# Introduction to LOINC and RELMA

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# Acknowledgements

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  - John Hook, Mark Fisher, Ryan Phillips, Karen Ahmad, and more!
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# Why LOINC?

"Within one laboratory, local jargon terms may be used which are usually well understood between colleagues, but would not be sufficiently widely known for communication with the outside world."

U. Forsum et al., Pure Appl. Chem 72:555-745, 2000 *Properties and Units in the Clinical Laboratory Sciences Part VII. Properties and Units in Clinical Microbiology*

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# Test comparisons

**What you see in the order list**

**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**

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# Anatomy of a LOINC Term

**5193-8:Hepatitis B virus surface Ab:ACnc:Pt:Ser:Qn:EIA**

| | |
|---|---|
| 5193-8 | LOINC Code |
| Hepatitis B virus surface Ab | Component |
| ACnc | Property Measured |
| Pt | Timing |
| Ser | System |
| Qn | Scale |
| EIA | Method |

*There are six major LOINC axes*

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# What is NOT part of a LOINC Name?

- The instrument used in testing
- Specific details about the specimen
- Priority (e.g. STAT)
- Where testing was done
- Who did the test
- Test interpretation
- Anything that is not an intrinsic part of the name of the result
- Other things that are carried in;
  - The OBX segment
  - An HL7 Version 3 Observation Object

# Component/Analyte

The substance or entity that is measured, evaluated, or observed

- Sodium
- Glucose
- Brucella sp. organism
- Influenza A Virus antigen
- Cytomegalovirus Virus antibody
- Lipids.Total

**5193-8:Hepatitis B virus surface Ab:ACnc:Pt:Ser:Qn:EIA**

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# Property

*the most difficult LOINC axis*

The characteristic or attribute of the analyte that is measured, evaluated, or observed

Major Categories
- **Mass:** Observations reported with mass (milligrams, grams, etc.) in the numerator of their units of measure
- **Substance:** Observations reported with moles or milliequivalents in the numerator of their units of measure
- **Catalytic activity:** Observations that report enzymatic activity
- **Arbitrary:** Results that report arbitrary units in the numerator of their units of measure
- **Number:** Counts

**5193-8:Hepatitis B virus surface Ab:ACnc:Pt:Ser:Qn:EIA**

# Timing*

The interval of time over which the observation or measurement was made

- Pt - at a point in time
- 12H - a twelve hour collection
- 24H - a twenty four hour collection

*Public Health Lab timings are usually Pt

*non-Pt timings are usually associated with Ratio Property

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# System

The system (context) or specimen type upon which the observation was made.

- Ser - Serum
- Bld - Whole blood (RBC)
- Ur- Urine
- BldA - Arterial blood
- Liver - Liver
- Flu – Body Fluid, unspecified
- Gast – Gastric fluid/contents
- Food – Food or feedstuff
- Tiss – Tissue
- XXX – To be specified in another part of the message

## Super System

Second subpart (^). When not included, "patient" is the default. Used to indicated blood product unit (BPU), a bone marrow donor, or a fetus.

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# Scale

- Qn - quantitative
  - Continuous numeric (real, integer, ratio)
  - Optional operator (>, ≥, ≤, <)
- Ord - ordinal
  - a ranked set of possible values (1+, 2+, 3+)
- Nom - nominal
  - an unranked collection of possible values
  - a taxonomy (e.g list of bacteria)
- Nar - narrative
  - free text narrative (e.g., visit note)

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# Method

- Methods only needed if interpretation affected
  - Different normal ranges
  - Test Sensitivity
- Listed only at the generic level
  - Agglutination
  - Immunoassay
  - Probe with target amplification
- Methods may also be sent in OBX.17

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## Mapping Terms to LOINC
### Things to Remember

- The thing ordered is not always the thing measured:
  - Blood Culture – live organism(s) identified
  - VDRL – *Treponema pallidum Ab*
  - Urinalysis – lots of different things
- The question (what am I measuring?) is not the answer (e.g. Pos)
  - You are mapping the question, not the answer!
- You must know the <u>specifics</u> of the component being tested for (what is this test actually measuring?)

