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Regenstrief Institute
regenstrief.org

Regenstrief Institute, Inc. is non-profit 501(c)3 research organization driven by a mission to connect and innovate for better health. Regenstrief serves as the overall steward and standards development organization (SDO) for LOINC.

The LOINC team within Regenstrief maintains the LOINC database and supporting documentation, processes submissions and edits to the content, develops and curates accessory content (descriptions, hierarchies, other attributes, etc.), develops the RELMA mapping program, and coordinates LOINC releases. The team also cultivates the LOINC community and the standard’s adoption worldwide.
I am excited to share with you the 2018 LOINC Annual Report. Health data interoperability made important progress in 2018. We are encouraged by all the ways in which health data is becoming liberated from the technical and systems-based silos that limited its use.

As a free and open global standard for tests, measures, and documents, LOINC plays an essential role in unlocking the potential for information systems and applications to improve health decision-making and care. Whether these systems interact with messages, documents, application programming interfaces, or common data models, LOINC provides a common way to identify and understand the health variables inside those structures.

In this 2018 report, we share a few highlights of the advancements we have made in LOINC's development and a high level view of what's happening in the vibrant LOINC user community. Some of the key milestones include launching an application programming interface (API) to LOINC content via the FHIR® standard, creating a new portal displaying all of the requests for new LOINC content, expanding the scope of LOINC Groups for rolling up sets of equivalent terms for a particular purpose, and publishing our first ever implementation guide—the Guide for Using LOINC Microbiology Terms. We are grateful to the volunteers of the LOINC Committee, as well as the many people requesting new terms, producing language translations, and contributing in other ways.

Looking ahead to 2019, we are excited to be celebrating LOINC's 25th anniversary. From LOINC's start back in 1994 until now, it has been a remarkable journey of many people working together. With LOINC's widespread global use we are seeing the fruits of that pioneering vision come to life.

Yet the work of providing a common, computable representation of health observables and documents continues. We continue adding new content to keep pace with advancements in science and medicine and continue expanding in emerging domains like genetic reporting, social and behavioral determinants of health, and environmental exposures. With support from our funding sources, we also have many technical infrastructure enhancements in the works.

Thanks for being part of the open community that continues to propel LOINC's development.

Happy LOINCing!
VISION

We imagine a world where people experience optimal health catalyzed by a seamless network of health information systems.

LOINC’S MISSION

Our mission is to develop and advance adoption of open data standards that enable efficient transmission, understanding, and use of health data.

We want to see LOINC integrated into every clinical information system that shares or aggregates data. Yes, it sounds audacious, but standards demonstrate the network effect and become more valuable as more people and systems use them. We are committed to a health ecosystem where data is available with open standards that unlock the potential for information systems and applications to improve health decision-making and care.
STRATEGY

How do we approach our fundamental challenge?
We learn. As individuals and as a collective community, we apply a learning mindset to every aspect of our work.

WE LEARN

What do we learn? We learn to create, curate, and deliver data standards that make health data more portable and understandable to different computer systems.

How does this actually play out in our work? Learning is the standard we expect of ourselves. We learn to be better each day. We look at each requested term, proposed edit, project, code routine, and task as an opportunity to learn more. By doing so, we get closer to our goal and we grow as people.
LOINC use has grown substantially in the past 20+ years. The year 2018 ended with 72,718 LOINC users representing 174 countries—a 27% rise in the number of registered accounts over the previous year.

loinc.org/atlas

LOINC is used in nearly every corner of the planet
LOINC grows because you ask! Since its inception, Regenstrief has developed LOINC as a free and open standard. Anyone may request new terms.

loinc.org/submissions

279
Total requests received in 2018

66
Number of organizations submitting requests in the year representing 14 countries

4,032
Terms requested in 2018

We welcome requests for new terms, and it’s because of submissions from the LOINC community that we’ve been able to grow and adapt so quickly.

LOINC users have always been able to request new terms using the established approach, but the process between submission and creation of a final LOINC code was a bit opaque. In 2018 we provided a new window into the volume and status of all requests.

This new tool on the LOINC website provides several key metrics about the current development queue:

- Requests received
- Requested LOINCs
- Requested LOINCs pending copyright approval
- LOINCs created since last release
- Median turnaround for new terms (in days)

These stats, updated nightly, are accompanied by a graph of total request input/output for the past six years.

