# Harmonized Pediatric Lipid Reporting Recommendations for Clinical Laboratories

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# Abstract

**Recommendation #2: We recommend clinical laboratories offer a lipid panel** Background: Early detection of dyslipidemia is important because atherosclerosis originates in childhood and dyslipidemia detected early strongly tracks into adulthood. Despite recent clinical guidelines on the consisting of total cholesterol, LDL-C, HDL-C, non-HDL-C and triglycerides. Lp(a) management of pediatric dyslipidemia, there is no guidance for translation into clinical laboratories. and ApoB should be offered only as individually orderable tests.

Methods: The Canadian Society of Clinical Chemists (CSCC) Working Group on Reference Interval Harmonization (hRI-WG) Lipid Team incorporated the 2022 Canadian Cardiovascular Society/Canadian Pediatric Cardiology Association (CCS/CPCA) Clinical Practice Update, 2011 NHLBI Integrated Guidelines, pediatric reference limits published by the CALIPER program, and new data analysis to develop recommendations for pediatric lipid reporting. Lipid thresholds were verified using CALIPER data and performance of the NIH equation was assessed. Flagging thresholds for nonfasting triglycerides were established by applying the refineR algorithm to two community laboratory cohorts and calculating 75<sup>th</sup> and 95<sup>th</sup> percentiles using CALIPER data.

**Results:** Five key recommendations were developed: 1) to offer nonfasting and fasting testing; 2) offer a panel including total cholesterol, LDL-C, HDL-C, non-HDL-C and triglycerides, with apoB and Lp(a) available as individually orderable tests; 3) recommend laboratories flag at the ≥95<sup>th</sup> percentile for total cholesterol, triglycerides, LDL-C, non-HDL-C, and apoB and at <10<sup>th</sup> percentile for HDL-C; 4) include interpretative comments on the lipid report and 5) implement the NIH equation to calculate LDL-C.

**Conclusion:** The CSCC hRI-WG Lipid Team plans to support the implementation of pediatric lipid reporting recommendations through the development of toolkits. Harmonization of pediatric lipid reporting will facilitate standardized lipid assessment and clinical decision making, ultimately optimizing pediatric clinical decision making and cardiovascular risk management.

#### Background

Pediatric obesity is increasing and cardiovascular disease (CVD) risk factors, including dyslipidemia, are increasingly prevalent in early life. Early detection of dyslipidemia is important because atherosclerosis originates in childhood and dyslipidemia detected in early life strongly tracks into adulthood (1). Many Canadian clinical laboratories currently reference the National Heart, Lung, and Blood Institute (NHLBI) Integrated Guidelines for cardiovascular health and risk reduction in children and adolescents, which was published in 2011 (2). However, in 2022, the Canadian Cardiovascular Society (CCS) and Canadian Pediatric Cardiology Association (CPCA) published a Clinical Practice Update for the detection, evaluation, and management of dyslipidemia in children and adolescents (3). Despite these recent clinical guidelines, there is no guidance on laboratory pediatric lipid reporting. The Canadian Society of Clinical Chemists (CSCC) Working Group on Reference Interval Harmonization (hRI-WG) Lipid Team aimed to develop recommendations to aid clinical laboratories to implement these guidelines and promote harmonized reporting and interpretation of pediatric lipid reporting across Canada.

The CSCC hRI-WG aims to harmonize laboratory test interpretation through assessing current practice, developing recommendations to promote harmonized reporting, and supporting clinical implementation of recommendations. Our group previously published the CSCC Harmonized Clinical Laboratory Lipid Reporting Recommendations (4), providing 6 key recommendations for laboratory reporting of lipid parameters in adults. In this study, the CSCC hRI-WG developed 5 key recommendations for pediatric lipid reporting, largely based on the 2022 CCS/CPCA Clinical Practice Update, the CALIPER database, and current data analysis, with the goal to help harmonize pediatric lipid reporting across Canada.

# Recommendations

#### **Recommendation #1: We recommend clinical laboratories offer both fasting and** nonfasting lipid assessment for pediatric patients.

