



HEART AND VASCULAR INSTITUTE

The Johns Hopkins Arrhythmia Service

A guide for patients and their families



JOHNS HOPKINS
MEDICINE



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Welcome to Johns Hopkins

Welcome to the Johns Hopkins Arrhythmia Service. Our service exists to provide patients with timely as well as accurate diagnoses and therapies. We do this by using advanced technologies and working as a team with you, your family and your physician to help you return to your normal daily activities as soon as possible.

The Arrhythmia Service began in the early 1970s with two goals: to provide leading-edge clinical care for patients with abnormal heart rhythms (arrhythmias) and conduct research to determine the cause of arrhythmias and develop therapies for patients who have arrhythmia-associated problems.

As the first such service in Maryland and one of the first in the United States, the Johns Hopkins Arrhythmia Service rapidly took on a leadership role. An early success was the development and use of the first implantable cardioverter-defibrillator (ICD). In 1980, Dr. Levi Watkins first implanted this device, invented by Drs. Michel Mirowski and Morton Mower, in a patient who had experienced numerous episodes of life-threatening arrhythmias. Since then, ICDs have saved hundreds of thousands of lives and are currently recognized as the most effective treatment to prevent sudden cardiac death. Doctors on our Arrhythmia Service also focus their efforts on catheter ablation, a minimally invasive technique that can cure a number of arrhythmias. Other areas of major interest include the causes and treatment of atrial fibrillation, the diagnosis and treatment of inheritable arrhythmias such as arrhythmogenic right ventricular dysplasia, the prevention and treatment of both common and rare problems that may cause sudden cardiac death, device therapy for monitoring and treatment of congestive heart failure, as well as further improving pacemaker and ICD therapy.

Our physicians, nurses and technologists are available to explain tests and procedures to you and your family, answer your questions, and guide you as you proceed through the diagnostic and treatment process. Some of your questions may be answered by the information we have assembled here for you

But don't hesitate to ask questions: Understanding your care is an important part of a complete recovery.

Sincerely,



Hugh Calkins, M.D., FACC, FHRS, FAHA
Nicholas J. Fortuin M.D. Professor of Cardiology
Professor of Medicine
Director, Arrhythmia Service and Electrophysiology Laboratory



“Johns Hopkins is dedicated to providing the best clinical care possible for all of our patients—everything we do starts from that simple fact.”

Hugh Calkins, M.D.

The Johns Hopkins Arrhythmia Service



Electrophysiology is the study of electrical activity in the heart, that is, how the heart beats. Our doctors are cardiologists who specialize in the electrical system of the heart. Cardiac electrophysiologists (arrhythmia specialists) rely on a patient's medical history and the results of a variety of procedures to diagnose heart rhythm abnormalities. Once the electrical disorder is diagnosed, the arrhythmia specialist works with your doctor to determine the risk posed by the heart rhythm abnormality and recommend treatment. Together, you, your primary care doctor or general cardiologist, and the arrhythmia specialist decide on the most appropriate treatment for you.

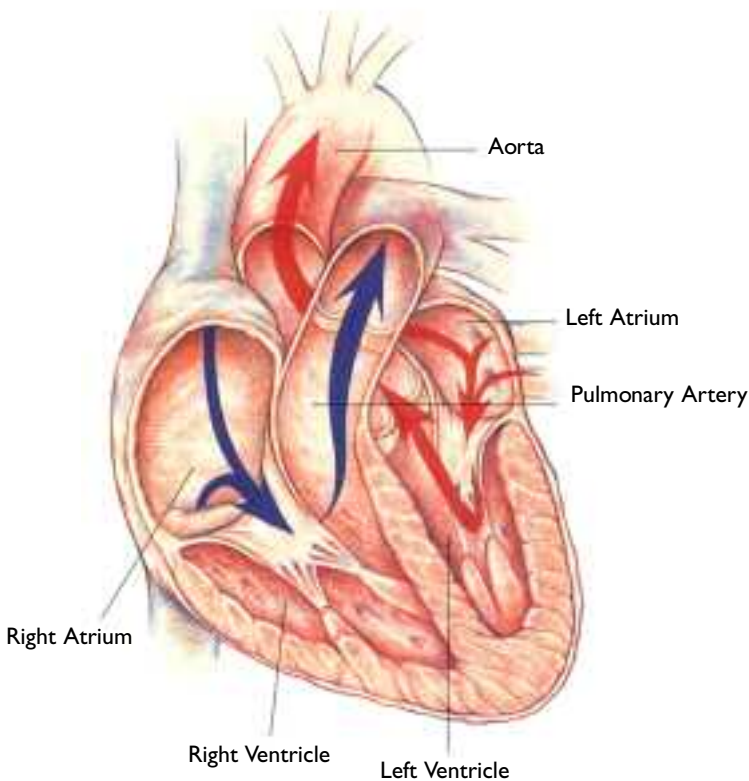
Understanding Your Heart

The heart is a four-chambered muscle that pumps blood, which carries oxygen and nutrients throughout the body. The two upper chambers of the heart, the right atrium and the left atrium, receive and collect the blood, and the lower chambers, the right and left ventricles, pump the blood. Specifically, the right atrium receives oxygen-depleted blood from the body and the right ventricle pumps it through the pulmonary artery to the lungs, where it picks up oxygen. At the same time, the left atrium receives oxygen-rich blood from the lungs and the left ventricle pumps it through a large artery, called the aorta, to the rest of the body.

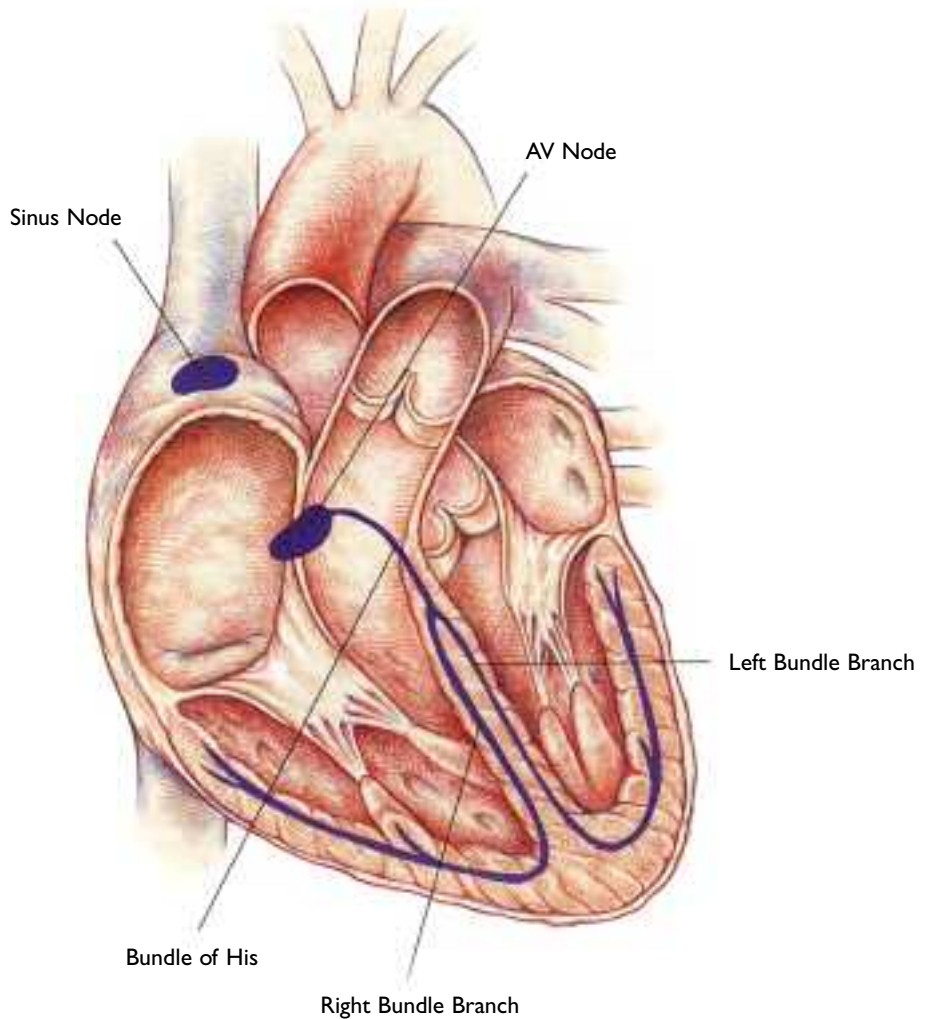


“I take pride in our ability to tackle not just routine cardiac procedures but rare and complex ones as well.”

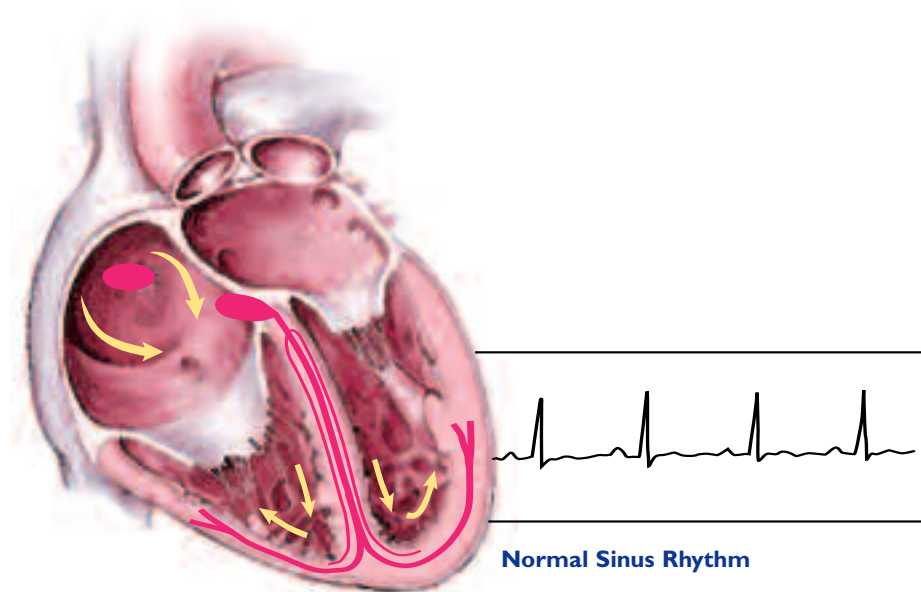
Ronald Berger, M.D., Ph.D.



Blood is pumped through the heart via muscle contractions, which must be electrically stimulated. In a normally functioning heart, the electrical signal starts in the upper right chamber of the heart in the sinus node, often referred to as the heart's natural pacemaker. This signal causes the upper chambers, the atria, to contract and squeeze blood into the lower chambers, the ventricles. The signal then travels to the atrioventricular (AV) node, located between the atria and the ventricles, where it is delayed for a fraction of a second. This delay allows the ventricles to fill completely with blood, which soon will be sent out of the heart. The impulse then travels rapidly through the bundle of His and then the right and left bundle branches.



Once the lower chambers are filled, the electrical impulse moves through a network of specialized fibers (the right and left bundles) that stimulate the ventricles to contract and pump blood to the lungs and the rest of the body. Normally, the heart's electrical system triggers the heart to beat in this precise sequence approximately 60 to 100 times each minute while resting. This is referred to as normal sinus rhythm. The heart rate will normally increase to above 100 times per minute with exercise.



What Are Arrhythmias?

An arrhythmia is an abnormality in the timing or pattern of the heartbeat. Arrhythmias may cause the heart to beat too rapidly, too slowly or irregularly. They are common and may cause a wide variety of symptoms, such as a racing, skipping or fluttering sensation (called palpitations) in your chest.

Cardiac arrhythmias also may cause light-headedness, fainting, chest pain, shortness of breath, fatigue or no symptoms at all. Many types of arrhythmia are merely nuisances; other types may be serious problems because they cause the patient to develop heart failure, pass out or even die suddenly when the heart beats too slowly or too rapidly to pump blood to the body.

