Many patients who have undergone treatment at the Center for Atrial Fibrillation are enjoying a tremendous improvement in their quality of life.
Atrial fibrillation: a serious, but treatable, heart condition

The Allegheny General Hospital Center for Atrial Fibrillation offers state-of-the-art medical and interventional therapies to treat atrial fibrillation so you can stay healthy and enjoy a better quality of life. Our multidisciplinary team of cardiac electrophysiologists, cardiologists, and cardiac surgeons work to provide you with a customized treatment plan, including options ranging from medical management to the latest catheter- and surgical-based ablation procedures.

This booklet is designed to help you better understand atrial fibrillation. It will also tell you how the Center for Atrial Fibrillation can customize a treatment plan to help get your heart back into a normal rhythm.
The heart’s electrical system

The heart has four chambers: right, left, top, and bottom. The top chambers are called the atria and the bottom chambers are called the ventricles.

Your heart is a complex pump that has its own electrical system. The heart’s electrical system creates a heart rhythm that drives the pump. The heart’s normal rhythm, called sinus rhythm, involves a predictable series of events that starts with the firing of the heart’s natural pacemaker, the sinus node. The sinus node is located high in the right atrium, and when it fires, it sends electrical signals through the atria, which respond by squeezing blood to the ventricles.

The electrical signals then reach a special structure in the middle of the heart, the atroventricular (AV) node. The AV node acts as a gatekeeper to the specialized conduction system of the ventricles, also known as the right and left bundle branches. The bundle branch system serves as the highway for electricity to spread quickly through the ventricles, which respond by squeezing blood to the body.
What is atrial fibrillation?

Atrial fibrillation (AF) is an abnormal heart rhythm that most commonly arises from the left atrium. In normal sinus rhythm, the top and bottom chambers of the heart work together to pump blood efficiently to the body. However, in AF, sinus rhythm is replaced by chaotic electrical activity that results in irregular transmission of impulses to the ventricles. The ventricles respond by beating in a disorganized fashion. The loss of coordinated activity between the top and bottom chambers causes the heart to pump less efficiently overall, compared to normal sinus rhythm.

AF has different characteristics in different patients. For some of our patients, AF comes and goes, in which case it is called paroxysmal atrial fibrillation. Other patients are in AF all the time, in which case it is called persistent atrial fibrillation.

Why should I be concerned about atrial fibrillation?

AF has two main consequences. The first, and major, consequence of AF is the risk of stroke. The risk of stroke is increased because, while in atrial fibrillation, blood does not move out of the top chambers of the heart efficiently. The blood may pool and form clots, which can then be pumped to the brain, causing a stroke.

The second major consequence of AF involves symptoms, including palpitations (pounding heartbeats), shortness of breath, fatigue, and dizziness. In rare cases, weeks to months of AF with fast heart rates can cause congestive heart failure, where the heart muscle weakens and fluid gathers in the lungs and body. Some patients may not feel any symptoms in AF, while other patients may experience severe symptoms in AF.
Why does atrial fibrillation happen?

There are a number of diseases and conditions that make it likely for a patient to develop AF. (See list at right.)

We do not fully understand all the factors that trigger AF. Furthermore, not all AF is the same. For example, up to 20 percent of patients with AF are young and healthy without any risk factors. These patients have AF that is clearly different than in older patients with other conditions, such as diabetes and high blood pressure.

How common is atrial fibrillation?

AF is the most common abnormal heart rhythm. More than 15 percent of people 75 years of age or older have AF, and the risk increases with age. More than 2 million Americans have been diagnosed with AF, and many more have AF which has not yet been diagnosed.

Is atrial fibrillation the same as a heart attack?

AF is not the same as having a heart attack. A heart attack happens when a large blood vessel that supplies the heart, called a coronary artery, becomes suddenly blocked. This results in damage and death to the heart muscle that was supplied by the blocked vessel.
Will my atrial fibrillation ever go away?