Nonfasting lipid assessment

- 2022 CCS/CPCA Clinical Practice Update recommends screening with nonfasting lipid assessment. • Nonfasting lipids more accurately represent the true state as many children do not fast, apart from
- when sleeping.
- Fasting 10-14 hrs for fasting lipid assessment may be challenging for pediatric patients.

#### **Fasting lipid assessment**

- 2022 CCS/CPCA Clinical Practice Update recommends fasting lipid assessment for diagnosis and the need for pharmacological therapy
- Diagnosis requires the average LDL-C from at least 2 fasting lipid profiles obtained at least 2 weeks but no more than 3 months apart. If LDL-C  $\geq$  3.4 mmol/L, exclude secondary causes, evaluate other risk factors and initiate lifestyle changes. Repeat fasting lipid profile is required.
- Follow up assessment requires fasting lipid profile.

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#### Recommendations

- Similar to adult reporting recommendations, we recommend offering a lipid panel (i.e., total cholesterol, LDL-C, HDL-C, non-HDL-C and triglycerides) in addition to making these lipid parameters available to be ordered individually.
- We also recommend offering lipoprotein (a) (Lp(a)) and apolipoprotein B (apoB) as either in-house or send out tests and offering them as individually orderable tests, not as part of the lipid panel.
- 2022 CCS/CPCA Clinical Practice Update provides minimal guidance on Lp(a) measurement in the pediatric population but indicate its measurement may be helpful when there is premature vascular disease without obvious risk factors and may further inform CVD risk assessment.
- Pediatric-specific recommendations for apoB measurement are limited. The NHLBI guidelines provide pediatric-specific apoB cut-offs, but indicate that measurement for apoB for universal screening provides no additional advantage over measuring non-HDL-C, LDL-C, and HDL-C.
- Neither the 2022 CCS/CPCA Clinical Practice Update (4), nor the 2019 AHA Scientific Statement (5), discuss apoB measurement in pediatrics.

Recommendation #3: We recommend laboratories flag at ≥95<sup>th</sup> percentile for total cholesterol, triglycerides, LDL-C, and non-HDL-C, and at <10<sup>th</sup> percentile for HDL-C, as outlined in the CCS/CPCA Clinical Practice Update (Sourced from NHLBI and validated using CALIPER and/or outpatient retrospective analysis). We recommend laboratories flag apoB results at ≥95<sup>th</sup> percentile based on CALIPER data. We recommend not implementing a flagging limit for Lp(a) but mentioning the adult cut-off in the interpretive comments.

Table 1. Acceptable and abnormal limits for lipid parameters based on CALIPER data ad CCS/CPCA guidelines (Original Source: NHLBI).

