

# Representing a Lab Result – Developing a LOINC Reference Table for a Distributed Research Network

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## Introduction

- The PCORnet CDM laboratory results table **includes 11 common laboratory tests (CLTs)**, to which local data are mapped.
- LOINC (Logical Observation Identifiers Names and Codes) values may be included for laboratory results.
- Clinical laboratory results are notorious for their **heterogeneity**. For many data partners, PCORnet was one of the first large-scale drivers for the **assignment of LOINC codes to laboratory results**.
- A laboratory result can be represented by **several “correct” choices**.
- PCORnet data partners asked the PCORnet Distributed Research Network Operations Center (DRNOC) for a **reference table** that would help them determine whether the LOINC codes they assigned for the 11 CLTs were appropriate.

## Methods

The following process was used to expand the lab result reference table:

- Reviewed content of **existing CLT – LOINC reference table** (to determine conceptual scope for each CLT in the CDM)
  - Reviewed **LOINC Top 2000+** list and **LOINC tutorials**
  - Attended **LOINC workshop** to confer with LOINC experts on Regenstrief LOINC Mapping Assistant (RELMA®) best practices
  - Utilized **RELMA®** to identify LOINC codes for inclusion in updated CLT – LOINC reference table (<https://github.com/CDMFORUM/CDM-GUIDANCE/wiki/Lab-Mapping-Resources>)
- Received input from PCORnet Lab Mapping Interest Group

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## Results

- A **more complete CLT – LOINC mapping table** was created. An additional 59 codes were added, with each CLT having between 2 and 35 codes.

## Discussion

- The updated listing of LOINC codes does not address all the **nuance** associated with the secondary use of laboratory data.
- Much as investigators had to learn which ICD codes to use when identifying patients who were treated for a particular condition, they will need to similarly **understand which LOINC code(s) to choose to represent which laboratory test(s)**.

## Lessons Learned

- As new laboratory tests are developed, and existing test methods are clarified, LOINC codes are created and deprecated. Consequently, **upstream LOINC assignment (e.g., reference labs/instrument manufacturers) might be more optimal**
- While a more complete reference table was created, the LOINC codes that correspond to a categorical name (e.g., “hemoglobin”) **will depend on the intended analytical purpose of the data, which must be considered on a case-by-case basis**

Content adapted from Mini Sentinel project

Reference Table 1: Laboratory Results and LOINC Codes

LAB\_NAME SPECIMEN SOURCE LOINC Comments

CK_MB	SERUM, PLASMA, or SR_PLS	2154-3	
CK_MB	SERUM, PLASMA, or SR_PLS	32673-6	
CK_MB	BLOOD	49531-5	
CK_MBI	SERUM, PLASMA, or SR_PLS	12187-1	
CK_MBI	SERUM, PLASMA, or SR_PLS	12189-7	
CK_MBI	SERUM, PLASMA, or SR_PLS	20569-0	
CK_MBI	SERUM, PLASMA, or SR_PLS	49136-3	Rarely used. Do not use LOINC code 15049-9 is a ratio for CK-MM instead of MB.
CREATININE	SERUM, PLASMA, or SR_PLS	14683-9	
CREATININE	BLOOD	21232-4	
CREATININE	SERUM, PLASMA, or SR_PLS	2160-0	
CREATININE	SERUM, PLASMA, or SR_PLS	35203-9	This code is "discouraged" (guidance added in v3.0)
CREATININE	BLOOD	38483-4	
CREATININE	SERUM, PLASMA, or SR_PLS	44784-7	
CREATININE	SERUM	54052-6	HEDIS 2009 code.
CREATININE	BLOOD	59826-8	
HGB	BLOOD	14775-1	
HGB	BLOOD	20509-6	
HGB	BLOOD	24360-0	HGB and HCT panel - keep only HGB results, e.g., those with units instead of "%".
HGB	BLOOD	30313-1	
HGB	BLOOD	30350-3	
HGB	BLOOD	30351-1	
HGB	BLOOD	30352-9	
HGB	BLOOD	55782-7	
HGB	BLOOD	59260-0	
HGB	BLOOD	718-7	
LDL	SERUM, PLASMA, or SR_PLS	47213-4	
INR	BLOOD	34714-6	
INR	BLOOD	46418-0	

LOINC Mapper's Guide to Top 2000++ US Lab Tests v1.4

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General Guidance

1) Ask your test kit and instrument manufacturer(s) and referral labs about which LOINC codes are relevant for their products. Increasingly, test kit and instrument manufacturers are requesting LOINC codes for their new test. Some of the larger manufacturers have mapped their routine tests done on to LOINC codes. Check with these in vitro diagnostic companies for the LOINC codes relevant for their tests. In addition, the largest referral laboratories in the US have mapped their high- to medium-volume tests to LOINC. Getting the LOINC mappings from either of these sources will save you time.

