**I AM CARDIO Web Content**

**Cardiovascular Disease**

**Overview**

Cardiovascular disease (CVD) is a damage to, or dysfunction of, the heart (‘cardio’) and vasculature. The vasculature include all blood vessels: arteries, capillaries, and veins. A main cause of CVD is when the vasculature and the heart are not functioning together properly. The other main cause of CVD is when the nerves controlling the heart or the vasculature are not functioning properly.

**The Heart**

**A Special Muscle**

The heart is a special muscle, made of special muscle cells. In fact the heart muscle cells are unique to the heart, located nowhere else in the body. They are special because they are linked together electrically through little holes in the cell membranes so each cell may communicate with the cells around it. In effect this forms a little nervous system throughout the heart, enabling it to beat rhythmically on its own.

The heart muscle cells and supporting connective tissue are arranged to form the structure of the heart, including the chambers and valves. The human heart has four chambers: two little chambers at the top of the heart called the atria, and two larger chambers forming the bottom of the heart called the ventricles.

**The Atria**

The atria work to place just enough blood into the ventricles so that the ventricles may work efficiently. The concept is similar to working with a screw-driver. If the handle to the screw-driver is too small or too large for your hand, you will either squeeze too hard or not be able to squeeze hard enough to do the job. With just the right size handle, not only can you do the job, but you can do it much more easily. This concept is the same for the purpose of the atria, to put just the right amount of blood into the ventricles for maximum efficiency in pumping blood out of the heart.

**The Ventricles**

The ventricles’ job is to pump blood out of the heart. The larger left ventricle receives oxygen-rich blood from the lungs via the left atria and pumps blood to the rest of the body. The smaller right ventricle receives oxygen-depleted blood from the body via the right atria and pumps blood to the lungs to exchange the carbon-dioxide for oxygen.

The mechanical function of the heart, the valves, chambers, muscle walls, etc., are monitored and their function measured by a test called the echocardiogram (“echo”). An echo uses high frequency sound waves, like sonar, to image the heart and allows the doctor to see if there are any leaks or damage. The electrical function of the heart, itself, is measured by the electrocardiogram (“ECG”). The ECG is made of three waveforms: the contraction of the atria (known as the “P-wave”), the contraction of the ventricles (known as the “QRS-complex”), and the relaxation of the ventricles (known as the “T-wave”). The contraction of the atria are not able to be seen because it is overwhelmed by the contraction of the ventricles.

**The Vasculature**

Your arteries and veins also have muscles. These are known as smooth or involuntary muscles. The muscles of your arteries contract rhythmically also (known as “peristalsis”). The arteries have more muscle than veins, because they have to help the heart to pump blood throughout the body. The heart cannot do it all on its own, or some of your body may never receive blood. The veins have less muscle because they deal with less pressure in returning blood to the heart. Veins below the heart that have to work against gravity also have valves the help the weaker veins, when functioning normally, prevent blood from flowing back down into the legs. Also, the muscles of your legs and abdomen help to squeeze blood back to the heart.

**The Autonomic Nervous System**

**Parasympathetic and Sympathetic Control of the Heart**

But this is only part of the story of the heart. Like all other muscles in the body, every muscle is controlled by a nerve. In the special case of the heart, the heart muscle is controlled by two nerves. These nerves are the parasympathetic (P) and sympathetic (S) branches of the autonomic nervous system (ANS). The ANS may be thought of as the “automatic” nervous system controlling all the things we do not have to think about, like heart rate (HR), blood pressure (BP) and breathing. The P&S complement each other to ensure that every cell in the body receives the proper amount of blood (nutrients, oxygen, and waste removal) with each heartbeat.

These nerves act like the thermostat in your home. Depending on what you want to do, the brain (via the brain stem) determines what heart rate and blood pressure is needed for the proper amount of blood to be pumped to the body (known as “cardiac output”). The P&S nervous systems determine the proper HR and BP given the information provided by the brain and communicates this information to the heart and blood vessels.

This is like you setting the thermostat in your house. You set it and forget it. Once set, the heating and cooling system of the house automatically take over and maintain the temperature you set, when everything is working properly. If you make a change the heater heats things up, or the cooling systems cools things down. Similarly, the S nervous system speeds up HR and increases BP, and the P nervous system slows down HR and helps to lower BP. Another way to consider it is like the accelerator (S) and brakes (P) on your car. The S speeds things up and the P slows things down, and the two must work properly together to avoid accidents (like heart attacks).

