Consolidated Health Informatics

Standards Adoption Report:
LABORATORY RESULTS NAMES

Index

Summary

Domain: Laboratory Results Names

Standards Adoption Recommendation: LOINC® (Logical Observation Identifier Names and Codes)

SCOPE
Lab test ordering and lab test result values are **not** included in this domain. The Interventions and Procedures Workgroup will address lab test orders and the Lab Contents Results Workgroup will address results contents.

RECOMMENDATION
Presently LOINC is the most complete, flexible and available terminology of laboratory test result names. CHI notes the wide acceptance of Laboratory LOINC® in both the public and private sector. The recommendation is accompanied by the need to make improvements in structure of Laboratory LOINC to make it more useful, less ambiguous and more robust. CHI recommends continued federal funding to support this goal. The developers of Laboratory LOINC are already working to meet this requirement. CHI also notes that the recommendation of Laboratory LOINC® is specific for that section of the LOINC code set.

OWNERSHIP
The Regenstrief Institute, Inc. owns LOINC®, herein referred to as LOINC.

APPROVALS AND ACCREDITATIONS
Approved by full standard development organization vote by HL7 v2.4 as a coding system for observation identifiers.

ACQUISITION AND COST
The LOINC database and associated documents and programs are copyrighted, but the copyright permits all commercial and non-commercial uses in perpetuity at no cost. If the LOINC database or its contents are distributed as a database, such distributions must include all of the parts of the formal LOINC term, the LOINC short name, the LOINC code, the deprecated flag, and the copyright. No such notice is required when LOINC codes are used in messages to report test results. The LOINC database can be obtained at no cost from the Regenstrief LOINC website (http://www.regenstrief.org/loinc). The website makes available a User's Guide, the free RELMA (Regenstrief Logical Mapping Assistant) program, and the RELMA User's Manual. RELMA is a program for browsing the LOINC database for mapping local test codes to LOINC codes.

Part I – Team & Domain Scope Identification

Target Vocabulary Domain

Common name used to describe the clinical/medical domain or messaging standard requirement that has been examined. Laboratory

Describe the specific purpose/primary use of this standard in the federal health care sector (100 words or less) Standard for lab result names

Sub-domains *Identify/dissect the domain into sub-domains, if any. For each, indicate if standards recommendations are or are not included in the scope of this recommendation.*

Domain/Sub-domain	In-Scope (Y/N)
Lab test result name	Y
Lab test ordering	N
Lab test result value	N

Information Exchange Requirements (IERs) *Using the table at appendix A, list the IERs involved when using this vocabulary.*

None Identified

Team Members *Team members' names and agency.*

Name	Agency/Department
Steven Brown	VA
Gregory Craigmiles	DoD
Jorge Ferrer	HHS/CMS
Jason Goldwater	HHS/CMS
Michael Lincoln	VA
Steven Steindel	HHS/CDC

Work Period *Dates work began/ended.*

Start	End
May 2002	January 2003

Part II – Standards Adoption Recommendation

Recommendation *Identify the solution recommended.*

LOINC

Ownership Structure *Describe who "owns" the standard, how it is managed and controlled.*

The Regenstrief Institute LOINC Committee divides the LOINC development into three divisions, the first of these is laboratory LOINC. The clinical LOINC division is concerned with non-laboratory diagnostic studies, critical care, and nursing measures, as well as the history, physical, and survey instruments. The clinical LOINC division includes a number of new projects for defining clinical notes, report titles, and dental observations.

Summary Basis for Recommendation *Summarize the team's basis for making the recommendation (300 words or less).*

Presently LOINC is the most complete, flexible and available terminology of laboratory test result names. The laboratory terminology working group recommends LOINC for endorsement by the CHI council with gaps to be addressed. The issues focus on ongoing improvement of LOINC is several critical areas. This recommendation is based on analysis of LOINC's current extent of deployment, LOINC's ability to promote interoperability, agency specific needs for LOINC, and a gap analysis of LOINC's features with agency needs. Regenstrief Institute has shown a willingness to make LOINC more usable. The federal government should continue and increase support for the Regenstrief Institute to continuously improve LOINC in order to achieve the long-term needs of federal information system interoperability.

