IHTSDO delivering
SNOMED CT®
the global clinical terminology

Meeting terminology requirements for order entry and result reporting

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Regenstrief Institute / LOINC
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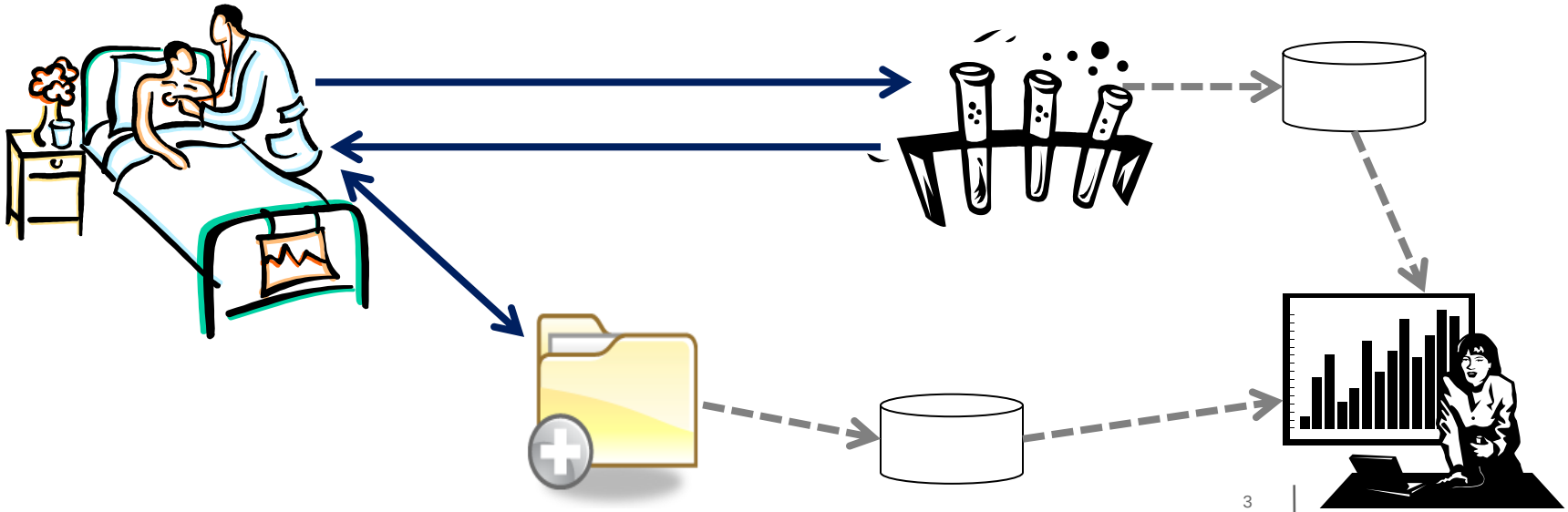
International Health Terminology
Standards Development Organisation

Overview

- Requirements
- Background and status of the agreement
- An introduction to LOINC
- Practical details of the agreement
- Implementing the agreement and looking forward

Requirements for order entry & result reporting

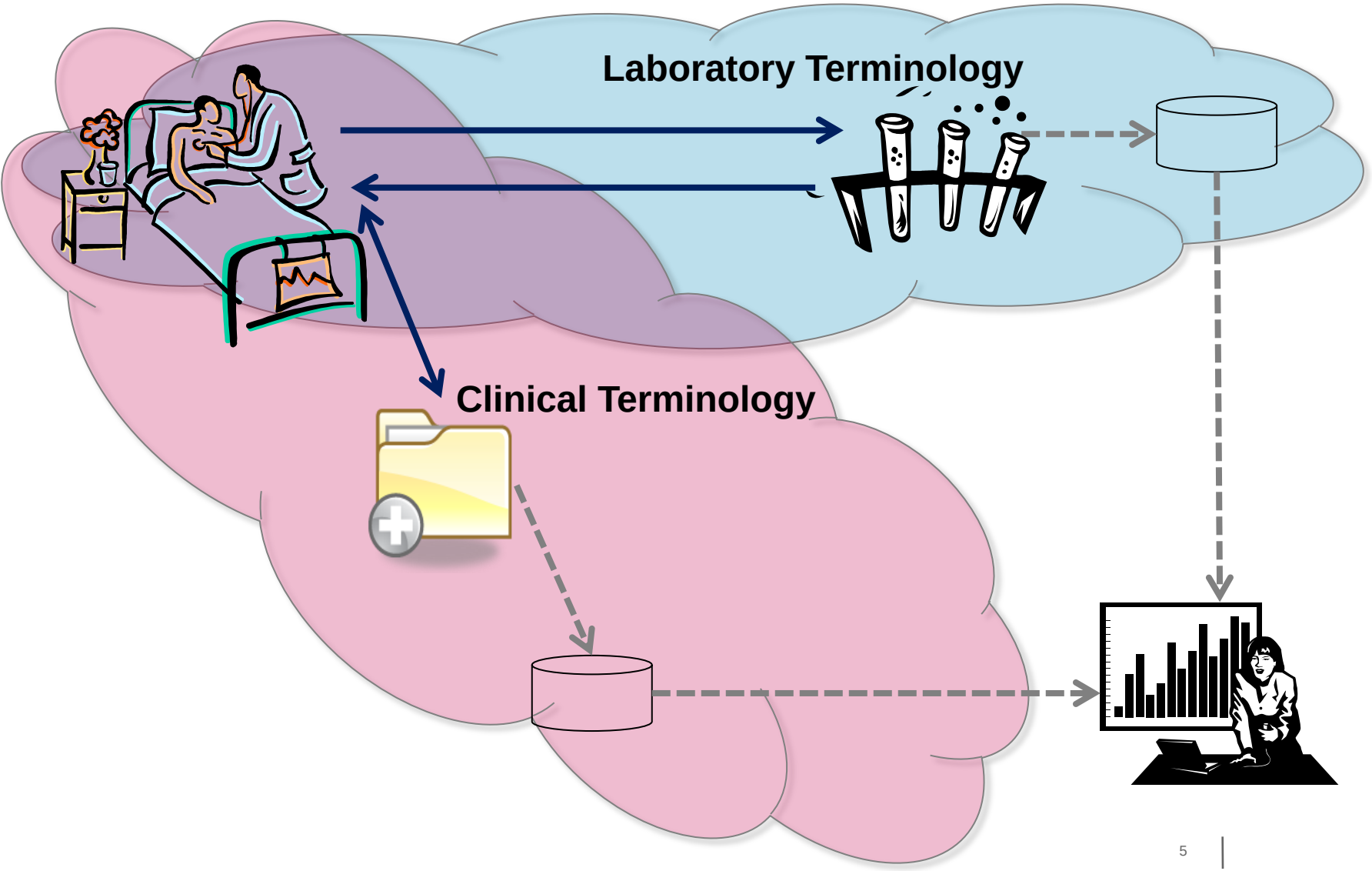
- Consistent ways to represent types tests and measurements in …
  - Requests (or orders) for investigation
  - Reports of results of investigations
  - Clinical records of subjects of investigation
  - Aggregated clinical information for research
  - Aggregated data for service management and audit