It is rare for AF to go away completely without treatment. It usually returns at some point. In some patients, it comes and goes often (paroxysmal atrial fibrillation) and will continue with this pattern for years. For other patients, AF is persistent and does not go away on its own unless an intervention is performed. Despite the fact that AF may not be completely cured, most people with this diagnosis can live full and active lives with appropriate treatment.

Is atrial fibrillation the same as atrial flutter?

Atrial flutter is related to, but not the same as AF. Atrial flutter is often found in patients with atrial fibrillation. Atrial flutter is an abnormal heart rhythm that most commonly occurs in the right atrium and is more electrically organized than AF. Patients with atrial flutter experience some of the same symptoms found in AF. It is important to note that atrial flutter carries the same risk of stroke. Treatment of atrial flutter is similar to AF, with the exception of ablation (when heart tissue is cauterized to stop an abnormal heart rhythm).

We recommend that patients having unusual chest pain or pressure call 911 for urgent medical attention.
What are the treatments for atrial fibrillation?

Treating AF involves measures to reduce the risk of stroke and also to reduce the burden of symptoms.

Patients with AF who have risk factors for stroke may be advised to begin blood thinning medications, or anticoagulants. Historically, the most commonly prescribed blood thinner is warfarin (Coumadin). Patients taking warfarin require a regular blood test (called an INR) because each patient responds to warfarin differently. Warfarin interacts with foods and other medications, and regular blood tests and follow-up are very important to maintain a safe and effective level of blood thinning. The most common side effect of warfarin is minor bleeding. Patients on warfarin may notice that cuts and scrapes bleed longer than usual. In rare cases, patients may experience severe bleeding, such as from a stomach ulcer. Fortunately, this type of bleeding is unusual as long as the warfarin is carefully managed.

New anticoagulants are now available. Unlike warfarin, they do not require blood tests and interact to a much lesser degree with food and other medications, yet still prevent strokes from occurring. There are other potential benefits of these medications your doctor will discuss with you.

Anticoagulation therapy must be tailored for each individual patient. You and your doctor will discuss both the risks and benefits of treatment.

Most Commonly Prescribed Anticoagulation Drugs

- warfarin (Coumadin®)
- dabigatran (Pradaxa®)
- rivaroxaban (Xarelto®)
- apixaban (Eliquis®)
- edoxaban (Savaysa®)
Heart rate and symptom control

Fast heart rates in AF can create both symptoms (for example, palpitations and fatigue) and temporary heart muscle weakness if left untreated for weeks to months.

Various medications, known as rate controlling medications, help regulate the heart rate in AF. Rate controlling medications include the classes of medicines listed to the right.

Returning the heart to sinus rhythm

When the heart rhythm changes from AF to sinus rhythm, this is called a cardioversion. Cardioversion can happen spontaneously, with medications known as antiarrhythmics, or by delivering a controlled electrical shock to the heart.

Electrical cardioversion

Electrical cardioversion (“DC” cardioversion) is a safe, routine, outpatient procedure. The patient arrives in a fasting state in the morning. An electrocardiogram (ECG) is performed to confirm the presence of atrial fibrillation and an intravenous (IV) line is started. An anesthesiologist gives medicine through the IV line to put the patient to sleep for a few minutes so that there is no pain or discomfort.
A small shock is then applied through pads placed on the patient’s back and chest, and in most cases, the heart’s rhythm is immediately reset to normal. The patient is observed for a few hours while the effects of anesthesia wear off, and is then allowed to go home accompanied by family or friends.

Electrical cardioversion is not a cure, but rather a temporary fix, for atrial fibrillation. Although uncommon, a major risk of this procedure is stroke, which can occur at the time of the shock or in the days to weeks afterwards. To prevent the risk of stroke, your doctor may ask you to undergo a special ultrasound of the heart, called a transesophageal echocardiogram (TEE), to make sure there is no blood clot in the heart.

Also, your doctor may not perform the procedure unless you have been fully anticoagulated for three consecutive weeks. Patients who have experienced AF for less than 48 hours can generally undergo cardioversion safely without these additional pre-procedure measures.