Conditional Recommendation *If this is a conditional recommendation, describe conditions upon which the recommendation is predicated.*

Address gaps 1-3 discussed in detail below

1. Consistent and widespread appearance of XXX codes in LOINC would ease introduction.
2. Introduction of a hierarchy to LOINC would allow for standard aggregation of terms across the healthcare system, ease in identifying needed terms, and identification of terms to assign within an institution.

3. Improvements are needed in content coverage, definitions, and unrecognized synonymy.

Approvals & Accreditations

Indicate the status of various accreditations and approvals:

Approvals & Accreditations	Yes/Approved	Applied	Not Approved
Full SDO Ballot	Yes, as part of HL7 v2.4 as a coding system for observation identifiers		
ANSI			

Options Considered *Inventory solution options considered*

Other options for lab result name terminology

Euclides/Open Labs

EUCLIDES, an acronym derived from European Clinical Data Exchange, is a data standard for clinical laboratory data exchange between independent and heterogeneous medical information systems. EUCLIDES, now known as the Open Labs Coding System, is supported by the Commission of the European Communities (CEC DGXIII) within the framework of the Advanced Informatics in Medicine (AIM) Program. EUCLIDES/Open Labs is a multiaxial coding system that ensures semantic unambiguity and facilitates the transfer of data to and from multiple systems.

All OpenLabs modules that provide a service as well as an interface to existing legacy systems and instruments used this laboratory standard. EUCLIDES/OpenLabs was used in a project aimed to standardize clinical laboratory data exchange between hospitals and general practitioners. A prototype was developed, converting ASTM 1238 requests and reports into EUCLIDES requests and reports using the new coding system, the new syntax and an implementation of the International standard X400 for the transport of the information.

Current documentation indicates that the new OpenLabs Coding System provides a mapping tool to link the new standards with local or older coding methods. It is unknown if any progress has been made to map between common European formats, such as CEN TC251 and OpenLabs. LOINC has the advantage that codes can be downloaded from its web site along with a mapping tool that bridges the new clinical data set with local codes as well as message formats, such as HL-7. Additionally, LOINC also maps to the UMLS, as well as SNOMED RT and CT, underlying its significance. There has been no evidence provided that EUCLIDES/OpenLabs can be linked to these data formats. It is unknown whether the EUCLIDES/OpenLabs standard can fit into an OBX segment within HL-7, DICOM and/or CEN TC251. While the conversion of ATSM into a common nomenclature provides some advantages, the message format used in public health systems within the U.S. would not fit within the EUCLIDES design.

Finally, EUCLIDES/OpenLabs does not have the widespread deployment that LOINC does. In 1991, a joint venture company of Belgacom and Alcatel decided to build telematics services around EUCLIDES. Deployment of this new technology within the Belgian Healthcare sector was limited.

CPT

The CPT coding system, although used extensively for payment purposes, does not provide the level of detail required to fully specify the name of a test result or clinical observation. For example, CPT codes are exchanged for laboratory analytes without

specifying the specimen source, kind of property of observation or measurement, time aspect of the measurement, the scale used, or methodology (where relevant). A fully specified laboratory observation must contain these attributes in order to correctly interpret the test result. The CPT coding system also provides a limited listing of laboratory analytes and requires extensive use of "unlisted procedure" codes. Although this may be appropriate for assigning charges for billing purposes, it cannot be employed to specify or communicate laboratory results between submitting and receiving facilities or their automated information systems.

SNOMED - The Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) is a product of the College of American Pathologists. It is designed to "capture information about a patient's history, illnesses, treatment and outcomes" (source: www.snomed.org). SNOMED is not designed to name laboratory results, and in fact is cross-mapped to LOINC for this purpose. (In October, 1997 CAP released SNOMED International Version 3.4 which contained additions to the SNOMED chemicals, functions, living organisms and other atomic axes that were mapped to LOINC).

Current Deployment

Summarize the degree of market penetration today; i.e., where is this solution installed today?
What number of or percentage of relevant vendors have adopted the standard?
What number or percentage of healthcare institutions have adopted the standard?
What number or percentage of federal agencies have adopted the standard?
Is the standard used in other countries?
Are there other relevant indicators of market acceptance?