2) When mapping, search against the LOINC common test list. In RELMA and on search.loinc.org you can set the search parameters to only look at the common tests. Work through the mapping by lab section. Realize that LOINC does not encompass terms that may be used in your lab system for internal accounting or "diagnostic" variables that are provided as indicators that might be used to trigger a follow up test, but are not supposed to be reported to the ordering provider because the results are not reliable enough. Blood cell counters usually report such indicators.

3) Obtain a master list of tests for mapping. RELMA has a function that will convert a large set of HL7 result (ORU) messages into a database that carries the name of the order, the units of measure, and sample data that can be the source of frequency statistics for deciding which terms to tackle first. RELMA also can use the units of measure to focus your search on LOINC terms whose property is consistent with the units of measure you report.

4) A new resource called LOINC Essentials. A new book called LOINC Essentials is now available (<https://danielvreeman.com/loinc-essentials>) that provides a detailed step-by-step guide for mapping your local codes to LOINC codes. This book is a nice adjunct to the domain-specific advice provided here in this Mapper's Guide to the Top 2000+ Lab Observations.

NOTE ABOUT RANKS: The ranks in the Top 2000+ laboratory results table were originally based on three large institutions' statistics. Since the data were acquired, some important new tests and recommendations or approaches to testing have emerged. As of version 1.4, we have added some of these tests to the table, not based on empiric statistics, but on our opinion that these are or should be in increased use. For these LOINC codes, we assigned a rank value of 3000 as a way to distinguish them from the tests originally included in the Top 2000+.

Search LOINC

Map Local Terms to LOINC

View/Add/Edit Local Terms

Export Local Terms

Propose New LOINC

Panels, Forms, & Surveys

Import Local Terms

Report Local Terms

User Preferences

Exit Program

PCORnet LAB\_NAME LOINC code Category or Name Component/Analyte Property Timing System Scale Method Units

