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ONTARIO ASSOCIATION OF MEDICAL LABORATORIES

OAML Communiqué

November, 2013

Community Laboratories Introduce the Option of Using Non-Fasting Specimens for the Measurement of Lipid Levels (C024)

Traditionally, screening for type 2 diabetes required a fasting specimen for glucose analysis. Screening can now be accomplished using a non-fasting specimen for either glycated hemoglobin (A1C), or glucose.[1] Similarly, assessment of dyslipidemia can now be accomplished using a non-fasting specimen. This communiqué describes the clinical merit of assessing lipid status using a non-fasting specimen.

The majority of clinical guidelines on this topic, including the Canadian Cardiovascular Society's (CCS) 2012 guideline entitled "Guidelines for the diagnosis and treatment of dyslipidemia for the prevention of cardiovascular disease in the adult", are based on the results of fasting specimens. However, the CCS 2012 guideline accepts and recommends the use of non-high density lipoprotein cholesterol (non-HDL-C) and apolipoprotein B (apo-B) as alternate lipid assessment targets. Non-HDL-C is calculated as total cholesterol (TC) minus high density lipoprotein cholesterol (HDL-C) and is expressed in mmol/L. Neither non-HDL-C nor apo-B is affected by the patient's fasting status.[2]

In addition, Sidhu and Naugler's community-based population study published in 2012 in the *Archives of Internal Medicine* with lipid data from 209,180 patients, also suggests fasting for routine lipid levels is largely unnecessary, as non-fasting lipid profiles change minimally in response to food intake.[3] This study illustrated that the change in the mean TC and HDL-C for fasting compared to non-fasting specimens was less than 2%. Average differences between fasting and non-fasting measurements were less than 10% for low density lipoprotein cholesterol (LDL-C) and less than 20% for triglycerides.

Based on CCS's 2012 guideline, Sidhu and Naugler's findings, and other peer reviewed literature supporting the use of non-fasting specimens, community laboratories will introduce the option of using non-fasting specimens for the measurement of lipid levels.[4-11]

Why Use Non-fasting Specimens for Lipid Measurement?

The option to use a non-fasting specimen will support patients' compliance with routine screening programs, as they will have the convenience of having their blood drawn any time during the day. In addition, it will benefit patients who have difficulty with prolonged fasting. It will also reduce the risk of fainting, especially in seniors, and will help avert metabolic disruptions in patients with diabetes.

Expected Changes in Test Ordering, Specimen Collection and Reporting Processes

- **Hours Fasting**
  Patients will be asked how long they have fasted and this information will be recorded on the laboratory requisition and included on the laboratory report to facilitate lipid result interpretation. A patient's specimen is considered to be a fasting specimen if drawn after the individual has fasted (water only) for a minimum of 10 hours.

Physicians collecting specimens in their own offices must record the number of hours fasting on the laboratory requisition. Specimens received without this information will be considered non-fasting.

- **Non-HDL-C**
  The concentration of non-HDL-C will be included in all lipid assessments results. The concentration of non-HDL-C is not affected by fasting status. Non-HDL-C is calculated as the difference between the TC and HDL-C and is the sum of all cholesterol transported in atherogenic lipoproteins, regardless of triglyceride levels.[2] It provides an accurate reflection of the level of atherogenic carrier proteins that promote deposition of cholesterol and are the key factor in atherogenesis. Current literature suggests that the relative concentration of these particles may be used as a lipid target instead of LDL-C.[9, 10]

  To order non-HDL-C, when a lipid profile is not required, write "non-HDL-C" on the laboratory requisition.

- **Elevated Triglycerides**
  When measured triglycerides are > 4.52 mmol/L, calculation of LDL-C is not valid and will not be reported. Non-HDL-C may be used as an alternative lipid target as noted above.

What is the Clinical Impact?

Several peer-reviewed articles have evaluated the clinical significance of lipid results measured on fasting versus non-fasting specimens and the effect of using non-fasting results in calculating the Framingham Risk Score (FRS).

