



## A Look at LOINC: The Established Standard for Lab Data Gains Visibility as Data Exchange Increases

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*Advanced health data exchange requires that organizations agree on how to transmit and label the data they share. Organizations need standards for transmitting messages, and then they need standards for identifying the data inside them.*

*One set of content standards is well ahead of the pack in its development and adoption—LOINC, used for the exchange of laboratory tests and clinical observations. As data sharing increases through health information exchange initiatives and adoption of electronic health records, LOINC will become a more familiar acronym. And given its maturity, its use may be expanded and adapted to other settings.*

Data messaging standards support the electronic health record (EHR) by defining how organizations should identify the messages they exchange. Communication interfaces for Health Level Seven (HL7) standards have been adopted in many systems to send lab results and diagnostic service results to their care systems, for example. Messaging standards do not govern the content of the messages, however. An organization receiving a message still must translate the contents from the sender's individual code.

In the case of laboratories and other diagnostic care services, most identify tests by their internal and idiosyncratic code values. Care systems receiving these messages cannot fully "understand" and automatically process the patient results unless they adopt the senders' laboratory codes or invest in the work to map each sender's codes to their own internal coding systems. This task becomes even more complicated when results are received from multiple laboratories and other diagnostic care services, each with their own content codes.

### Universal Identifiers for Message Content

In the case of laboratories and other diagnostic care services, however, a set of content standards has gained wide acceptance. LOINC (Logical Observation Identifiers Names and Codes) codes are universal identifiers for laboratory and other clinical observations. LOINC is a standardized set of names and codes for laboratory tests and clinical observations that was first developed in the mid-1990s by laboratorians and informaticists at the Regenstrief Institute for Health Care.

The LOINC database was originally developed to provide universal identifiers for observations in HL7 messages. LOINC codes identify clinical or lab observations and can be used to transmit content and merge clinical content from many sources into a common database that can be used for patient care, clinical research, or management. The scope of the current LOINC database includes both laboratory and clinical terms.

LOINC follows good coding system practices. For example, LOINC codes carry no embedded meaning and are never reused or deleted. The Regenstrief Institute maintains the LOINC database and its supporting documentation. The database comes with a mapping program called Regenstrief LOINC Mapping Assistant, which assists in mapping local test codes to LOINC codes and facilitates browsing the LOINC codes. Both the codes and the mapping program are available at no cost from the Regenstrief Institute at [www.regenstrief.org/loinc](http://www.regenstrief.org/loinc).

### A Sample LOINC Laboratory Use Case

- A lab order for a serum potassium is entered into an EHR system by a clinician.
- The test is ordered as a serum potassium and is translated to LOINC code 2697-1, the code for the method used in the laboratory performing the test.
- The EHR system generates a paper or electronic order that is sent to the lab (a commercial, hospital, or office lab). Information such as the patient identifier and test identifier is included. The LOINC code is added to pending orders on the patient record.
- The information from the order is transmitted to the laboratory information system (LIS).
- The LIS generates labels for ordered tests. The information regarding the specimen to draw and how to collect is associated with the LOINC code within the LIS.
- The specimen is collected or delivered to the lab.

- The lab performs the ordered tests.
- The status or results of the ordered tests are electronically sent to the EHR system that generated the order using LOINC code 2697-1, followed by the numerical result. The electronic message may be in a format similar to the following:  
OBX|3|ST|2697-1^POTASSIUM^LN^3.6^MG/DL|2006/04/14 09:06.24

## Who Uses LOINC?

The LOINC standard has been endorsed by the American Clinical Laboratory Association and the College of American Pathologists. It is already included as an alternate code set for lab tests by a number of the larger clinical labs including Quest, LabCorp, Mayo Medical Laboratories, and MDS Labs. Large HMOs, including Kaiser Permanente and Aetna, are using LOINC codes for reporting laboratory results, as are governmental organizations including the Centers for Disease Control and Prevention, the Department of Defense, and the Veterans Administration, where it is an approved standard in the Consolidated Health Informatics initiative. The National Library of Medicine supports the ongoing development of LOINC, and the standard is represented in the library's Unified Medical Language System Metathesaurus.

Health and Human Services secretary Mike Leavitt proposed LOINC as a new code set for certain HIPAA attachments. LOINC codes would be used to specifically identify additional information being requested and the coded answers that respond to the requests.

