

Cardiac Risk (Cholesterol Panel)

- The Cardiac Risk (Cholesterol) Panel consists of a group of tests that can be used to help determine risk for coronary heart disease. These tests have been shown to be good indicators of whether someone is likely to have a heart attack or stroke caused by blockage of blood vessels or hardening of the arteries (atherosclerosis)
- The Cardiac Risk (Cholesterol) Panel includes:
 - Total Cholesterol – Cholesterol is a type of fat that is required for the production of steroids, bile acids and cell membranes. However, elevated cholesterol levels have been associated with increased risk of coronary heart disease.
 - HDL-C (High Density Lipoprotein Cholesterol) is often referred to as the “good” cholesterol.
 - LDL-C (Low Density Lipoprotein Cholesterol) is often referred to as the “bad” cholesterol
 - Triglycerides – are a type of fat present in the blood stream. Triglycerides act as a storage source for energy.
- The National Cholesterol Education Program (NCEP) has established guidelines for adult lipid testing:
 - Total Cholesterol less than 200 mg/dl is desirable
 - HDL-C greater than 60 mg/dl is desirable
 - LDL-C less than 100 mg/dL is desirable
 - Triglycerides less than 150 mg/dl is normal

High Sensitivity C-Reactive Protein (hsCRP)

C-reactive protein (CRP) is made by the liver and secreted into the blood stream. It is an acute phase reactant that is increased with inflammation and infection as well as following a myocardial infarction, surgery and trauma.

Studies have shown that measuring hsCRP can identify the risk level for cardiovascular disease in apparently healthy people. High levels of CRP in otherwise healthy individuals have been found to be predictive of future risk of heart attack, stroke, sudden cardiac death, and peripheral arterial disease, even when cholesterol levels are within an acceptable range.

Complete Blood Count without Differential

- Often referred to as a Hemogram, this profile includes counting the number of white and red blood cells in your blood.
- Included in this profile:
 - White blood cells (WBC) are an indicator of your current health status. Elevated WBC counts may indicate inflammation and/or a bacterial infection. Low WBC counts may indicate viral infections.
 - Red blood cells (RBC) are essential for the transport of oxygen throughout your body. Elevated RBC counts may indicate dehydration or overproduction of RBCs by the bone marrow. Low RBC counts may indicate anemia that may be caused by various factors.

- Red Blood Cell Indices (MCV, MCH, MCHC, and RDW) measure the average characteristics of the RBC.
 - MCV measures the average size of the RBC, Low values indicate the cells are microcytic (small RBCs) and are often seen in conditions such as iron deficiency and lead poisoning. High MCV values, macrocytosis (large RBCs) may be found in conditions such as folate or Vitamin B12 deficiency, liver disease, post splenectomy, chemotherapy, or hypothyroidism.
 - MCH measures the average weight of hemoglobin (HGB) per red cell
 - MCHC measures the average concentration of HGB per RBC. Hypochromic (low MCHC) or “pale cells” are seen with iron deficiency anemia.
 - RDW index is a quantitative estimate of the uniformity of individual red cell size. High levels may indicate iron deficiency or other conditions with a wide distribution of various size red cells.
- Platelets (PLT) are the cells responsible for helping your body to form a clot. They act as the ‘plug’.

Comprehensive Metabolic Panel

This is a comprehensive chemistry panel that provides information about the current status of your kidneys, liver, blood sugar, blood proteins and electrolytes.

- Kidney tests:
 - Creatinine and BUN (Blood Urea Nitrogen) are dissolved waste products in blood used to assess kidney function and hydration. Creatinine is less sensitive to hydration levels and liver function than BUN
- Liver Tests
 - ALP (Alkaline Phosphatase) – Reference ranges vary with age and during pregnancy. ALP is very “bone dependent”; higher normal values in youth (during growth spurts) and lower normal values with age as bone growth decreases. Used to assess liver and bone disease. Generally, mildly elevated levels are not significant without other abnormal tests.
 - ALT (Alanine Amino Transferase) & AST (Aspartate Amino Transferase) are The alanine amino transferase (ALT) blood test is typically used to detect liver injury. It is often ordered in conjunction with aspartate amino transferase (AST) or as part of a liver panel to screen for and/or help diagnose liver disease. AST and ALT are considered to be two of the most important tests to detect liver injury, although ALT is more specific than AST. Sometimes AST is compared directly to ALT and an AST/ALT ratio is calculated. This ratio may be used to distinguish between different causes of liver damage.

- Total Bilirubin – used to assess liver function, monitor hepatitis and hemolytic anemias. Mild elevation of total bilirubin may be due to dehydration or diet.
- Glucose – Also known as blood sugar. Please note that the reference ranges are based on a fasting state.
- Total Protein / Albumin / Globulin - Total protein is the sum of the circulating proteins in the serum. Interpretation is dependent on measurement of the separate fractions, which include albumin and globulin.
 - A/G ratio (albumin / globulin) is a numerical expression of the relationship of these two analytes. Abnormal A/G ratios may indicate the need for further testing.
 - Protein is used to assess nutritional status, liver function, kidney function and chronic infection / inflammatory disease states.
 - Elevated albumin levels may be due to dehydration
 - Decreased albumin levels may indicate poor nutrition, liver or kidney dysfunction
 - High globulin levels may be found in chronic disease (inflammation) and liver disease
- Electrolytes (sodium, potassium, chloride and carbon dioxide) – dissolved chemicals in the blood that are used to assess hydration, respiratory/metabolic acid-base balance and renal function

Prostatic Specific Antigen (PSA)

This is a test used to screen males for possible prostate cancer. In addition, physicians may perform a digital rectal exam in the screening process.