SUBMISSION QUEUE DETAILS
Because of the complex development and rigorous review we undertake, an answer to the common “How long will my request take?” question is difficult to answer. We can clearly show the trends to give you a better understanding of what to expect.

MY SUBMISSIONS
LOINC users can now also view the entirety of their personal term request history going back to 2014. Like your personal order history on a shopping website, this view shows when all your requests were made and their result. It’s a handy way to determine where your request is in the process.

SUBMISSION QUEUE DETAILS
Not only does Regenstrief provide an overview of our incoming queue, we also show a comprehensive view of what exactly is inside each of those requests—regardless of who made them—and their stage in the creation process.
COMMUNITY ENGAGEMENT

LOINC users form a vibrant community with a wealth of diverse expertise, resources, and knowledge. Regenstrief has developed several means of fostering community participation and interaction.

MAILING LIST
Our email list is the primary platform for distributing LOINC happenings, such as a new release. Everyone with an interest in LOINC should be subscribed to this list. We promise not to overwhelm your inbox and will send no more than four messages per month to this primary list.

loinc.org/mailing-list

USER FORUM
LOINC’s online discussion forum allows community members to interact on a variety of topics. We encourage participation in this open setting as the community is often best poised to assist with questions on implementation and other uses of LOINC.

loinc.org/forum

USER INQUIRIES
LOINC provides limited technical assistance to its Premium Members. We welcome feedback from the entire user community but we may not be able to respond in a timely manner to all questions received. The most efficient method for us to respond to issues is via the Contact Us form on our website.

loinc.org/contact

MORE WAYS TO PARTICIPATE IN THE LOINC COMMUNITY
- @LOINC on Twitter
- LOINC Committee
- Special Topics Workgroups
- Adopter Directory
- Translations
- LOINC Conferences
- Public Meetings

30,785  List subscribers
12,144  Unique forum viewers
1,593  Conversations

+69%  Change over previous year
914  Forum posts
617  Unique users

249  Forum participants
3,016  Messages received
COMMUNITY OUTREACH

LOINC CONFERENCES

LOINC Conferences are special events that combine educational workshops and a public LOINC Committee Meeting. In 2018, two laboratory-focused conferences were held at Regenstrief Institute in Indianapolis and two clinical-themed events were hosted by Intermountain Healthcare in Salt Lake City.

LOINCers from around the world attended these quarterly events, which featured education and implementation sessions presented by speakers from Regenstrief, Intermountain Healthcare, The Joint Commission, 3M Health Information Systems, University of Wisconsin, Diameter Health, and Dana-Farber Cancer Institute.

loinc.org/conference

SOCIAL DETERMINANTS OF HEALTH PRESENTATION

In August 2018, Daniel Vreeman gave a special talk on social and behavioral determinants of health (SDH) where he explained LOINC’s role in the emerging area. His Advancing the interoperability of social and behavioral determinants of health presentation discussed the fundamental need for representing individual- and community-level SDH variables in common vocabulary standards. The session highlighted the growing momentum for incorporating SDH variables in LOINC.

The presentation was delivered at Regenstrief Institute and made available as a live webinar to over 470 online attendees. A recording is available on the LOINC website.

loinc.org/sdh
The LOINC Award for Distinguished Contributions honors an individual who has made sustained and enduring contributions that advance health data interoperability with LOINC.

loinc.org/award

LOINC AWARD FOR DISTINGUISHED ACHIEVEMENTS

2018 HONOREE

PAMELA D. BANNING
MLS(ASCP) cm, PMP®(PMI)

Pamela D. Banning, MLS(ASCP)cm, PMP®(PMI) of West Linn, OR, was presented with the 2018 award at the LOINC meeting in June.

Banning is a long-time active member of the LOINC community. She has served as a member of the Laboratory LOINC Committee since its early days, missing only one meeting in two decades.

Throughout her career, Banning has been a passionate champion of LOINC for data interoperability. In over 20 years, Banning has mapped hundreds of thousands of local lab codes to LOINC for 3M’s clients (and previously for ARUP), including the U.S. Department of Defense. She helped incorporate the terminology into the 3M Healthcare Data Dictionary.