Key findings are summarized below:

The literature suggests that use of non-fasting lipid levels is acceptable for initial assessment of hyperlipidemia.[3-11, 14] As well, epidemiological data illustrate that results from non-fasting specimens may be a **MORE** significant predictor of cardiovascular disease (CVD), since most patients spend the majority of their day in a post-prandial state.[6]

- **Non-HDL-C** is an accurate reflection of the concentration of atherogenic lipocarrier proteins and is unaffected by fasting status, so it should be considered as an alternative to LDL-C for lipid assessment.[2,9]
- **Cholesterol and HDL-C:** The Framingham risk calculations for coronary heart disease (CHD) are based on TC and HDL-C. Since the difference in results of fasting vs. non-fasting specimens for these analytes is less than 2%, the risk of CVD has been found to be similar.[3]
- **LDL-Cholesterol:** A maximum of 0.2 mmol/L decrease in LDL-C was observed between fasting and non-fasting samples collected after normal food intake in a study of 33,391 patients. A mean decrease of 0.1 mmol/L (95% CI -0.2 – 0.0 mmol/L) was noted on LDL-C collected up to 4 hours post meal and was determined by the authors to not be of clinical significance.[5] Mora observed that lipid concentrations differed minimally between fasting and non-fasting state, however; there was a stronger association with CVD in fasting collections (risk ratio 1.21) compared to non-fasting LDL-C (risk ratio 1.00) (n=26, 330 women).[7]
- **Triglycerides:** A study published in the *Journal of the American Medical Association* analysing more than 300,000 people demonstrated that in contrast with previous findings based on much less data triglycerides provide no additional information about vascular risk, although there may be separate reasons to measure triglyceride concentration (e.g. prevention of pancreatitis).[11]

  Eberly's study published in the *Archives of Internal Medicine* found that after adjustment for risk-factors, study data (n = 2,809) indicated evaluation of non-fasting and fasting specimens for levels of triglycerides produced very similar hazard ratios for CVD and 25 year mortality. A review of fatal and

non-fatal CHD cases included in this study also demonstrated that non-fasting specimens are as valuable as fasting specimens to determine risk of CVD.[6]

- **Diabetic Patients:** In Lunds's 2011 limited study of 66 patients with type 2 diabetes, Lund expressed concern that treatment targets would have been missed in some patients whose LDL-C had been calculated using results from non-fasting specimens.[12,13]

  However, Langsted's study, which included 2,770 diabetics among 58,434 subjects, concluded that a non-fasting lipid analysis was appropriate for use in both diabetic and non-diabetic patients.[4]

  Further, an independent 8 year review of 1,337 diabetic subjects by van Dieren in 2011 confirmed that with the exception of triglycerides, lipid measurements did not significantly change if specimens were collected after a normal meal. In addition, the non-fasting results correctly predicted cardiovascular risk events.[8] These data suggest that the use of non-fasting lipid measurements is an acceptable option even in the diabetic population.

When are Fasting Specimens Important?

Fasting specimens are still recommended in the following situations:

- Before ordering a fasting specimen to help facilitate the decision to initiate or alter drug therapy it is recommended that the non-HDL or the apo-B levels are first reviewed. Current literature suggests that non-HDL-C & apo-B are more reliable indicators of CVD than LDL-C.[9, 10] In those instances when LDL-C must be used, the patient should be fasting, since LDL-C is subject to error of up to 10% if calculated on a non-fasting specimen.
- Non-fasting hypertriglyceridemia (triglycerides > 2.00 mmol/L) may warrant fasting analyses to enable an informed treatment decision e.g. prevention of pancreatitis.

To Learn More

Please visit the OAML website at www.oaml.com in December 2013 to obtain the 2013 version of the OAML's *Guideline for Lipid Testing in Adults*, which provides more information on lipid testing in adults.

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