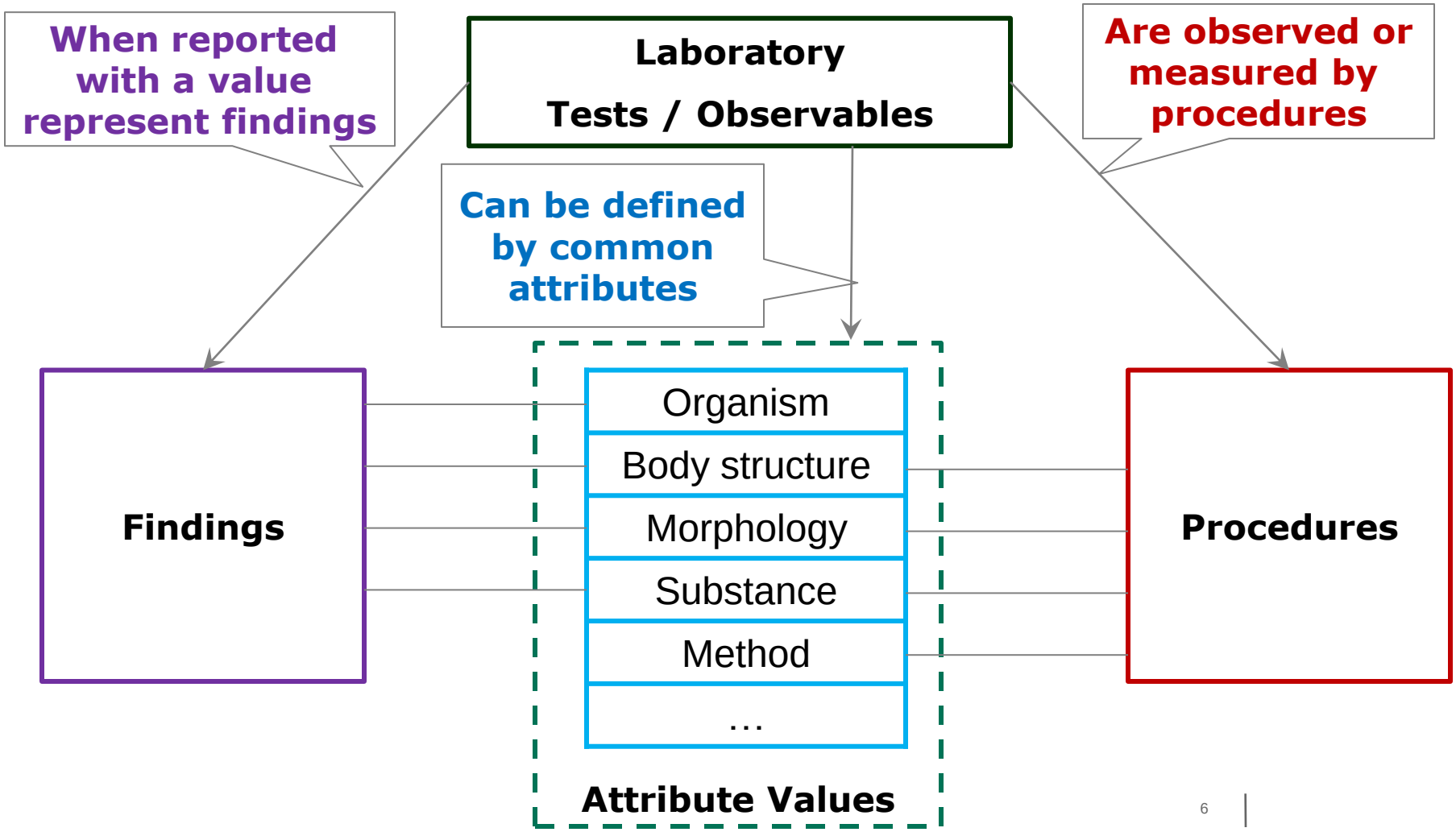
Possible ways of meeting the requirements for order entry & result reporting

- SNOMED CT the leading global clinical terminology
  - Contains concepts representing laboratory tests & observables
  - However, its coverage in the laboratory domain is incomplete
- LOINC the most widely used code system for requesting and reporting laboratory tests
  - Contains codes for specific tests in ways that meets practical requirements for communication of orders and reports
  - However, it lacks some of the detailed semantics that the SNOMED CT concept model offers
- A combination of LOINC and SNOMED CT
  - Already used in several countries
  - However, currently this results in duplication of effort, perceived competition and mixed semantics where the domains overlap

Practical overlaps between laboratory and clinical terminology



Logical overlaps between laboratory and clinical terminologies



Background: An Opportunity for Cooperation

- SNOMED CT is the leading global clinical terminology
  - IHTSDO, the owner of SNOMED CT, is a not for profit organisation with objectives directed at enhancing health care delivery to serve the public good.
- LOINC is the worlds most widely used code system for requesting and reporting laboratory tests
  - Regenstrief Institute (RI), the owner of LOINC, is a not for profit organisation with objectives directed at enhancing health care delivery to serve the public good.
- An cooperation agreement between IHTSDO and RI
  - Should be possible due to shared objectives
  - Could address SNOMED CT/LOINC boundary issues
  - Would thus provide an effective way to address requirements for order entry and result reporting

Update: The Opportunity is being Taken

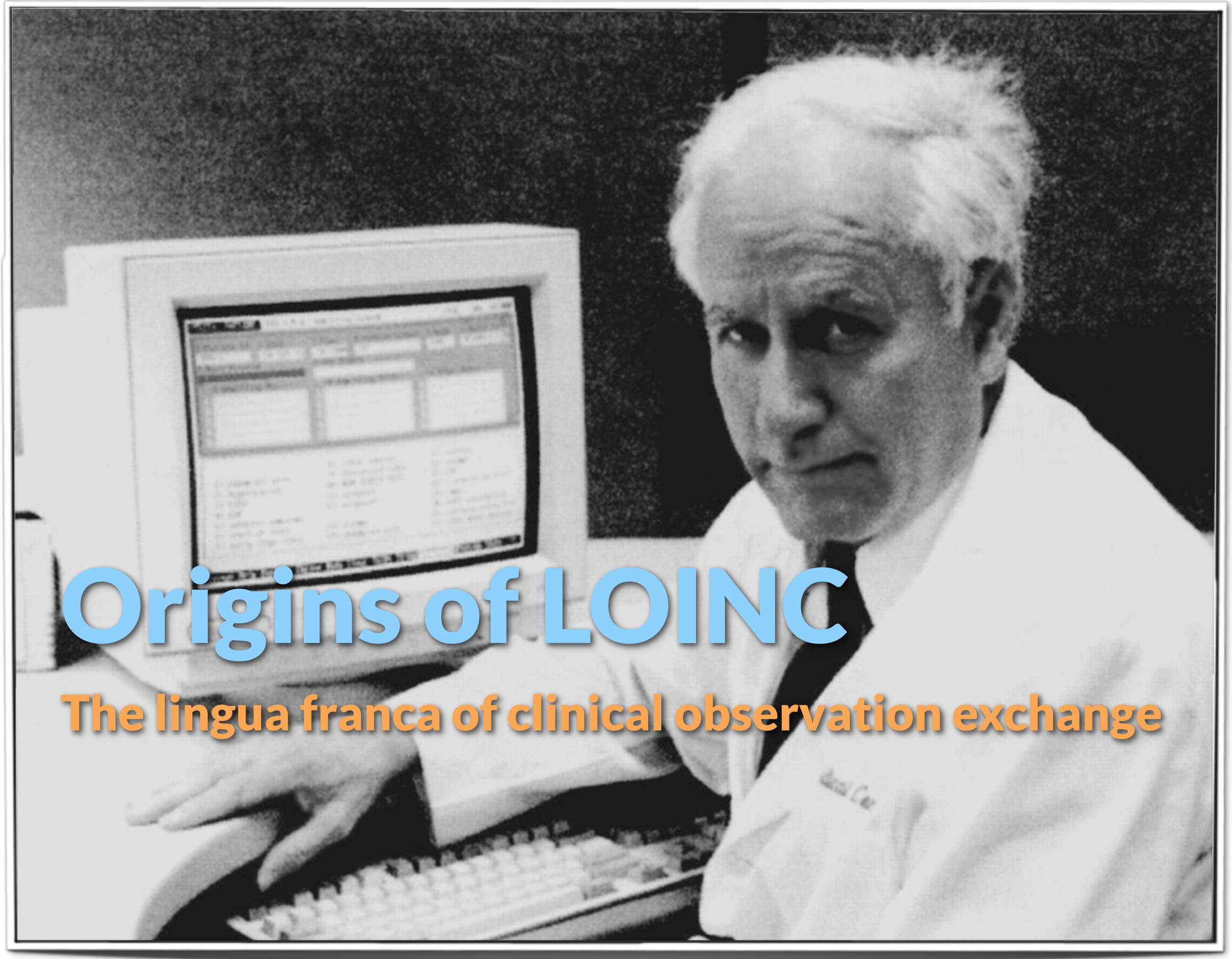
- Good progress has been made
  - Shared objectives
  - Agreement on practical issues at operational level in both organizations
  - Common understanding on key business issues at executive level in both organizations
  - The governance bodies in both organization have accepted the proposed agreement in principle (subject to contract)
- Next step
  - Drafting and signature of a final legal agreement
- Future steps
  - Undertaking work on implementing the agreement including …
    - Making links between SNOMED CT and LOINC content
    - Providing implementation advice on using SNOMED CT and LOINC together