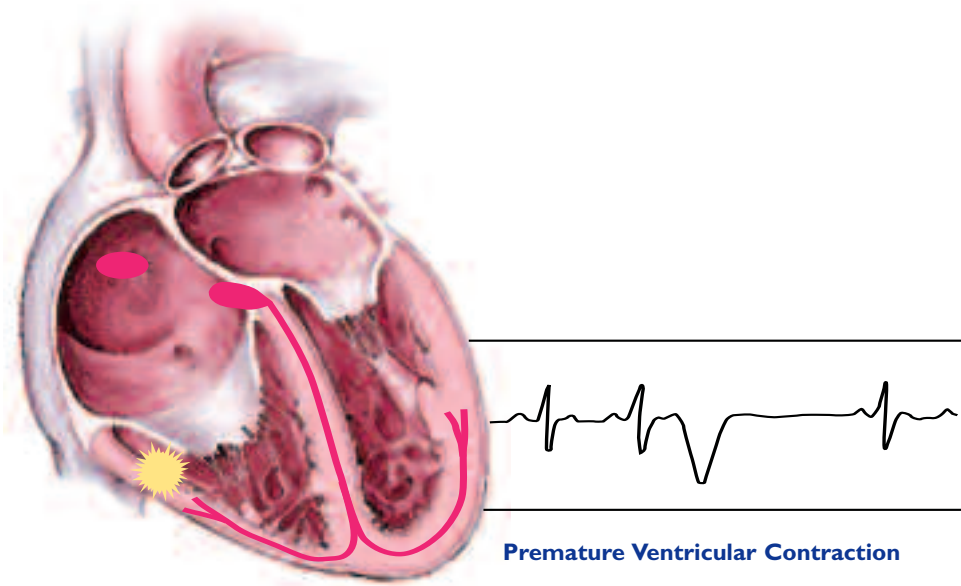


Our electrophysiology labs are equipped with state-of-the-art 3-D electroanatomic computerized mapping equipment and biplane fluoroscopy to facilitate complex catheter ablations and reduce the amount of X-ray exposure. The doctor routinely meets with the patient beforehand to explain the procedure and answer any questions.

There are four major kinds of arrhythmia

1. Irregular or Extra Heartbeats

Irregular or extra heartbeats happen when an electrical signal starts some place other than the sinus node and causes the heart to beat out of rhythm. Depending on the precise timing of the extra heartbeat, patients may experience an “extra beat,” a “skipped beat,” a “forceful beat” or a “fluttering” sensation. Many patients are completely unaware that they are experiencing extra heartbeats. Even completely healthy people have irregular or extra heartbeats once in a while. Usually, they are nothing to worry about. In some cases, however, irregular or extra beats can cause bothersome symptoms or may lead to other types of sustained rapid heart rhythms.



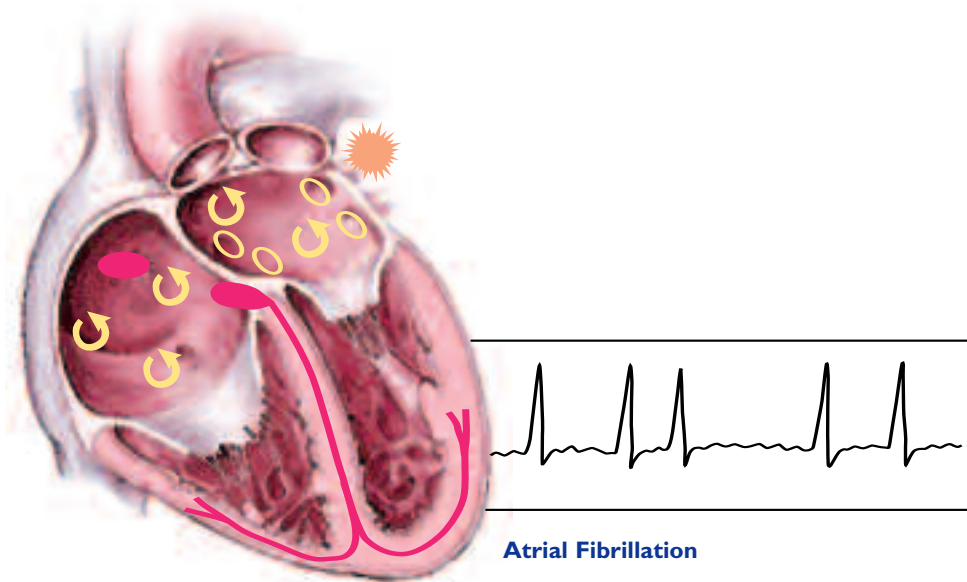
Premature Ventricular Contraction

2. Supraventricular Tachycardia

Supraventricular tachycardia (SVT) is a series of rapid heartbeats that begin in or involve the upper chambers (atria) of the heart. SVT can cause the heart to beat very rapidly or erratically. As a result, the heart may beat inefficiently, and the body may receive an inadequate blood supply. There are three major types of SVT.

Atrial Fibrillation

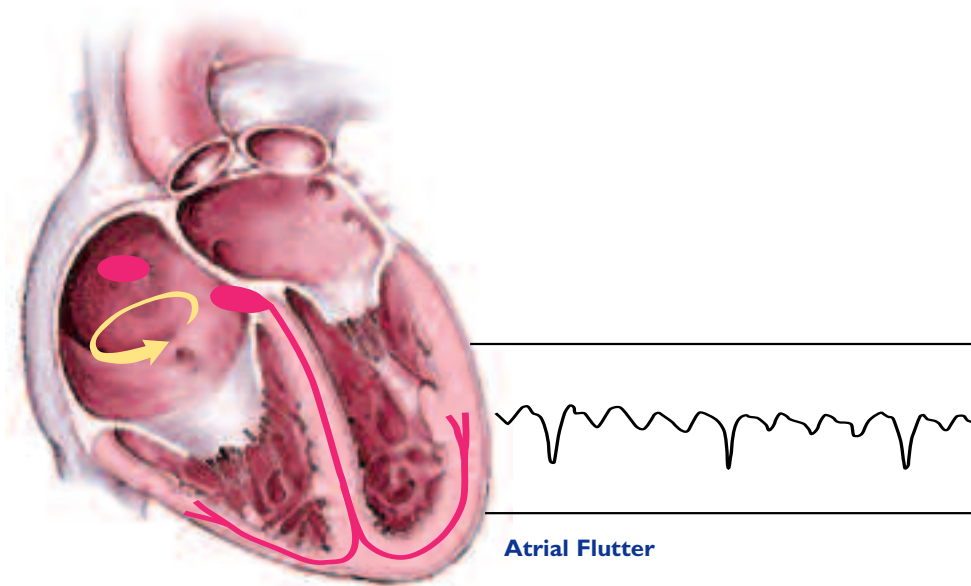
Atrial fibrillation results from the rapid and uncoordinated firing of electrical impulses from multiple sites in the upper chambers, which causes ineffective atrial contractions. Some of these impulses travel to the ventricles, resulting in irregular, erratic (chaotic) and rapid heart rhythm. Atrial fibrillation is the most common type of SVT, affecting nearly 3 million people in the United States alone. Atrial fibrillation occurs most commonly in patients over 50 years of age and those who have other types of heart disease. Sometimes, atrial fibrillation occurs in young, otherwise healthy individuals. Atrial fibrillation can cause a wide variety of symptoms and can also increase the risk of developing a stroke. As a result, patients who have atrial fibrillation often require treatment with medications or catheter ablation procedures. Treatment with a blood thinner such as coumadin or aspirin is also recommended to lower the risk of stroke.



Atrial Flutter and Atrial Tachycardia

“Typical atrial flutter” results from a single “short circuit” in the right atrium. This short-circuit causes the atria to beat at about 300 beats per minute while the lower chamber of the heart (the ventricles) beat at a slower rate (often 75 to 150 beats per minute). Like atrial fibrillation, atrial flutter occurs most commonly in elderly patients and those with other types of heart disease. It also can cause a wide variety of symptoms and increase the risk of developing a stroke. Treatment options include various types of medications as well as catheter ablation, which cures the problem in most patients.

Less commonly, a patient may have “atypical atrial flutter,” which results from a short circuit in an unusual location like the left atrium or near scar tissue. Some patients have atrial tachycardia, a rapidly firing focus which may originate from either atria. These arrhythmias also usually warrant medical therapy or complex catheter ablation.

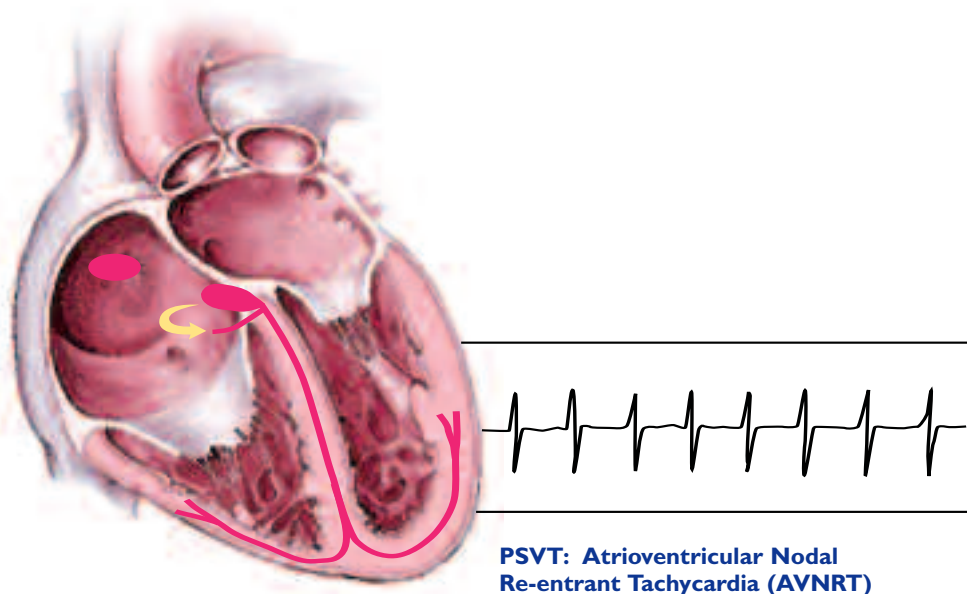


Paroxysmal Supraventricular Tachycardia

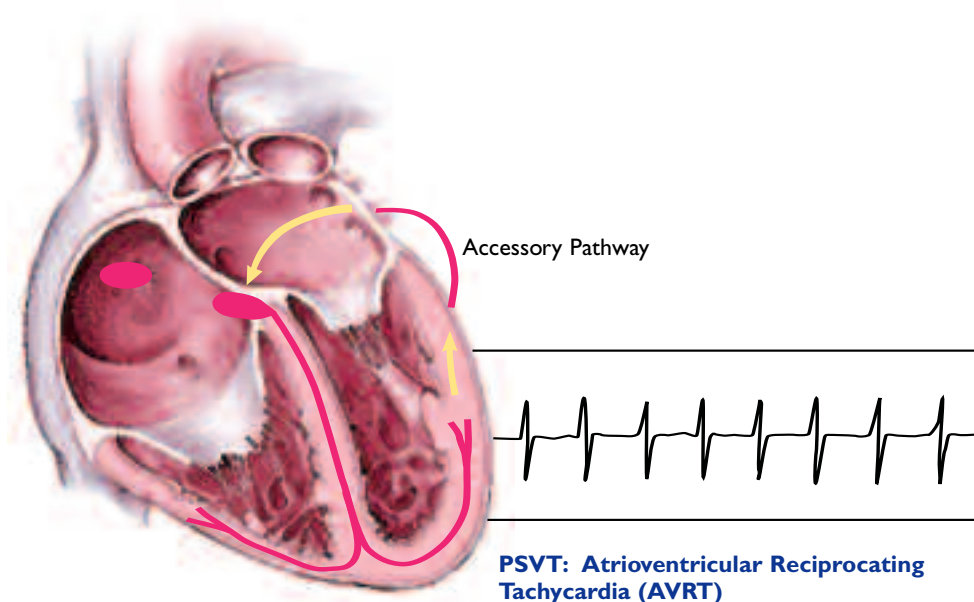
Paroxysmal supraventricular tachycardia (PSVT) is another type of “short circuit” arrhythmia. It may result from either atrioventricular nodal re-entrant tachycardia (AVNRT) or from an accessory pathway, which may occur as part of the Wolff-Parkinson-White syndrome.

PSVT may occur at any age and commonly occurs in patients who have no other types of heart disease. Patients with PSVT typically describe a rapid, or racing, regular heartbeat (between 130 and 230 beats per minute) that starts and stops abruptly. It is commonly misdiagnosed as a panic attack. With the exception of some patients with the Wolff-Parkinson-White syndrome, PSVT generally is not a dangerous arrhythmia. However, it can result in debilitating symptoms. Treatment options include a variety of drugs or catheter ablation, which cures the problem in most patients.

In AVNRT, a small extra pathway exists in or near the AV node. If an electrical impulse enters this pathway, it may start traveling in a circular pattern that causes the heart to abruptly start beating fast and regular.