# RELMA®

Regenstrief LOINC Mapping Assistant

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# RELMA Functions

- Manual and automated mapping assistant
- Same free use as LOINC (see license)
- Comes with the LOINC files and indexes
- RELMA tools transform local words in local file
  - User creates file of local term/name and codes
- Assigns LOINC term to local test/battery code

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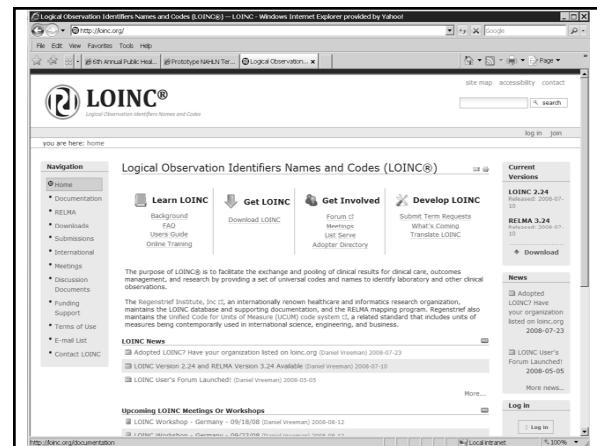
## RELMA Search logic

For a given test:
- User can select LOINC records containing:
  - A set of words connected by ANDs or Ors
  - Additional keyed in words
  - A particular category of test (e.g. microbiology)
  - Wild cards of ? and *
  - Selected classes, systems, components,
  - Any intersection of the above

Note:
> RELMA assumes *exact match* on word unless user adds terminal "*" to indicate wild card.

## RELMA Logic

**Not → #<word A>**

**Or → <word A> | <word B >**

**And→ <word B>   <word A>**

# Importing Local Terms into RELMA

# 4 Ways to Load Local Master Observation Files

- Direct entry into LMOF from within RELMA (painful)
- Create an Access table that mimics the LMOF structure (less painful but tedious)
  - Appendix A: RELMA Manual
- Create a delimited ASCII file from your local test catalog (good choice)
- Load directly from HL7 v2.x messages (best? choice)
  - Pulls data from OBR and OBX segments

## Example Delimited File



## Open File in RELMA



## Fields Segregated



## Ready to Import

## Alternative (best) Way

- Use large set of HL7 messages
- Automatically make dataset of:
  - OBR ID
  - OBR description
  - OBX ID
  - OBX description
  - Sample of results with
    - Real values
    - Units
    - Abnormal flags
    - Normal ranges

## Preparing your Data for Mapping

- Improve mapping success by:
  - Expanding abbreviations
  - Standardizing colloquial terms
  - Ignoring "administrative" terms
  - Standardizing time references
- Can be done prior to importing
- Better to use tools built into RELMA
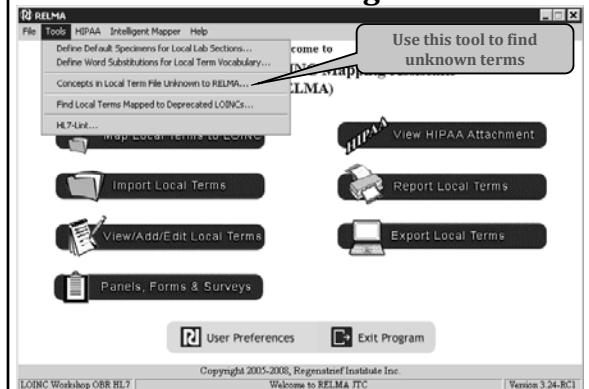
## RELMA Cleaning Tools