Objectives of the proposed agreement

- To support consistent coding of order entry and result reporting
  - by addressing coding and modeling of terminology content in the domains covered by LOINC orders and observations
- To avoid unnecessary duplication of effort
- To develop cooperation between IHTSDO & Regenstrief
  - ✗ Not a one-off activity
  - ✗ Not an acquisition or merger
  - ✗ Not an exclusive arrangement
  - ✓ A long-term working relationship

An introduction to LOINC

Daniel Vreeman



Origins of LOINC

The lingua franca of clinical observation exchange

The rain forest canopy is a seamless web through which arboreal creatures efficiently move to reach the edible fruits without any attention to the individual trees.

McDonald et al. Canopy Computing: using the Web in Clinical Practice. *JAMA*. 1998;280(15):1325-1329.

photo via nosha

Arboreal Informatics Pioneers

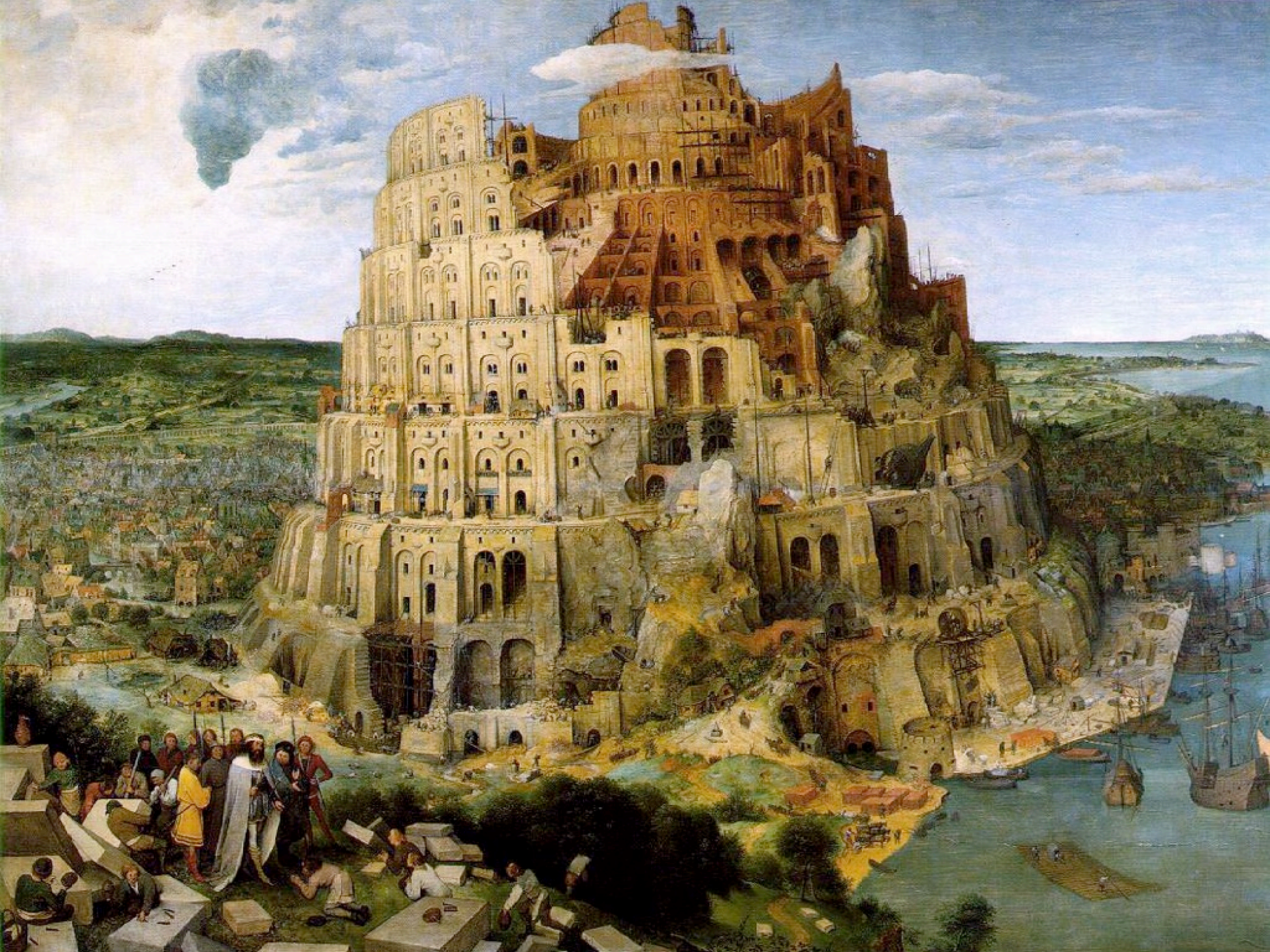
40 years of EMR work

Indiana Network for Patient Care

Nation's most comprehensive and longest tenured HIE

Regenstrief

– the "Data Switzerland"



LOINC®

from Regenstrief

A universal code system that facilitates exchange, pooling, and processing of results

Same or Different?

What you see in the test catalog

Lab A

Test Name: Lyme Disease Serology

Measures: *B. burgdorferi* Ab IgG

Method: ELISA

Scale: quantitative

e.g.: Titer 1:40

LOINC Code = 5062-5

Lab B

Test Name: Lyme Disease Antibody

Measures: *B. burgdorferi* Ab IgM

Method: Immune blot

Scale: qualitative

e.g.: Positive

LOINC Code = 6321-4

Similar name, different meaning…

photo via Caption Time

meerkat **meerkat** ***mere cat*** **meerkat**

MEASUREMENTS

“Я”

US

photo via puuikibeach

Anatomy of a LOINC Term

5671-3:Lead:MCnc:Pt:Bld:Qn::

5671-3 — **LOINC Code**

Lead	We call these	Component
MCnc	LOINC "Parts"	Property Measured
Pt		Timing
Bld		System
Qn		Scale
		Method

There are six major LOINC axes

If an observation is a question and the observation value is an answer…

LOINC provides codes for ***questions***

Where needed, other vocabularies (e.g. SNOMED CT) provide codes for ***answers***

What is my patient's hemoglobin level?

718-7:Hemoglobin:MCnc:Pt:Bld:Qn

How fast does my patient usually walk?