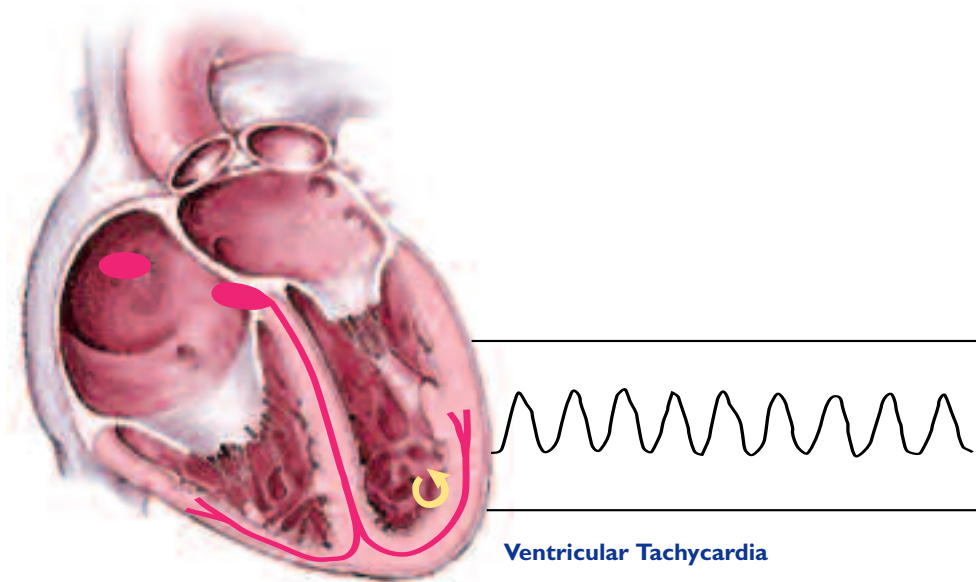
Wolff-Parkinson-White syndrome occurs when there is an extra connection between the atria and ventricles (accessory pathway). The presence of this second connection between the atria and ventricles is a setup for developing a “short circuit” arrhythmia: Electrical impulses may start traveling in a circular pattern and cause the heart to beat too rapidly (AVRT: atrioventricular reciprocating tachycardia). Under rare circumstances, patients with Wolff-Parkinson-White syndrome can develop an extremely rapid heart rhythm abnormality that may be life-threatening.



3. Ventricular Tachycardia

Ventricular tachycardia (VT) is a series of rapid heartbeats that originate in the lower chambers of the heart (the ventricles). As a result, the heart may beat inefficiently, and the body may receive an inadequate blood supply. Ventricular tachycardia most often occurs when the heart muscle has been damaged by a heart attack or some other disease, creating abnormal electrical pathways in the ventricles.

This type of tachycardia may last only a few beats and cause no problems; however, it may continue and lead to life-threatening arrhythmias and cardiac arrest. Treatment options include medications, catheter ablation or placement of an implantable cardioverter-defibrillator (ICD).



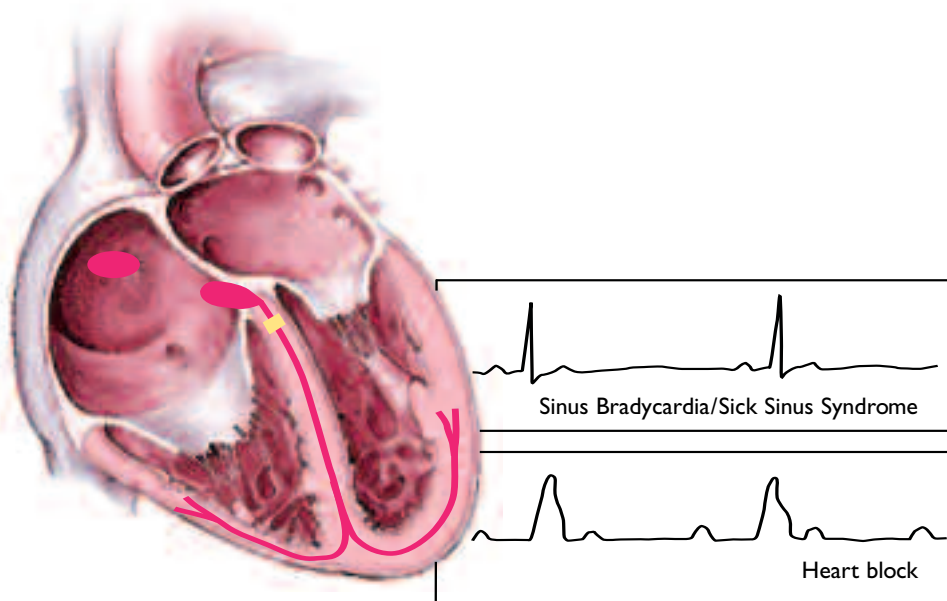
4. Bradycardia

Bradycardia is a slow heart rate, when the heart beats less than 60 beats per minute. In some patients who are otherwise healthy, the heartbeat may slow to less than 60 beats per minute while resting or sleeping. This usually causes no symptoms and does not require treatment. In other patients, bradycardia may occur due to age-related wear and tear on the heart or some other heart disease and may cause undue fatigue, lightheadedness or fainting (syncope). There are two basic types of bradycardia.

Sick sinus syndrome occurs when the sinus node (the heart's own pacemaker) fails and does not reliably trigger heartbeats. This is very common in elderly persons but may occur at any age.

Heart block is a complete or partial interruption of the electrical impulses on their way to the ventricles and results in a slow, unreliable heartbeat. Heart block may be present at birth, may result from other types of heart disease (after a heart attack for example), or may be due to age-related wear and tear on the heart's electrical system.

Permanent pacemakers can be implanted to prevent patients from experiencing symptoms due to a slow heart beat.



Bradycardia

Diagnosing Arrhythmias

If an abnormal heart rhythm is suspected, your doctor may recommend one or more tests to diagnose the arrhythmia and determine if it is causing your symptoms. These tests may include an electrocardiogram (ECG, also identified as an EKG), a special type of ECG called a signal-averaged ECG (SAECG), a Holter monitor, an event monitor, an exercise stress test, a tilt table test or an electrophysiology (EP) study.



Nurses and technologists see to the comfort and care of patients before the procedure. Patients will have a number of painless “leads” attached to their skin, blood pressure cuff around their arm and an oxygen monitor on their hand throughout the procedure.

Electrocardiogram

An electrocardiogram (ECG) is a simple test that traces the electrical activity of your heart. During an ECG, you lie flat on a table, connected to an ECG machine with wires taped to your chest, arms and legs. The test is painless and takes only a few minutes. The ECG produces a printout that doctors can examine to diagnose arrhythmias or other types of heart disease.

Holter Monitoring

Holter monitoring is a continuous ECG recording, usually for 24 to 48 hours, while you go about your normal daily activities. It is useful to detect arrhythmias that may not occur during a resting ECG. During Holter monitoring, wires are connected to your chest and attached to a small recording device that you carry with you. If you experience any symptoms, you are asked to push a button and record your symptoms so that your heart rhythm at the time of your symptoms can be determined. An arrhythmia specialist will later analyze the electrical recordings to determine what your actual heart rhythm was at the time that you were experiencing your symptoms and also whether any asymptomatic abnormal heart rhythms occurred while you were wearing the Holter monitor.

Event Monitors

Event monitors are similar to Holter monitors but they do not record the heart rhythm continuously. Event monitors only record the heart rhythm when an abnormally fast or slow heartbeat occurs or when you activate them. They typically are used for one or two months, during which you are instructed to trigger the device and record your symptoms if symptoms occur. Once a recording is obtained, the ECG tracing can be transmitted over the phone to a monitoring station that will analyze the ECG recording and send it to your arrhythmia specialist for interpretation.

Implantable Monitor

The implantable monitor is a small device that is inserted under the skin (similar to a pacemaker) and functions like an event monitor. This device is typically recommended for patients who have passing-out spells every three to 12 months and in whom other tests have not determined a cause. The technique involved with inserting this monitor is similar to a pacemaker insertion. However, the incision is smaller, no wires need to be placed in the heart and the procedure is usually performed on an outpatient basis.



The latest generation of implantable monitor is no larger than a few sticks of gum.

Exercise Stress Test

Some arrhythmias only occur while a patient is exercising. Because of this, your doctor may recommend an exercise stress test (or treadmill test). During this test, you briskly walk or jog on a treadmill while hooked up to an ECG machine. This allows your arrhythmia specialist to determine if you are experiencing any arrhythmias while exercising and also determine if you have evidence of a blocked heart artery.

Echocardiogram and Transesophageal Echocardiogram

An echocardiogram is a noninvasive, painless test that allows cardiologists to see if your heart is functioning normally or if it is enlarged or weakened or has a damaged valve. Ultrasound waves are directed through the chest to the heart. The echoes of the sound waves are processed and used to produce images of the heart. Additionally, a transesophageal echocardiogram (TEE) may be performed by having you swallow the ultrasound probe (following numbing medication to the throat and appropriate sedation). The TEE provides close-up images of the heart from the esophagus. This technique is an excellent way to search for blood clots in the atria. Your physician may request that you have a TEE prior to an electrical cardioversion or catheter ablation. Most patients tolerate this test quite well.

MRI Scan

Magnetic resonance imaging (MRI) is a painless means of evaluating the heart's structure and function. It can sometimes detect rare heart conditions (such as arrhythmogenic right ventricular dysplasia and cardiac sarcoidosis) and involves no radiation. MRI scans are sometimes obtained prior to complex catheter ablations.

CT Scan

Computed tomography (CT) scanning is performed by taking high-resolution X-ray images using a multislice scanner. This advanced imaging can detect coronary artery disease, evaluate congenital heart disease, and may be used to evaluate a patient's heart prior to a complex catheter ablation procedure.

Magnetic Resonance Imaging in Patients With Implanted Cardiac Pacemakers and Defibrillators.

Magnetic resonance imaging is a useful diagnostic test for patients with various kinds of medical problems. In the past, MRI was not allowed in patients with implanted cardiac pacemakers and defibrillators. Thanks to the research efforts of several physicians and researchers, including those at The Johns Hopkins Hospital, MRI can now be safely performed in many patients with implanted cardiac devices. More than 300 patients with implanted pacemakers and defibrillators have safely undergone MRI at The Johns Hopkins Hospital, where this procedure is now considered the standard of care.

Patients with implanted cardiac pacemakers and defibrillators who need an MRI procedure must have their device fully tested and reprogrammed to MRI-safe settings before entering the MRI room. During the procedure, the patient's EKG is continuously monitored by a doctor or nurse who has been specially trained in both MRI safety and cardiac device management. Following the MRI, the pacemaker or defibrillator is retested to ensure that no damage to the device occurred during the MRI procedure, and the patient's original device settings are restored.

Please contact the scheduling office to arrange an MRI for a patient who has a pacemaker or ICD.

Tilt Table Test

A tilt table test can help diagnose an abnormality of blood pressure regulation causing "fainting," which is referred to by a variety of names, including neurally mediated syncope, neurocardiogenic syncope or vasovagal syncope.

During the tilt table test, an intravenous (IV) line is placed in your arm and ECG wires are attached to your chest. You then lie flat on a table for 10 to 15 minutes while your heart rate and blood pressure are monitored. At that point, the table is tilted upright so that you are in an almost standing position. You are asked to remain still for 30 to 45 minutes while your heart rate and blood pressure are monitored. If you have a normal response, you may receive medication through your IV and have the test repeated. If your symptoms are provoked by the tilt test, the team notes your heart's rhythm and your blood pressure before returning the tilt table to the flat position. You will recover quickly after the test and should be able to return home soon after.



"I'm keen on developing the new technology necessary to forgo radiation exposure for many cardiac procedures."

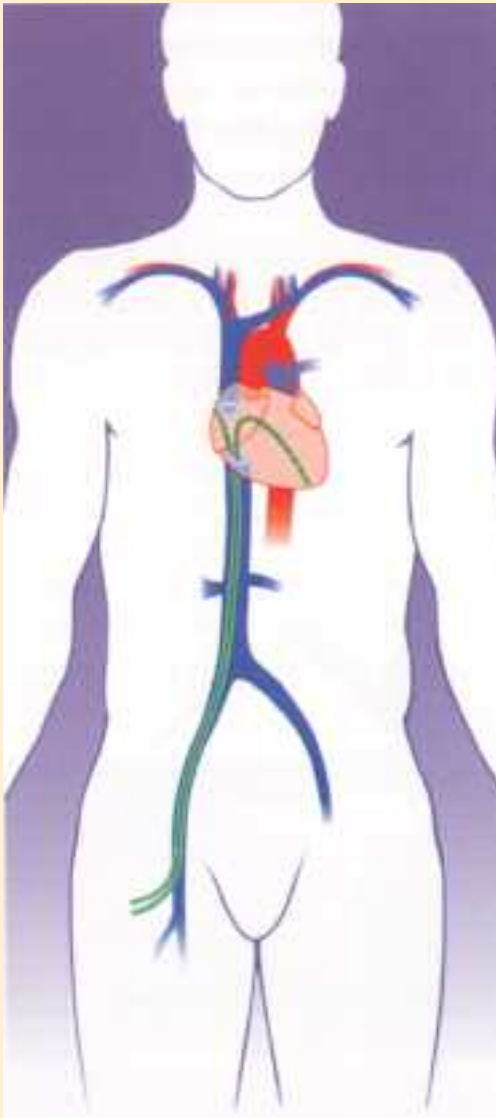
Henry Halperin, M.D., M.A.