**Parasympathetic and Sympathetic Monitoring**

The nervous control of your heart is measured by P&S Monitoring that uses your HR and breathing (respiratory activity, or RA) to determine P&S function. Your HR varies breath by breath, normally. This is known as HR-variability (HRV). As you breath in your HR increases a little and as you breath out your HR decreases a little. This is known as respiratory sinus arrhythmia (RSA), the only arrhythmia you want.

RSA is a function of what is known as the cardio-vagal response. Vagal, refers to the Vagus Nerve which is a significant portion of the P nervous system. By analyzing HRV, total (T) ANS function is measured. By analyzing RSA through RA, P nervous system is measured. Since T = S + P. Given that we can measure T and P. We can compute S from T & P as S = T – P. Now, whether you are seriously ill or not, young or old, active or resting, on medications or not, your P&S function can be measured, to determine how it effects your heart, vasculature, and all other systems of your body.

**Sympathetic Control of the Vasculature**

The muscles of your vasculature are controlled only by the S nervous system. More S-activity, due to stress or exercise, constricts (narrows the diameter of) your vasculature, increasing BP. Less S-activity, when relaxing, dilates (expands the diameter of) your vasculature, decreasing BP.

These three parts of your body (heart, vasculature and ANS) must work properly together to avoid heart disease.

**What is Heart Disease?**

The more general question is what is CVD. CVD includes heart disease. Heart disease may occur due to disease or disorder of the vasculature or disease or dysfunction of the ANS, as well as diseases of the heart muscle itself.

Diseases of the vasculature tend to cause the heart to work harder and “wear-out” faster; and include:

* hardening of the arteries, known as atherosclerosis;
* narrow arteries, causing high BP and hypertension;
* clogged arteries surrounding the heart, reducing blood supply to the heart itself, known as coronary artery disease (CAD);
* peripheral arteries with walls that are too thick or that are clogged with cholesterol or blood clots, known as peripheral artery disease (PAD);
* veins in the legs that are not functioning properly, with bad valves or “lazy walls” due to weakened smooth muscle, slowing blood return to the heart, causing what is known as orthostatic dysfunction, which can lead to afternoon fatigue and cognitive impairment, evening edema, varicose or spider veins, and eventually dizziness upon standing.
  + The most common form of orthostatic dysfunction is orthostatic hypotension (OH). OH is defined as a significant drop in BP upon standing or sitting from a supine position.

P&S dysfunction may cause heart disease, by causing the heart to work harder or not enough, and include:

* Peripheral autonomic dysfunction, or neuropathy (PAN), which may contribute to:
  + PAD by not controlling the peripheral arteries properly, allowing them to be
    - too narrow, leading to Hypertension, or
    - too wide, leading to Hypotension;
  + Orthostatic dysfunction, including OH, allowing the peripheral veins to be too wide slowing blood return to the heart, or preventing the valves from engaging, causing the blood to pool in the lower legs and feet;
* Advanced Autonomic Dysfunction (AAD), also known as Diabetic Autonomic Neuropathy (DAN) in diabetics has many symptoms depending on the organ system affected. For the cardiovascular system, AAD, a mild lack of proper control of the cardiovascular system, may contribute to:
  + Orthostatic dysfunction, including OH;
  + PAD, with Hypertension or Hypotension;
  + Palpitations, including the feeling of abnormal heart beats with normal EKG (including Holter monitoring, event monitoring, or stress test);
  + Tachycardia from too much S-activity;
  + Bradycardia from too much P-activity.
* Cardiovascular Autonomic Neuropathy (CAN), the more advanced stage of AAD, also has many symptoms depending on the organ system affected. For the cardiovascular system, CAN, a severe lack of proper control of the cardiovascular system, may contribute to:
  + Hypertension from too much S-activity;
  + Hypotension from too little S-activity;
  + Tachycardia from too much S-activity;
  + Bradycardia from too much P-activity;
  + CAD due to improper ANS control of the coronary arteries;
  + Irregular heartbeats, known as Arrhythmia, including atrial fibrillation, atrial flutter, , premature atrial contractions (PACs), premature ventricular contractions (PVCs), and supraventricular tachycardia (SVT).
* Heart Diseases:
  + *Arrhythmias* are cause by improper electrical conduction pathways around the heart;
  + *Valve dysfunction* prevents the heart from pumping blood to the body efficiently;
  + *CAD or Coronary Heart Disease (CHD)*, blockages of coronary arteries due to plaque build-up from cholesterol, prevent portions of the heart from receiving proper blood supplies and may lead to
    - *Ischemia* – a type of heart attack where a portion of the heart muscle stops working because of lack of blood (oxygen), but blood is returned before that portion of the heart muscle dies.
    - *Infarct* – a type of heart attack where a portion of the heart muscle stops working because of lack of blood (oxygen), and blood is not returned soon enough and that portion of the heart muscle dies.
  + *Heart Failure* is a condition in which the heart can't pump enough blood to meet the body's needs. In some cases, the heart can't fill with enough blood. In other cases, the heart can't pump blood to the rest of the body with enough force. Some people have both problems. The term "heart failure" doesn't mean that your heart has stopped or is about to stop working. Heart failure develops over time as the heart's pumping action grows weaker. Heart failure may cause fluid to build up in the feet, ankles, legs, liver, abdomen, and the veins in the neck and may also cause shortness of breath and fatigue or tiredness.
    - *Congestive Heart Failure (CHF)*, a weakening of the heart muscle from injury, disease, or becoming “worn-out.” This weakness leads to build-up of fluid in the sac around the heart that protects the heart from rubbing against the rib cage (known as the pericardium). If this fluid is not removed fast enough, the heart is “strangled” and can no longer beat. This fluid may also fill the lungs and surrounding tissues.
  + *Cardiomyopathy (CMP)*, is a “sickness” of the heart muscle. CMP may be caused by infections of the heart muscle, direct injury or trauma to the heart muscle, may be present at birth (congenital), or may be caused by heart valve dysfunction, chronic high BP, arrhythmias, ischemia, infarction, or over-work from vascular or ANS disorders.