A transesophageal echocardiogram (TEE) is an ultrasound procedure that allows your doctor to look for blood clots inside the heart. It is usually performed immediately before a cardioversion. Before a TEE, relaxing medications are given. A special tube is then passed down the esophagus (food pipe), which lies directly behind the heart. The main risk of a TEE is a sore throat. If you have any difficulty swallowing, or know of any problems with your esophagus, please tell your doctor prior to the procedure.
Antiarrhythmic medications

After a successful cardioversion, or after a recurrence of AF following a cardioversion, your doctor may advise you to begin taking medications to keep your heart in a normal rhythm. These medications, known as antiarrhythmics, are designed to help maintain normal sinus rhythm. Individual patients respond differently to different antiarrhythmics. Many patients will have to try a number of antiarrhythmic medicines before finding the one that works best for them. These medications all have side effects that your doctor will discuss with you. Many of these medications require a 2-3 day hospital stay when they are started. Other medications require periodic blood tests, X-rays, or heart monitoring. Your doctor will discuss the specifics of your antiarrhythmic medication with you.

Interventional procedures

For patients with symptomatic AF despite treatment with antiarrhythmic drugs, the Center for Atrial Fibrillation offers an array of interventional procedures to help manage the condition.

The veins that return blood from the lungs to the heart (the pulmonary veins) may generate abnormal electrical impulses that trigger the start of AF. Procedures have been developed to prevent these electrical impulses from the pulmonary veins from entering the left atrium — thereby decreasing or eliminating the recurrence of AF.

### Antiarrhythmic Medications

- **flecainide** (Tambocor®)
- **propafenone** (Rythmol®)
- **sotalol** (Betapace®)
- **dofetilide** (Tikosyn®)
- **amiodarone** (Cordarone®)
- **dronedarone** (Multaq®)
- **quinidine**
- **disopyramide** (Norpace®)
Different ablation procedures are available to prevent the electrical activity from the pulmonary veins from entering the left atrium. One is a catheter-based procedure performed by a cardiac electrophysiologist, called a Pulmonary Vein Isolation. The second is a hybrid procedure performed by both a cardiac surgeon and a cardiac electrophysiologist. The third is a minimally invasive surgical procedure called a Mini-MAZE. The fourth is a full operative MAZE procedure. The various procedures are described below.

**Catheter-Based Pulmonary Vein Isolation (PVI)**

This is the most common treatment of AF. Prior to the procedure, the patient undergoes an imaging test of the heart (either a MRI or a CT scan). In addition, the patient may be asked to undergo a transesophageal echocardiogram (TEE) to ensure that there is no clot inside the heart before the procedure, also known as ablation, is performed. PVI is performed under general anesthesia. Multiple long wires, called catheters, are advanced from the groin and neck into the heart. The areas surrounding the pulmonary veins are cauterized or, in some cases, frozen. Electrical activity is recorded from inside each of the veins during the ablation. The ablation is complete when electrical activity is no longer seen inside the pulmonary veins. Catheter-based ablation procedures take between three to six hours to complete. When the procedure is complete, the patient is asked to lie flat for six hours to allow the catheter entry sites...
to heal. The patient is then observed on a heart monitor overnight and allowed to go home the next day. After going home, patients should not do any heavy physical labor or lifting for at least one week.

It takes about three months for the ablation sites in the heart to heal after the procedure. During this three-month period, it is not uncommon for patients to experience recurrent arrhythmias. For this reason, we recommend continuation of anticoagulation and antiarrhythmic therapy during this period of time. The first follow-up appointment will be two weeks after the procedure. At your three month appointment, your physician may recommend stopping antiarrhythmic medications if your heart rhythm remains normal.

A PVI is about 70 percent effective at either significantly decreasing or eliminating the recurrence of AF. It also can decrease the severity of symptoms associated with AF. Approximately 30 percent of patients may experience AF or atrial flutter after a PVI. This usually will subside after two to three months. Some patients will require additional procedures if AF or atrial flutter continues to recur. The success rate after repeat procedures is approximately 80 to 85 percent.