Tilt Table Test

Electrophysiology Study

Some arrhythmias are difficult to diagnose and may require an electrophysiology (EP) study. An EP study is often used to evaluate patients who have “fainted” or have experienced an abnormal rapid heart rhythm. This test may be recommended for patients who have impaired heart function and intermittent extra heartbeats, even if they are not experiencing symptoms. In other circumstances, patients with an inherited cardiac condition may undergo an EP study as part of their risk assessment. In these cases, the EP study may identify patients who are at high risk of developing a serious arrhythmia indicating the need for preventive treatment.



In an EP study, the electrophysiologist inserts several intravenous (IV) lines into large veins. The electrophysiologist then passes several electrical catheters through the IVs and guides them into the heart using X-ray imaging. This allows the electrophysiologist to examine the electrical activity inside your heart to determine if and why the rhythm is abnormal. Once that is known, your physician can prescribe the most effective treatment.

Electrical catheters are inserted into a vein in the leg and are positioned to record the electrical activity inside the heart.



During an electrophysiology study, catheters are inserted into the heart from the legs under X-ray guidance.

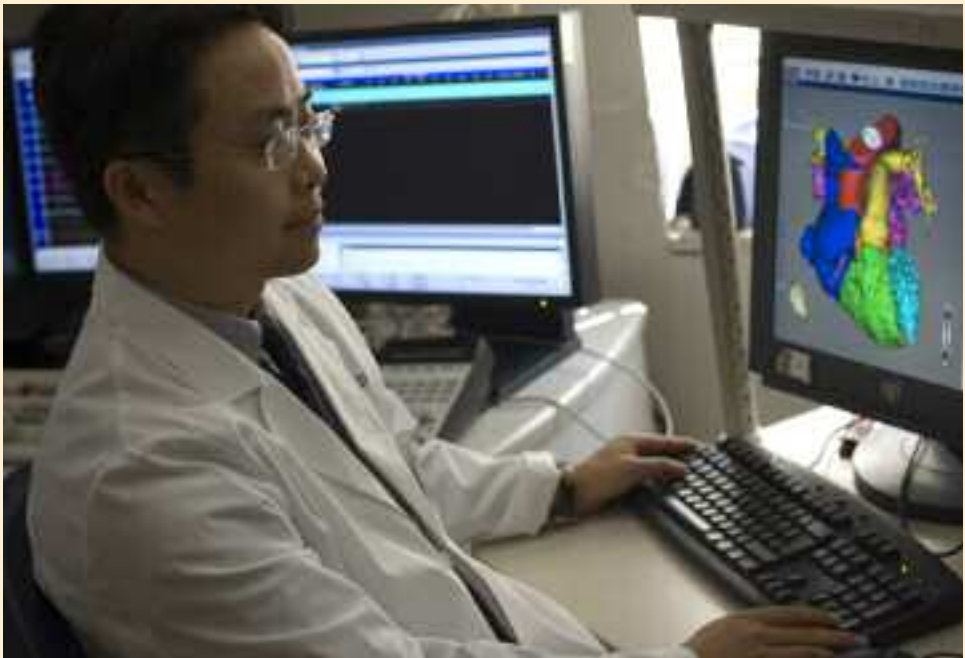
Your doctor will discuss preparation for the test. In general, you should not eat or drink after midnight the night before the study. Check with your doctor about taking your normal medications. During the study, you will lie on an X-ray table with a blood pressure cuff on your arm, a clip on your finger to monitor your oxygen level, and wires on your legs, arms and chest to check your heart rate. The nurse will give you medication for sedation and to minimize discomfort before and during the procedure.

The sites where the doctor will be working will be cleaned and shaved. You will be covered with sterile drapes from your shoulders to your feet. Then the doctor will numb the area on your leg or neck where the wires will be inserted. The wires will be passed through the veins toward the heart. You may feel pressure, but you should not feel any sharp pain. Once the catheters are in position, they are connected to a computer that produces internal ECGs.

The catheters are used to record and stimulate electrical activity. You may feel your heart beating faster than normal, a skipped beat, or familiar symptoms such as dizziness or palpitations. The EP study usually lasts one to three hours.

Once the study is complete, the wires and IVs are removed and pressure is applied to the numbed area for five to 10 minutes to prevent bleeding. You then must rest in bed for three to four hours with your leg(s) straight. You can eat and drink when you are awake. During recovery, your nurse will record your blood pressure, check the area where the IVs were, and monitor your heart rhythm regularly. If you are an outpatient, you may leave after a short recovery period, but you will need someone to drive you home. You should avoid heavy lifting or other vigorous activities for three days after the procedure.

Depending on the results of your EP study, your doctors may recommend a change in medication, catheter ablation, implantation of a pacemaker or defibrillator to manage your heart's rhythms, or more diagnostic tests.



Computers assist electrophysiologists in pinpointing the exact cause of arrhythmia.

Treating Arrhythmias

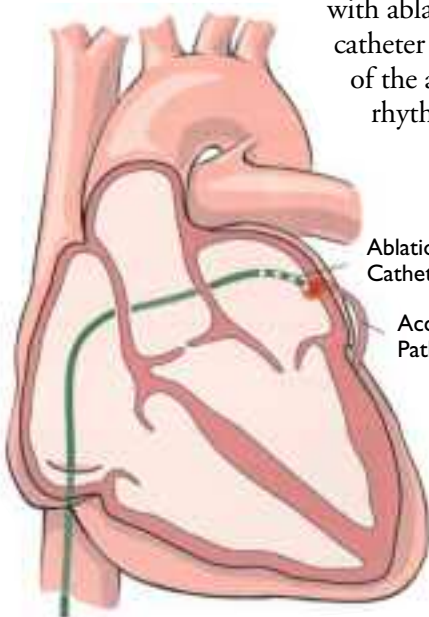
Treatment options for patients with arrhythmias include medication, catheter ablation, and placement of a pacemaker or ICD.

Catheter Ablation

Catheter ablation is a procedure that is used to destroy (ablate) areas of the heart which are causing arrhythmias. In a radiofrequency ablation, electrophysiologists pinpoint the area and then use radio wave energy to “cauterize” the tiny part of the heart muscle causing the abnormal heart rhythm. Catheter ablation plays an important role in the management of most types of cardiac arrhythmias.

The procedure is done in the EP lab under the direction of a team of highly trained doctors, nurses and technologists. Using X-rays as a guide, the doctor will pass several small catheters through veins in the groin or neck and position them in the area that is interfering with the heart’s normal electrical activity. A diagnostic EP study (previously described) is always performed as part of the catheter ablation procedure to accurately diagnose the heart rhythm abnormality. Three dimensional mapping, using a previously acquired MRI or CT scan, may sometimes be required as determined by your physician. If one of the many arrhythmias that are curable with ablation is identified, a catheter is guided to the site of the abnormal heart

rhythm. Thermal energy (extreme heat) or cryoenergy (extreme cold) is then passed through the catheter to this site to destroy the problem-causing tissue. This procedure typically lasts three to five hours.



Catheter Ablation of an Accessory Pathway



“Pursuing research at the cellular and molecular levels has convinced me that significant progress in our understanding and management of cardiac arrhythmias is possible.”

Gordon Tomaselli, M.D.

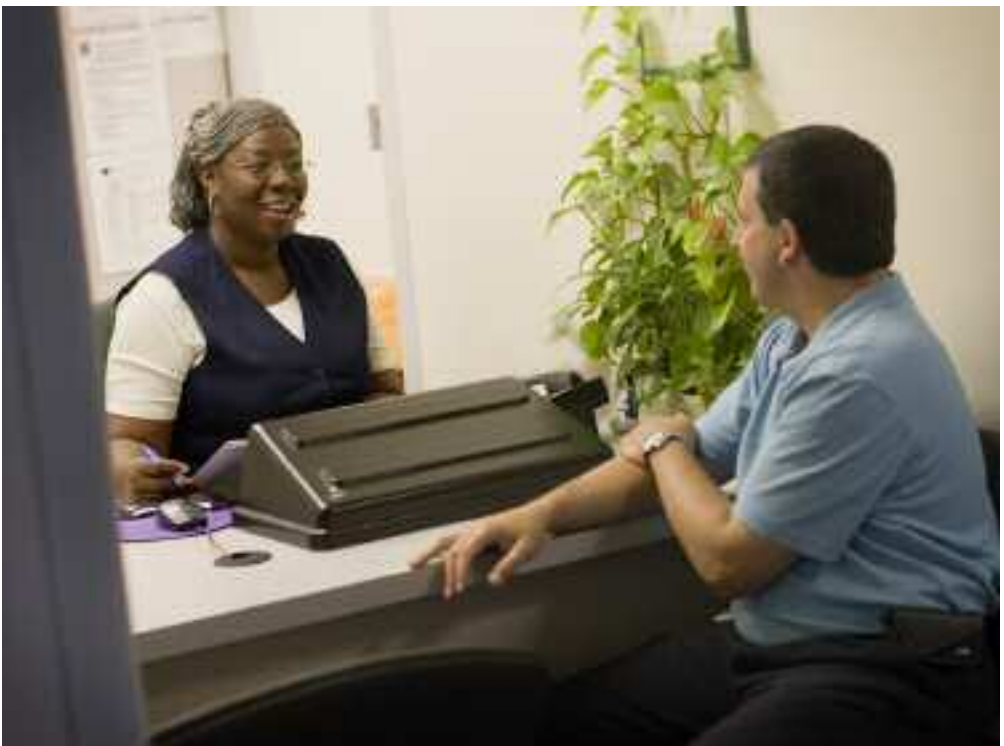


“We will often take on cases that other electrophysiologists have rejected as too high risk or too complicated.”

Charles Henrikson, M.D., M.P.H.

You should avoid eating or drinking anything after midnight the night before the study except for your normal medications, unless otherwise directed by your doctor or nurse. Once you are at the EP lab, a nurse will place an IV in your hand or arm so that you can receive fluids and medications.

During the procedure, you will lie on a padded X-ray table. You will have a blood pressure cuff on your arm, a clip on your finger to monitor oxygen, and wires on your legs, arms and chest to check your heart rate. The nurse will give you pain medication and a sedative. The amount of sedation is adjusted for patient comfort. The area of your chest and groin where the doctor will be working will be cleaned and shaved, and you will be covered with sterile drapes from your shoulders to your feet. The doctor will give you a small needle to numb the area where the catheters will be inserted.



As a matter of policy, a receptionist will be kept informed of your progress so that family and friends in the waiting room can be updated on a regular basis.



When patients are done with their procedure, they need to lie quietly for several hours, but can eat and drink and enjoy a good television show. Nurses check on patients routinely to make sure they have everything they need.

Once the problem area of the heart is “knocked out,” the catheters will be removed and pressure will be applied to the area to stop any bleeding. After the procedure, you need to rest in bed for three to six hours without bending your leg(s). Your nurse will take your blood pressure regularly, check the area where the wires were and monitor your heart rhythm. You may experience soreness as the anesthetic wears off, so do not hesitate to ask for pain medication. Tell your doctor or nurse immediately if you notice bleeding, swelling or undue discomfort in the area where the catheters were inserted. Most catheter ablation procedures are performed on an outpatient basis. However, depending on the specific procedure and the time the procedure is performed, you may spend one or two nights in the hospital. Avoid heavy lifting or excessive exercise for three days after the procedure.

Catheter ablation is a safe therapy; however, any invasive procedure carries unique risks. These risks will be reviewed with you before the procedure.



“I’ve trained at several prominent institutions in the country but chose to stay at Hopkins for its camaraderie and unrivaled patient care.”

David Spragg, M.D.

Antiarrhythmic Medications

Antiarrhythmic medications are commonly used to treat heart arrhythmias. These medications alter the electrical properties of the heart either directly by affecting the electrical currents in the heart or indirectly by blocking the effects of adrenaline or improving blood flow to the heart. There are many types of antiarrhythmic medications. The most common are beta blockers, calcium channel blockers and digoxin. Other frequently prescribed antiarrhythmic drugs (in alphabetical order) include amiodarone, disopyramide, dofetilide, flecainide, propafenone and sotalol. Although antiarrhythmic medications are effective in treating many types of heart arrhythmias, they can also cause a variety of minor and major side effects.