| Lipid         | Age     | CCS/CPCA                 | (Original        | CALI             | PER              | CALIPER (Obe     | ese excluded) <sup>b</sup> | CALIPER (Overweight & |                      |  |
|---------------|---------|--------------------------|------------------|------------------|------------------|------------------|----------------------------|-----------------------|----------------------|--|
| Parameter     |         | Source:                  | NHLBI)           |                  |                  |                  |                            |                       | cluded) <sup>c</sup> |  |
|               |         | 75 <sup>th</sup>         | 95 <sup>th</sup> | 75 <sup>th</sup> | 95 <sup>th</sup> | 75 <sup>th</sup> | 95 <sup>th</sup>           | 75 <sup>th</sup>      | 95 <sup>th</sup>     |  |
|               |         | percentile               | percentile       | percentile       | percentile       | percentile       | percentile                 | percentile            | percentile           |  |
|               |         | (Acceptable              | (Abnormal        | (Acceptable      | (Abnormal        | (Acceptable      | (Abnormal                  | (Acceptable           | (Abnormal            |  |
|               |         | "<")                     | "≥")             | "<")             | "≥")             | "<")             | "≥")                       | "<")                  | "≥")                 |  |
| Total         | 2-<19y  | 4.4                      | 5.2              | 4.45             | 5.25             | 4.45             | 5.25                       | 4.43                  | 5.24                 |  |
| cholesterol   |         | (4.10-4.70) <sup>a</sup> | (4.89-5.51)      |                  |                  |                  |                            |                       |                      |  |
| LDL-C         | 2-<19y  | 2.8                      | 3.4              | 2.56             | 3.27             | 2.53             | 3.26                       | 2.50                  | 3.20                 |  |
| (Friedewald   |         | (2.38-3.22)              | (2.89-3.91)      |                  |                  |                  |                            |                       |                      |  |
| equation)     |         |                          |                  |                  |                  |                  |                            |                       |                      |  |
| LDL-C (NIH    | 2-<19y  | N/A                      | N/A              | 2.62             | 3.33             | 2.61             | 3.31                       | 2.56                  | 3.24                 |  |
| equation)     |         |                          |                  |                  |                  |                  |                            |                       |                      |  |
| Triglycerides | 2-<10y  | 0.8                      | 1.1              | 1.58             | 2.34             | 1.53             | 2.29                       | 1.52                  | 2.24                 |  |
|               |         | (0.60-1.00)              | (0.90-1.30)      |                  |                  |                  |                            |                       |                      |  |
|               | 10-<19y | 1.0                      | 1.5              | 1.64             | 2.50             | 1.59             | 2.42                       | 1.49                  | 2.37                 |  |
|               |         | (0.80-1.20)              | (1.30-1.70)      |                  |                  |                  |                            |                       |                      |  |
| Non-HDL-C     | 2-<19y  | 3.10                     | 3.75             | 3.17             | 3.92             | 3.13             | 3.88                       | 3.09                  | 3.83                 |  |
|               |         | (2.64-3.57)              | (3.19-4.31)      |                  |                  |                  |                            |                       |                      |  |
| АроВ          | 2-<19y  | 0.90                     | 1.00             | 0.65             | 0.83             | 0.64             | 0.83                       | 0.64                  | 0.81                 |  |
|               |         | (0.74-1.06)              | (0.83-1.18)      |                  |                  |                  |                            |                       |                      |  |
|               |         | 25 <sup>th</sup>         | 10 <sup>th</sup> | 25 <sup>th</sup> | 10 <sup>th</sup> | 25 <sup>th</sup> | 10 <sup>th</sup>           | 25 <sup>th</sup>      | 10 <sup>th</sup>     |  |
|               |         | percentile               | percentile       | percentile       | percentile       | percentile       | percentile                 | percentile            | percentile           |  |
|               |         | (Acceptable              | (Abnormal        | (Acceptable      | (Abnormal        | (Acceptable      | (Abnormal                  | (Acceptable           | (Abnormal            |  |
|               |         | ">")                     | "<")             | ">")             | "<")             | ">")             | "<")                       | ">")                  | "<")                 |  |
| HDL-C         | 2-<19y  | 1.2                      | 1.0              | 1.05             | 0.83             | 1.08             | 0.86                       | 1.07                  | 0.87                 |  |
|               |         | (1.06-1.34)              | (0.88-1.12)      |                  |                  |                  |                            |                       |                      |  |

Bolded red values exceeded the acceptable ranges based on applying the allowable performance limits recommended by the Institute for Quality Management in Healthcare (IQMH) to thresholds reported by the Canadian Cardiovascular Society (CCS)/Canadian Pediatric Cardiology Association (CPCA), originally sourced from the National Heart, Lung, and Blood Institute (NHLBI) guidelines. <sup>a</sup>Acceptable range based on allowable performance limits recommended by IQMH or European Federation of Clinical Chemistry and Laboratory Medicine (EFLM)

biological variation database (for apoB only) <sup>b</sup>Obese (body mass index (BMI) >97th percentile based on WHO growth reference standards) individuals 5-<19 years of age excluded.

<sup>c</sup>Obese (BMI >97th percentile) and overweight (85th percentile ≤ BMI ≤97th percentile based on WHO growth reference standards) individuals 5-<19 years of age excluded.