**How Does Heart Disease Start?**

There are many risk factors for heart disease. Some of these risk factors you are born with or cannot be eliminated, but may be treated to minimize. These are known as non-modifiable risk factors. Others are under your control. These are known as modifiable risk factors. There are traditional risk factors that are well known and researched and have a high probability of causing heart disease. There are also non-traditional risk factors that are not quite so well-known and researched but seem to have a high probability of causing heart disease. These two grouping overlap.

* **Traditional Risk Factors** include:
  + Age
    - Women ≥ 55 years of age and post-menopausal women, and
    - Men ≥ 45 years,
  + Diabetes Mellitus,
  + Smoking,
  + High blood pressure (BP) or Hypertension
    - Hypertension is defined as resting BP > 140/90 mmHg or history of anti-hypertensives,
  + Dyslipidemia, may include one or more of the following three disorders
    1. High levels of low-density lipoprotein (LDL, also known as “bad cholesterol”)
       - This form of Dyslipidemia is defined as LDL cholesterol > 99 mg/dL,

1. Low levels of high-density lipoprotein cholesterol (HDL,also known as the “good” cholesterol)
   * + - This form of Dyslipidemia is defined as HDL cholesterol < 40 mg/dL, and
2. Hypertriglyceridemia, cause by too many triglycerides in the blood,
   * + - This form of Dyslipidemia is defined as Triglycerides > 150 mg/dL, and
   * Family history of premature coronary artery disease (CAD).
     + Premature is defined in women as < 65 years old and in men as < 55 years old,
     + This includes heart attack (ischemia or infarction).

* **Non-Traditional Risk Factors**:
  + Abnormal Ankle-Brachial Index (ABI);
  + Chronic stress.
  + Chronic inflammation as indicated by abnormal levels of C-Reactive Protein (CRP), Fibrinogen, Lipoprotein (a), Brain Natriuretic Peptide (BNP), or Human immunodeficiency virus (HIV);
  + Homocysteine elevation;
  + Microproteinuria (urinary protein excretion between 80 and 300 mg/24h, including Albumin to Creatinine ratio > 30 mg/mmol or albumin concentration > 200 mg/L);
  + Microalbuminaria (Albumin to Creatinine ratio > 2.5 mg/mmol in men or > 3.5 mg/mmol in women, or albumin concentration > 20 mg/L);
  + Metabolic Syndrome;
  + Elevated serum insulin levels;
  + Renal Disease;
  + Abnormal Calcium Score;
  + Carotid Intima-Media Thickness;
  + Left ventricular (LV) hypertrophy;
  + Psychosocial stresses;
  + Alcohol;
  + Abnormal diet;
  + Clinical depression;
  + Obesity, particularly of the abdominal male type;
  + Sedentary lifestyle;
  + Various types of infections; and
  + Collagen vascular diseases.
* **Modifiable Risk Factors** (those that may be treated and negated, reversed, or diminished):
  + Smoking,
  + Dyslipidemia,
  + Hypertension,
  + sedentary lifestyle,
  + diet, obesity,
  + type 2 Diabetes Mellitus or impaired glucose tolerance, and
  + Chronic stress
  + High CRP levels.
* **Non-Modifiable Risk Factors**:
  + Age,
  + Gender,
  + Genetic abnormalities, and
  + Family history of premature atherosclerosis.
  + African Americans. African Americans are more likely to have heart failure than people of other races. They're also more likely to have symptoms at a younger age, have more hospital visits due to heart failure, and die from heart failure.
* **Other causes of Heart disease** includes:
  + CMP;
  + CHF;
  + Congenital heart diseases;
  + Heart Valve dysfunction;
  + Arrhythmias;
  + Cancer treatments, including chemotherapy and radiation;
  + Thyroid disorders;
  + Substance abuses;
  + HIV/AIDS;
  + Too much vitamin E; and
  + Obstructive sleep apnea.

