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Briefs Focus

Advanced Biomarker Testing Provides More Tangible Results in Wellness Programs

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The benefits of comprehensive, advanced biomarker testing are becoming ever more apparent in applied clinical settings, including the workforce arena of employee wellness programs.[1] Cardiovascular disease (CVD) and diabetes are national epidemics and the leading causes of lost productivity and runaway health care costs for many employers. Commonly used health screening techniques, like finger-stick blood lipid tests, are failing to identify employees who are at risk for these preventable conditions. Although many factors contribute to CVD, heart attacks, and strokes, traditional cholesterol/lipid screenings look at only a handful of them. In addition, when diabetes is diagnosed in clinical practice using traditional measures, patients are literally several years into that disease. The good news is that by optimizing technology to lower process costs, advanced laboratory testing is now available to populations. Advanced biomarker testing enhances early detection, prevention, personalized treatment, and even reversal of atherosclerosis, diabetes, and related conditions. That is why employers have begun using advanced testing in employee wellness programs.

For example, a national company with 1,438 participating employees implemented a program that included advanced laboratory testing and saw significant results in just one year. Upon the initial screening, advanced testing revealed true health risks that would not have been detected with traditional testing: 44% (637 employees) were at risk for prediabetes and 81% (1,169 employees) were at risk for developing CVD. After health coaching, visits to their personal physician, and two follow-up rounds of advanced laboratory testing (at 6 and 12 months), there was significant improvement in these high-risk categories: 16% improvement in insulin resistance (98 employees reversed their risk for developing diabetes), and 12% improvement in atherogenic lipoproteins (144 employees moved out of the high-risk category for developing CVD). In addition, one-third of

the population reduced their body mass index (BMI) by losing 5-7 lbs. on average. These improvements in risk for CVD and diabetes mean a healthier, more productive workforce with lower medical costs and fewer absences for sickness.

A second example describes a state government agency in the Southeast United States conducting a similar program that included advanced laboratory testing. Among their ~1,800 participating employees, 67% who had optimal traditional lipid values (LDL-C <100 mg/dL) showed high risk for CVD with advanced biomarkers. In addition, 58% of the participants had normal glucose and HbA1C levels, traditional measures for diabetes risk. However, advanced testing showed that 44% of these individuals had high-risk markers for insulin resistance, an early warning sign for developing diabetes. Health-risk assessment data revealed an even greater concern: only 15% of employees had ever been told by a healthcare provider that they were at risk for (or currently had) diabetes, whereas advanced testing showed that 10% had high-risk markers suggestive of diabetes, an additional 32% showed levels consistent with prediabetes, and an additional 26% showed signs of insulin resistance. This population is currently undergoing follow-up advanced testing to measure health improvements. There is no doubt that uncovering hidden risk through advanced testing is a significant first step toward preventing disease progression in this population.

The best approach to preventing CVD and associated clinical events is one of therapeutic intervention early in life rather than waiting for symptoms to become apparent.

Large integrated health systems are frantically trying to walk the fine line between the traditional fee-for-service model and value-based healthcare models of the future. Early adopters of advanced testing may find it to be helpful on multiple levels:[2] advanced testing identifies more at-risk patients than traditional testing, and thus generates additional appropriate downstream interactions and procedures in the fee-for-service world; it helps manage conditions more appropriately and thus drives down per-patient costs and life-threatening events in the long run; and lastly, effective use of advanced testing for better treatment and outcomes can differentiate a health system from competitors in a rapidly evolving market.

From a Clinical Perspective

The leading cause of morbidity and mortality in the American adult population is clinical events related to atherothrombosis—heart attacks and strokes resulting from blood clots due to the dislodging of atherosclerotic plaque that has built up in the arteries over time. The National Health and Nutrition Examination Survey (NHANES) has shown that the majority of such events stem from underlying resistance to the normal effects of insulin and associated metabolic disease, including abnormal circulating lipid levels.[3] Genetic disorders also play a role, resulting from DNA variants (polymorphisms) in genes related to lipid metabolism and leading to conditions that confer increased cardiovascular risk, such as familial hypercholesterolemia and elevated circulating lipoprotein(a).

However, lipid testing as a means to identify those at greatest cardiovascular risk has been disappointing: of adults admitted to hospitals for coronary atherosclerosis, ~50% have at-goal concentra-

tions of low-density lipoprotein cholesterol (LDL-C) <100 mg/dL and ~17% have <70 mg/dL, while ~45% have a normal high-density lipoprotein cholesterol (HDL-C) >40 mg/dL and most have a triglyceride level <150 mg/dL.[4] Current atherosclerotic treatment regimens using a "one size fits all" mentality have undoubtedly helped to reduce the number of deaths attributed to CVD, but substantial residual risk remains—in more than 50% of the population.

Noted genetic lipid researchers Cohen and Hobbs recently emphasized that the best approach to preventing CVD and associated clinical events is one of therapeutic intervention early in life rather than waiting for symptoms to become apparent.[5] If this is true, we must better understand the early pathology of atherogenesis (initiation of atherosclerotic plaque formation), test for biomarkers that can identify such pathology, and then develop effective, individualized treatment regimens to reverse disease and prevent adverse outcomes.

Atherogenesis occurs when apolipoprotein B (apoB)-containing lipoproteins (mostly LDLs) enter the arterial wall and initiate a chronic maladaptive inflammatory process that leads to blood vessel injury and plaque development. The major reason such lipoproteins enter the arterial wall is high particle number as measured by apoB or LDL-P, not particle size or cholesterol content.[6] Because of the superiority of apoB or LDL-P over LDL-C in predicting cardiovascular risk, coupled with commonly occurring discordance between apoB and LDL-C (influenced by particle size and relative lipoprotein core content of triglycerides vs. cholesterol), five cardiovascular specialty organizations have now incorporated apoB/LDL-P testing into position statements.[7-10]

Beyond lipid/lipoprotein pathology, other identifiable risk factors are now emerging as key predictors of cardiometabolic disease, the majority of which are potentially treatable: inflammation, insulin resistance, coagulation dynamics, hormonal perturbations, heart muscle function, metabolic factors, and genetic influences. Utilizing information garnered from the clinical history, physical examination, and comprehensive advanced biomarker evaluation of the risk factors listed above, the therapeutic team can identify previously hard-to-identify metabolic pathologies and personalize not only pharmacological therapies, but also specific lifestyle recommendations to at-risk persons which would not otherwise be possible.[11] For example, the residual CVD risk associated with abnormalities of apoB, small dense LDL-C (sdLDL-C), HDL_2-C, free fatty acids (FFA), insulin, adiponectin, and leptin alert clinicians to the presence of insulin resistance, which is often not apparent from a traditional lipid panel. In this instance, a patient would benefit from a reduction in dietary carbohydrate. Similarly, a patient may have a normal lipid panel but with advanced testing show signs of inflammation/oxidative stress. Here, prioritizing discussion of the types of dietary fat consumed may be a more effective way to improve their health. Biomarkers can help the nutritionist by identifying deficiencies of key vitamins and omega-3 FA, and by defining patterns of lipid synthesis and absorption.

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