LOINC Current Deployment:

The LOINC codes were initially released on the Internet in April of 1995. Since then, seventeen revisions of the LOINC database have been released and it now includes over 30,000 observation concepts. The informatics committee of the College of American Pathologists has endorsed the LOINC codes. The American Clinical Laboratory Association (ACLA), an association of large referral laboratories whose members are responsible for more than 60% of US outpatient laboratory test volume, has recommended LOINC for adoption by its members. Quest Diagnostics (formerly Corning MetPath), LabCorp, and SmithKline Beecham (now part of Quest Diagnostics), three of the largest commercial laboratories in the US, have adopted LOINC as their code system for reportable test results, as has ARUP (Associated Regional and University Pathologists). Mayo Medical Laboratories is currently mapping their tests to LOINC. In addition, the University of Colorado, Intermountain Health Care, Promedica, Kaiser Permanante, Clarian Health (Indiana University, Methodist Hospital, and Riley Hospital), Partners Healthcare System of Boston (Brigham and Women's and Mass General

Hospital), Care Group of Boston, Mayo Medical Group, the Hospital for Sick Children in Toronto, New York-Presbyterian Hospital, the University Hospitals of Columbia and Cornell, the Department of Veterans Affairs, and the Department of Defense are adopting the LOINC codes for laboratory reporting. All US veterinary medicine laboratories have committed to the use of LOINC. HMOs such as Empire Blue Cross and Aetna Health Care are also adopting LOINC for internal purposes. Internationally, LOINC has also met success. The Swiss Center for Quality Control (Geneva, Switzerland) is adopting LOINC for quality assurance mandates. The provinces of Ontario and British Columbia, Canada, are adopting LOINC codes province wide, and Newfoundland is considering following in their footsteps. Most recently, Germany has adopted LOINC for national use. LOINC is used in Australia, Korea, Estonia, Brazil, and New Zealand. The LOINC codes have been incorporated into the National Library of Medicine's ULMS. They have been incorporated in CMS's quality assurance testing pilot programs. They have been adopted by the Centers for Disease Control and Prevention/Council of State and Territorial Epidemiologists' project for electronically reporting/transmitting communicable disease information and by NAACCR (North American Association of Central Cancer Registries) for their tumor registry variables. LOINC and SNOMED are also supporting a collaboration that will ensure a consistent, unambiguous clinical reference terminology that builds upon the strengths of each.

Among laboratory information systems (LIS), a survey published by the College of American Pathologists in November 2000 revealed that LOINC code indexes were provided in 33 LIS systems, representing 10,914 installed LIS sites. The Department of Defense Composite Health Care System also incorporated a LOINC index code during 2001. The current version of CHCS containing the LOINC index is now deployed to all 103 DoD laboratories. The Veterans' Affairs system, VISTA, has also incorporated a LOINC Index and is collaborating with DoD on an interoperability project that will utilize LOINC codes for results transfer between DoD, VA, and commercial reference laboratories.

Part III – Adoption & Deployment Information

Provide all information gathered in the course of making the recommendation that may assist with adoption of the standard in the federal health care sector. This information will support the work of an implementation team.

Existing Need & Use Environment

Measure the need for this standard and the extent of existing exchange among federal users. Provide information regarding federal departments and agencies use or non-use of this health information in paper or electronic form, summarize their primary reason for using the information, and indicate if they exchange the information internally or externally with other federal or non-federal entities.

Column A: Agency or Department Identity (name)
Column B: Use data in this domain today? (Y or N)
Column C: Is use of data a core mission requirement? (Y or N)
Column D: Exchange with others in federal sector now? (Y or N)
Column E: Currently exchange paper or electronic (P, E, B (both), N/Ap)
Column F: Name of paper/electronic vocabulary, if any (name)
Column G: Basis/purposes for data use (research, patient care, benefits)

Department/Agency	B	C	D	E	F	G	Comments
Department of Veterans Affairs	Y	Y	Y	B	LOINC, local terms, and free text	Research, Patient care & Benefits	
Department of Defense							
HHS Office of the Secretary							
Administration for Children and Families (ACF)							
Administration on Aging (AOA)							
Agency for Healthcare Research and Quality (AHRQ)							
Agency for Toxic Substances and Disease Registry (ATSDR)							
Centers for Disease							

