An Introduction to LOINC

Logical Observation Identifier Name and Codes

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History (1)

- The Regenstrief Institute for Health Care developed LOINC under the sponsorship of NLM and other government and private organizations. It is available at no cost
- Development began in the mid 1990s by Dr. Clem McDonald and others at Regenstrief
- First release (v 1.0) was on 4/24/95
- Originally called Laboratory Observations, Identifiers, Names and Codes

History (2)

- Original data sources for LOINC include
  - Silver Book for International Union of Pure and Applied Chemistry
  - International Federation of Clinical Chemistry
  - Textbooks of pathology
  - Expertise and work of LOINC members
  - EUCLIDES (European database)
  - Master files from Indiana University/Regenstrief, University of Utah, Mayo Medical Laboratories, LDS Hospital, Department of Veterans Affairs, Quest Diagnostics, University of Washington, and Association of Regional and University of Pathologists

History (3)

- Now called Logical Observation Identifiers Names and Codes (LOINC®)
- Has two sections
  - Laboratory portion
    - Standard test names and codes
    - Includes chemistry, hematology, serology, microbiology (including parasitology and virology), toxicology
    - Drugs and cell counts for blood smears and cerebrospinal fluids
    - Antibiotic susceptibilities
  - Clinical portion
    - Vitals signs, hemodynamics, intake/output, ECG, obstetric ultrasound, cardio echo, urologic imaging, pulmonary ventilator management, survey instruments, other

LOINC Code

- Codes are unique and have no meaning
- Format is nnnnn-n where the last n is a mod 10 check digit

- Each LOINC record corresponds to a single test or panel
- Includes long names, short names and synonyms

Definition axes

- Component name (analytic)
- Property measured
- Timing
- Type of sample
- Type of scale
- Method (where relevant)

COMPONENT

- What is measured, evaluated or observed
- Examples
  - Potassium
  - Hemoglobin
  - Hepatitis C antigen

PROPERTY MEASURED

- Characteristics of what is measured
- Examples
  - Length
  - Volume
  - Mass concentration
  - Time stamp
  - Enzyme activity

TIMING

- Interval of time over which the observation or measurement was made
- Examples
  - Point in time (PT)
  - Observation integrated over an extended duration of time - 24-hour urine

SAMPLE/SYSTEM

- Context or specimen type within which the observation was made
- Examples
  - Urine
  - Blood
  - Abdomen
  - Heart

TYPE OF SCALE

- The scale of measure
- Scales may be
  - Quantitative (true measurement)
  - Ordinal (ranked set of options)
  - Nominal (e.g. E. coli)
  - Narrative (dictation results from x-ray)

METHOD

- Method or procedure used to produce the result or observation (when relevant)
- Examples
  - Cuff method for blood pressure
  - Automated BP measurement

Further divisions

- Name can be divided into 3 subparts delimited by ^.
- 1st subpart can be further subdivided into 3 more levels of taxonomic specification, separated by dots (.)
- 2nd subpart contains information about the challenge
- 3rd subpart is for adjustments/corrections

Hierarchical structure of component

- Component name
  - Name and modifier
    - Component name
    - Component subname
    - Component sub-subname
  - Information about challenge
  - Adjustments/corrections

Further divisions

- Timing and system/sample can be divided into 2 subparts delimited by ^
- Time: 2nd subpart identifies max, min, mean, etc
- Specimen: 2nd subpart identifies source if not the patient (e.g. fetus)

What is not part of name

- Instrument used in testing
- Fine details about sample or site of collection
- Priority of testing (stat or routine)
- Who verified result
- Size of sample collected
- Place of testing

Naming conventions

- total, not tot
- fraction, not frac
- alpha, not A- etc.
- oxygen, not O
- dextro, not d-

Other Naming Rules

- Place Identifier of substance measured first
- Use generic name of drug
- Use full taxonomic name of organism or virus
- Name vitamins by chemical name
- Rules for species and groups of species
- Avoid direct, indirect; conjugated, unconjugated
- Use platelets not thrombocytes
- Use noun form of target of antibody