## Replace Local Terms
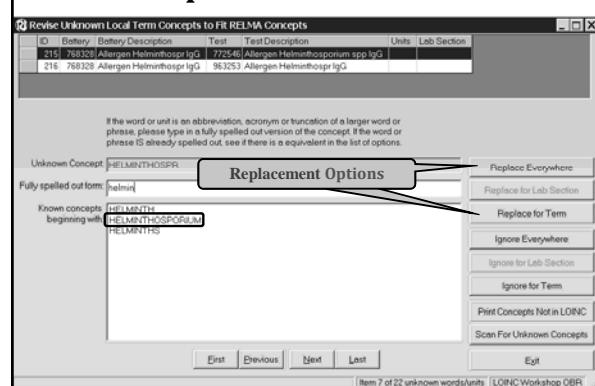


## Standard Mapping Screen
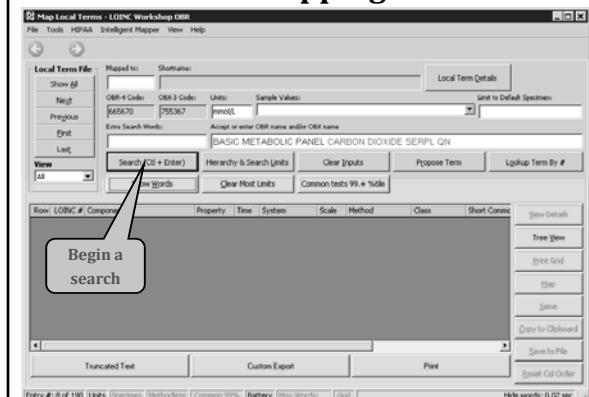


## Showing Search Terms and Frequency

## Mapping Results



**Match units selected by default**

**Number of matching records found**

## Ad hoc term search



**Enter keywords here**
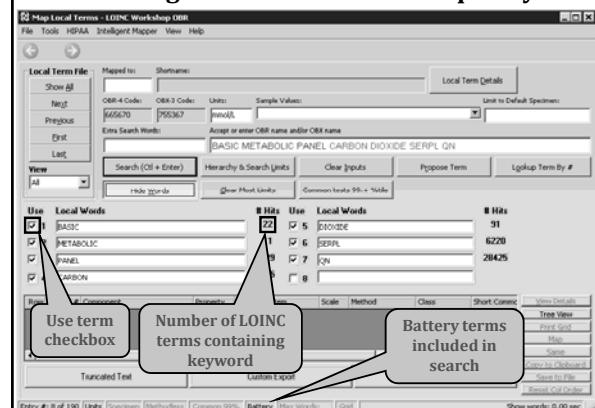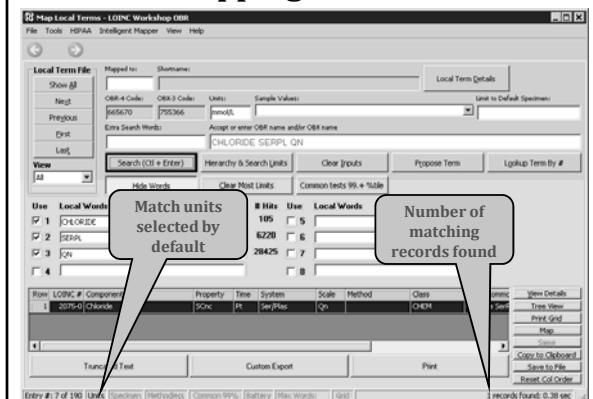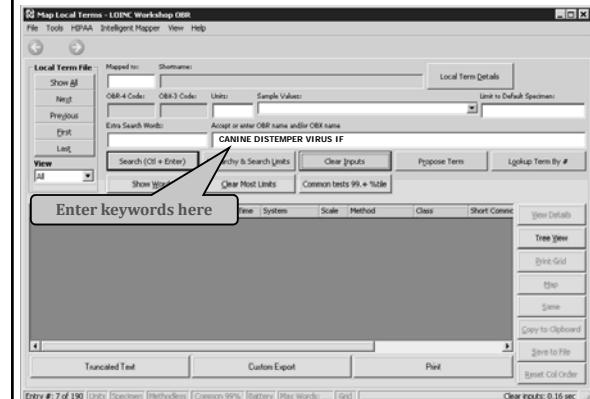
## Ad hoc term search



## Assigning a LOINC Map



**Highlight correct term**

**Click "Map" Button (or doubleclick)**
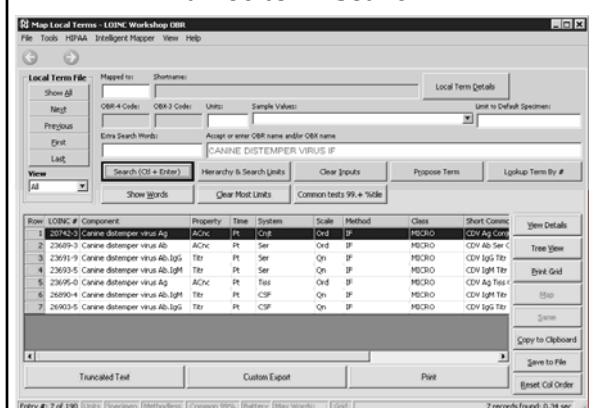
## Assigning a LOINC Map
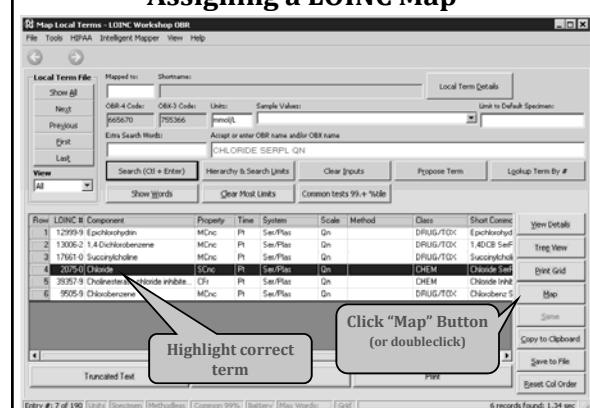