PSA is also used to monitor the effectiveness of treatment for patients diagnosed with prostate cancer. It may also be performed at regular intervals after treatment to detect recurrence of the cancer.

There is currently no consensus about using PSA to screen for prostate cancer in asymptomatic men.

Any abnormal PSA levels should be followed up by your primary care provider.

Thyroid Stimulating Hormone (TSH)

TSH is used to evaluate thyroid function and/or symptoms of hyperthyroidism or hypothyroidism.

Signs of hyperthyroidism may include:

- Elevated heart rate
- Anxiety
- Weight loss
- Difficulty sleeping

- Weakness
- Light sensitivity
- Puffy, dry or irritated eyes

Signs of hypothyroidism may include:

- Weight gain
- Dry skin
- Constipation
- Hair Loss
- Puffy Skin
- Cold intolerance
- Fatigue
- Menstrual irregularity in women

Abnormal TSH levels should be reviewed by your primary care provider as they may be associated with thyroid dysfunction requiring further testing.

Hemoglobin A1C (Hgb A1C)

Hemoglobin A1C shows a historical picture of what your blood glucose (blood sugar) levels have been for the past few months. Hemoglobin A1C is reported as a percentage. An estimated average blood glucose is reported which is calculated based on your Hgb A1C results. This helps to relate your HgbA1C to your average blood glucose level over the past few months. Please note this number will not necessarily match your daily glucose result.

It is important for patients diagnosed with diabetes to maintain their blood glucose level as close to normal as possible. This will help to prevent diabetes related damage to kidneys, eyes, nerves and cardiovascular system. Monitoring Hemoglobin A1C helps to determine how close to normal levels your blood glucose level has been maintained.

Hemoglobin A1C can be used to screen for and diagnose diabetes as well with the following exceptions:

- pregnant women
- people with recent severe bleeding or blood transfusions
- people with chronic liver or kidney disease
- people with blood disorders

In these cases, fasting blood glucose levels and / or glucose tolerance tests may be used to diagnose diabetes.

Also note that Hemoglobin A1C is not sensitive enough to detect temporary, acute blood glucose variations.

Serum Iron, Total Iron Binding Capacity and Ferritin

- Iron is an essential nutrient. It is needed in small quantities to help form normal red blood cells (RBCs). Iron is a critical part of hemoglobin, the protein in red blood cells that binds oxygen in the lungs and releases it as blood travels to other parts of the body.
 - Low iron levels can lead to anemia and the production of RBCs that are microcytic and hypochromic.
 - Large quantities of iron can be toxic to the body, and absorption of too much iron over time can lead to the accumulation of iron compounds in organs and tissues. This can damage organs such as the liver, heart, and pancreas.
- Total Iron Binding Capacity – assess your body’s ability to transport iron in the blood by measuring the total amount of iron that can be bound by proteins in the blood.
 - High levels usually indicate iron deficiency but may also be associated with pregnancy or use of oral contraceptives.
 - Low levels are associated with excess iron, malnutrition, or diseases that cause loss of protein through urination.
- Ferritin is the storage protein for iron
 - Low levels are associated with iron deficiency
 - Elevated levels are associated with excess iron storage disorders such as hemochromatosis. Elevated levels may also be seen in patients who have had multiple blood transfusions.

Blood Type (ABO & Rh)

Red blood cells (RBCs) have markers or antigens on the surface of the cells. Two major antigens or surface identifiers on human RBCs are the A and B antigens. Blood is grouped according to the presence or absence of these antigens.

- Type A - express A antigen on RBCs
- Type B – express B antigen on RBCs
- Type AB – express A & B antigens on RBCs
- Type O – express no A or B antigens on RBCs

Another important surface antigen is called Rh factor. If present on the RBCs, your blood type is Rh+ (positive); if it is absent; your blood type is Rh-(negative).

Interesting...

- Type O positive is the most common blood type in the US (approximately 38%)
- Type AB negative is the rarest blood type in the US (approximately 1%)

- Type O negative is also known as the universal donor
- Type B positive represents approximately 9% of the US population.

Uric Acid

This test is used to detect elevated levels which can be used to help diagnose gout. Uric acid levels are also monitored in people undergoing chemotherapy or radiation treatment. Rapid cell turnover from such treatment can result in increased uric acid

- Elevated levels can be related to the kidney's inability to clear uric acid or due to overproduction. Excess uric acid can cause crystals to form in the joints, which leads to inflammation and pain characteristic of gout.
- Decreased levels are rare and are seldom considered a cause for concern.

Serum Pregnancy

This test detects the presence of hCG which is a hormone present when you are pregnant.

In non-pregnant women, hCG levels are normally undetectable

A serum pregnancy test may be positive as early as just a few days after a missed menstrual period.

If the serum pregnancy test is negative and you suspect you are pregnant, this could be due to the fact that hCG levels are too low to detect. In this case, a repeat test in a few days can be performed.

References:

<http://labtestsonline.org/>

Mosby's Diagnostic and Laboratory Test Reference, 3rd Ed
ABC's of Interpretive Laboratory Data 2nd Ed