She has also supported international implementations of LOINC with Canada Health Infoway and Singapore’s Ministry of Health. Banning is a strong LOINC advocate, guiding educational efforts and encouraging community involvement. Banning’s friendly smile and warm personality are as notable as her many LOINC accomplishments.
A total of 2,743 new terms were added to the LOINC database in 2018. Additionally, nearly 10,000 existing terms were edited either based on questions and recommendations from the LOINC user community or internal review. Most of the updates were to secondary attributes such as the Long Common Name or Shortname, term descriptions, related codes, and Answer list types.

Among the new content additions were:
- Over 400 microbiology terms
- More than 200 Document Ontology terms
- HEDIS 2019 value sets
- Laboratory terms with new Methods including Line Blot and Cell binding assay Immunofluorescent assay (CBA IFA)
- Several new and updated IEEE Device Code Mappings
- Nearly 250 clinical and survey panels in a variety of domains, from CMS Long-Term Post-Acute Care (LT-PAC) assessments to Patient-Reported Outcome (PRO) measures to CDC Emergency Operations

The existing names associated with each LOINC term are not ideal for every context. Our work to create more provider-friendly display names has been a multi-year journey with input from many LOINC users. The initial, Alpha release of the artifact in June provided algorithmically-created DisplayNames for all laboratory terms.

In December, we released a Beta version of the DisplayNames artifact and also incorporated these new names into the RELMA and search. loinc.org display grid and term details pages.

### Display Name Artifact

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In December, we released a Beta version of the DisplayNames artifact and also incorporated these new names into the RELMA and search. loinc.org display grid and term details pages.
RELMA® & search.loinc.org

RELMA is a freely-available Windows program for searching the LOINC database and mapping local codes to LOINC terms.

Search.loinc.org is a web-based tool that provides many of the same searching functions available within RELMA.

5,490
Total downloads of the RELMA program (stand alone and combined package) in 2018

961,536
Queries made by users on the search.loinc.org website in 2018

153,851
Total user sessions on the search.loinc.org site in 2018

December 2018 upgrades to both products added searching on the new LOINC DisplayName field.

RELMA’s June release saw a revision to the Panel export function. New AnswerList and AnswerListLinks tabs in the generated spreadsheet match the format of the LOINC release artifacts of the same names.

Building on search syntax documentation added in 2017, we produced new quick reference cards. These postcard-sized cheat sheets are a handy tool for both novice and seasoned LOINCers. They were distributed exclusively at LOINC Conferences and special events.
Users can now retrieve LOINC content programmatically with a new terminology server via HL7’s FHIR® API. Launched in September 2018, LOINC’s FHIR server makes available current LOINC content by request.

Using the base URL of fhir.loinc.org and a free LOINC username and password, developers can programmatically get LOINC content using three API endpoints as defined in FHIR. Responses are a structured definition in JavaScript Object Notation (JSON) or Extensible Markup Language (XML) format.

**VALUESSET**
LOINC uses FHIR’s ValueSet resource to define three types of code collections. Answer Lists and LOINC Groups are available upon demand, as are several key subsets including the LOINC Document Ontology and LOINC/RSNA Radiology Playbook. Through $expand and $validate-code operations, developers can get a list of codes within a particular value set or determine if an individual code exists within a defined collection.

**CONCEPTMAP**
FHIR’s ConceptMap resource provides a means of programmatically mapping codes from LOINC to other code systems. For instance, the corresponding RPID within RadLex for nearly 1,000 LOINC radiology terms can be found via this request using the $translate operation.

Presently, LOINC’s Terminology Server using FHIR carries a BETA status. The functionality may change and availability is not guaranteed. Regenstrief also cautions against using the server in a production context.

LOINC users can explore a primer at the following location. The tutorial contains complete documentation of LOINC’s FHIR implementation along with examples to copy and try on your own.

loinc.org/fhir

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**1,817,128**
Successful requests made to LOINC’s FHIR server in 2018—since its introduction in September

**152**
Median processing time per request, in milliseconds

HL7, FHIR and the FHIR [FLAME DESIGN] are the registered trademarks of Health Level Seven International.
Several improvements were made to LOINC.org this year, building on the website’s relaunch in 2017.