**LOINC Term Assigned**
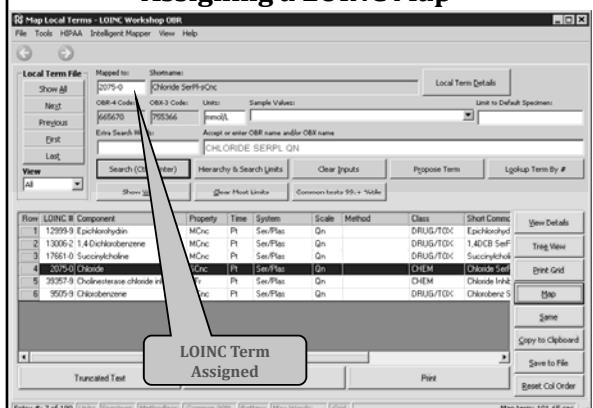
## Setting Search Limits

- Narrows search to specific subset of LOINC terms
- Reduces number of candidate terms
- Limits can be applied to all components
- Component attribute can be further restricted by number of words
- Tree structure allows for hierarchical constraints

# RELMA - Search Constraints

- Controls general search constraints including:
  - Limit to LOINC terms compatible with submitted units
  - Force match with any specimen contained in name
  - Methodless terms only (*now enhanced*)
  - Limit to components with N or fewer words in their name
  - Pop up search timing statistics after each search
- Use carefully or search may not be successful
  (Note parallel control switches at bottom of screen)

# Terms Consistent with Specimen



Only CSF Terms are returned

# Setting Search Limits



Methodless Terms Restriction

Override Methodless Terms Restriction

# Limit to Methodless Terms



# Limit to Methodless Terms



Only Methodless Terms Appear

# More on Methodless Terms

- Some LOINC categories do not have methodless terms
- Checking methodless only will remove these from view on results grid
- Checking additional box allows these to be seen

## Methodless Only Checked



Only Methodless terms returned

Differ in one or more components

## Conditional Methodless



More terms returned

No methodless term; all shown

## Setting Search Limits



Limit to Lab Tests Only
(No Clinical LOINC Terms)

## Navigating through the Mapping Process

## LOINC Mapping Tactics

- Try using method-less terms first
  - Specific methods (if needed) can be transmitted in:
    - OBX–17 (v2.x)
    - Observation.methodCode (v3.0)
- If specimen type is transmitted in the message (OBR or SPM), limit system to "XXX"
- Examine local units or real results to verify correct properties
  - Properties are rarely distinguishable in tests
- With every release - Update previous mappings to identify deprecated terms

## Common Mapping Issues

- Locally Defined Test Name Ambiguity
  - Reuse of local test code
- "Analyte-free" Local Test Names
- Incongruent Value sets (Scale ambiguity)
- Result vs. Interpretation
- Available LOINC Terms too Specific
- Available LOINC Terms too General
- Panel vs. Discrete Test
  - Common in Microbiology

## Search Hints and Tips

- Keywords with zero frequency are ignored
  - May need to rephrase – use synonym
- Some causes for no returned terms
  - Too many keywords in search – uncheck some
  - Limits applied that don't make sense
    - E.g. Method-less tests plus Method tree set to EIA
  - Did not find and revise words not in RELMA
    - Local units not in RELMA
- Units are GREAT discriminators
- You may have tests that need to be added to LOINC

## Using LOINC and SNOMED Together

## Where do LOINC and SNOMED Fit?

**Remember:**

- LOINC represents the question:
  - Is there any Botulism toxin in my specimen? (33708-9)
  - Organisms identified in specimen? (634-6)
- SNOMED represents the answer:
  - Negative (SCTID 260385009)
  - *E. coli* O157:H7 (SCTID 103429008)

## Where do LOINC and SNOMED Fit?

- In an HL7 message, LOINC may be used:
  - In OBR-4 (Universal Service Identifier)
  - In OBX-3 (Observation Identifier)
  - In Version 3 - Observation.code

- SNOMED may be used:
  - In OBX-5 (where nominal values are needed)
  - Almost anyplace else in an HL7 message where coded values are needed