Topotrin T Cardiac (quantitative)	4842-9	Topotrin T Cardiac (Mass/volume) in Blood	Topotrin T Cardiac	MCNC	PL	Bld	Qn	ug/L	
	699-9	Topotrin T Cardiac (Mass/volume) in Venous blood	Topotrin T Cardiac	MCNC	PL	Bld	Qn	ug/L	
	699-7	Topotrin T Cardiac (Mass/volume) in Serum or Plasma	Topotrin T Cardiac	MCNC	PL	Ser/Plas	Qn	ug/L	
	67031-1	Topotrin T Cardiac (Mass/volume) in Serum or Plasma by Detection limit < 5	Topotrin T Cardiac	MCNC	PL	Ser/Plas	Qn	Detection limit(ug/L)	
Hemoglobin A1c	41993-3	Hemoglobin A1c (Mass/volume) in Blood	Hemoglobin A1c	MCNC	PL	Bld	Qn	%	
	4548-4	Hemoglobin A1c/Hemoglobin total in Blood	Hemoglobin A1c/Hemoglobin total	MCNC	PL	Bld	Qn	%	
	17859-5	Hemoglobin A1c/Hemoglobin total in Blood by calculation	Hemoglobin A1c/Hemoglobin total	MCNC	PL	Bld	Qn	%	
	4548-2	Hemoglobin A1c/Hemoglobin total in Blood by Electrophoresis	Hemoglobin A1c/Hemoglobin total	MCNC	PL	Bld	Qn	%	
	17859-4	Hemoglobin A1c/Hemoglobin total in Blood by HPLC	Hemoglobin A1c/Hemoglobin total	MCNC	PL	Bld	Qn	%	
	42384-8	Hemoglobin A1c/Hemoglobin total in Blood by HPLC/EDC protocol	Hemoglobin A1c/Hemoglobin total	MCNC	PL	Bld	Qn	%	
	71875-9	Hemoglobin A1c/Hemoglobin total (Pure mass fraction) in Blood	Hemoglobin A1c/Hemoglobin total	MCNC	PL	Bld	Qn	%	
	92501-4	Hemoglobin A1c/Hemoglobin total in Blood by HPLC protocol	Hemoglobin A1c/Hemoglobin total	MCNC	PL	Bld	Qn	%	
Creatine kinase MB	49551-5	Creatine kinase MB (Mass/volume) in Blood	Creatine kinase MB	MCNC	PL	Bld	Qn	ng/mL	
	51506-4	Creatine kinase MB (Enzymatic activity/volume) in Cerebral spinal fluid by Electrophoresis	Creatine kinase MB	MCNC	PL	Bld	Qn	ng/mL	
	4842-4	Creatine kinase MB (Enzymatic activity/volume) in Serum or Plasma	Creatine kinase MB	MCNC	PL	Ser/Plas	Qn	ng/mL	
	12674-4	Creatine kinase MB (Enzymatic activity/volume) in Serum or Plasma by Electro	Creatine kinase MB	MCNC	PL	Ser/Plas	Qn	ng/mL	
	2154-3	Creatine kinase MB (Enzymatic activity/volume) in Serum or Plasma by Electro	Creatine kinase MB	MCNC	PL	Ser/Plas	Qn	ng/mL	
	1599-9	Creatine kinase MB (Mass/volume) in Serum or Plasma	Creatine kinase MB	MCNC	PL	Ser/Plas	Qn	ng/mL	
Creatine kinase total	2156-8	Creatine kinase (Enzymatic activity/volume) in Amniotic fluid	Creatine kinase	MCNC	PL	Amnio	Qn	U/L	
	50796-4	Creatine kinase (Mass/volume) in Blood	Creatine kinase	MCNC	PL	Bld	Qn	ng/mL	
	4842-2	Creatine kinase (Enzymatic activity/volume) in Body fluid	Creatine kinase	MCNC	PL	Body fluid	Qn	U/L	
	1658-4	Creatine kinase (Enzymatic activity/volume) in Body fluid	Creatine kinase	MCNC	PL	Body fluid	Qn	U/L	
	2151-9	Creatine kinase (Enzymatic activity/volume) in Cerebral spinal fluid	Creatine kinase	MCNC	PL	CSF	Qn	U/L	
	54439-9	Creatine kinase (Enzymatic activity/volume) in Dialysis fluid	Creatine kinase	MCNC	PL	Dial fluid	Qn	U/L	
	2151-4	Creatine kinase (Enzymatic activity/volume) in Serum or Plasma	Creatine kinase	MCNC	PL	Ser/Plas	Qn	U/L	
Creatine kinase MB/Creatine kinase total	20569-0	Creatine kinase MB/Creatine kinase total in Serum or Plasma	Creatine kinase MB/Creatine kinase total	MCNC	PL	Ser/Plas	Qn	%	
	12189-7	Creatine kinase MB/Creatine kinase total in Serum or Plasma by calculation	Creatine kinase MB/Creatine kinase total	MCNC	PL	Ser/Plas	Qn	%	
	12187-1	Creatine kinase MB/Creatine kinase total in Serum or Plasma by Electrophoresis	Creatine kinase MB/Creatine kinase total	MCNC	PL	Ser/Plas	Qn	%	
	72564-6	Creatine kinase MB/Creatine kinase total (Pure catalytic fraction) in Serum or Creatine kinase MB/Creatine kinase total	Creatine kinase MB/Creatine kinase total	MCNC	PL	Ser/Plas	Qn	%	
	72565-0	Creatine kinase MB/Creatine kinase total (Pure catalytic fraction) in Serum or Creatine kinase MB/Creatine kinase total	Creatine kinase MB/Creatine kinase total	MCNC	PL	Ser/Plas	Qn	%	
	49136-3	Creatine kinase MB/Creatine kinase total (Ratio) in Serum or Plasma	Creatine kinase MB/Creatine kinase total	MCNC	PL	Ser/Plas	Qn	%	
Creatinine	2160-0	Creatinine (Mass/volume) in Serum or Plasma	Creatinine	MCNC	PL	Ser/Plas	Qn	mg/dL	
	2161-8	Creatinine (Mass/volume) in Urine	Creatinine	MCNC	PL	Urine	Qn	mg/dL	
	38483-4	Creatinine (Mass/volume) in Blood	Creatinine	MCNC	PL	Bld	Qn	mg/dL	
	39874-3	Creatinine (Mass/volume) in unspecified time Urine	Creatinine	MCNC	PL	Urine	Qn	mg/dL	
	2162-6	Creatinine (Mass/volume) in 24 hour Urine	Creatinine	MCNC	PL	Urine	Qn	mg/dL	
	12189-3	Creatinine (Mass/volume) in Body fluid	Creatinine	MCNC	PL	Body fluid	Qn	mg/dL	
	20624-2	Creatinine (Mass/volume) in 24 hour Urine	Creatinine	MCNC	PL	Urine	Qn	mg/dL	
International Normalized Ratio	34714-6	INR in Blood by Coagulation assay	Coagulation tissue factor induced INR ReTime	PL	Bld	Qn	Coag	INR	
	48429-0	INR in Capillary blood by Coagulation assay	Coagulation tissue factor induced INR ReTime	PL	Bld	Qn	Coag	INR	
	6301-6	INR in Patient poor plasma by Coagulation assay	Coagulation tissue factor induced INR ReTime	PL	PPP	Qn	Coag	INR	
	34875-9	INR in Patient poor plasma or blood by Coagulation assay	Coagulation tissue factor induced INR ReTime	PL	PPP/Bld	Qn	Coag	INR	
	6301-9	INR in Patient poor plasma by Coagulation assay - poor heparin adsorption	Coagulation tissue factor induced INR ReTime	PL	PPP	Qn	Coag	INR	
	63019-9	INR in Patient poor plasma by Coagulation assay - poor heparin adsorption	Coagulation tissue factor induced INR ReTime	PL	PPP	Qn	Coag	INR	

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