Discontinuation of Grading for Calculated LDL-C Results

LDL-cholesterol (LDL-C) is typically estimated using the Friedewald formula (LDL-C = TC-HDL-VLDL) when triglycerides are less than 400 mg/dL. TG/5 is recommended by the National Cholesterol Education Program to estimate VLDL. While other divisors have been used to estimate VLDL, such as TG/6, only TG/5 is recommended.

The Chemistry Resource Committee has evaluated the possibility of grading reported results for calculated LDL-C and has determined that such grading to reliably assess performance is not feasible. The following example will illustrate the problems with grading LDL-C calculated results.

The grading criteria that are used for the lipid challenges in the C survey are as follows:

<table>
<thead>
<tr>
<th>Lipid Component</th>
<th>Grading Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol:</td>
<td>Peer group mean ± 10%</td>
</tr>
<tr>
<td>Triglycerides:</td>
<td>Peer group mean ± 25%</td>
</tr>
<tr>
<td>HDL-C:</td>
<td>Peer group mean ± 30%</td>
</tr>
<tr>
<td>LDL-C: (Calculated/Measured)</td>
<td>Peer group mean ± 20%</td>
</tr>
</tbody>
</table>

When taken together the different lipid components comprise the Friedewald formula for estimating LDL-C:

$$\text{LDL-C (±20%)} = \text{TC (±10%)} - \text{HDL-C (±30%)} - \frac{\text{TG (±25%)}}{5}.$$

As an example, if we assume a peer group mean of 111.9 mg/dL for calculated LDL-C, the acceptable range would be 89-135 mg/dL.

Now assume that the cholesterol, triglycerides and HDL-C components are all graded acceptable as reported below:

- TC = 229 mg/dL (196-240)
- HDL = 37 mg/dL (26-50)
- TG = 261 mg/dL (202-337)

In this example the laboratory would report a LDL-C calculated value of 139.8 [229-37-(261/5)] and would fail the challenge for calculated LDL-C when compared to the acceptable range of 85-135. In fact in this example if the extreme, but acceptable, values for the lipid components were reported the following failed calculated LDL-C results would be reported:

- Situation (Highest reported LDL-C)
  240-26-202/5 = 174 FAILED for LDL-C

- Situation (Lowest reported LDL-C)
  196-50-337/5 = 79 FAILED for LDL-C

Thus even though the lipid components used in the Friedewald equation are acceptable the resulting calculated LDL-C is not. This occurs because the criteria limits for two of the components are greater than the acceptable limits for calculated LDL-C and permit too much variability in the LDL-C estimation. In addition the peer group for calculated LDL-C is comprised of a variety of different instrument systems and reagent combinations and thus is not a true peer group. It is not possible to construct appropriate peer groups based on all the possible instrument/reagent combinations for the three lipid components that are used in the Friedewald equation. For these reasons, the decision was made to discontinue grading of LDL-C calculated results.

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