

# Characterization and Availability of PCORnet<sup>®</sup> Laboratory Results

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## Background

- One of the unique features of the National Patient-Centered Clinical Research Network(PCORnet) is the availability of lab result data, enabling research that can identify a cohort and/or evaluate outcomes based on a lab value. These results are captured in the PCORnet Common Data Model (CDM) using LOINC<sup>®</sup>, an international standard for laboratory and clinical test results.
- The PCORnet Coordinating Center(CC) developed data curation processes to profile data – including lab results available across the network. The results are logically organized into Data Curation (DC) Lab Groups, for use in study planning, reporting, and data quality monitoring. These processes are updated during semi-annual data curation cycles.

## Methods

- LOINC is a common terminology for labs and utilized by PCORnet, we use LOINC version 2.58.
- The PCORnet CC developed a rule-based approach to create DC Lab Group using LOINC attributes such as COMPONENT and SYSTEM and using lab information web resources such as
  - <https://labtestsonline.org/>
  - <https://www.labcorp.com/test-menu/search>
  - <https://www.mayomedicallaboratories.com/>
- In order to assign each LOINC code to only one DC Lab Group, separation rules were developed and applied. See Table 1. DC Lab Group Separation Rules.

- Identification rules based on LOINC attributes were developed to classify appropriate LOINC codes into each DC Lab Group. For example, LOINC codes for Albumin URINE 24H will be identified when COMPONENT='ALBUMIN', SYSTEM='URINE', CLASS='CHEM', TIME='PT', and LONG\_COMMON\_NAME CONTAINS 'PRESENCE'.

Table 1. DC LAB GROUP Separation Rules

Separation Rule	Rule Description	Example
System (Specimen)	If a test is performed with both BLOOD/SERUM/PLASMA (B/S/P) and URINE, separate DC LAB GROUP as B/S/P or URINE	Albumin B/S/P and Albumin Urine
Time	If a lab group's system is urine, identify PT (measured at a point in time) and 24H (measured in the 24 hours urine sample) separately	Creatinine Urine, Creatinine Urine PT and Creatinine Urine 24H
Method	If a specific METHOD needs to be specified, separate it from other LOINC	Specific Gravity URINE and Specific Gravity URINE Dipstick
Presence	Separate tests measuring presence from others	WBC Urine test and WBC Urine Presence test
Scale	Absolute number/count measure and percentage measure were separated	
Scale	Other than presence, no condition was applied with SCALE attribute to include more LOINC <sup>®</sup> codes under each lab group except TROPONIN T.CARDIAC.	

## REFERENCES

- PCORnet<sup>®</sup>. Partner networks. <http://pcornet.org/participating-networks/>. Last updated on July 2, 2018.
- PCORnet<sup>®</sup>. PCORnet Common Data Model (CDM). <http://www.pcornet.org/pcornet-common-data-model/>. Last updated on May 18, 2018.
- Qualls LG, Phillips TA, Hammill BG, Topping J, Louzao DM, Brown JS, Curtis LH, Marsolo K. Evaluating Foundational Data Quality in the National Patient-Centered Clinical Research Network (PCORnet<sup>®</sup>). EGEMS (Wash DC) 6(1): 3, pp. 1–9. DOI: <https://doi.org/10.5334/egems.199>.
- LOINC<sup>®</sup>. <https://loinc.org/>

## Progress and Results

- The DC Lab Group process resulted in the creation of 490 groups, accounting for 90% of the PCORnet laboratory data available as of Sep 2018.
- The 49 non-captured lab groups are mostly lab tests for the presence of an analyte (e.g. albumin). In most cases, those analytes are captured in another DC Lab Group. For example, Albumin B/S/P exists in the data even though Albumin B/S/P presence does not.

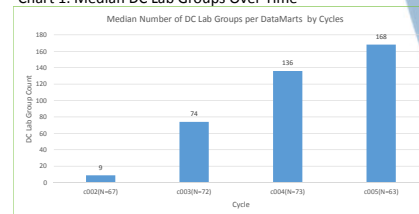
Table 2. PCORnet Data DC Lab Group Metrics in Cycle 5

Metrics	Data curation report excluding invalid LOINC <sup>®</sup> codes
Record count in the lab data (denominator) <sup>1</sup>	9.1 billions
Number of Data Marts with lab data	64
Record count captured under the DC Lab Group (numerator)	8.2 billions
Number of DataMarts in the data with one or more DC Lab Group	63
% Assigned to a DC Lab Group	90.4%
Number of DC Lab Groups defined in the list	490
Number of DC Lab Groups present in PCORnet data	441
Number of LOINC codes identified in the list	2,332
Number of LOINC codes present in the PCORnet data	1,223

1. Excluding NULL or missing, OT, NI, UN, invalid LOINC codes and non-laboratory LOINC codes

- The classification system is able to describe lab data availability over time across the PCORnet network. It also describes how PCORnet's data availability has improved over time as partners have expanded their source system mappings.

Chart 1. Median DC Lab Groups Over Time



- 80% of DataMarts (51 DataMarts) populated the following 37 DC Lab Groups in cycle 5.

Table 3. High frequency DC Lab Group in PCORnet Data

DC Lab Group
Hemoglobin B/S/P, Creatinine B/S/P, Cholesterol-LDL Absolute, CK, Hemoglobin A1C, Glucose B/S/P, ALT, INR, Platelets, Bilirubin Total B/S/P, TROP_I, ALP Total, CK_MB, Sodium B/S/P, Calcium B/S/P, Lipase, Hematocrit, POTASSIUM B/S/P, BUN, Cholesterol-HDL Absolute, MCV, Albumin B/S/P, Neutrophils Absolute, AST, WBC B/S/P, RBC B/S/P, Triglyceride, Chloride B/S/P, Lymphocytes Absolute, MCH, Cholesterol-Total, MCHC, Total CO2, Phosphorus B/S/P, Monocytes Absolute, Basophils Absolute, Protein B/S/P

## Conclusions & Discussion

- LOINC was designed to comprehensively organize data and encompass the many methods/processes used in clinical laboratory testing. As a result, dozens of codes may correspond to a given laboratory concept, which makes querying for broad concepts difficult.
- The DC Lab Groups were created to simplify the characterization of PCORnet lab data and describe the availability of certain lab results across the network. The depth and breadth of these groups make them well suited to quickly answer prep-to-research questions and explore potential data quality issues such as unexpected variability in result ranges.
- Beginning with the June 2017 LOINC release, a LOINC Group File was made available to address many of the issues described previously. We have shared our results with the LOINC community to help speed the maturation of the LOINC Group file, and we will continue to review subsequent releases to determine how we might better leverage this resource.

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## DISCLOSURES

No disclosure to report

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