Control and Prevention (CDC)							
Centers for Medicare and Medicaid Services (CMS)							
Food and Drug Administration (FDA)							
Health Resources and Services Administration (HRSA)							
Indian Health Service (IHS)							
National Institutes of Health (NIH)							
Substance Abuse and Mental Health Services Administration (SAMHSA)							
Social Security Administration							
Department of Agriculture							
State Department							
US Agency for International Development							
Justice Department							
Treasury Department							
Department of Education							
General Services Administration							
Environmental Protection Agency							
Department of Housing & Urban Development							
Department of Transportation							
Homeland Security							

As is Agency Specific Needs for LOINC

Department of Veterans Affairs

The Veterans Health Administration (VHA) used its FY2001 $21 billion budget to serve over 4.2 million veterans, including three quarters of disabled and low-income veterans. VHA employs approximately 180,000 health care professionals at 163 hospitals, more than 800 community and facility-based clinics, 135 nursing homes, 43 domiciliaries, 206 readjustment counseling centers and various other facilities. VHA has an extensive computerized information system, VistA, to manage clinical information at each care delivery site.

The sharing of clinical data between sites, and the provision of comparable data across sites for research and management purposes is a high priority within VHA. Laboratory results and medications are felt to be highly valuable and achievable domains. In fact, the Under Secretary for Health mandated the use of LOINC in each VistA system in 2001.

Department of Defense

The Department of Defense has incorporated LOINC into the Composite Health Care System (CHCS) which is utilized by 103 DoD military treatment facilities world-wide. Within the CHCS standard laboratory test file, approximately 6,100 laboratory tests are mapped to LOINC codes. DoD is currently sponsoring a Global Laboratory Information Transfer (GLIT) project to implement the transfer of laboratory orders and results between DoD military treatment facilities, VA treatment facilities, and commercial reference laboratories utilizing LOINC codes as laboratory test result identifiers.

Department of Health and Human Services

HHS Agency	***Potential use of Laboratory LOINC***
Office of the Secretary	Limited to no direct use. Planning requires knowledge of use and limitations.
Administration for Children and Families (ACF)	Limited to none.
Administration on Aging (AOA)	Limited to none.
Agency for Healthcare Research and Quality (AHRQ)	Extensive as many of their programs involve in depth knowledge of medical laboratory results. Agency is actively involved in CHI and external standard setting and is already knowledgeable on laboratory LOINC.
Agency for Toxic	Many of their programs involve in depth knowledge of medical and

Substances and Disease Registry (ATSDR)	other laboratory results. Agency follows CDC policy (below) on laboratory LOINC and is knowledgeable.
Centers for Disease Control and Prevention (CDC)	Extensive as many of their programs involve in depth knowledge of laboratory results. Agency already endorses the use of laboratory LOINC for use in the National Electronic Surveillance System (NEDSS), and is actively involved in both CHI and external standard setting.
Centers for Medicare and Medicaid Services (CMS)	Limited at present, but may expand as laboratory LOINC is more widely used in quality improvement programs. Agency is actively involved in CHI and external standard setting.
Food and Drug Administration (FDA)	Limited at present, but will expand as laboratory LOINC is more widely used in patient medical record systems and hence clinical trails. Agency is actively involved in external standard setting but currently has limited CHI involvement.
Health Resources and Services Administration (HRSA)	Limited at present, but will expand as laboratory LOINC is more widely used in the care-providing portions of their programs. Agency is involved in external standard setting but currently has limited CHI involvement.
Indian Health Service (IHS)	Extensive as their treatment facilities will be using laboratory LOINC for coding of test results in record system. Agency is actively involved external standard setting and works closely with both the Department of Veterans Affairs and Department of Defense in the development and deployment of clinical record systems.
National Institutes of Health (NIH)	Extensive as many of their programs involve in depth knowledge of laboratory results. Portions of the Agency are already extensively involved in CHI and external standard setting.
Substance Abuse and Mental Health Services Administration (SAMHSA)	Limited at present, but will expand as laboratory LOINC is more widely used in substance testing laboratories and the care-providing portions of their programs. Agency is involved has limited CHI and external standard setting involvement.