EXAMPLES (1)

- SODIUM:SCNC:PT:SER/PLAS:QN
- SODIUM:SRAT:24H:UR:QN
- GLUCOSE^2H POST 100 G GLUCOSE PO:MCNC:PT:SER/PLAS:QN

EXAMPLES (2)

- ABO GROUP:TYPE:PT: BLD^DONOR:NOM
- BODY TEMPERATURE:TEMP:8H:MAX:XXX:QN
- CHIEF COMPLAINT:FIND:PT:^PATIENT: NAR: REPORTED

EXAMPLES (3)

- STREPTOCOCCUS PNEUMONIA AB.IGG^1ST
- SPECIMEN:ACNC:PT:SER:QN:MICROSCOPIC
- OBSERVATION:PRID:PT:XXX:NOM:GRAM STAIN
- ERTHROCYTES:ACNC:PT:SMN:ORD:MICROSCOPY.LIGHT
- HFE GENE.MUTATION ANALYSIS:PRID:BLD/TSS:NOM:MOLGEN

Clinical LOINC

- Name
- Type of property
- Timing
- Body system
- Scale
- Method

Examples

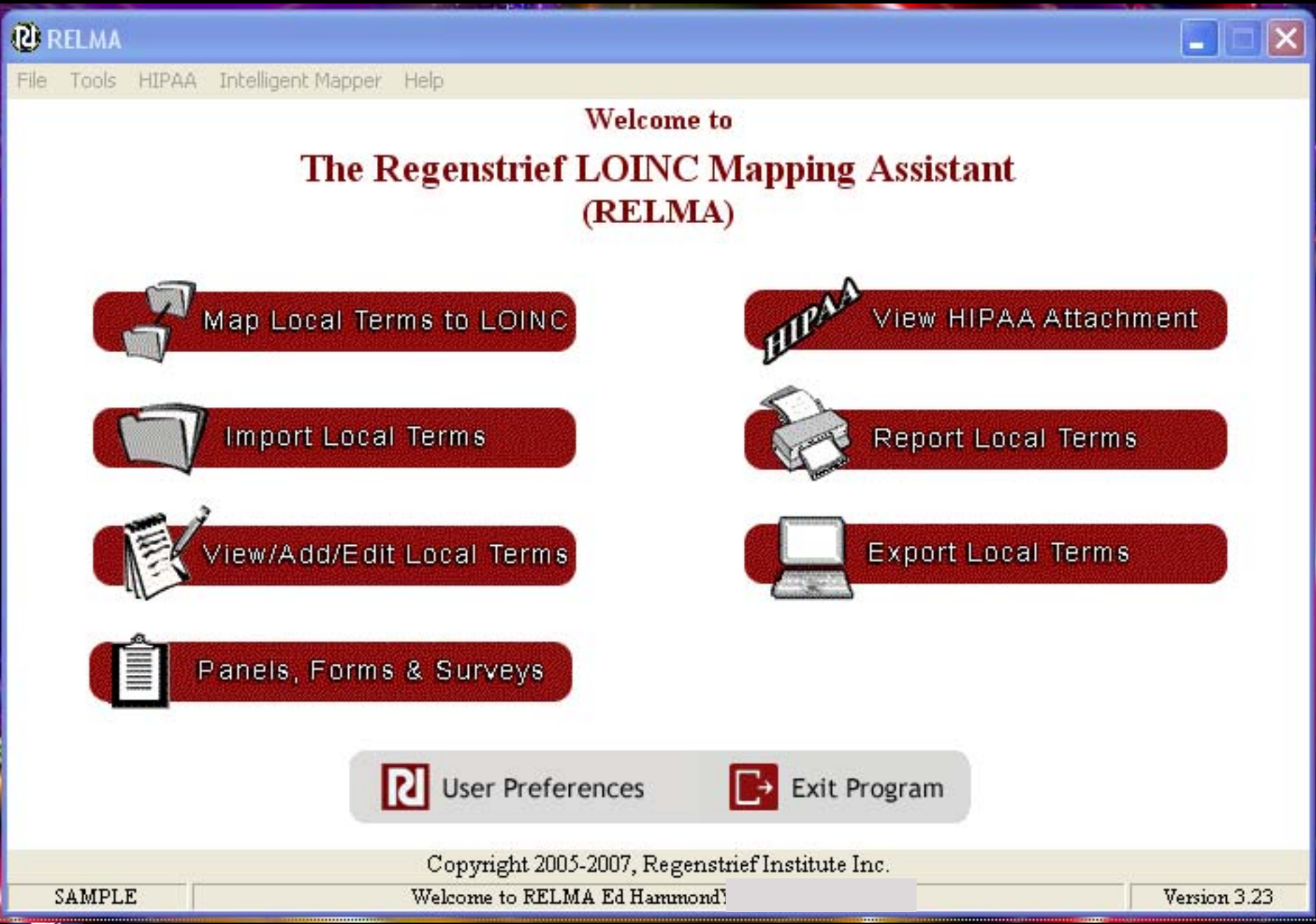
- QRS interval, systolic
- ventricle.left.outflow
- kidney.right
- circumference at nipple line, length