**How Does it Worsen?**

The most common reason why heart disease worsens is because patients do not follow their physician’s recommendations or instructions, and they continue a lifestyle that promotes modifiable risk factors such as chronic stress, smoking, obesity, poor and fatty diets. Other reasons for worsening heart disease that are beyond the patient’s control, the non-modifiable risk factors, include aging, genetic and family heritage factors. If these are a cause, learn about your disease and know the early warning signs and symptoms. Prevention and vigilance are the best means of slowing the progress of the disease.

**How Do I Prevent It?**

Know the early warning signs and symptoms, and adopting a lifestyle that avoids chronic stress, stops smoking and avoids second hand smoke, that reduces body fat, and eliminates poor and fatty diets.

**Heart Attack – Signs and Symptoms**

Women may have different signs and symptoms for heart attack from men. However, chest pain or pressure is the most common symptom of a heart attack for both genders.

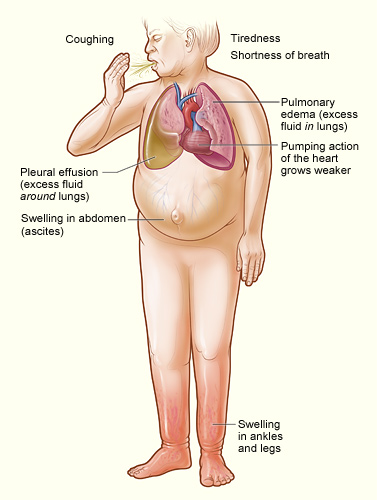
|  |  |
| --- | --- |
| Women | Men |
| Symptoms of a heart attack that women feel may include:   * + 1. Chest pain or discomfort. Chest pain is the most common heart attack symptom. It may feel like uncomfortable pressure, squeezing, fullness or pain in the center of your chest that lasts more than a few minutes, or goes away and comes back.     2. Some women may experience heart attack symptoms differently than men. Women may experience jaw pain or back pain in the area across the shoulder blades (*i.e.*, along the bra line).     3. Heart attack symptoms in women may also include pain or discomfort in the stomach including nausea or vomiting,     4. Pain or discomfort in one or both arms or neck.     5. Breaking out in a cold sweat or lightheadedness.     6. Shortness of breath or fatigue.     7. no symptoms (approximately one quarter of all heart attacks are silent, without chest pain or new symptoms and silent heart attacks are especially common among patients with [diabetes mellitus](http://www.medicinenet.com/script/main/art.asp?articlekey=343)). | Symptoms of a heart attack that men feel may include:   1. Chest pain or pressure, fullness, and/or squeezing sensation of the chest. Chest pain is the most common heart attack symptom. It may feel like uncomfortable pressure, squeezing, fullness or pain in the center of your chest that lasts more than a few minutes, or goes away and comes back. 2. Some men may experience jaw pain, toothache, headache; 3. shortness of breath; 4. nausea, vomiting, or general stomach discomfort; 5. sweating; 6. heartburn or indigestion; 7. arm pain (more commonly the left arm, but may be either arm); 8. general malaise (vague feeling of illness); and 9. no symptoms (approximately one quarter of all heart attacks are silent, without chest pain or new symptoms and silent heart attacks are especially common among patients with [diabetes mellitus](http://www.medicinenet.com/script/main/art.asp?articlekey=343)). |

**If you have any of these signs, don’t wait more than five minutes before calling for help. Call 9-1-1 and get to a hospital right away.**

Even though the symptoms of a heart attack at times can be vague and mild, it is important to remember that heart attacks producing no symptoms or only mild symptoms can be just as serious and life-threatening as heart attacks that cause severe chest pain. Too often patients attribute heart attack symptoms to "indigestion," "[fatigue](http://www.medicinenet.com/script/main/art.asp?articlekey=9879)," or "[stress](http://www.medicinenet.com/script/main/art.asp?articlekey=488)," and consequently delay seeking prompt medical attention. The importance of seeking prompt medical attention in the presence of symptoms that suggest a heart attack cannot be overemphasize. Early diagnosis and treatment saves lives, and delays in reaching medical assistance can be fatal. A delay in treatment can lead to permanently reduced function of the heart due to more extensive damage to the heart muscle.