41959-8:Walking speed:Vel:1W^mean:^Patient:Qn:Calculated

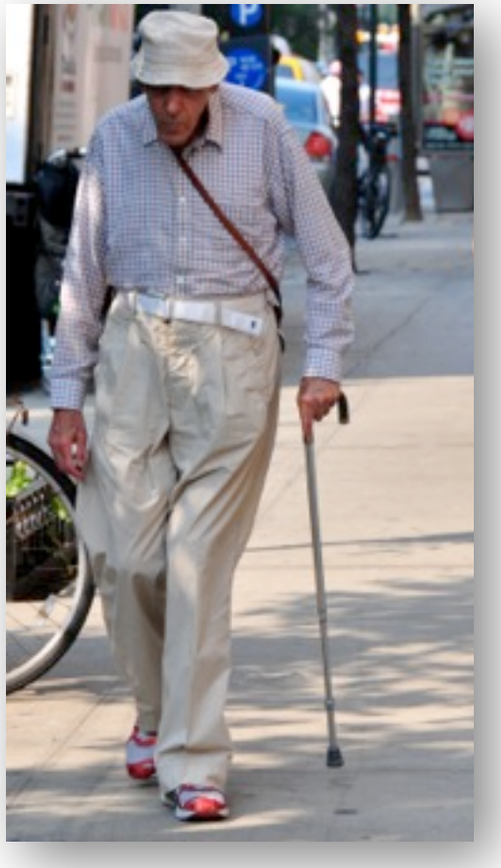
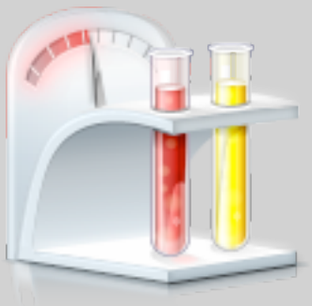


photo via Ed Yourdon

Indiana Network for Patient Care



LocalCode^LocalName^CodeSystem^LOINCcode^LOINCname^CodeSystem

```
MSH|^~\&|HOSPITAL_A|SAMPLE_HOSPITAL_A|||$YearMonthDay||||||||||||||
PID|||$patientId$||$patientName$||||||||||||||||||||
PV1|||||||$attendingDoctor$||$consultingDoctor$||||||||
OBR|1|||012^CBC/Auto Diff^HSPA^57021-8^CBC W Auto Diff^LN||$reqDate|||||||||
OBX|2|NM|123^WBC^HSP_A^26464-8^Leukocytes [#/volume] in Blood^LN||10.8|K/MM3|||||F|
OBX|3|NM|234^RBC^HSP_A^26453-1^Erythrocytes [#/volume] in Blood^LN||4.82|MIL/MM3|||||F|
OBX|4|NM|345^HGB^HSP_A^718-7^Hemoglobin [Mass/volume] in Blood^LN||15.7|GM/DL|||||F|
OBX|5|NM|456^HCT^HSP_A^20570-8^Hematocrit [Volume Fraction] of Blood^LN||45|%|||||||F|
```

Result with a Coded Value

Data type of result (OBX-5) is a coded element

This code is from LOINC

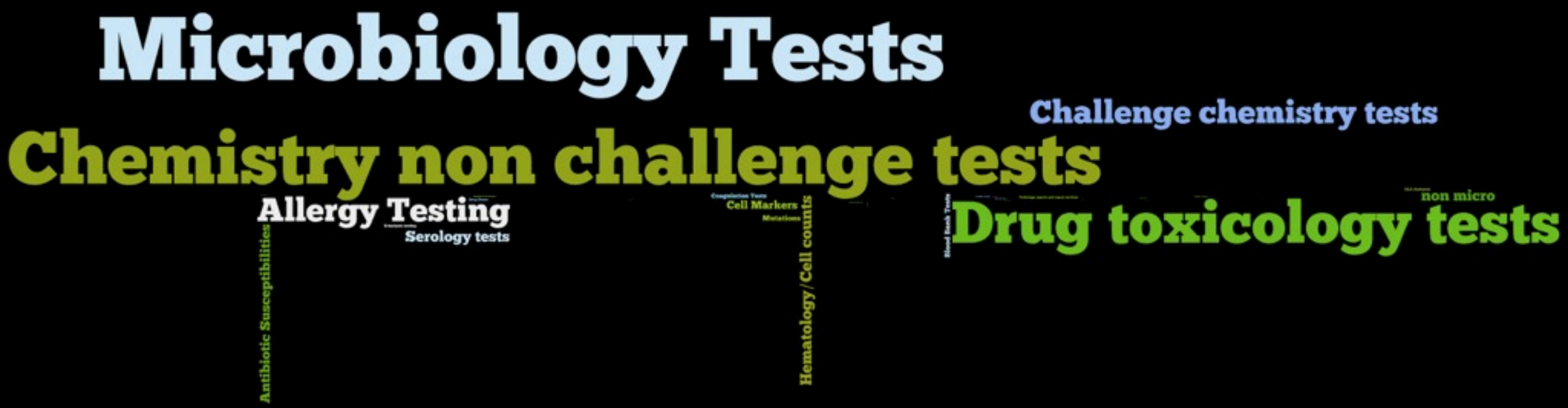
This code is from SNOMED CT

```
OBX|1|CE|6609-2^Listeria ID^LN|1|36094007^L. monocytogenes^SCT|||F
```

Code identifying this observation
(what are these results?
listeria culture)

Code identifying the result
(L. monocytogenes)

Laboratory LOINC



Clinical LOINC

Radiology Studies

Patient Reported Outcomes Information System

Outcome and Assessment Information Set

OB Ultrasound impression and Measures

Dental Measurements

Minimum Data Set

Respiratory measures and ventilator management

Clinical Report Document

Physical Exam sections and measures

OMAHA

Cardiac Ultrasound

History categories

survey

Tumor Registry

Continuity Assessment Record and Evaluation

Quality of Life Outcomes in Neurological Disorders

NAACCR

PhenX

Laboratory LOINC Committee Chair:

Clem McDonald, MD

Clinical LOINC Committee Chair:

Stan Huff, MD

LOINC Collections

Panels, forms, surveys, and other patient assessments

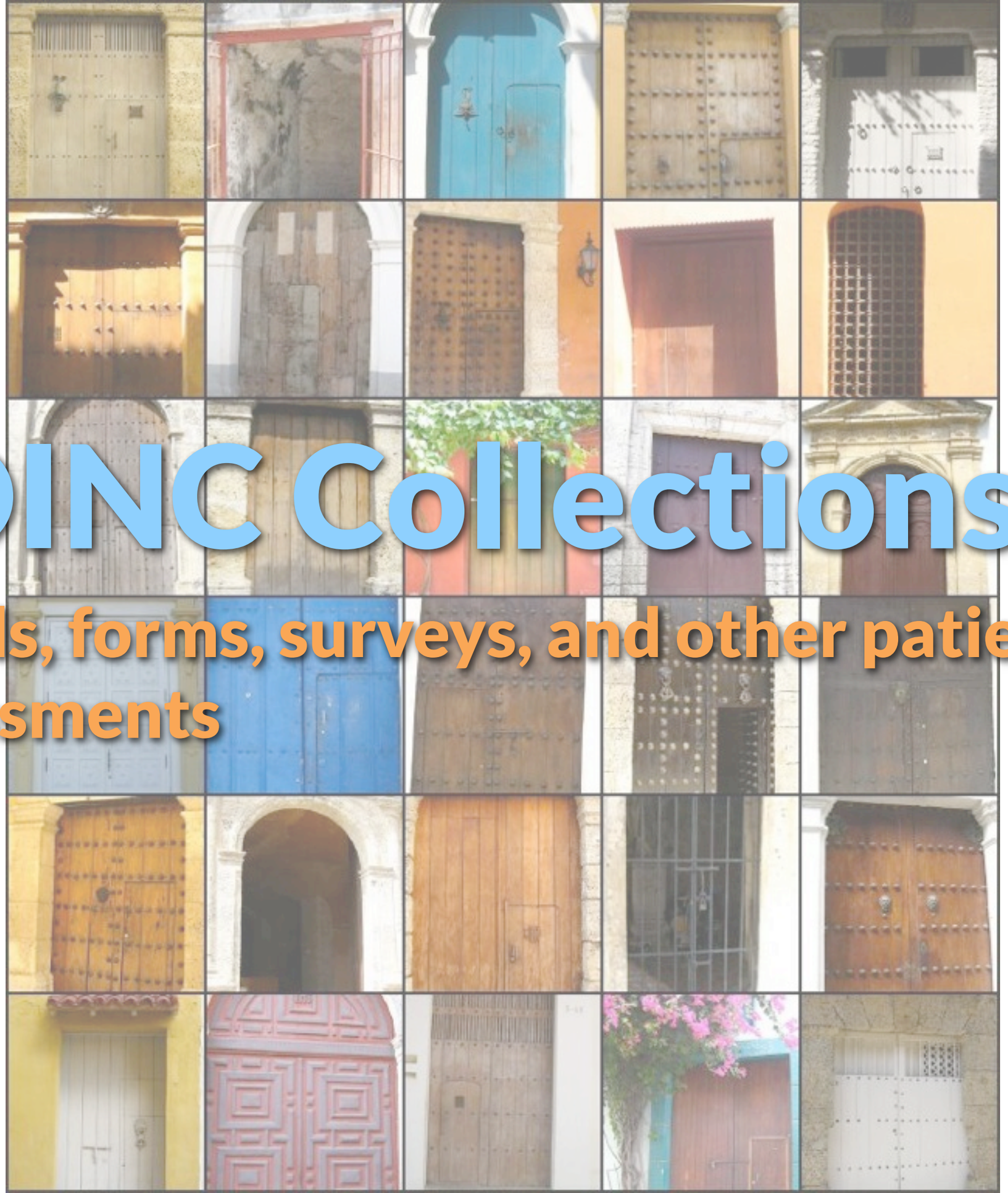


photo via LuzA

Standardized Assessments and Collections

Representing Patient Assessments in LOINC®

Daniel J. Vreeman, PT, DPT, MSc[a], Clement J. McDonald, MD[b], Stanley M. Huff, MD[c]
[a]Regenstrief Institute, Inc and Indiana University School of Medicine, Indianapolis, IN; [b]Lister Hill Center, National Library of Medicine, Washington DC; [c]University of Utah and Intermountain Healthcare, Salt Lake City, UT

ABSTRACT

Without being included in accepted vocabulary standards, the results of completed patient assessment instruments cannot be easily shared in health information exchanges. To address this important barrier, we have developed a robust model to represent assessments in LOINC through iterative refinement and collaborative development. To capture the essential aspects of the assessment, the LOINC model represents the hierarchical panel structure, global item attributes, panel-specific item attributes, and structured answer lists. All assessments are available in a uniform format within the freely available LOINC distribution. We have successfully added many assessments to LOINC in this model, including several federally required assessments that contain functioning and disability content. We continue adding to this "master question file" to further enable interoperable exchange, storage, and processing of assessment data.

INTRODUCTION

Despite progress on many fronts, interoperable health information exchange continues to be hampered by the plethora of idiosyncratic conventions for representing clinical concepts in different electronic systems. Many times, the lack of interoperable connections between systems means that valuable results are unavailable to clinicians when they need it.[1] LOINC® (Logical Observation Identifiers Names and Codes) is a universal code system for identifying representation of assessments since its early development when it included codes for standardized scales such as the Glasgow Coma Score and the Apgar Score. Prior work[5,6] has demonstrated the capability of LOINC's semantic model to represent many assessments with only modest extensions.

Over time, we have both significantly refined LOINC's model for patient assessments and added much new content. Here we present a summary of this progress. Specifically, the purpose of this paper is to describe LOINC's model for assessments, the methods and rationale by which this model was developed, the current assessment content, and some of the lessons learned in the process.

BACKGROUND

Fully specified LOINC names are constructed on six main axes (Component, Property, Timing, System, Scale, and Method) containing sufficient information to distinguish among similar observations.[2] Different LOINC codes are assigned to observations that measure the same attribute but have different clinical meanings. The LOINC codes, names, and other attributes are distributed in the main LOINC database made available at no cost in regular releases on the LOINC website (http://loinc.org). In addition to the LOINC database, Regenstrief develops and distributes at no cost a software program called RELMA that provides tools for searching the LOINC database, viewing detailed accessory content, and for mapping local terminology to LOINC terms.

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LOINC®: a universal catalogue of individual clinical observations and uniform representation of enumerated collections

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Abstract: In many areas of practice and research, clinical observations are recorded on data collection forms by asking and answering questions, yet without being represented in accepted terminology standards these results cannot be easily shared among clinical care and research systems. LOINC contains a well-developed model for representing variables, answer lists and the collections that contain them. We have successfully added many assessments and other collections of variables to LOINC in this model. By creating a uniform representation and distributing it worldwide at no cost, LOINC aims to lower the barriers to interoperability among systems and make this valuable data available across settings when and where it is needed.

Keywords: clinical observations; framework; health information technology; patient data; patient assessments; data sets; public health; research; standards; terminology.

Vreeman DJ, McDonald CJ, Huff SM. Representing patient assessments in LOINC®. AMIA Annu Symp Proc. 2010;832-836. PMID: 21347095 .

Vreeman DJ, McDonald CJ, Huff SM. LOINC® - A Universal Catalog of Individual Clinical Observations and Uniform Representation of Enumerated Collections. Int J Funct Inform Personal Med. 2010;3(4):273-291.