After completing your evaluation, your doctor will decide if you would benefit from treatment with an antiarrhythmic medication. The risks and benefits of this medication will be discussed. Your doctor will also discuss with you whether antiarrhythmic therapy is your only treatment option or whether other treatment options such as catheter ablation or device therapy are feasible. It is important to be sure that your new antiarrhythmic medication does not interact with any of the medications you may currently be receiving. Please feel free to ask any questions which you might have.

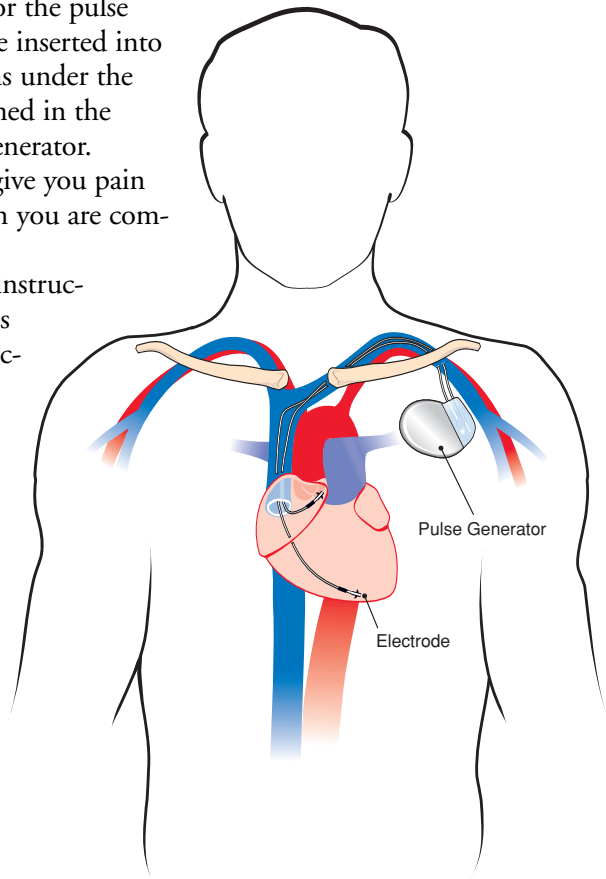
Cardiac Pacemakers

A pacemaker is used primarily to correct some types of bradycardia, or slow heart rhythms. The pacemaker is implanted in the body, usually below the collarbone, where it monitors the heart rhythm and triggers an electrical impulse if the heart is beating too slowly. The pacemaker is composed of a small, titanium-encased pulse generator that contains a lithium battery and electrical circuitry attached to one, two or three leads (wires) that are inserted into the heart. Pacemaker pulse generators are checked two to three times a year and must be replaced every five to 10 years.

Pacemaker implantation takes about one to three hours in the electrophysiology lab. A 1- to 2-inch incision is made beneath the collarbone and a small “pocket” is created for the pulse generator under the skin. The leads are inserted into the heart through a large vein that runs under the collarbone. Once the leads are positioned in the heart, they are attached to the pulse generator. During the procedure, the nurse will give you pain medication and a sedative to be certain you are comfortable.

You will receive detailed follow-up instructions before you leave the hospital. It is important that you follow these instructions and call your doctor or nurse with any questions.

You will also need to carry a pacemaker ID card with you. It contains useful, manufacturer-specific details regarding your device for medical personnel.



Permanent Pacemaker

Implantable Cardioverter-Defibrillators (ICDs)

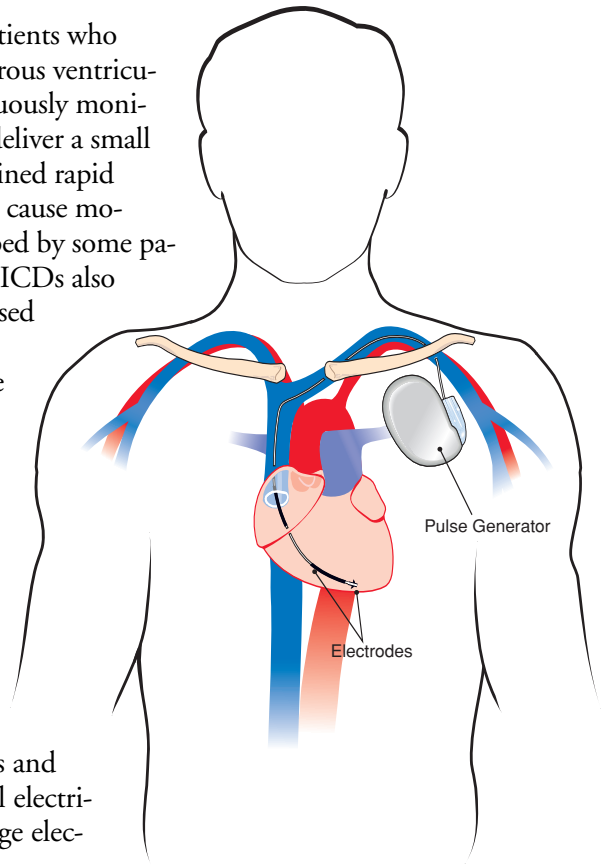
ICDs are commonly used to treat patients who have experienced a potentially dangerous ventricular arrhythmia. These devices continuously monitor the heartbeat and automatically deliver a small electrical shock to the heart if a sustained rapid heart rhythm occurs. The shock may cause momentary discomfort, which is described by some patients as being “kicked in the chest.” ICDs also function as pacemakers and can be used to treat both slow and fast heart rhythm abnormalities. ICDs must be checked every three to four months and replaced every four to eight years.

The ICD is composed of a titanium-encased pulse generator (the size of a small box of raisins) that contains a lithium battery and electrical circuitry and capacitors attached to one, two or three leads (wires) that are inserted into the heart. It monitors heartbeats and when appropriate it generates a small electrical impulse to pace the heart or a large electrical impulse to shock the heart.

The technique used to insert an ICD is almost identical to implanting a pacemaker. It is performed in the electrophysiology lab and takes two to three hours. A 2-inch incision is made beneath the collarbone and a small “pocket” under the skin is created for the pulse generator. The leads are inserted into the heart through a large vein that runs under the collarbone. Once the leads are positioned in the heart, they are attached to the pulse generator. Then your abnormal heart rhythm is deliberately triggered to determine how much energy is required to shock the heart back into normal rhythm. This allows the ICD to be optimally adjusted. During the procedure, the nurse will give you pain medication and a sedative to be certain you are comfortable. When the ICD is tested, you are fully asleep.

You will receive detailed follow-up instructions before you leave the hospital. It is important that you follow these instructions and call your doctor or nurse with any questions. You will also need to carry an ID card with you, which can inform medical personnel of important, manufacturer-specific details regarding your device. You may also need to show your ID card to security personnel because the device may set off security devices in airports and other high-security areas.

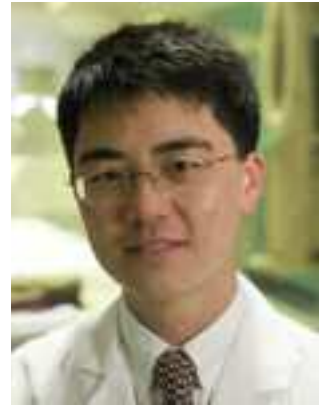
The risks associated with placement of an ICD are low and will be discussed in detail with you before the procedure.



Implantable Cardioverter-Defibrillator

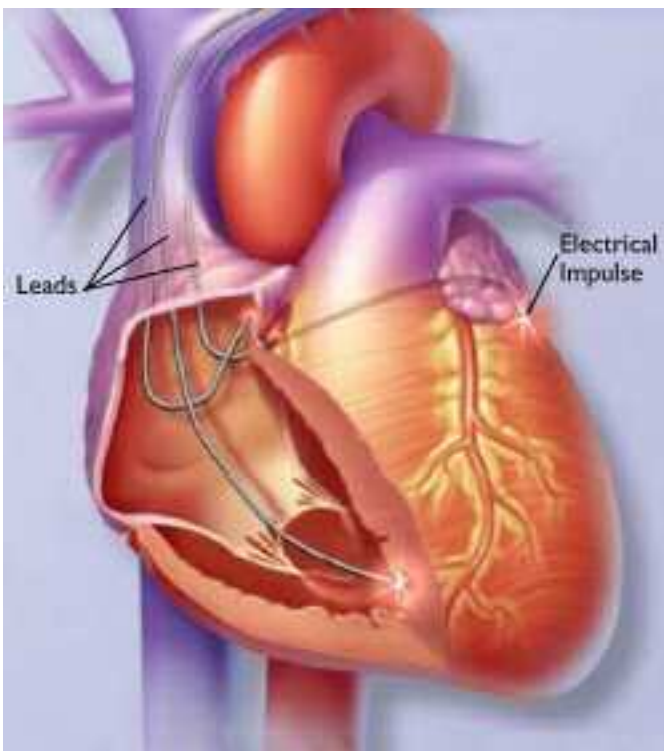
Cardiac Resynchronization Therapy

In recent years, new technology has been developed for patients with both advanced heart failure and mechanical “dyssynchrony.” Dyssynchrony occurs when the right side of the heart beats out of step with the left side of the heart as identified on electrocardiogram (or echocardiogram.) These devices consist of a pacemaker or an ICD connected to three wires that are placed in the right atrium, right ventricle and coronary sinus—a large vein behind the left ventricle (see diagram). With pacing from three distinct locations “in synchrony,” the weakened heart can often beat more effectively, resulting in improved quality of life and length of life. The surgical techniques and potential complications are similar to conventional pacemaker or ICD insertions albeit higher due to the added complexity of placing the special third wire on the left side of the heart. Johns Hopkins has played an important role in the development of resynchronization therapy for the treatment of heart failure patients.



“Some physicians dread tough cases, but I’ve always relished a clinical challenge—I wouldn’t be here otherwise.”

Alan Cheng, M.D.



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Cardiac Resynchronization Pacemaker-Defibrillator



“As an interventionalist, my considerable experience in cardiac pacing supports the efforts of the electrophysiology group.”

Jeffrey Brinker, M.D.

Pacemaker and ICD Lead Extraction

Although pacemakers and ICD pulse generators need to be replaced every four to 10 years, the leads (wires) that connect the device to the heart usually remain in place forever. Under rare circumstances, these leads will have to be removed. The most common reason for this is the development of an infection on the leads. This type of infection is nearly impossible to treat with antibiotics, so it may be necessary to remove (extract) the leads. Leads that have been in place less than six months usually can be removed without much difficulty or risk. However, leads that have been in place for many years may require a special laser-cutting sheath to free them from the wall of the heart. Although similar to having a pacemaker or ICD implanted, lead extraction is more difficult and is associated with a greater chance of complications. In the unlikely event that you require this procedure, you will be provided with more details about the procedure that are unique to your case.

Cardioversion

Cardioversion is a common procedure to shock the heart back into rhythm. Most patients who undergo a cardioversion procedure have either atrial fibrillation or atrial flutter. The procedure is done in the electrophysiology lab under the direction of a team of highly trained doctors, nurses and technologists.

You should avoid eating or drinking anything after midnight the night before the study except for your normal medications, unless otherwise directed by your doctor or nurse. Most patients who undergo this procedure are placed on coumadin, a blood thinner, for at least four weeks before and following cardioversion.

In some situations, your doctor may recommend that you have a special type of echocardiogram, called a transesophageal echocardiogram, immediately before your cardioversion to be certain there are no blood clots in your heart before shocking.

Once at the EP lab, a nurse will place an IV in your hand or arm so that you can receive fluids and medications. During the procedure, you will lie on a padded table. You will have a blood pressure cuff on your arm, a clip on your finger to make sure you are getting enough oxygen, and ECG electrodes and two large patches on the chest. The electrodes and patches monitor the heart rhythm and are also used to deliver a safe, controlled shock to the chest to restore normal rhythm.

Once you are fully asleep, a shock is delivered to your chest to restore normal rhythm. During recovery, your nurse will record your blood pressure and monitor your heart rhythm regularly. You can eat and drink when you are awake. If you are an outpatient, you may leave after a short recovery period, but you will need someone to drive you home. You can resume full activities one day following the procedure.



“One of my interests is the use of advanced high resolution magnetic resonance imaging to identify young individuals who are at risk of sudden cardiac arrest due to rare inherited forms of heart disease.”

Harikrishna Tandri, M.D.



“Implantable arrhythmia devices shouldn’t restrict lives but improve them, and their follow-up should be timely and convenient.”

Sunil Sinha, M.D.