We’ve all seen the movie scenes where a man gasps, clutches his chest and falls to the ground. In reality, a heart attack victim could easily be a woman, and the scene may not be that dramatic.

Although men and women can experience chest pressure that feels like “an elephant sitting across the chest,” women can experience a heart attack without chest pressure. Even though [heart disease](http://www.heart.org/HEARTORG/Conditions/More/MyHeartandStrokeNews/Coronary-Artery-Disease---Coronary-Heart-Disease_UCM_436416_Article.jsp) is the No. 1 killer of women, women often think the symptoms indicate less life-threatening conditions like acid reflux, the flu or normal aging.

**Heart Failure – Signs and Symptoms**

The most common signs and symptoms of heart failure are:

* Shortness of breath or trouble breathing
* Fatigue (tiredness)
* Swelling in the ankles, feet, legs, abdomen, and veins in the neck

All of these symptoms are the result of fluid buildup in your body. When symptoms start, you may feel tired and short of breath after routine physical effort, like climbing stairs.

As your heart grows weaker, symptoms get worse. You may begin to feel tired and short of breath after getting dressed or walking across the room. Some people have shortness of breath while lying flat.

Fluid buildup from heart failure also causes weight gain, frequent urination, and a cough that's worse at night and when you're lying down. This cough may be a sign of acute pulmonary edema (e-DE-ma). This is a condition in which too much fluid builds up in your lungs. The condition requires emergency treatment.

**Heart Failure - Prevention**

You can take steps to prevent heart failure. The sooner you start, the better your chances of preventing or delaying the condition.

**For People Who Have Healthy Hearts**

If you have a healthy heart, you can take action to prevent heart disease and heart failure. To reduce your risk of heart disease:

* Follow a healthy diet. A healthy diet includes a variety of vegetables and fruits. It also includes whole grains, fat-free or low-fat dairy products, and protein foods. A healthy diet is low in sodium (salt), added sugars, solid fats, and refined grains.
* If you smoke, make an effort to quit. Talk with your doctor about programs and products that can help you quit smoking. Also, try to avoid secondhand smoke.
* If you're overweight or obese, try to lose weight. Work with your health care team to create a reasonable weight-loss plan.
* Be physically active. People gain health benefits from as little as 60 minutes of moderate-intensity aerobic activity per week. The more active you are, the more you will benefit.
* Avoid using illegal drugs.
* Avoid chronic stress.

**For People Who Are at High Risk for Heart Failure**

Even if you're at high risk for heart failure, you can take steps to reduce your risk. People at high risk include those who have coronary heart disease, high blood pressure, or diabetes.

* Follow all of the steps listed above. Talk with your doctor about what types and amounts of physical activity are safe for you.
* Treat and control any conditions that can cause heart failure. Take medicines as your doctor prescribes.
* Avoid drinking alcohol.
* Avoid chronic stress.
* See your doctor for ongoing care.

**For People Who Have Heart Damage but No Signs of Heart Failure**

If you have heart damage but no signs of heart failure, you can still reduce your risk of developing the condition. In addition to the steps above, take your medicines as prescribed to reduce your heart's workload.

**How Do I Reverse It?**

In general, heart disease may be reversed by eliminating modifiable risk factors, following your doctors prescriptions, and proper diet and exercise. For example, heart disease may be reversed by adopting a lifestyle that avoids chronic stress, stops smoking and avoids second hand smoke, that reduces body fat, and eliminates poor and fatty diets. For non-modifiable risk factors (such as age, and genetic and family heritage factors), prevention and vigilance is the key. Knowing your disease and the early warning signs and symptoms helps to get treatment quickly and slows the progress of the disease.

**How Do I Begin My Journey to Heart Wellness?**

1. See your doctor.
2. Follow your doctors recommendations and prescriptions.
3. Avoid modifiable risk factors, including reduce stress.
4. Eat healthy and exercise.
5. Meditate or pray more.