Open Development

It's free, but invaluable

Worldwide distribution at no cost

New terms from end-users

Welcome all comers

Committees are volunteers

Funding Support

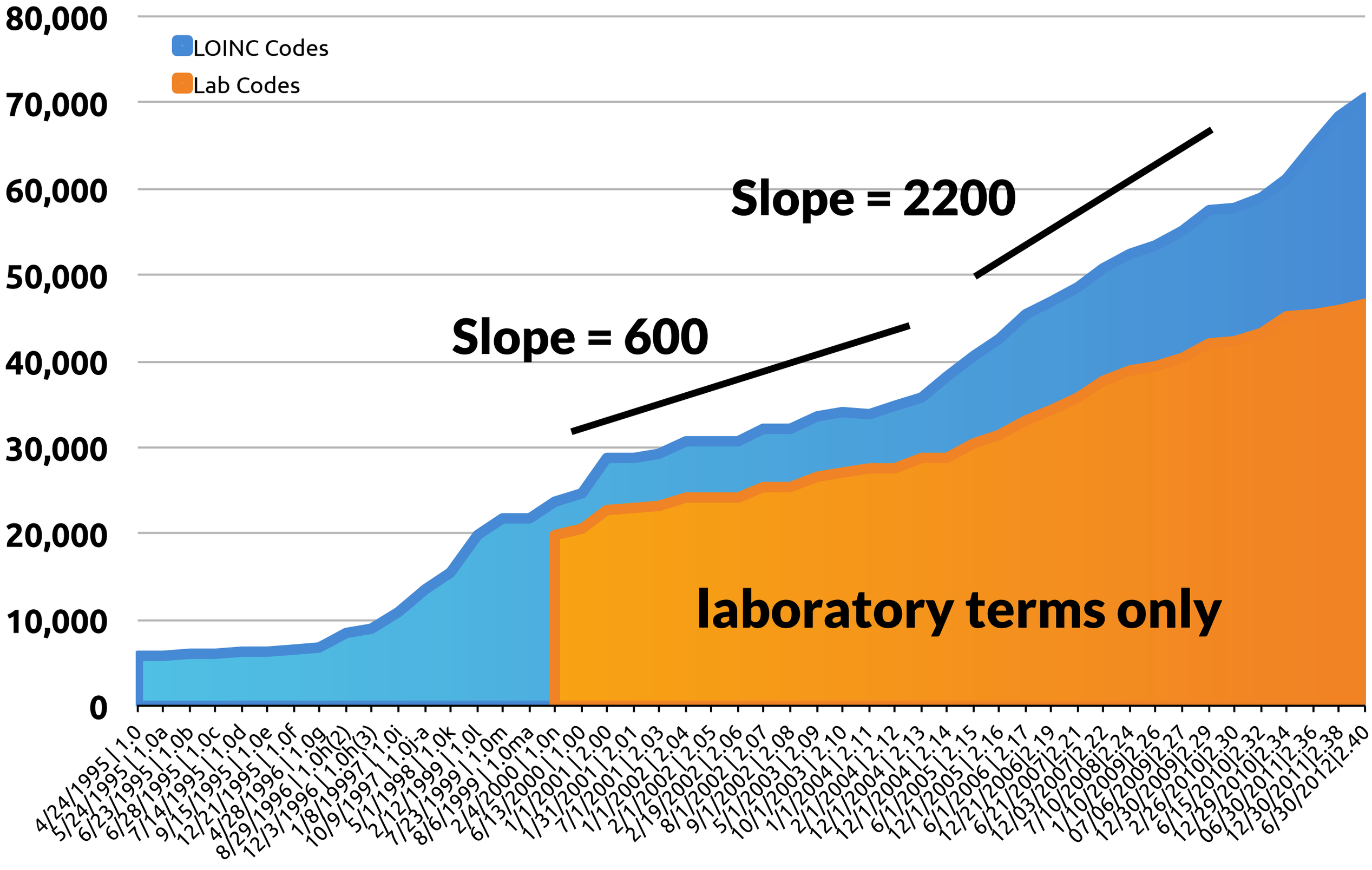
Main current sources are:

U.S. National Library of Medicine
Regenstrief Foundation

Prior support from

Several other U.S. federal agencies,
John A. Hartford Foundation

LOINC Codes Over Time by Release



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Logical Observation Identifiers Names and Codes (LOINC®)

A universal code system for identifying laboratory and clinical observations.

From serum levels of hepatitis B surface antigen to diastolic blood pressure, LOINC has standardized terms for all kinds of observations and measurements that **enable exchange and aggregation of electronic health data from many independent systems.**

More than 18,000 people in 148 countries use LOINC to help make bridges across their islands of health data.

It's free, but invaluable. Both LOINC and the RELMA mapping program that helps link your local codes to LOINC terms are **distributed at no cost** by the Regenstrief Institute. LOINC is your key to interoperable data exchange.

Ready to get started?

Download Now (free)
Get started with LOINC today!

Current Versions

LOINC 2.40
Released: 2012-06-30

RELMA 5.8
Released: 2012-06-30

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Common LOINCs

Get started with the most frequently used LOINC result codes.

Top 2000 Results plus Mapper's Guide

You might also like: Top 300 Orders | Common UCUM units

Explore LOINC

Search the latest version of LOINC right from your browser.

searchloinc.org

Share your Mappings

We're building tools to help tap the "wisdom of the crowd".

Add Your Mappings to a Shared Repository

Deadline for 1st round of mapping contributions is October 12, 2012

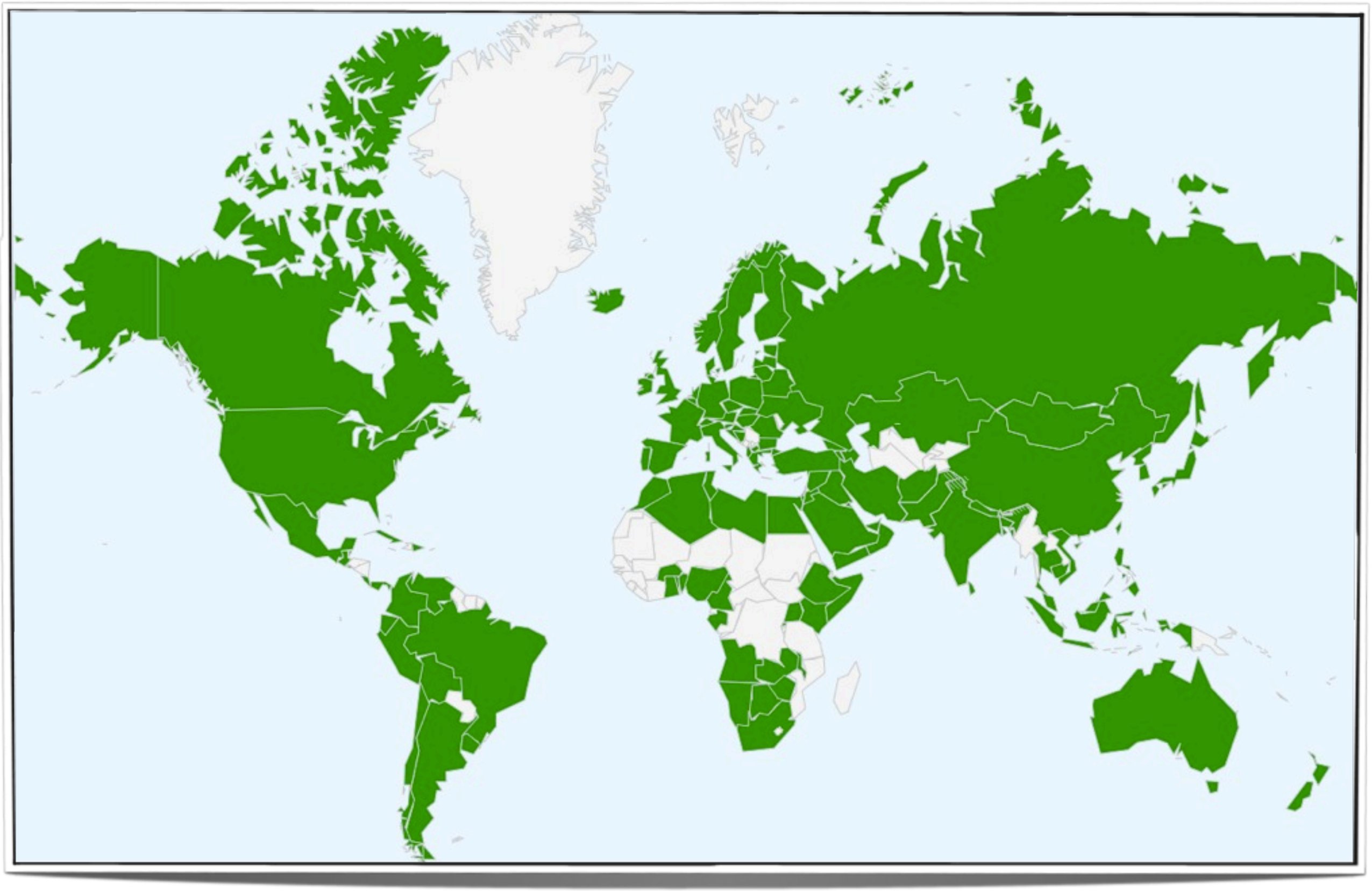
12 Public Laboratory LOINC Workshop & Committee Meeting 12/06/12-12/07/12