**Table 2.** Options for fasting and nonfasting triglyceride thresholds.

|               | Fast                            | ting                            | Non-Fasting                     |                                 |  |  |
|---------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--|--|
| Age Partition | Option #1                       | Option #2                       | Option #1                       | Option #2                       |  |  |
| (years)       | (CCS/CPCA Recommendations)      | (20% lower than non-fasting,    | (CALIPER data with OW and OB    | (20% higher than fasting, same  |  |  |
|               |                                 | same logic applied in adults)   | excluded)                       | logic applied in adults)        |  |  |
|               |                                 |                                 |                                 |                                 |  |  |
| 2-<10         | Acceptable: < 0.80 mmol/L       | Acceptable: < 1.20 mmol/L       | Acceptable: < 1.50 mmol/L       | Acceptable: < 1.00 mmol/L       |  |  |
|               | Borderline: 0.80 - <1.10 mmol/L | Borderline: 1.20 - <1.80 mmol/L | Borderline: 1.50 - <2.20 mmol/L | Borderline: 1.00 - <1.30 mmol/L |  |  |
|               | Abnormal: $\geq$ 1.10 mmol/L    | Abnormal: ≥ 1.80 mmol/L         | Abnormal: ≥ 2.20 mmol/L         | Abnormal: $\geq$ 1.30 mmol/L    |  |  |
| 10-<19        | Acceptable: < 1.00 mmol/L       | Acceptable: < 1.20 mmol/L       | Acceptable: < 1.50 mmol/L       | Acceptable: < 1.20 mmol/L       |  |  |
|               | Borderline: 1.00 - <1.50 mmol/L | Borderline: 1.20 - <1.90 mmol/L | Borderline: 1.50 - <2.40 mmol/L | Borderline: 1.20 - <1.80 mmol/L |  |  |
|               | Abnormal: $\geq$ 1.50 mmol/L    | Abnormal: ≥ 1.90 mmol/L         | Abnormal: $\geq$ 2.40 mmol/L    | Abnormal: ≥ 1.80 mmol/L         |  |  |
|               |                                 |                                 |                                 |                                 |  |  |