Other Governmental Agencies

A number of other governmental departments and agencies are likely to have an interest in lab result names and values. These include:

State: Maintains medical records on its employees
Justice: CDC and FBI cooperate on various issues such as bioterrorism
Homeland Security: Same use cases as above
EPA: Monitoring environmental exposures such as lead levels
Agriculture, Housing, and Transportation: occasional general usage

Number of Terms

Quantify the number of vocabulary terms, range of terms or other order of magnitude.

As of July 2002, the LOINC database contained records for more than 30,000 different observations. Lab LOINC has approximately 25,000 terms.

How often are terms updated?

New releases of the LOINC database and/or RELMA program occur 3-4 times per year

Range of Coverage

Within the recommended vocabulary, what portions of the standard are complete and can be implemented now? (300 words or less)

Lab LOINC is implementable now. It is not complete and never will be. No clinical terminology is static. Ongoing maintenance to grow and evolve LOINC is ongoing

Acquisition: *How are the data sets/codes acquired and use licensed?*

The LOINC database can be obtained from the Regenstrief LOINC website (http://www.regenstrief.org/loinc/),

The LOINC database and associated documents and programs are copyrighted, but the copyright permits all commercial and non-commercial uses in perpetuity at no cost. If the LOINC database or its contents are distributed as a database, such distributions must include all of the parts of the formal LOINC term, the LOINC short name, the LOINC code, the deprecated flag, and the copyright. No such notice is required when LOINC codes are used in messages to report test results.

Cost

What is the direct cost to obtain permission to use the data sets/codes? (licensure, acquisition, other external data sets required, training and education, updates and maintenance, etc.)

The LOINC database and associated documents and programs are copyrighted, but the copyright permits all commercial and non-commercial uses in perpetuity at no cost.

Costs related to training & education, integration into existing systems and other implementation related issues can only be estimated in context of the specific implementation project and estimates will not be provided as part of this document

Systems Requirements

Is the standard associated with or limited to a specific hardware or software technology or other protocol?

Systems must be able to integrate the LOINC distribution, which is available as a PDF report sorted alphabetically by class, as a tab delimited ASCII text file, and/or as an Access database

Guidance: *What public domain and implementation and user guides, implementation tools or other assistance is available and are they approved by the SDO?*

http://www.regenstrief.org/loinc/ provides the 72-page LOINC Users' Guide (PDF), the free RELMA program, which downloads with full LOINC access to the database, and the RELMA Users' Manual. RELMA is a program for browsing the LOINC database and for mapping local test codes to LOINC codes.

Is a conformance standard specified? Are conformance tools available?

Maintenance:
How do you coordinate inclusion and maintenance with the standards developer/owners?
What is the process for adding new capabilities or fixes?
What is the average time between versions?
What methods or tools are used to expedite the standards development cycle?
How are local extensions, beyond the scope of the standard, supported if at all?

LOINC has 4-6 committee meetings per year, half clinical and half laboratory. At least

one laboratory and one clinical meeting are open to the public. New releases of the LOINC database and/or RELMA program occur 3-4 times per year. The LOINC committee welcomes suggestions about observation terms that have not yet been included in the LOINC database. The LOINC Users' Guide defines the structure and format required for new submissions.

Customization: *Describe known implementations that have been achieved without user customization, if any.*

See implementation section above

If user customization is needed or desirable, how is this achieved? (e.g, optional fields, interface engines, etc.)

Mapping Requirements

Describe the extent to which user agencies will likely need to perform mapping from internal codes to this standard.

Extensive unless systems are already mapped

Identify the tools available to user agencies to automate or otherwise simplify mapping from existing codes to this standard.

http://www.regenstrief.org/loinc/ provides the 72-page LOINC Users' Guide (PDF), the free RELMA program, which downloads with full LOINC access to the database, and the RELMA Users' Manual. RELMA is a program for browsing the LOINC database and for mapping local test codes to LOINC codes.

Compatibility

Identify the extent of off-the-shelf conformity with other standards and requirements:

Conformity with other Standards	Yes (100%)	No (0%)	Yes with exception
NEDSS requirements	**x**		
HIPAA standards	**x**		
HL7 2.x	**x**		

Implementation Timeframe

Estimate the number of months required to deploy this standard; identify unique considerations that will impact deployment schedules.