The National Committee for Quality Assurance supports the use of LOINC codes for some measures in the 2005 edition of its Health Plan Employer Data and Information Set. Laboratory instrument vendors are being encouraged to deliver LOINC codes embedded within the instrument result outputs. Internationally, Mexico, China, Germany, New Zealand, Switzerland, Canada, and Australia are actively coding their laboratory tests and results to LOINC codes.

## ELINCS for Smoothing the EHR Connection

LOINC and the HL7 version 2.4 messaging standard form the basis for a messaging specification to standardize the electronic reporting of test results from clinical laboratories to EHR systems. The EHR-Laboratory Interoperability and Connectivity Specification (ELINCS) is intended to provide a precise and generally applicable lab-reporting specification that can be adopted as an industry standard, thereby eliminating the need for every clinical lab and EHR system to redesign its interface each time a lab-to-EHR interface is implemented.

Numerous labs and health IT vendors are currently evaluating these specifications. One ELINCS goal is the delivery of real-time lab results from a lab's information system to an EHR. Work on ELINCS will be coordinated closely with national and international efforts to ensure widespread adoption.

Groups included in the effort are the Certification Commission for Healthcare Information Technology, Connecting for Health, eHealth Initiative, the Centers for Medicare and Medicaid Services DOQ-IT program, Integrating the Healthcare Enterprise, Public Health Information Network, and HL7. Five California healthcare organizations have been awarded grants and are testing ELINCS in clinical settings. They are expected to fully implement the specifications and have real-time delivery of lab results this year.

The code for the single LOINC record should be used in the observation identifier field (OBX-3) of a HL7 message. An example of an order for LDL cholesterol using ELINCS specifications is shown below. The LOINC code for LDL cholesterol is followed by the LOINC name for that code, followed by LN, representing LOINC:

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2089-1^LDL Cholesterol^LN
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## LOINC beyond the Lab

LOINC is also being used beyond the typical hospital or reference lab. The clinical LOINC division is concerned with nonlaboratory diagnostic studies, critical care, and nursing measures, as well as the history, physical, and survey instruments.

Veterinary medicine's National Animal Health Laboratory Network uses HL7 messaging with LOINC codes as test identifiers; SNOMED is used for species, anatomy, and pathogen identifiers. The American Nurses Association recognizes LOINC as an additional terminology. LOINC codes are available for discharge summaries, EKGs, obstetrical ultrasounds, radiology test names, as well as many other clinical studies.

Some tumor registries use LOINC coding, and the Centers for Disease Control and Prevention is expanding its use of LOINC and HL7 for the reporting of communicable

diseases. HIPAA attachments use LOINC codes to identify the individual observations within the attachment.

Clinical LOINC codes also are used for several purposes within ambulance service attachments. This is an attempt to standardize ambulance visits for reimbursement purposes. Sample codes are shown in the table opposite.

Clinical LOINC is used to identify the attachment or attachment components being requested to support a claim or encounters in the X12N 277 transaction set. It is also used to identify the attachment, the attachment components, and their answer parts in the HL7 CDA document. This is returned in the X12N 275 transaction set. LOINC modifier codes may be used in the 277 transaction to further define the specificity of a request.

Widespread adoption of a universal coding system for tests such as LOINC will ensure that receiving systems can recognize and process all results that flow to them using electronic messaging standards. Messages with standardized data content can be stored efficiently in the health record or repository system and lead to the development of clinical repositories and research databases for physician offices, hospitals, HMOs, and public health laboratories.

Organizations can realize major benefits through pooling and analysis of results without manual labor. For these reasons, laboratories should adopt LOINC codes internally and include them in their outgoing HL7 reports. Reference labs and instrument vendors can provide LOINC codes with their results and test kits to assist their customers in this endeavor. This interoperability is vital in meeting the growing need to connect organizations, provide clinical decision support, and help ensure compliance with legal disease-reporting requirements.

### Sample Clinical LOINC Codes

The following are examples of clinical LOINC codes that may be used as components for the ambulance service attachment:

LOINC Code	Name
18584-3	EMS Transport, Body weight at transport (composite)
15510-1	EMS Transport, Distance transported
15513-5	EMS Transport, Reason for scheduled trip (composite)

### References

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