LOINC Today

- The current version of LOINC is v2.2 and was released in December 2007. The database contains 50,809 terms
- LOINC continues to evolve with new codes. New direction includes terminology for genomics
- Defined process for submitting new terms

Regenstrief LOINC Mapping Assistant

- The Regenstrief Institute provides a Windows-based mapping utility called the Regenstrief LOINC Mapping Assistant (RELMA) to facilitate searches through the LOINC database and to assist efforts to map local codes to LOINC codes. Like the LOINC database, this program is also available for free use


RELMA
File Tools HIPAA Intelligent Mapper Help
Welcome to
The Regenstrief LOINC Mapping Assistant
(RELMA)
Map Local Terms to LOINC
Import Local Terms
View/Add/Edit Local Terms
Panels, Forms & Surveys
HIPAA
View HIPAA Attachment
Report Local Terms
Export Local Terms
User Preferences
Exit Program
Copyright 2005-2007, Regenstrief Institute Inc.
SAMPLE
Welcome to RELMA Ed Hammond
Version 3.23

Advantages of using LOINC

- Improved communication in integrated health delivery networks
- Supports aggregated electronic health records
- Permits automatic transfer to public health authorities of case reports for reportable diseases
- Improved transfer of payment particularly claims attachments
- Supports reduction of errors

Endorsement

- CAP
- ACLA
- Most clinical laboratories
- Most major medical centers
- US government (for laboratory test names)
  - DOD, VA, HHS, CDC, FDA, CHI Initiative
- Mapped in UMLS
- Most recently endorsed by caBIG and extensive review
- Used internationally

Current use of LOINC

- Currently most clinical laboratories and other diagnostic services use HL7 to send their results electronically from their reporting systems to their care systems
- Most labs, however, identify tests in these messages by means of their internal code values
- Care systems must either use the internal codes provided by laboratory or map to LOINC or local codes
- Universal use of LOINC would solve this problem, and there is momentum to move in this direction

For this research

- Mapping from local or internal codes is not easy because which LOINC code to be used is not obvious
- If agreement can be reached among the vendors to adopt LOINC as the official controlled terminology for laboratory tests names, that offers the best solution. Otherwise, we should attempt to do a single mapping

Normal Limits

- A challenging problem when the normal limits for the same test differs. The data cannot be easily merged when this happens
- Possible solutions
  - Attempt to get consistency in normal limits
  - If normal limits are radically different, treat as different tests
  - Convert to standard limits and normalize values

Vocabulary in HL7

- HL7 has not created a comprehensive terminology. It has created vocabulary tables when required terms are not available in any controlled terminology system and in cases when the terms are in very general use and exists in multiple controlled terminologies
- HL7 has endorsed the use of certain terminologies for specific purposes
  - LOINC for laboratory test names
  - SNOMED CT for laboratory result values and diagnoses
  - RxNorm for drugs
- The binding of terminologies to messages is largely done through Implementation Manuals