. Available at http://www.hl7.org.

2. Version 2.3.1 can be found at the HL7 Web site.

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