#### Recommendations

#### **Recommendation #4:** We recommend including interpretive comments on the lipid report.

**Table 3.** Recommended harmonized pediatric lipid report for implementation in clinical laboratories.

| Analyte       | Age        | Normal Range   | Always Comment   | Conditional Comments                            |
|---------------|------------|----------------|--|---|
| Total         | <19 years  | < 5.20 mmol/L  | Acceptable: < 4.40 mmol/L  |   |
| Cholesterol   | ,          | ,              | Borderline: 4 40 - < 5 20 mmol/l                                 |   |
|               |            |                | Abnormal: $> 5.20 \text{ mmol/l}$                                |   |
|               | <10 years  | > 1.00  mmol/l | Accontable: $>1.20 \text{ mmol/L}$                               | $ f $ $  D   < <0.20 \text{ mmol}/  \cdot $     |
|               | <19 years  | ≥ 1.00 mm0l/L  |  |   |
|               |            |                | Borderline: 1.00 - 1.20 mmol/L                                   | "HDL-C <0.30 mmol/L may be associated           |
|               |            |                | Abnormal: <1.00 mmol/L   | with genetic dyslipidemias. Refer to            |
|               |            |                |  | specialist."                                    |
| LDL-C         | <19 years  | < 3.40 mmol/L  | Acceptable: < 2.80 mmol/L  | If LDL-C $\geq$ 4.0 mmol/L:                     |
|               |            |                | Borderline: 2.80 - <3.40 mmol/L                                  | "LDL-C $\geq$ 4.0 mmol/L may be associated with |
|               |            |                | Abnormal: $\geq$ 3.40 mmol/L                                     | genetic dyslipidemias. Refer to specialist."    |
|               |            |                | ,  |   |
|               |            |                | IDL-C was calculated using the XX equation                       | Using Friedewald Equation:                      |
|               |            |                |  | If trighterides >4.52 mmol/L cancel I.D.C.      |
|               |            |                | Defente 2022 CCC/CDCA avidelines for edultional UDL C            | in thighyterides >4.32 minor/L, cancer LDL-C    |
|               |            |                | Refer to 2022 CCS/CPCA guidelines for additional LDL-C           | and add comment to LDL-C result:                |
|               |            |                | thresholds for treatment initiation and monitoring.              | "LDL-C cannot be calculated. Triglycerides      |
|               |            |                |  | exceed 4.52 mmol/L. Recollect in a fasting      |
|               |            |                |  | state."   |
|               |            |                |  |   |
|               |            |                |  | Using NIH Equation:                             |
|               |            |                |  | If triglycerides >9.04 mmol/L. cancel LDL-C     |
|               |            |                |  | and add comment to I DI-C result:               |
|               |            |                |  | "I DL C cannot be calculated Trightcorides      |
|               |            |                |  | EDE-C califiot be calculated. Highycendes       |
|               |            |                |  | exceed 9.04 mmol/L. Recollect in a fasting      |
|               |            |                |  | state."   |
| Triglycerides | 0-9 years  | < 2.20 mmol/L  | Non-fasting thresholds:  | If TG >6.00 mmol/L:                             |
|               |            |                | Acceptable: < 1.50 mmol/L  | "TG >6.00 mmol/L may be associated with         |
|               |            |                | Borderline: 1.50 - <2.20 mmol/L                                  | genetic dyslipidemias. Refer to specialist."    |
|               |            |                | Abnormal: $\geq$ 2.20 mmol/L                                     |   |
|               |            |                |  |   |
|               |            |                | Triglycerides can be more than 20% lower in the fasting state.   |   |
|               | 10-<19     | < 2 40 mmol/l  | Non-fasting thresholds:  |   |
|               | Vears      |                | Accentable: $< 1.50 \text{ mmol}/l$                              |   |
|               | years      |                | Porderline: 1 E0 <2.40 mmol/l                                    |   |
|               |            |                | Abremente > 2.40 mmol/L  |   |
|               |            |                | Abnormal: $\geq$ 2.40 mmol/L                                     |   |
|               |            |                |  |   |
|               |            |                | Triglycerides can be 10-20% lower in the fasting state.          |   |
| Non-HDL-C     | <19 years  | < 3.75 mmol/L  | Acceptable: < 3.10 mmol/L  |   |
|               |            |                | Borderline: 3.10 - <3.75 mmol/L                                  |   |
|               |            |                | Abnormal: $\geq$ 3.75 mmol/L                                     |   |
| Fasting       | Record (h) |                |  |   |
| (hours)       |            |                |  |   |
| АроВ          | <19 years  | < 0.80 g/L     | Desired: < 0.65 g/L  |   |
|               | · ·        | 0.             | Borderline: 0.65 – 0.80 g/L                                      |   |
|               |            |                | Abnormal: $> 0.80 \text{ g/l}$                                   |   |
|               |            |                |  |   |
|               |            |                | Anop was massured using the XX method                            |   |
|               | <10 years  | NI / A         | Apob was measured using the $\overline{\Lambda\Lambda}$ method   |   |
|               | <19 years  | N/A            | Lp(a) was measured using <u>AA</u> method.                       |   |
|               |            |                |  |   |
|               |            |                | Lp(a) >100 nmol/L predisposes to premature ASCVD in              |   |
|               |            |                | adulthood, although no clinical end points in children have been |   |
|               |            |                | established.   |   |
|               |            |                |  |   |
|               |            |                | Lp(a) increases throughout childhood and adolescence but is not  |   |
|               |            |                | known to change during adulthood. Repeat orders may be           |   |
|               |            |                | appropriate in pediatric patients or in adulthood if the first   |   |
|               |            |                | appropriate in pediatric patients of in additiood in the first   |   |
|               |            |                | result was obtained in childhood or adolescence.                 |   |

Table 4. Determining the percent increase in nonfasting vs fasting triglycerides (mmol/L) in pediatric (2 - < 19 yrs) and adults  $(\geq 19 \text{ yrs})$ .