As part of ongoing efforts to improve site performance, an advanced caching mechanism was added. Database resources and image assets are now intelligently saved and served allowing for a lower response time on all page requests.

A content delivery network (CDN) was also employed to further enhance site speed. The CDN places website resources in geographically advantageous locations so even if you are in an area distant from the server’s home in Indiana, you can access LOINC information quickly.

LOINC users long used RELMA and spreadsheet-based templates to make new term requests. Work on an all-new, web-based request form began in late 2018 and launched in January 2019.

This new process walks users through the sometimes tedious process of creating a request. The multi-stage form guides submitters through all the details necessary to complete their submission. Work is saved at every step so users can leave and return to complete their request.

Users have the option of uploading a spreadsheet of values or composing a set individual term requests one-by-one by completing the required fields online.

For the first time at such a massive scale, we approached over 69,000 registered LOINC users with the opportunity to provide feedback. An invitation to complete a survey was sent to these community members in November 2018.

Users were asked for their preferences and practices regarding several key areas: LOINC content, RELMA, search.loinc.org, LOINC Terminology Server using FHIR, LOINC website, and documentation and learning resources.

Respondents were also asked open-ended questions around areas where LOINC could improve.

The survey answers will help inform LOINC’s development plans going into 2019. We will perform future surveys twice annually.
Members of the LOINC community interested in joining the Committee can visit the LOINC website for details and to apply. Committee rosters are also available on the site.

NEW COMMITTEE
To oversee the development of the LOINC/RSNA Radiology Playbook, a new LOINC/RadLex Committee was established. It consists of members selected by both organizations along with at-large designees and several non-member advisors.

NEW SUBCOMMITTEE
Also approved in 2018 was the promotion of the long-standing Document Ontology Workgroup to an official subcommittee of the Clinical LOINC Committee. This group meets online each month to discuss organization of LOINC’s Document Ontology. All are welcome to attend; see website for details.

NURSING SUBCOMMITTEE MEETING SERIES
Kicking off with an in-person event at the Spring 2018 LOINC Conference, the Nursing Subcommittee started a series of monthly online meetings around its purpose: to facilitate the development and use of LOINC codes for observations used during key stages of the nursing process, including assessments, goals, and outcomes. See the website for how to join these open events.

2018 COMMITTEE MEETINGS
LOINC Committee meetings were held on the second day of the quarterly LOINC Conference in 2018. The public meetings were available to in-person and online attendees. Agenda and documents from each of these events is available on the LOINC website.

- Clinical LOINC
  March 22, 2018
  Intermountain Healthcare

- Laboratory LOINC
  June 7, 2018
  Regenstrief Institute

- Clinical LOINC
  October 10, 2018
  Intermountain Healthcare

- Laboratory LOINC
  December 6, 2018
  Regenstrief Institute
SPECIAL INITIATIVES

COLLABORATION WITH CMS
In 2018, we continued to work with the U.S. Centers for Medicare and Medicaid Services (CMS) on the LOINC representation of patient assessment instruments that CMS requires for use in post-acute settings. All instruments that are currently required for use have been published, as have some upcoming versions that will go into effect in the next 6 to 12 months. We provide the LOINC representation before the instruments are required in clinical practice so that health IT vendors have the opportunity to implement them before the clinical requirement goes into effect.

ENVIRONMENTAL EXPOSURE DATA COLLABORATION WITH RTI
In 2018, we made significant progress in a multi-year project with the PhenX team at the Research Triangle Institute (RTI International). The primary focus of this project is on representing measures of environmental exposures in LOINC. This effort includes both reviewing and updating existing LOINC content that was created in collaboration with PhenX several years ago as well as creating new LOINC content as needed.

COLLABORATION WITH CDISC
In preparation for FDA’s requirement that regulated clinical trials send LOINC-encoded laboratory result data to the FDA starting in 2020, we continued collaborating with the Clinical Data Interchange Standards Consortium (CDISC) on transitioning to the use of LOINC codes within their data exchange standards. We worked with the CDISC lab terminology team on a draft set of mappings from CDISC lab terminology elements to LOINC terms. We expect that this file will be available for review later in 2019.