New to LOINC? Watch the LOINC Introduction Webinar

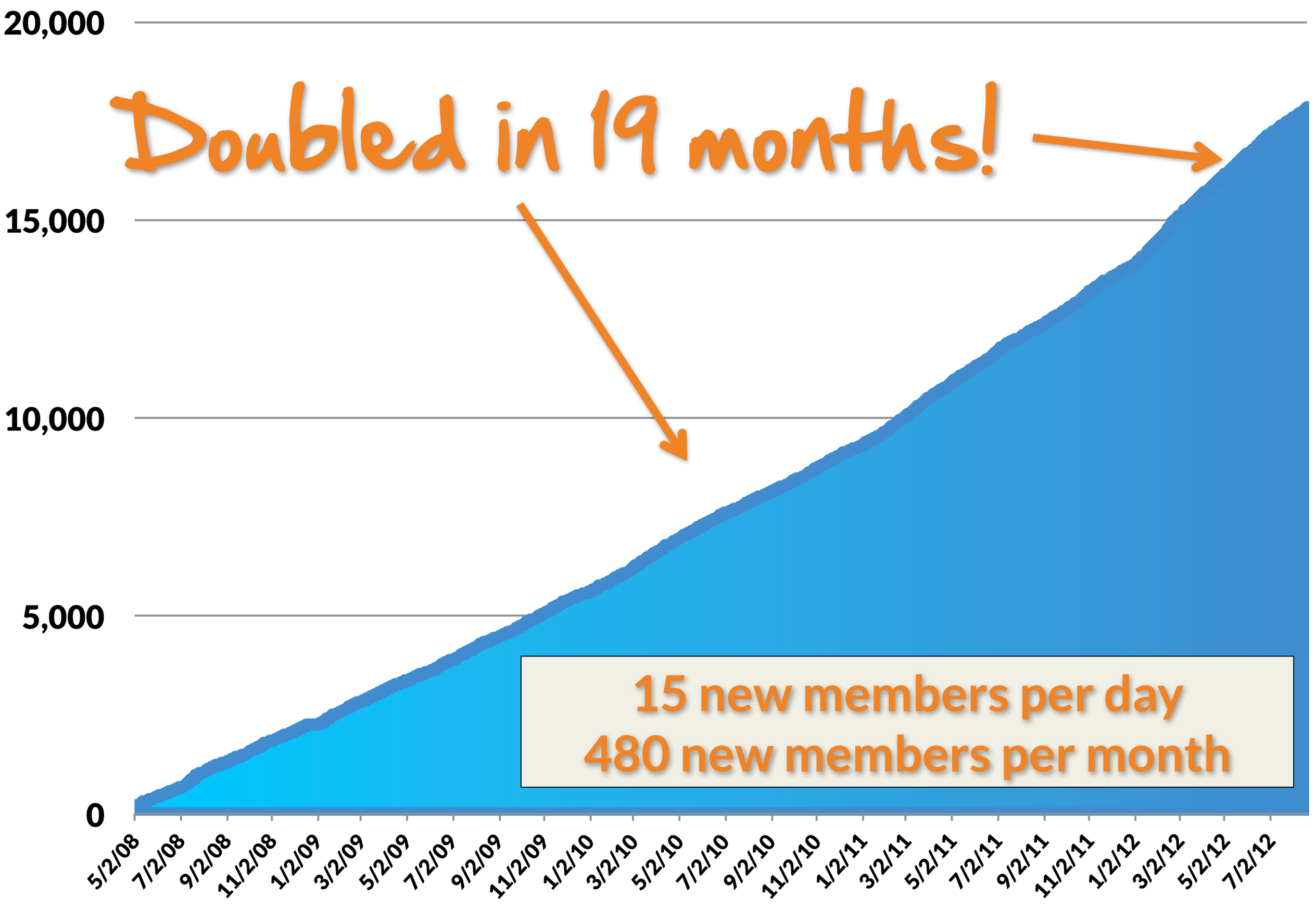
LOINC: An Introduction to the Universal Catalog of Laboratory and Clinical Observations

Daniel J. Vreeman, PT, DPT, MSc
Runtime: 58 mins

18,900+ users in 148 countries



loinc.org members



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LOINC and RELMA Complete Download File (All Formats Included) (302.3 MB)

File Version: LOINC 2.40 and RELMA 5.8 | Release Date: 2012-06-30 | File type: application/zip

This file contains the RELMA® program installer (which also includes the LOINC® and RELMA® Users' Guides), and the LOINC® database in both MS Access™ and tab-delimited formats.

To download this file you need to log in with your user name and password. If you do not have an account here, head over to the registration form.

LOINC Table

LOINC 2.40
Released: 2012-06-30

The LOINC table with fields for LOINC codes, each of the six parts of the formal name of the LOINC, synonyms, comments, and other information. Distributed as a tab-delimited text file and Access database, and a release to release Change File and Change Report. Documentation includes LOINC Release Notes and the comprehensive LOINC User's Guide.

Download Now (free)

Accessory Files

LOINC 2.40
Released: 2012-06-30

Additional files available in the LOINC distribution.

- LOINC Panels and Forms File
- LOINC Multiaxial Hierarchy File
- LOINC Context-specific Hierarchy Template File
- LOINC Top 2000 Results
- LOINC Top 300 Orders
- Common UCUM units

Download Now (free)

RELMA

RELMA 5.8
Released: 2012-06-30

Regenstrief LOINC Mapping Assistant (RELMA®) is a Windows program for searching the LOINC database and helping you map local codes to LOINC codes. Documentation includes RELMA Release Notes and a comprehensive RELMA User's Manual.

Download Now (free)

Current Versions

LOINC 2.40
Released: 2012-06-30

RELMA 5.8
Released: 2012-06-30

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LOINC

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Join the conversation

search.loinc.org

Options Help loinc.org Set Language

LOINC From Regenstrief

cftr gene Search

1 / 2 [1 - 18 / 30]

LOINC	LongName	Component	Property	Timing	System	Scale	Method	exUCUMunits	exUnits	Rank
38404-0	CFTR gene mutation analysis in Blood or Tissue by Molecular genetics method Narrative	CFTR gene mutation analysis	Prid	Pt	Bld/Tiss	Nar	Molgen			1180
21654-9	CFTR gene mutations found [Identifier] in Blood or Tissue by Molecular genetics method Nominal	CFTR gene mutation analysis	Prid	Pt	Bld/Tiss	Nom	Molgen			460
38691-8	ABCC8 gene mutation analysis in Blood or Tissue by Molecular genetics method Narrative	ABCC8 gene mutation analysis	Prid	Pt	Bld/Tiss	Nar	Molgen			
38918-9	ABCC8 gene mutations found [Identifier] in Blood or Tissue by Molecular genetics method Nominal	ABCC8 gene mutation analysis	Prid	Pt	Bld/Tiss	Nom	Molgen			
42938-1	CFTR gene allele 1 [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene allele 1	Arb	Pt	Bld/Tiss	Ord	Molgen			
42939-9	CFTR gene allele 2 [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene allele 2	Arb	Pt	Bld/Tiss	Ord	Molgen			
69480-2	CFTR gene deletion and duplication mutation analysis [Identifier] in Blood or Tissue by MLPA Narrative	CFTR gene deletion+duplication	Prid	Pt	Bld/Tiss	Nar	MLPA			
46989-0	CFTR gene mutation analysis in Amniotic fluid by Molecular genetics method Narrative	CFTR gene mutation analysis	Prid	Pt	Amnio fld	Nar	Molgen			
34718-7	CFTR gene mutations found [Identifier] in Amniotic fluid by Molecular genetics method Nominal	CFTR gene mutation analysis	Prid	Pt	Amnio fld	Nom	Molgen			
54083-1	CFTR gene mutations found [Identifier] in Dried blood spot Nominal	CFTR gene mutation analysis	Prid	Pt	Bld.dot	Nom				
50998-4	CFTR gene mutations tested for [#] in Blood or Tissue by Molecular genetics method	CFTR gene mutations tested for	Num	Pt	Bld/Tiss	Qn	Molgen			
21656-4	CFTR gene mutations tested for in Blood or Tissue by Molecular genetics method Nominal	CFTR gene mutations tested for	Prid	Pt	Bld/Tiss	Nom	Molgen			
38449-5	CFTR gene c.1078delT [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene.c.1078delT	Arb	Pt	Bld/Tiss	Ord	Molgen			
38450-3	CFTR gene c.2184delA [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene.c.2184delA	Arb	Pt	Bld/Tiss	Ord	Molgen			
38451-1	CFTR gene c.2789+5G>A [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene.c.2789+5G>A	Arb	Pt	Bld/Tiss	Ord	Molgen			
38452-9	CFTR gene c.3120+1G>A [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene.c.3120+1G>A	Arb	Pt	Bld/Tiss	Ord	Molgen			
34706-2	CFTR gene c.3199del6 [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene.c.3199del6	Arb	Pt	Bld/Tiss	Ord	Molgen			
38453-7	CFTR gene c.3659delC [Presence] in Blood or Tissue by Molecular genetics method	CFTR gene.c.3659delC	Arb	Pt	Bld/Tiss	Ord	Molgen			