|                             | Fasting       |           |           |                           |                           | Non-Fasting |      |        |                           | Percent Increase<br>((Non-fasting TG – Fasting TG)<br>/Fasting TG) % |      |        |                           |                           |
|-----------------------------|---------------|-----------|-----------|---------------------------|---------------------------|-------------|------|--------|---------------------------|--|------|--------|---------------------------|---------------------------|
| Age<br>Partition<br>(years) | n             | Mean      | Median    | 75 <sup>th</sup><br>Perc. | 95 <sup>th</sup><br>Perc. | n           | Mean | Median | 75 <sup>th</sup><br>Perc. | 95 <sup>th</sup><br>Perc.  | Mean | Median | 75 <sup>th</sup><br>Perc. | 95 <sup>th</sup><br>Perc. |
| DynaLIFE Mo                 | edical Labs ( | Siemens A | Atellica) |                           |                           |             |      |        |                           |  |      |        |                           |                           |
| 2-<19                       | 4578          | 1.16      | 0.98      | 1.38                      | 2.46                      | 7661        | 1.37 | 1.13   | 1.64                      | 2.99   | 18%  | 15%    | 19%                       | 22%                       |
| 2-<10                       | 492           | 0.96      | 0.83      | 1.19                      | 1.90                      | 654         | 1.40 | 1.16   | 1.76                      | 3.17   | 47%  | 41%    | 47%                       | 67%                       |
| 10-<19                      | 4086          | 1.18      | 1.00      | 1.41                      | 2.52                      | 7007        | 1.37 | 1.13   | 1.63                      | 2.99   | 15%  | 13%    | 16%                       | 19%                       |
| ≥19                         | 262279        | 1.55      | 1.33      | 1.87                      | 3.20                      | 317098      | 1.81 | 1.52   | 2.22                      | 3.98   | 17%  | 14%    | 19%                       | 24%                       |
| Dynacare (R                 | oche cobas)   |           |           |                           |                           |             |      |        |                           |  |      |        |                           |                           |
| 2-<19                       | 18619         | 1.11      | 0.94      | 1.33                      | 2.31                      | 20162       | 1.26 | 1.05   | 1.52                      | 2.67   | 13%  | 12%    | 14%                       | 16%                       |
| 2-<10                       | 1487          | 1.00      | 0.84      | 1.23                      | 2.14                      | 1980        | 1.28 | 1.03   | 1.59                      | 2.75   | 28%  | 23%    | 29%                       | 29%                       |
| 10-<19                      | 17132         | 1.13      | 0.95      | 1.34                      | 2.33                      | 18182       | 1.26 | 1.05   | 1.52                      | 2.65   | 12%  | 11%    | 13%                       | 14%                       |
| ≥19                         | 126414        | 1.50      | 1.25      | 1.79                      | 3.19                      | 23919       | 1.66 | 1.38   | 2.01                      | 3.55   | 11%  | 10%    | 12%                       | 11%                       |
|                             |               |           |           |                           |                           |             |      |        |                           |  |      |        |                           |                           |

Complete lipid panel results between 1/1/2021 - 12/31/2021 for pediatric patients were included in the analysis.

# Recommendations

**Recommendation #5: We recommend implementation of the new NIH equation** to replace the Friedewald equation for calculating LDL-C.

- NIH equation overcomes limitations of the Friedewald equation including accurately estimating LDL-C in non-fasting samples, when LDL-C is low (down to 0.50 mmol/L), and when triglycerides are up to 9.04 mmol/L
- The NIH LDL-C equation, is calculated as (all parameters in mmol/L):

|           | Cholesterol | HDL - C | (Triglycerides | Triglycerides x Non – HDL – C | $Trigly cerides^2$ | 0 244   |
|-----------|-------------|---------|----------------|-------------------------------|--------------------|---------|
| LDL = C = | 0.948       | 0.971   | 3.74           | 24.16                         | 79.36              | - 0.244 |

Table 5. Correlation between Friedewald and NIH-calculated LDL-C in pediatric patients (2-<19 yrs) categorized by triglyceride concentration.