Arrhythmia Device Clinics

Inserting the hardware of pacemakers, defibrillators, biventricular pacemaker-defibrillators and implantable monitors is only part of complete care. The other part is monitoring and programming the device software over the long term. This aspect is crucial for optimizing the performance of many of today’s remarkably sophisticated pacemakers and ICDs. Battery status and the intra-cardiac leads are routinely checked to remedy any potential problems that might be of future clinical concern. As well, clinical episodes with recorded arrhythmias can be found quickly and accurately reviewed such as the case with ICD shocks. In addition to “interrogating” patients’ devices in the hospital or clinic, Johns Hopkins is rapidly adopting technology that facilitates reliable, useful and secure Web-based “remote analysis” from a patient’s home or workplace thus reducing frequent in-person check-ups, even from out of state.

Pacemakers routinely require computer programmer checks every three to six months. Defibrillators are normally checked every three to four months. Implantable monitors are often checked every three months or as symptoms dictate. If concerns arise over a device’s performance or a new clinical development occurs (such as syncope or ICD shocks), a rapid appointment is expedited.

Johns Hopkins is dedicated to maintaining comprehensive, timely and effective device follow-up. Fully dedicated arrhythmia device clinics are located at both The Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center. Several Johns Hopkins community cardiology clinics also provide periodic arrhythmia device checks.

Pediatrics

The pediatric electrophysiology program at The Johns Hopkins Hospital specializes in the evaluation and treatment of heart rhythm disorders and syncope (fainting) in children. Although the range of diagnostic tests and treatment options available to children with arrhythmias is similar to those for adults, we recognize that children are not merely “small adults.”

The pediatric electrophysiology program provides the same high-quality care as the adult program and has physicians and nurses who are specially trained in the care of children with rhythm disorders.

Successful treatment of irregular heart rhythms in children requires that doctors understand the types of arrhythmias seen in children as well as developmental issues that may affect them. Pediatric electrophysiologists also have an in-depth knowledge of the types of heart rhythm problems often associated with congenital heart disease. The special needs of children and their families are addressed throughout the evaluation and treatment process, with extra attention given to age-appropriate explanations and ways to make children comfortable during procedures.



“Children are not just small adults. They have special needs, both physical and emotional, and careful planning is crucial to ensure that they get the great care they deserve.”

Jane Crosson, M.D.



Children get a special walk-through before their procedure to make the high-tech electrophysiology lab less intimidating. Nurses and technologists are adept at helping young patients relax, and Dr. Jane Crosson, a pediatric electrophysiologist at Hopkins, is always available to check in before the procedure.

Center for Inherited Heart Disease

Clinicians are increasingly coming to recognize uncommon forms of heart disease as common causes of arrhythmias in often young and athletic persons. Some of these diseases have been characterized on a genetic basis, including hypertrophic cardiomyopathy (HCM) and arrhythmogenic right ventricular dysplasia (ARVD), which may be inherited in either a familial manner or as a spontaneous occurrence. Johns Hopkins is playing a leading role in performing research, diagnosis, counseling and treatment of these complex genetic conditions. Johns Hopkins has established the Center for Inherited Heart Disease to help facilitate the genetic and clinical evaluation of patients with inherited types of heart disease. In addition to this program, Johns Hopkins has programs focused on ARVD and HCM.

Hypertrophic Cardiomyopathy Program

Hypertrophic cardiomyopathy (often called HCM) is a condition associated with the abnormal thickening of part or all of the heart muscle. It often affects young individuals and may not cause many symptoms but could result in sudden death. People with HCM have unique needs and require specialized care over a wide range of medical expertise targeted toward relieving symptoms, preventing complications and exploring surgical options.

Special facilities available through the Johns Hopkins Hypertrophic Cardiomyopathy Clinic include access to specialists in HCM management, echocardiography, magnetic resonance imaging and spectroscopy, genotyping and genetic counseling, noninvasive risk assessment for sudden death, defibrillator implantation, percutaneous alcohol septal ablation, surgical myectomy and cardiac transplantation. Patients and relatives are also offered voluntary enrollment in a variety of ongoing research projects.

Arrhythmogenic Right Ventricular Dysplasia Program

Arrhythmogenic right ventricular dysplasia (ARVD) is a rare familial disorder that causes cardiomyopathy, a weakening of the heart muscle. It often causes abnormal heartbeats in the lower right heart chamber where the muscle becomes abnormally fatty and fibrous. In effect, ARVD results from an abnormality in the “glue” that connects heart muscle cells together. This results in separation of the heart muscle cells and replacement by fatty and fibrotic tissue. ARVD is a genetic condition that may be inherited. It is estimated that ARVD occurs in one of every 5,000 people. ARVD most commonly presents in young, apparently healthy and even athletic people, with at least three-fourths of cases becoming known before 40 years of age. The most common symptoms are palpitations and syncope and less commonly, sudden cardiac death. These symptoms are triggered by ventricular arrhythmias that are caused by scarring of the heart muscle.

Diagnosis of ARVD is often very difficult because there is no single test that can either establish or exclude this condition. The specific cause of ARVD remains poorly defined, but increasing evidence points to a genetic cause. In fact, a recognized genetic mutation can be identified in approximately 50 percent of patients with ARVD. There is no known cure for ARVD. At the present time, the ventricular arrhythmias are treated with the primary goal of preventing sudden cardiac death. Many patients with ARVD are treated with an implantable defibrillator.

A large number of questions about ARVD remain unanswered. For example, it is unclear how rapidly the cardiomyopathy that affects the right ventricle progresses and whether medications and/or changes in activity level can alter the rate of progression. There also are a large number of questions about which tests, short of genetic testing, are best at either diagnosing or excluding ARVD.

The Johns Hopkins Arrhythmogenic Right Ventricular Dysplasia Program was formed to provide specialized evaluation and care of patients with ARVD. Genetic counselors are available to work with patients and their families to establish the diagnosis and determine if other family members are affected. The program also focuses on research that will help address the many unanswered questions about ARVD. Genetic testing for ARVD is offered at Johns Hopkins through the ARVD program (www.ARVD.com).





“State-of-the-art 3-D computerized mapping is extremely helpful for the most challenging atrial arrhythmia ablation procedures.”

Saman Nazarian, M.D.

Atrial Fibrillation and Atrial Tachyarrhythmia Center

The Johns Hopkins Hospital has established a center that is focused on the evaluation and treatment of patients with atrial fibrillation (AF) and also patients with complex atrial tachyarrhythmia such as atrial flutter or atrial tachycardia. Much of our current emphasis is on catheter ablation of atrial fibrillation.

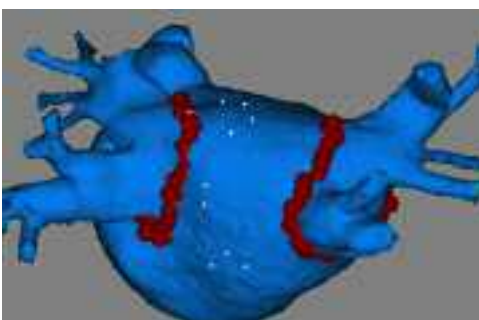
Catheter ablation of atrial fibrillation is a procedure developed over the past decade that allows treatment of AF using catheters inserted from the leg. Catheter ablation procedures are performed in a catheterization laboratory. The most commonly used approach for catheter ablation of AF involves the creation of continuous circumferential lesions around the two right and the two left pulmonary veins in the left atrium. The end point for this type of ablation procedure is the electrical isolation of the pulmonary veins. This is the technique used most widely at Johns Hopkins. For our procedure we use a special system that allows information from your CT or MRI scan to be imported into the procedure to allow for precise 3-D mapping.

The success rate depends on various clinical factors. In general, younger patients with normal-size left atrium, normal heart function and intermittent atrial fibrillation (i.e., who are not in atrial fibrillation all the time) can expect the highest success rate. Lower success rates are expected in older patients, those with other types of heart disease, and those who are in chronic AF.

Some patients need a second ablation procedure six or more months after their first one. Our experience, and that of others throughout the world, has showed that “redo” procedures can significantly improve the overall success rates of AF ablation.

Another option available at Johns Hopkins is surgical ablation of atrial fibrillation. This procedure can be performed through small incisions in your chest wall. Surgical ablation of AF requires three or four days in the hospital.

When you meet with one of our electrophysiologists, they provide more detailed information about success and complication rates of both catheter and surgical ablation of AF. They also answer any questions you may have about atrial fibrillation, atrial flutter, atrial tachycardia and their management.



This is a reconstructed CT scan 3-D image of the left atrium and attached pulmonary veins. The ablation lesions are shown surrounding the two left and the two right pulmonary veins.

Minimally Invasive Radiofrequency Ablation for Atrial Fibrillation

The Johns Hopkins Minimally Invasive Cardiac Surgical Program, under the direction of Dr. David Yuh, offers minimally invasive surgical radiofrequency ablation for patients who suffer from atrial fibrillation.

The “mini-Maze” ablation procedures are derived from the original Cox-Maze operations developed in the 1980s and early 1990s. Performed through a standard sternotomy and using the heart-lung bypass machine, these operations were designed to surgically interrupt the “reentrant” electrical pathways found in atrial wall tissue that cause atrial fibrillation and atrial flutter. The most refined of these operations achieved success rates greater than 95 percent but are not widely performed due to their invasiveness and complexity. New surgical technology now permits cardiac surgeons to perform procedures based on the Cox-Maze principles through much smaller incisions made between the ribs on each side of the chest without using the heart-lung machine. Using a fiberoptic camera to visualize the heart through these small incisions, the surgeon makes a series of lesions on the outside of the heart using various types of energy such as radiofrequency, freezing or ultrasonic energy. Success rates of these newer mini-Maze procedures in excess of 80 percent have been observed. As with catheter-based interventions, patients with recent-onset paroxysmal (episodic) atrial fibrillation enjoy greater success rates than patients with longstanding continuous atrial fibrillation.

Often, the left atrial appendage is also removed during these procedures, because it is widely believed that this is where blood clots tend to form in patients suffering from atrial fibrillation. Removing this source of clots is intended to significantly reduce the risk of stroke and, in many cases, reduce or eliminate the need for long-term coumadin anticoagulant therapy.

Most mini-Maze operations take three to four hours. The minimally invasive approaches used usually result in a relatively short postoperative hospital stay averaging three to four days. Since it often takes several months for the procedure to take full effect, patients are generally placed on a short course of antiarrhythmic drugs (e.g., amiodarone, beta blocker) and coumadin. Most patients are able to resume normal activities two to four weeks after surgery.

For questions or to arrange a consultation with Dr. Yuh, please contact the Cardiac Surgery office at 410-955-9780 Monday through Friday, 8:30 a.m. to 5:00 p.m.



“In properly selected patients, I have found the mini-Maze procedure to be an extraordinarily effective treatment for atrial fibrillation.”

David Yuh, M.D.

If you have additional questions about atrial fibrillation or about catheter ablation of AF, you can:

- Schedule an appointment to see an electrophysiologist at Johns Hopkins 410-955-3116
- Call the atrial fibrillation center at 410-614-4552
- E-mail an atrial fibrillation nurse specialist: atrialfibline@jhmi.edu

Arrhythmia Service at Johns Hopkins Bayview Medical Center



“We are proud to offer a comprehensive cardiac arrhythmia program at Bayview in keeping with Johns Hopkins’ leadership in this fast-evolving field.”

Joseph Marine, M.D.

The Arrhythmia Service provides a full complement of electrophysiology testing and treatment at Johns Hopkins Bayview Medical Center. If you live near Bayview, you may prefer to have your procedure performed at this location. Please discuss this with your doctor.



Johns Hopkins Bayview Medical Center

4940 Eastern Avenue
Baltimore, MD 21224-2780
Office: 410-550-1973

Driving directions from the north and east:

Take I-95 south to Eastern Avenue (Exit 59) and turn right. Follow Eastern Avenue going west for approximately one mile. Entrance to campus is on the right, Bayview Boulevard.

Driving from the south:

Take I-95 north through the Fort McHenry Tunnel to Eastern Avenue (Exit 59). Turn left onto Eastern Avenue and proceed west approximately one mile. Entrance to campus is on the right, Bayview Boulevard.



Arrhythmia Service at Howard County General Hospital

The Johns Hopkins Arrhythmia Service now provides a full range of electrophysiologic services at Howard County General Hospital including patient consultation, electrophysiologic studies, catheter ablation, pacemaker implantation, and device implantation. If you live in or near Howard County, you may prefer to have your procedure performed at this hospital in Columbia. Please discuss this with your doctor.

Howard County General Hospital

5755 Cedar Lane
Columbia, MD 21044
www.hcgh.org

Johns Hopkins Community Arrhythmia Clinics

Several physicians from the Johns Hopkins Arrhythmia Service also attend Arrhythmia Clinics at certain Johns Hopkins Cardiology locations outside of Baltimore. If you would prefer to have your arrhythmia consultation at one of the sites listed below, please discuss this with your doctor.