loinc.org/terms-of-use

photo via 917press

Just kidding.

Copyright is a ***good*** thing for standards.

It’s the licensing part that is interesting.

No cost

Worldwide

In perpetuity

Use

Copy

Distribute

photo via [Refracted Moments™]

CANNOT use any Licensed Material to develop or promulgate a different standard for orders or observations.

That would defeat the purpose of having a standard!

Available Linguistic Variants

	Display	Searchable	Documentation	Other Resources
Chinese (China)	✓	✓	✓	✓
Estonian (Estonia)	✓	✓	✓	✓
English (United States) - *Official Distribution*	✓	✓	✓	✓
French (Canada)	✓	✓		
French (France)	✓	✓	✓	
French (Switzerland)	✓			
German (Germany)	✓	✓	✓	✓
German (Switzerland)	✓			
Greek (Greece)	✓			
Italian (Italy)	✓	✓		✓
Italian (Switzerland)	✓			
Korean (Korea, Republic of)	✓	✓		
Portuguese (Brazil) - *Draft*	✓			
Spanish (Argentina)	✓	✓		
Spanish (Mexico)			✓	✓
Spanish (Spain)	✓	✓		
Turkish (Turkey)			✓	

Adopted as National Standard

Brazil

Canada

France

Germany

The Netherlands

Mexico

Rwanda

Thailand

USA

Large Implementations

SIGA Saúde project

Canada Health Infoway

ePSOS

Assistance publique - Hôpitaux de Paris

Red Agrolab

BiTAC

Hong Kong Hospital Authority

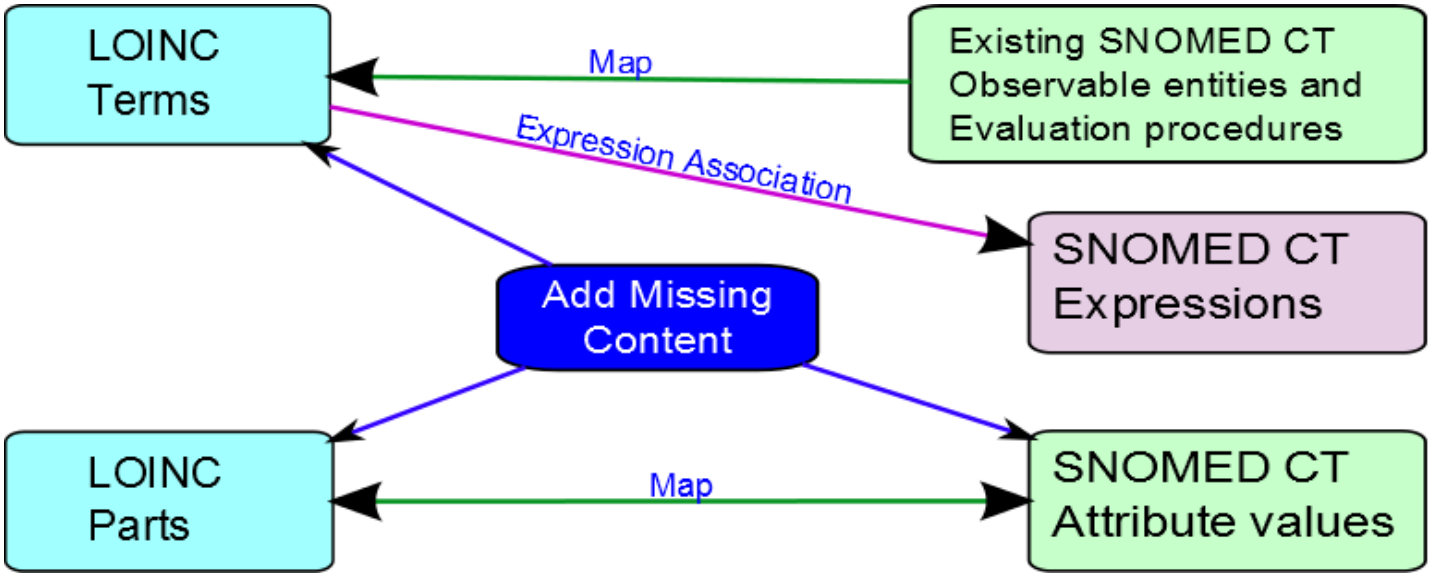
Many more...

Now we're ready to get LOINCing!

photo via ryarwood

Enabling SNOMED CT and LOINC to work together

The practical approach



- Maps between LOINC Parts and SNOMED CT
  - Addition of content where necessary to complete these maps
- LOINC terms linked to “SNOMED CT Expressions” to provide SNOMED CT semantic view of LOINC Terms
  - Limited additions of content subject to specific restrictions **intended to limit duplication of effort and content**

Planned outcomes

- Additions to SNOMED CT International Release
  - Map Refset to/from LOINC Parts
  - Association Refset from LOINC Terms to SNOMED CT Expressions
- Additions to LOINC release files
  - Equivalent SNOMED CT concept identifiers added to relevant LOINC Parts
  - SNOMED CT Expressions linked to LOINC Terms
  - Associations between LOINC Terms & sets of SNOMED CT answer values
- Licensing and distribution of LOINC and SNOMED CT will continue according to the policies & practices of each organization
- Consistent advice on implementing SNOMED CT and LOINC together supported by both IHTSDO and RI
  - Taking account of recommendations of HL7 TermInfo R2 project
  - Based on a model of observables which will allow semantic comparison of combinations of LOINC questions and SNOMED CT coded answers

How Much Work is Involved?

- Putting this agreement into effect will require both IHTSDO and the LOINC Committee to do some work
  - Creating maps & associations between LOINC & SNOMED CT
  - Adding content
  - Developing implementation guidance
- Without this agreement work would have been needed to cover the known content gaps in SNOMED CT coverage of the laboratory domain
- With the agreement there are many benefits
  - Working together reduces the barriers to adoption of both SNOMED CT and LOINC
  - Cooperation will also encourage IHTSDO Membership growth in countries that have already adopted LOINC

Summary

- Objective and approach have been agreed at operational levels in both organization
- The governance bodies of IHTSDO and Regenstrief Institute have accepted the principles of the agreement
- The next step is to finalize a legal agreement
- Beyond this there is work to be done!

- Note:
  - This presentation is a brief summary of key points from the agreement
  - More details of the proposal will be made publicly available as soon as possible

Thank you for your attention

Questions?

- Contact IHTSDO: info@ihtsdo.org
- Web site: www.ihtsdo.org