Conversion to Lab LOINC:

A recent presentation by Lee Min Lau (Lau, L M, Johnson, K, Monson, K, Lam, S H, Huff, S M. A method for the automated mapping of laboratory results to LOINC. Proc AMIA Symp 2000;:472-6: http://www.amia.org/pubs/symposia/D200807.PDF) describes the numerous problems in translating the internal names for laboratory procedures into appropriate LOINC codes. Conversations with this group indicate that the conversion of a laboratory doing a limited and standard test menu is generally quick; no more than a few weeks. In a laboratory doing many complex procedures, this process is prolonged. Conversion of the simple tests is generally short, again a few weeks. Assigning LOINC codes to the remaining tests can take up to three months as the appropriate LOINC code is identified through evaluation of actual usage of the test in the laboratory. (While the laboratory workers can detail what is stated in the procedure manuals, usage, particularly with regard to specimen type, may vary enough to change the LOINC code.) The Regenstrief group found similar timeframes during their assignment of LOINC codes to five Indianapolis hospitals.

Since these reports, the LOINC Committee has expanded the ability of their RELMA tool to identify the correct LOINC code for a test from minimal input. They have also introduced more generic codes, particularly those not requiring specific identification of the method or specimen, to facilitate selection of an appropriate code. For those codes not identifying one of the axis components specifically, it is assumed that the missing element is identified elsewhere in the message. Continuing work on the RELMA tool and the ability to automatically map a laboratory code list LOINC is underway at the Regenstrief Institute.

Gaps

Identify the gaps in data, vocabulary or interoperability.

Laboratory LOINC Gaps:

LOINC is a pre-coordinated non-structured list of terms a part of which is assigned to laboratory tests. The structure of LOINC involves six axes: Component (Test Name), Property of Measurement (Concentration); Time Aspect (24 Hours); System (Specimen); Scale Type (Quantitative); and Method Type (Method Name). Each of the axes within a

code is unique and unrelated to any other code. Codes that have similar components for one or more axes are also unrelated. Coordination and distribution of LOINC is maintained under various grants from several government agencies to Regenstrief Institute, but the actual introduction of new codes to LOINC involves voluntary submission of code sets from outsiders.

The following gaps need to be addressed before LOINC can be recommended without qualification by the CHI Laboratory Name subgroup:

1. Consistent and widespread appearance of XXX codes in LOINC would ease introduction. The specificity of LOINC codes in early laboratory implementations prevented easy assignment of codes to laboratory tests. Many of the codes did not match the way laboratories did business. For example, a laboratory might use an identifier for a laboratory test that was specimen independent, relying on another part of the result to convey the specimen type. To accommodate this and similar situations, LOINC has introduced the concept of independence in some of its axes through the use of XXX (defined elsewhere in the message) identifiers for one or more of a code's axes.

2. Introduction of a hierarchy to LOINC would allow for standard aggregation of terms across the healthcare system, ease in identifying needed terms, and identification of terms to assign within an institution. The non-hierarchical nature of LOINC makes consistent aggregation of concepts difficult. Preliminary work towards developing hierarchies is being considered by the LOINC committee.

   For example, consider the test for Helicobacter Pylori, a commonly performed test done on peptic ulcer patients. LOINC represents the possible tests for Helicobacter as:

LOINC#	Component	Property	Time	System	Scale	Method
587-6	HELICOBACTER PYLORI	ACNC	PT	XXX	ORD	
22310-7	HELICOBACTER PYLORI AB	ACNC	PT	SER	ORD	IF
6419-6	HELICOBACTER PYLORI AB	ACNC	PT	SER	ORD	
7900-4	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	EIA
5174-8	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	IF
16929-2	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	
16533-2	HELICOBACTER PYLORI AB	TITR	PT	SER	QN	
5175-5	HELICOBACTER PYLORI AB	TITR	PT	SER	QN	LA
16125-7	HELICOBACTER PYLORI AB	ACNC	PT	SER	ORD	
7901-2	HELICOBACTER PYLORIAB.	ACNC	PT	SER	QN	
6420-4	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	EIA
16126-5	HELICOBACTER PYLORI AB	ACNC	PT	SER	ORD	
17859-0	HELICOBACTER PYLORI AB	ACNC	PT	SER	ORD	EIA
7902-0	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	