Columbia

Johns Hopkins Cardiology - Columbia
5450 Knoll North Drive, Suite 270
Columbia MD 21045
Phone: 410-964-5303
Fax: 410-964-5329

Odenton

Johns Hopkins Cardiology - Odenton
1132 Annapolis Road, Suite 104
Odenton MD 21113
Phone: 410-874-1520
Fax: 410-874-1525

Lutherville

Johns Hopkins Cardiology - Green Spring
10755 Falls Road, Suites 320 and 340
Lutherville MD 21093
Phone: 410-583-2740
Fax: 410-583-2741

White Marsh

Johns Hopkins Cardiology - White Marsh
4924 Campbell Blvd., Suite 110
Baltimore, MD 21236
Phone: 443-442-2000
Fax: 443-442-2018



Johns Hopkins at Green Spring Station

How We Help With Appointments and Other Arrangements

Appointments

There are several ways to make appointments for arrhythmia services. The most direct way is for your physician to call the Hopkins Access Line (HAL) at 1-800-765-5447 and ask for any one of the Johns Hopkins electrophysiology doctors. Your doctor can also call the cardiovascular access line (CAL) at 410-502-0550 to expedite an outpatient clinician appointment or consultation. Your doctor also may call one of the EP doctors directly. If you prefer to schedule the appointment yourself, you may call the outpatient clinic scheduling coordinator at 410-955-3116 or call one of the physician phone numbers listed on the inside back cover of this brochure.

Hopkins USA: For Our Out-of-Town Guests

Johns Hopkins USA provides one point of contact for our out-of-town patients. Our staff can help you identify the appropriate physician or specialist, coordinate multiple medical appointments, arrange second opinions, and obtain general information on Johns Hopkins' numerous services. In addition, Johns Hopkins USA staff can provide information regarding transportation, lodging and other travel needs. Call 410-735-HUSA (4872) to talk with Hopkins USA. For family accommodations on the patient floor, see the Marburg Pavilion.

Johns Hopkins Medicine International

The professional staff of Johns Hopkins Medicine International coordinates all aspects of international patients' medical care, paying special attention to personal, cultural, and travel-related needs. The staff will arrange consultations, second opinions or treatments and coordinate appointments in a time-efficient manner. The staff also provides medical records reviews before the patient travels to the United States, language interpreters, cost estimates, and assistance with travel arrangements. For more information, call 410-955-8032. From outside the country, call +01-410-614-4334, or visit the website, <http://www.jhintl.net>.



Gourmet meals delivered to the patient's bedside or to the family are one of the advantages of the Marburg Pavilion. Medical equipment is concealed behind the cabinets when not in use.

Services for You and Your Family

Accommodations Office

The Johns Hopkins Hospital has arranged special rates (and shuttle service in some instances) at several local hotels for patients and their families. A full-service travel agency is available to help patients and families with air, hotel or ground accommodations. It is open Monday through Friday 8:30 a.m. to 5 p.m. Please call 1-800-225-2201 or 410-614-1911 for assistance.

Billing

The surgical admitting office will review your insurance information and work with you to determine your insurance coverage and what portion of your stay may be your financial responsibility.

Communication

Please let us know if you have specific needs concerning language, hearing or vision. Ask your care provider to arrange for an interpreter if you are deaf or hearing impaired, or if English is not your primary language.

Foreign Language Interpreters

To arrange for a foreign language interpreter, contact or speak to a staff member. Interpreter service is available 24 hours a day seven days a week.

For the Hearing Impaired

To schedule a sign language interpreter, call the Patient Relations Department Monday through Friday between 8:30 a.m. and 5 p.m., at 410-955-2273. During other times, your nurse can schedule an interpreter for you.

TTY service is available in the following locations:

- Patient Relations Office, 410-955-6446
- Main Admitting Office, 410-955-2102
- Outpatient Center, 410-955-3735

Assistive devices are available upon request by calling 410-955-2273. Televisions have closed captioning. All fire and smoke alarms include a strobe light.

Food Services

For Patients

Inpatient meals: Breakfast generally is served between 7:30 and 9:30 a.m.; lunch between 11:30 a.m. and 1:30 p.m.; and dinner between 4:30 and 6:30 p.m. Special diets will be provided as requested by your physician. Please inform your nurse if you have any dietary restrictions for personal or religious reasons. Gourmet meal service, a select group of entrees served on china with linen and flowers, is available at an additional cost. Please call 410-955-6858 at least 24 hours in advance to order your gourmet meal.

For Visitors

Cobblestone Café (Main Hospital Cafeteria) Offering breakfast and lunch, hot entrees, soups, sweets and self-serve salad bar. *Open Monday through Friday 6 a.m. to 4 p.m.*

Vending machines available 24 hours a day.

Einstein Bagels Offering a variety of fresh baked goods, made-to-order sandwiches, bagels, soups, desserts and premium coffees. *Open Monday through Friday 5 a.m. to*

5 p.m.; Saturday and Sunday 6 a.m. to 2 p.m.

Flamers Offering a variety of flavors of charbroiled chicken and burgers plus a selection of salads. *Open daily 24 hours.*

Freshens Offering low-fat frozen yogurt, tropical fruit juice, orange and low-calorie smoothies. *Open Monday through Friday 11 a.m. to 9 p.m.; Saturday and Sunday 11 a.m. to 6 p.m.*

Noble Romans Offering a variety of pizza choices and baked pasta. *Open daily 24 hours.*

Subway A popular franchise featuring submarine sandwiches on freshly baked breads, sandwich and/or bread specialty products, children's packs and freshly baked cookies. *Open daily 7:30 a.m. to midnight.*

Tower Terrace Restaurant Located off the main hospital lobby. Offering casual dining and full service in an elegant atmosphere. Menu items include deluxe salads and Maryland crab soup, daily entrée specials and gourmet desserts. The restaurant's Southern Tsunami offers a variety of fresh sushi. Carry-out available. *Open Monday through Friday 11 a.m. to 2:45 p.m.*

Grille 601 Located in the Outpatient Center, 2nd floor. *Open Monday through Friday 6 a.m. to 2:30 p.m.*

Blimpies *Open Monday through Friday 10 a.m. to 5 p.m.*

Flamers *Open Monday through Friday 10 a.m. to 5 p.m.*

Noble Romans *Open Monday through Friday 7 a.m. to 5 p.m.*

Women's Board Coffee Bar Located near the Wolfe Street entrance and in the Outpatient Center. Offering fresh-brewed coffees and bottled drinks. *Open Monday through Friday 7 a.m. to 3 p.m.*

Guest Services

For assistance with directions, hotels and local attractions, call 410-614-5100 or visit the reception desk in the Nelson lobby, near the Wolfe Street entrance. In the Outpatient Center, go to the first floor lobby, or call 410-955-9500. Services are available Monday through Friday 9 a.m. to 5 p.m.

Marburg Pavilion

Located in the historic Marburg Building, the Marburg Pavilion offers deluxe accommodations for adult patients. A limited number of private rooms and two-room suites are available for an additional charge and feature fine wood furniture, private baths, entertainment centers and an array of services such as expanded dining menus and overnight sleeping accommodations for family members. For more information, call 410-614-4777.

Libraries

The Patient Library, located at Carnegie 173, is open Monday through Friday 8:30 a.m. to 4 p.m. Books, magazines, games, puzzles and playing cards are available on loan free of charge to patients and families.

The Family Resource Center and Children's Library is located at Children's Center 301 and is open Monday, Wednesday and Friday 11:30 a.m. to 6:30 p.m. and Saturday 1 p.m. to 5 p.m. It offers medical information for patients and families, children's books, magazines and videotapes. Call 410-955-6442.

Mass Transit Administration

A full-service MTA metro subway station is located between the Outpatient Center and the hospital on the concourse level. Bus service also is available. For information on the metro subway line from Owings Mills, Maryland, or bus routes to the hospital call 410-539-5000 or go to mtamaryland.com.

Parking for Patients and Visitors

Use the McElderry Street Garage, which is open 24 hours a day seven days a week and is conveniently located adjacent to the Outpatient Center. Be sure to carry your parking ticket with you because you must pay for parking before you return to your vehicle.

Parking Coupons

Patients and visitors who need parking over an extended period of time should consider buying parking coupons, which are sold in books of five or 10 at a discounted rate. Parking coupons do not expire, but we do not offer a refund for unused coupons. Parking coupons are for use in the garages only. You may buy coupon books at:

- Cashier's Office, Nelson 161, *Monday through Friday 7:30 a.m. to 5 p.m.*
- Cashier's Office, Harvey 108, *Monday through Friday 8 a.m. to 4 p.m.*
- McElderry Garage, *Daily 24 hours.*
- Orleans Garage, *Daily 24 hours.*

Shuttle Service

Patients and visitors who park in the McElderry Street Garage and need to go to the main hospital may use the patient courtesy shuttle. The shuttle runs from the Outpatient Center to the main hospital entrance on Wolfe Street. The shuttle operates every 20 minutes (depending on traffic and weather conditions) Monday through Friday 5 a.m. to 10 p.m.; weekends and holidays 11 a.m. to 9 p.m.

Valet Parking

Patients and visitors may also take advantage of valet parking. You may buy valet coupons in the hospital parking/ID office located in Nelson/Harvey 108. The coupons may be used only at the valet locations:

- Hospital main entrance on Wolfe Street, Monday through Friday 6 a.m. to 9 p.m. (stops taking cars at 7 p.m.)
- Outpatient Center main entrance, Monday through Friday 8 a.m. to 4 p.m. (stops taking cars at 3 p.m.)

After valet closing time, you must retrieve your vehicle from the garage or lot yourself. Security will assist you with locating your vehicle.

Pastoral Care

The Pastoral Care staff provides sensitive spiritual support, sacramental ministries, advance directive consultation and other services for patients and their family members. Your observance of the rituals and sacraments of your faith will be respected, and your religious needs will be accommodated as fully as possible.

Religious services are available in the hospital, including Catholic mass, Jewish minyan, Protestant worship and Muslim prayer. For specific times and locations, please call 410-955-5842.

Two interfaith chapels are open 24 hours a day for private prayer and meditation. One is located on the first floor of the hospital in the corner of the Children's Center lobby. The other is in the Harry and Jeanette Weinberg Building off the main lobby.

A chaplain is in the hospital at all times. To request a visit from a chaplain or a clergy person of a particular faith on a weekday, please call 410-955-5842. Your nurse will assist you at night and on the weekend.

Patient Information

Family and friends may dial 410-502-4000 for your room location and a brief description of your condition. If you wish this information to be withheld, please inform your nurse.

Patient Representatives

The Patient Relations Department can help you with any questions, concerns or needs that you may have regarding your stay in the hospital.

Patient representatives can:

- investigate concerns and complaints and facilitate their resolution
- address questions and special needs
- arrange for sign language interpreters and assistive devices for the hearing impaired
- serve as liaisons between your family and the health care staff in the operating room and intensive care waiting rooms

To speak with a patient representative, call 410-955-2273 Monday through Friday between 8:30 a.m. and 5 p.m.

Pharmacy

Pharmacies are available at three convenient locations:

Johns Hopkins
Outpatient Center, first floor
Monday through Friday
8 a.m. to 6 p.m.
Call 410-955-3733 or
fax 410-614-3733

Weinberg Building
first floor
Monday through Friday
9 a.m. to 7 p.m.
Saturday and Sunday
10 a.m. to 6 p.m.
Call 410-955-5747 or
fax 410-502-1511

Monument Street
Outpatient Pharmacy
1810 E. Monument St.
Monday through Friday
8 a.m. to 7 p.m.
Saturday 9 a.m. to 4 p.m.
Call 410-502-5735 or
fax 410-502-5734

Registration Staff

Our goal is to help you get settled and feel comfortable as quickly as possible. On the day of your admission to the hospital, you will meet with a patient service coordinator.

Please have the following items with you:

- your orange hospital plate (if you were issued one at a prior visit)
- your health insurance card
- personal identification (such as a driver's license or picture I.D.)
- HMO/PPO referral forms (if required)
- medical records, X-ray films or prior test results (if your physician has requested them)
- a copy of your advance directives

You will be given an identification bracelet with your name and Hopkins history number. Please confirm that the information is correct. Do not take the bracelet off until you have been discharged from the hospital. If the bracelet comes off for any reason, notify your nurse and ask for a new one.

Please send home any valuables that you have with you. If you must keep your valuables at the hospital, we urge you to place them in a hospital safe.