|  | Sample Size | r <sup>2</sup> | Slope  | Intercept |  |  |  |  |  |  |  |
|--|-------------|----------------|--------|-----------|--|--|--|--|--|--|--|
| DynaLIFE Medical Labs (Siemens Atellica) |             |                |        |           |  |  |  |  |  |  |  |
| All                                      | 12252       | 0.9853         | 0.9951 | 0.0595    |  |  |  |  |  |  |  |
| TG <4.52 mmol/L                          | 12135       | 0.9902         | 1.0057 | 0.0311    |  |  |  |  |  |  |  |
| TG 4.52-9.04 mmol/L                      | 112         | 0.9914         | 0.7998 | 0.8062    |  |  |  |  |  |  |  |
| TG >9.04 mmol/L                          | 5           | 0.9996         | 0.6701 | 1.2213    |  |  |  |  |  |  |  |
| Dynacare (Roche cobas)                   |             |                |        |           |  |  |  |  |  |  |  |
| All                                      | 40852       | 0.9870         | 1.0036 | 0.0363    |  |  |  |  |  |  |  |
| TG <4.52 mmol/L                          | 40642       | 0.9926         | 1.0138 | 0.0099    |  |  |  |  |  |  |  |
| TG 4.52-9.04 mmol/L                      | 189         | 0.9928         | 0.7890 | 0.8408    |  |  |  |  |  |  |  |
| TG >9.04 mmol/L                          | 21          | 0.8853         | 0.4845 | 1.6114    |  |  |  |  |  |  |  |

**Table 6.** Comparison of the number of inaccurate and/or unreportable LDL-C results in pediatric patients (2-<19 years) when calculated by the NIH or Friedewald equation.

|                               | DynaLIFE Medica | l Labs (n=12252) | Dynacare (n=40814) |                  |  |  |
|-------------------------------|-----------------|------------------|--------------------|------------------|--|--|
|                               | NIH LDL-C       | Friedewald LDL-C | NIH LDL-C          | Friedewald LDL-C |  |  |
| Negative LDL-C                | 0               | 5 (0.04%)        | 0                  | 8 (0.02%)        |  |  |
| Low LDL-C                     |                 |                  |                    |                  |  |  |
| NIH <0.52 mmol/L              | 3 (0.02%)       | 2678 (21.9%)     | 25 (0.06%)         | 8919 (21.89%)    |  |  |
| Friedewald <1.80 mmol/L       |                 |                  |                    |                  |  |  |
| High TG                       |                 |                  |                    |                  |  |  |
| NIH >9.04 mmol/L              | 5 (0.04%)       | 117 (0.95%)      | 3 (0.01%)          | 298 (0.87%)      |  |  |
| Friedewald >4.52 mmol/L       |                 |                  |                    |                  |  |  |
| Increased number of samples   |                 |                  |                    |                  |  |  |
| reported using NIH vs         | 112 (0          | 91%)             | 295 (0.86%)        |                  |  |  |
| Friedewald due to high TG     | 112 (0          | .5170)           | 255 (1             | 0.00707          |  |  |
| (4.53 – 9.04 mmol/L)          |                 |                  |                    |                  |  |  |
| Type III hyperlipoproteinemia | 0               | 0                | 2 (<0.1%)          | 0                |  |  |
| (VLDL-C/TG > 0.76)            | Ū               | U                | 2 (10.1/0)         | J                |  |  |

# Conclusion

- Until recently, clinical guidance on lipid assessment in pediatrics has been lacking in Canada. • CSCC hRI-WG provides a pediatric harmonized lipid report, including 5 key reporting
- recommendations, based largely on the CCS/CPCA Clinical Practice Update, which includes lipid thresholds from the 2011 NHLBI Guideline.
- Flagging recommendations for several lipid parameters, including total cholesterol, LDL-C, HDL-C, and non-HDL-C were verified with CALIPER data.
- · Recommended thresholds for triglycerides and apoB are based on CALIPER data, as CCS/CPCA or NHLBI recommended thresholds failed verification.
- Recommended laboratory lipid reporting provide the first Canadian guidelines of its kind for pediatric lipid assessment.
- We hope these recommendations will be adopted by the Canadian laboratory community and help harmonize interpretation of lipid testing in pediatrics. We also provided novel data suggesting the consideration to update some lipid thresholds in future guidelines.

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