5176-3	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	
16127-3	HELICOBACTER PYLORI AB	ACNC	PT	SER		
7903-8	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	
5177-1	HELICOBACTER PYLORI AB	ACNC	PT	SER	QN	EIA
17780-8	HELICOBACTER PYLORI AG	ACNC	PT	STL	ORD	EIA

(note: ACNC = concentration, PT= point in time measure, SER = serum, ORD = ordinal scale, QN = quantitative scale, LA = latex agglutination, etc)

The 20 test elaborations here each represent a slightly different combination of component, property, time, system, scale, and method. All 20 are meaningfully distinct in the context of a laboratory system. However, there are really many fewer clinically meaningful combinations of tests. Usually the practitioner isn't concerned that the titre test is done by means of "LA" (latex agglutination) or by an alternative technique. For example, we might have the following aggregation at a clinical level:

LOINC#	Component	Property	Time	System	Scale	Method
587-6 22310-7 6419-6 16126-5 17859-0	HELICOBACTER PYLORI AB (IgG or unspecified antibody reported as ordinal scale, e.g., 1+	ACNC	PT	SER	ORD	various
7900-4 5174-8 16929-2 7902-0 5176-3	HELICOBACTER PYLORI AB (IgG or unspecified antibody reported as mass conc, e.g. 42 ng	ACNC	PT	SER	QN	various
16533-2 5175-5	HELICOBACTER PYLORI AB (IgG or unspecified antibody reported as titre, e.g. 1:64 dilutio	TITR	PT	SER	QN	various
16125-7	HELICOBACTER PYLORI AB (IgA surface antibody by ordinal	ACNC	PT	SER	ORD	
7901-2 6420-4	HELICOBACTER PYLORIAB. (IgA surface antibody by mass c	ACNC	PT	SER	QN	
16127-3 7903-8 5177-1	HELICOBACTER PYLORI AB (IgM acute phase antibody indic acute vs. old infection)	ACNC	PT	SER		
17780-8	HELICOBACTER PYLORI AG (Antigen—not antibody—stool t	ACNC	PT	STL	ORD	EIA

But even this may be splitting hairs, as most reasonable clinicians could argue that there only four "clinical tests":

LOINC#	Component	Property	Time	System	Scale	Method
587-6 22310-7 6419-6 16126-5 17859-0 7900-4 5174-8 16929-2 7902-0 5176-5 16533-2 5175-5	HELICOBACTER PYLORI AB (IgG or unspecified antibody reported as ACNC ordinal scale ACNC mass conc or Titre)	ACNC	PT	SER	QN or ORD	various
16125-7 7901-2 6420-4	HELICOBACTER PYLORIAB. (IgA surface antibody by mass c or by ordinal scale)	ACNC	PT	SER	QN or ORD	various
16127-3 7903-8 5177-1	HELICOBACTER PYLORI AB (IgM acute phase antibody indic acute vs. old infection)	ACNC	PT	SER	QN or ORD	various
17780-8	HELICOBACTER PYLORI AG (Antigen—not antibody—stool t	ACNC	PT	STL	ORD	EIA

Most clinicians will wish to aggregate at the level of three types of antibody test results and positive antigen tests as shown directly above. A GI section division chief or pathologist at a particular site may wish to aggregate at even a higher level, such as how many resources are being expended on helicobacter pylori testing of all types (collapsing 20 tests into one category), but later that same day may be interested in something as finally grained as a single, atomic test:

7901-2	HELICOBACTER PYLORIAB.	ACNC	PT	SER	QN	

…when performing a research study that requires precise definitions.

3. Improvements are needed in content coverage, definitions, and unrecognized synonymy. The voluntary nature of term submission has lead to inadvertent duplication of terms, a density of term definitions in areas of interest to submitting topic experts, a sparseness of terms in areas where topic experts did not volunteer, and a lack of consensus in term definitions, especially with regard to the method axis and the combination of method and system axes.

Regenstrief Institute recognizes some of the above and is introducing more generic terms

and establishing a hierarchy. They have introduced and are continually refining a software tool called the “Regenstrief LOINC Mapping Assistant” (RELMA) that imposes structure to LOINC and makes term identification easier. A process to impose rigidity on code submission however, appears lacking.

Obstacles

What obstacles, if any, have slowed penetration of this standard? (Technical, financial, and/or cultural)

LOINC is widely distributed and has a high market penetration but the extent of use is not known