Lipid Measurements in the Management of Cardiovascular Diseases:

Practical Recommendations

NATIONAL LIPID ASSOCIATION

Lipoprotein measurements are pivotal in the management of patients at risk for atherosclerotic coronary heart disease (CHD) with myocardial infarction and coronary death as the main outcomes, and for atherosclerotic cardiovascular disease (ASCVD), which includes CHD and stroke. Recent developments and changes in guidelines affect optimization of using lipid measures as cardiovascular biomarkers.

HIGHLIGHTS

- It is acceptable to screen with nonfasting lipids.
- Non-High-Density Lipoprotein HDL-Cholesterol (non-HDL-C) is measured reliably in either the fasting or the nonfasting state and can effectively guide ASCVD prevention.
- Low Density Lipoprotein Cholesterol (LDL-C) can be estimated from total cholesterol, High Density Lipoprotein Cholesterol (HDL-C), and triglyceride (TG) measurements.

LABORATORY PRE-ANALYTIC VARIATIONS RESULT FROM:

- **Lifestyle**
- **Altered lipid metabolism due to disease**
  Ideally, a patient sample should only be collected when the patient is in a stable metabolic state and does not have a concurrent illness.
- **Source of the specimen**
- **Conditions of sample collection**
  Obtaining more than one specimen on different days should be considered to gain greater certainty about baseline values before initiating lipid-lowering drug interventions.

RECOMMENDATIONS: FASTING

- **Fasting lipid specimens are recommended for routine screening.**
- **Non-fasting lipid specimens are reasonable alternatives to fasting specimens for routine screening.**
- **It is reasonable to follow up abnormal non-fasting lipid measurements, especially TG levels > 175 mg/dL, with fasting lipid measurements.**

LABORATORY ANALYTIC ISSUES

- **LDL cholesterol can be estimated from total cholesterol, HDL-C, and TG determinations.**
- **Non-HDL-C is determined reliable when fasting or nonfasting.**
- **Advanced lipoprotein tests (e.g., LDL particle number, small dense LDL-C, remnant cholesterol) lack appropriate standardization and cross comparison of these tests utilizing different measurement techniques is difficult.**

RECOMMENDATION: PRECISION

- **It is recommended that lipid laboratories participate in programs that monitor accuracy and precision.**

LABORATORY POST-ANALYTIC ISSUES

- **Lipid lab reports are more informative when desirable values are noted**

EXAMPLE OF A LIPID MEASUREMENT LABORATORY REPORT

Patient Name: _____

Fasting: Yes ( ) No ( )

Measurement	Desirable Values*	Results	High Alert Values* *(Refer to Lipid Specialist)*
Total cholesterol	<200 mg/dL		
HDL-C	>40 mg/dL for men >50 mg/dL for women		<20 mg/dL
Non-HDL-C	<130 mg/dL <100 mg/dL for ASCVD or high risk pts		>220 mg/dL Consider inherited hyperlipidemia
LDL-C	<100 mg/dL <70 mg/dL for ASCVD or high risk pts		<50 untreated >190 mg/dL
TG	<150 mg/dL fasting <175 mg/dL nonfasting		500-999 mg/dL – severe >1000 mg/dL – critical value

RECOMMENDATIONS: LAB REPORTS

- **Lipid laboratory reports are recommended to include common lipid ranges, and extreme values should be highlighted for specific measures.**
- **Reporting of measurement accuracy and precision is reasonable for specific laboratory measures.**
- **The method used to calculate or measure LDL-C is recommended to be described in laboratory reports.**
- **LDL-C in adults >190 mg/dL is recommended to be reported as severe hypercholesterolemia, given the possibility of familial hypercholesterolemia, elevated levels of Lp(a), or potential need for treatment with high intensity statins**
- **Non-HDL-C in adults >200 mg/dL is recommended to be reported as possible inherited hyperlipidemia.**
- **Non-HDL-C is recommended to be reported routinely as part of the standard lipid profile.**
- **TG concentration >500 mg/dL is recommended to be reported as severe hypertriglyceridemia.**

CLINICAL CARE LABORATORY CONSIDERATIONS: GENERAL ISSUES

How often should lipid levels be measured in patients on lipid-altering therapy?

- Obtain lipid measurements 4 – 12 weeks after a change in lipid treatment.

How should clinicians interpret lipid levels in acutely ill patients?

- Acutely ill patients may have lower lipid levels. Results from inpatient lipid testing may require follow-up outpatient lipid testing.

What should be the frequency of lipid testing for persons undergoing lipid apheresis or injectable lipid medications, such as PCSK9 monoclonal antibodies?

- For persons on lipid apheresis, lipids are typically measured immediately before and after the apheresis procedure. To assess response to therapy with injectable lipid-lowering medications, it is recommended that the number of days since the last injection and the time interval between injections be considered when evaluating response to therapy.

Which LDL-C assay methods or calculation methods(s) can be used? What is the accuracy of the different approaches?

- In the absence of a cost-effective, accurate, and widely available direct method of measuring LDL-C, the assessment of LDL-C in clinical trials and in clinical practice has largely relied on calculation of LDL-C recognizing problematic underestimation in patients paricularly with high triglycerides.

ROUTINE AND ADVANCED LIPID MEASURES

Both LDL-C and non-HDL-C have been shown to be excellent lipid measures for screening, the initial evaluation, and to track patient care and risk for ASCVD outcomes.

SPECIFIC CONSIDERATIONS FOR TRADITIONAL AND ADVANCED LIPID TESTING

For high-risk patients with LDL-C below 70 mg/dl on treatment, which lipid/lipoprotein measures are most appropriate to assess residual atherogenic burden?

- For patients at high ASCVD risk with LDL-C < 70 mg/dl, the current threshold for potential further intervention, residual atherogenic burden may be ascertained by assessing measures of other lipid measurements beyond LDL-C. The three most widely used assays to assess this residual burden are non-HDL-C, apoB and LDL-P.

SUMMARY

The main goal of lipid testing is accurate identification of persons at high risk for ASCVD and the relevant science continues to evolve. Methods used to measure or calculate LDL-C from conventional lipid measurements are likely to be refined. Specialized evaluations of atherogenic lipid levels are generally not needed to assess patients prior to the initiation of aggressive lipid altering therapy.