Telephone and Television Services

Our telephone and television services are available to you 24 hours a day. To request service, dial 2-7250 from your bedside phone and follow the instructions. The daily charge for these services can be billed to your home telephone bill or to a personal credit card. If you prefer, you may purchase a prepaid TV rental card from the kiosk in the main admitting office.

To make calls from your bedside phone:

- When calling a Hopkins number from your room or any on-campus phone, use only the last five numbers. For example, if you want to reach 410-955-5000, dial 5-5000.
- When calling a local number in the Baltimore area, dial 9 and the full telephone number, including the area code.
- For long-distance calls, you must use a calling card or personal credit card. Prepaid calling cards are available in the Gift Shop in the Nelson Lobby. The hospital does not accept collect calls.

Coming to The Johns Hopkins Hospital and the Outpatient Center

From Washington D.C., Virginia and the I-95 access at Baltimore-Washington International Airport

Take I-95 north to Exit 53 (I-395) into Baltimore (do not take the Martin Luther King Jr. Boulevard fork off the exit). Turn right at Pratt Street (by Baltimore Convention Center). Stay on Pratt Street for 1.4 miles to Broadway, then turn left on North Caroline Street. Follow the signs to patient parking. The entrance to the garage is on McElderry Street on the right. After you park your car, follow the signs to the Outpatient Center.

From Philadelphia, New York and Northeastern Baltimore Suburbs

Take I-95 south toward Baltimore to Exit 57 (Boston Street and O'Donnell Street). Proceed on Boston Street approximately two miles and turn left onto Fleet Street. Follow Fleet Street to Broadway, then turn right on Broadway. Turn left from Broadway onto Orleans Street. Go one block to North Caroline Street and turn right. Follow the signs to patient parking. The entrance to the garage is on McElderry Street on the right. After you park your car, follow the signs to the Outpatient Center.

From York, Central Pennsylvania and Northern Baltimore Suburbs

Take I-83 south (Harrisburg Expressway) into Baltimore (note: I-83 becomes the Jones Falls Expressway as you approach Baltimore). Exit at Fayette Street and turn left. Follow Fayette toward the medical campus. Follow Fayette Street to left on North Caroline Street. Follow the signs to patient parking. The entrance to the garage is on McElderry Street to the right. After parking your car, follow the signs to the Outpatient Center.

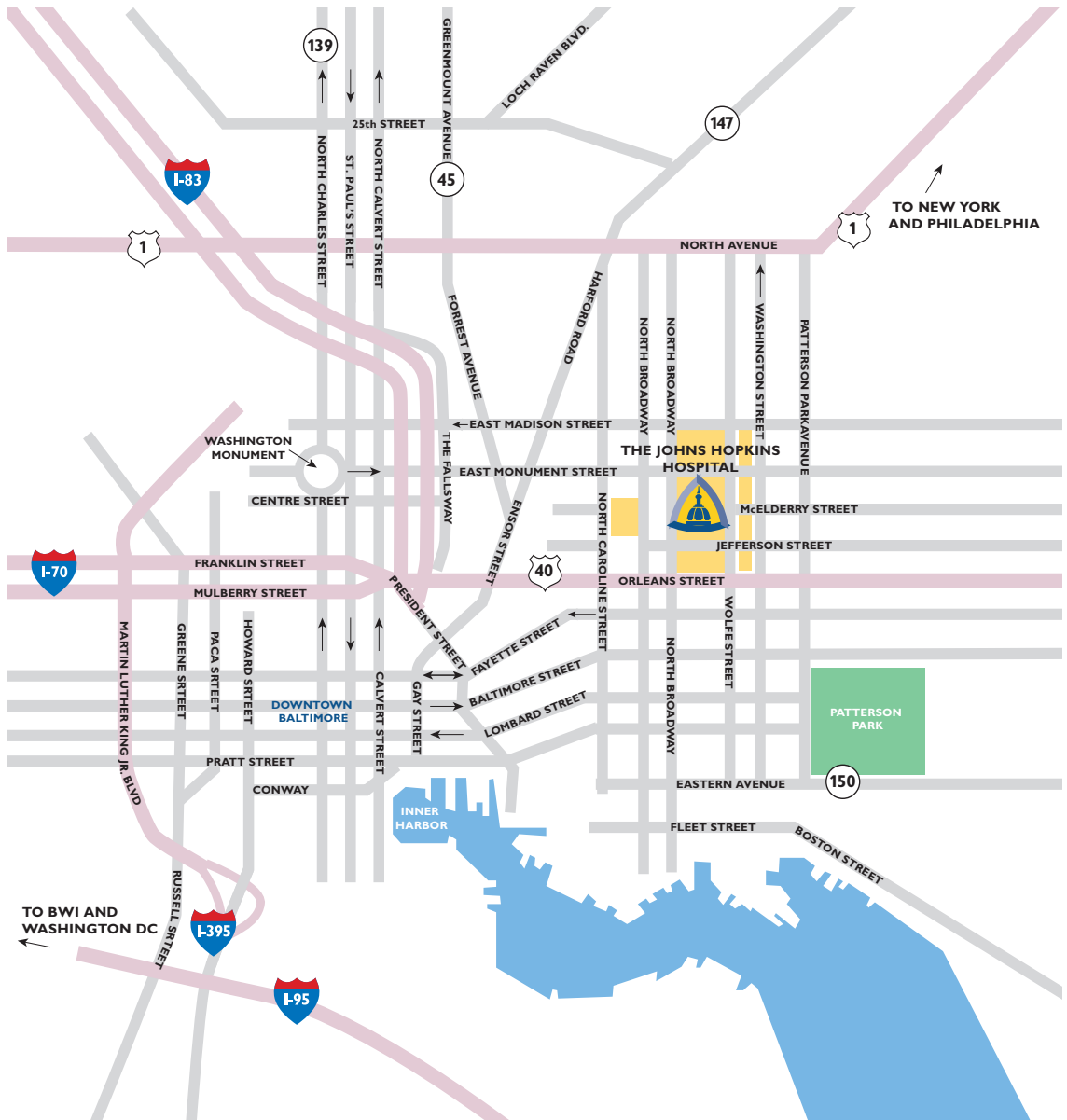
From Annapolis and Maryland's Eastern Shore

From Route 50, take I-97 toward Baltimore and follow I-97 to the Baltimore Beltway (I-695) toward Towson. Take the Beltway to the Baltimore-Washington Parkway (I-295) North. Follow I-295 into Baltimore (it becomes Russell Street). Turn right on Pratt Street. Stay on Pratt for 1.4 miles to left on North Caroline Street. Follow the signs to patient parking. The entrance to the garage is on McElderry Street on the right. After parking your car, follow the signs to the Outpatient Center.

From Frederick and Western Maryland

Take I-70 east to the Baltimore Beltway (I-695) east to I-95 north. Take I-95 north to Exit 53 (I-395 north) into Baltimore. Turn right at Pratt Street (by the Baltimore Convention Center). Stay on Pratt for 1.4 miles to left North Caroline Street. Follow the signs to patient parking. The entrance to the garage is on McElderry Street on the right. After parking your car, follow the signs to the Outpatient Center.





Johns Hopkins Arrhythmia Service Physicians

Hugh Calkins, MD <i>Director</i>	410-955-7405	Joseph Marine, MD <i>Director, Bayview Program</i>	410-550-1973
Ronald Berger, MD, PhD <i>Co-Director</i>	410-614-2751	Saman Nazarian, MD	410-614-2751
Jeffrey Brinker, MD	410-955-6086	Sunil Sinha, MD	410-955-2412
Alan Cheng, MD	410-550-1973	David Spragg, MD	410-550-1973
Jane Crosson, MD <i>Pediatric Service</i>	410-614-0706	Harikrishna Tandri, MD	410-955-2412
Henry Halperin, MD, MA	410-955-2412	Gordon Tomaselli, MD <i>Chief of Cardiology</i>	410-955-2774
Charles Henrikson, MD	410-955-2412	David Yuh, MD <i>Arrhythmia Surgery</i>	410-955-9780

Referral Phone Numbers

Atrial Fibrillation Center	410-614-4552
Cardiovascular Access Line (CAL) (<i>for physician referral for outpatient consultation</i>) <i>Or CAL@jhmi.edu</i>	410-502-0550
Hopkins Access Line (HAL) (<i>for physician to physician communication;</i> <i>hospital transfers and referrals</i>)	1-800-765-5447
Outpatient clinical appointments (<i>arrhythmia, general cardiology,</i> <i>pacemaker and implantable defibrillator clinics</i>)	410-955-3116
Outpatient pediatric appointments (<i>arrhythmia and general pediatric cardiology</i>)	410-955-5910/410-955-9714
Electrophysiology procedure scheduling office	410-614-4243
ARVD Program	410-502-7161

Services

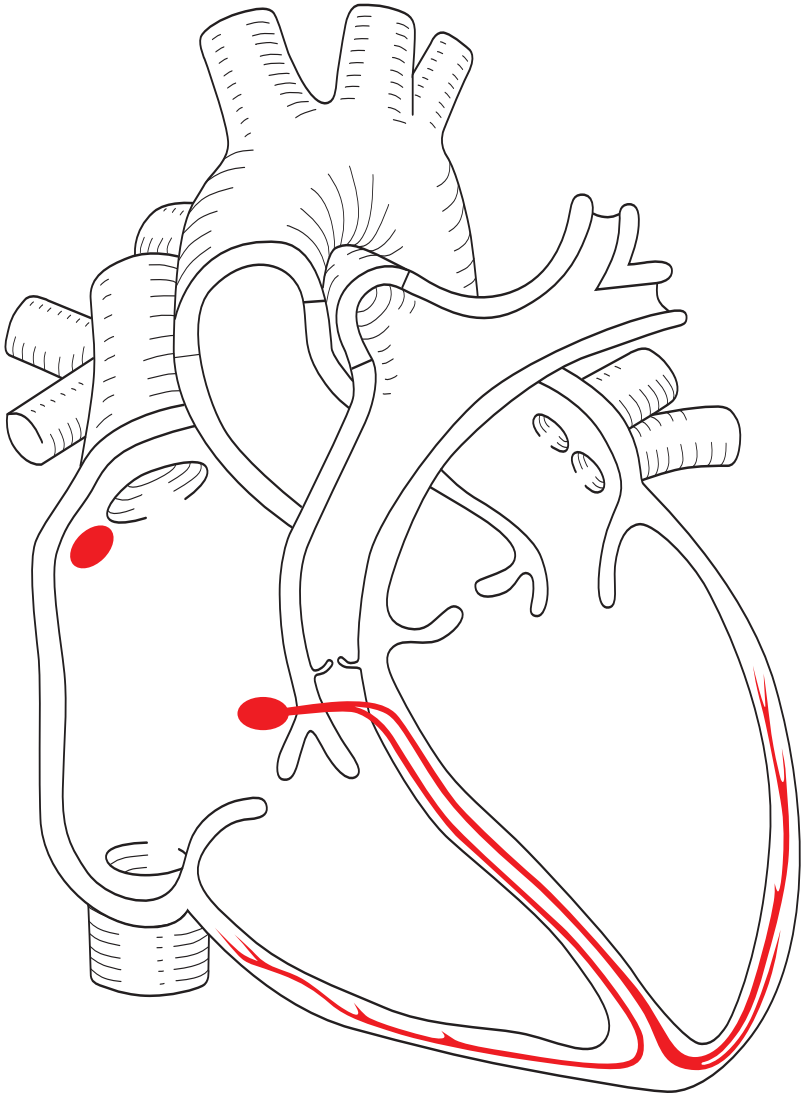
The Johns Hopkins Hospital

The Johns Hopkins Hospital main number	410-955-5000
The Johns Hopkins Hospital patient information number	410-502-4000
The Johns Hopkins Arrhythmia Service	410-955-7405
Arrhythmogenic Right Ventricular Dysplasia Center	410-502-7161
Atrial Fibrillation Center <i>AtrialFibLine@jhmi.edu</i>	410-614-4552
Hopkins USA (<i>for out-of-town guests</i>)	410-735-4872
Marburg Pavilion (<i>special amenities floor</i>)	410-614-4777
International Services	410-955-8032
Arrhythmia nurse specialists	410-955-1143
Pacemaker and ICD Clinic	410-955-1143

Johns Hopkins Bayview Medical Center

Arrhythmia Service at Johns Hopkins Bayview Medical Center	
Main number and patient information	410-550-0100
Outpatient Clinic appointments	410-550-4642
Electrophysiology procedure scheduling	410-550-3380/3381

Notes & Questions





JOHNS HOPKINS
M E D I C I N E

Johns Hopkins
Arrhythmia Service
600 North Wolfe Street
Carnegie 530
Baltimore, Maryland 21287
410-955-7405
<http://www.hopkinsmedicine.org/heart>