A new equation for calculation of low-density lipoprotein cholesterol in patients with normolipemia and/or hypertriglyceridemia

By Sampson M, Ling C, Sun Q, … Fleming JK, Otvos JD, et al.
Published in JAMA Cardiol.

The Question
Because direct measurement of LDL-C is analytically complex, clinical labs traditionally calculate levels using the Friedewald equation. This equation is limited in its accuracy measuring LDL-C levels below 70 mg/dL and in determining LDL-C levels when triglyceride levels are >400 mg/dL. Testing requires a fasting sample. Is there a new equation that can overcome these limitations?

The Research
LabCorp scientists in collaboration with the NIH developed an improved LDL-C equation that overcomes the limitations of the Friedewald equation. The NIH LDL-C equation, validated by analysis of >250,000 samples from multiple populations, uses a much more sophisticated process for estimating VLDL-C than either the Friedewald or Martin-Hopkins equations. As a result, LDL-C is calculated more accurately compared to the gold-standard β-quantification method, particularly in patients with low LDL-C under 70 mg/dL and those with elevated triglyceride levels as high as 800 mg/dL. In addition, the NIH equation performs slightly better than the Martin-Hopkins equation throughout the entire range of TG values. Patient classification into correct diagnostic/prognostic categories for ASCVD risk management is also improved, resulting in 35% less misclassification when hypertriglyceridemic patients (400-800 mg/dL) were categorized into different LDL-C treatment groups. LabCorp will use the NIH LDL-C calculation in place of the Friedewald equation for all lipid panels that report calculated LDL-C concentrations.

The Takeaways

- As direct measure of LDL-C is analytically complex, clinical labs traditionally calculate LDL-C using the Friedewald equation
- The Friedewald equation requires the patient to be fasting and to have triglyceride values at the time of testing, less than 400 mg/dL; this equation furthermore is less reliable for clinical decision-making at lower levels of LDL-C (<70 mg/dL)
- Current cholesterol management guidelines rely on LDL-C levels for therapeutic decision-making, and low-LDL-C samples are more common now with the introduction of more effective lipid lowering therapy
- The new equation will be implemented at LabCorp in our standard lipid panels at no additional cost and will allow for more accurate calculation of LDL-C in patients with low LDL-C and/or hypertriglyceridemia (TG levels, <800 mg/dL)
- The NIH equation performs equally well in both fasting and non-fasting states