FDA GUIDANCE ON LOINC FOR IN VITRO DIAGNOSTIC TESTS
In June the U.S. Food & Drug Administration issued its recommendations on using LOINC for In Vitro Diagnostic tests. The guidance “strongly encourages the use of consensus standards for coding of IVD tests and specifically recognizes the utility of LOINC for this purpose.”

FHIR TERMINOLOGY COLLABORATION WITH SMILE CDR
Regenstrief worked with the FHIR community to create a canonical representation of LOINC as a FHIR CodeSystem. We then partnered with Smile CDR to enable support for this representation and other key features of the LOINC API using the open-source HAPI-FHIR software.

DEVELOPMENT OF FHIR REPRESENTATION OF LIVD
The IVD Industry Connectivity Consortium (IICC), which developed the LIVD standard for listing the appropriate LOINC codes for a vendor’s test results, has been working with HL7 to create a FHIR-based specification of the LIVD standard. This specification was balloted in the September 2018 HL7 ballot cycle at a Comment level. We have continued to promote the use of the LIVD standard and to support the IICC and other stakeholders.
SPECIAL INITIATIVES

GUIDE FOR USING LOINC MICROBIOLOGY TERMS

In August 2018, Regenstrief published a free resource to help users choose the correct LOINC code for microbiology and infectious disease laboratory tests.

The primary focus of the Guide for Using LOINC Microbiology Terms is mapping observation values that are reported to a patient record. The document covers lab tests that detect and identify a variety of microorganisms by culture, microscopy, immunoassay, and molecular methods and includes detailed examples for each. It also includes a LOINC primer, important mapping principles, and information on validation, maintenance, and publication of mappings.

This work was funded by the U.S. Department of Health & Human Services’ Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria (PACCARB) initiative through the U.S. Food & Drug Administration.

loinc.org/guides/micro

LOINC GROUPS

Two updates were published in 2018 to the Groups effort to roll up clinically-equivalent groups of LOINC codes for various purposes.

As of December’s “Beta.2” release of the files, 24,749 unique LOINC terms are included in one or more Groups. Content has been added in several domains including Radiology terms by Region Imaged, estimated fetal body weight and gestational age, pregnancy delivery date, pregnancy tests, and biochemical markers of smoking, and several Groups based on a broader clinical concept, such as Social Determinants of Health and physical activity.

More Group-level attributes, including UsageNotes and Component-level molecular weights from the PubChem database were added for nearly 900 Groups.

This work was supported by the National Center For Advancing Translational Sciences of the National Institutes of Health under Award Number UL1TR001108.

loinc.org/groups
The goal of LOINC is to help people experience optimal health through seamless information processing. This goal is attainable, but only with your support. We’d love for you to work with us to create this reality. As an individual, you can make a one-time contribution to Regenstrief Institute. Alternatively, we offer several sponsorship opportunities for organizations.

loinc.org/donate

Show your individual support for LOINC and get some special benefits in the process. Starting at $75 for one year, you can take advantage of these perks to take your LOINCing to the next level. You can also get a Mapping Validity Checker for an additional fee.

See our website for complete details as well as our sponsorship program.

loinc.org/members

**2018 FUNDING SUPPORT**

- Enhancing the Logical Observation Identifiers Names and Codes (LOINC®) Standard to Support U.S. Interoperability. Office of the National Coordinator for Health Information Technology. 90AX0021/01-00
- Indiana Clinical and Translational Sciences Institute: Administrative Supplement to Create LOINC Equivalence Groups. National Center for Advancing Translational Sciences. 3UL1TR001108-0451
- Health Care Systems Research Collaboratory - Administrative Supplement: ADAPTABLE. Duke University Subcontract on Assistant Secretary for Planning and Evaluation (ASPE) award. 3U54AT007748-05-S1
- Answer Set Expansion and Implementation Support for the Guide for Using LOINC® Microbiology Terms. Food and Drug Administration (FDA). HHS223201810268P
- Collaboration on Codification of IVD Tests with LOINC. bioMérieux. 1201 bioMérieux
- Linking Complex Disease and Exposure Data to Established Data Standards. Research Triangle Institute (RTI) International sub award via National Institute of Environmental Health Sciences. 1R24ES028479-01
- Post-Acute Care (PAC). Centers for Medicare & Medicaid Service. HHS550201600040C