The risks of a PVI include the following:

- Injury to the blood vessels of the groin, which may require surgery
- Bleeding into the groin or abdomen, which may require surgery
- Bleeding around the heart, which may need to be drained
- Stroke, due to clot formation on a catheter inside the heart
- Injury to the esophagus or formation of a connection between the esophagus and left atrium (very rare)
- Narrowing of pulmonary veins
- Damage to the phrenic nerve, which carries electrical signals to the diaphragm

Hybrid procedure

We offer an alternative form of pulmonary vein isolation in patients with special requirements. This procedure is called a hybrid PVI and is useful for patients who have AF of longstanding duration and an enlarged left atrium. It is a two-step procedure involving cardiac surgeons (Step 1) and cardiac electrophysiologists (Step 2).
During Step 1, cardiac surgeons introduce a special ablation catheter through the skin under the breast bone into the space around the outside of the heart. Under direct visualization, a thorough ablation of the back wall of the enlarged left atrium and lower pulmonary veins is performed. Step 2 involves completing the pulmonary vein isolation with catheters from inside the heart as previously described.

**Mini-MAZE**

The mini-MAZE procedure is a less invasive form of the traditional open chest MAZE procedure and is performed by cardiac surgeons. This procedure requires small chest incisions for insertion of a video camera and mini-MAZE instruments. The mini-MAZE instrument allows the surgeons to perform a pulmonary vein isolation from outside of the heart. Following ablation, the surgeon may also remove a small structure called the left atrial appendage, which is associated with stroke in atrial fibrillation. The mini-MAZE procedure typically takes three hours to perform. The catheter-based PVI is typically the recommended procedural option for most patients due to its less invasive nature and shorter recovery times. Your physician may recommend a mini-MAZE procedure under special circumstances.
**Cox IV MAZE**

The MAZE technique was developed in the 1980s as the first surgical ablation treatment of AF. It was designed to create a MAZE that would trap the abnormal electrical signals and prevent atrial fibrillation. Since that time, it has been refined to the Cox IV MAZE technique, a much faster, safer, and more effective procedure. It was designed to be performed as a stand-alone operation or in conjunction with other cardiac procedures. The goals of the Cox IV MAZE procedure are to restore normal heart rhythm and reduce the risk of stroke by removing the left atrial appendage. The Cox IV MAZE procedure has been shown to be very effective in restoring normal heart rhythm. As such, it helps eliminate the risk of stroke and the need for anticoagulation. Eliminating anticoagulation also reduces the risk of anticoagulation-related bleeding.

Patients selected for a MAZE procedure typically have failed a catheter ablation or are undergoing heart surgery for another cardiac problem. The specific selection criteria for the MAZE procedure include:

- Medically-refractory patients with atrial fibrillation
- Patients who failed a catheter ablation with atrial fibrillation
- Patients with a contraindication to Coumadin or who have had a stroke while adequately anticoagulated
- Patients diagnosed with tachycardia-induced cardiomyopathy
- Virtually all patients with AF undergoing a coronary or valve procedure

The Cox IV MAZE procedure is performed with the heart-lung machine and can be done either through standard open heart approaches or minimally invasive techniques with a small incision in the right chest.

**Risks of Cox IV MAZE include:**

- Bleeding (<1%)
- Stroke (<1%)
- Infection (<1%)
- Need for a pacemaker (<3%)
Surgical procedures to reduce stroke risk

As part of our comprehensive treatment of AF, we offer a variety of surgical procedures for those patients who have had, or are at risk of having a stroke, or those who cannot be safely treated with blood thinners. Many of these procedures can be tailored to individual patient needs and conditions. Ask your doctor to discuss these with you to determine if you may be a candidate.

Clinical trials

Allegheny Health Network is at the forefront of advanced scientific research on atrial fibrillation. Our physician researchers participate in national and international clinical trials. Please be sure to check with your physician on ongoing research efforts to determine if you may be a candidate in one or more of these trials.

An experienced, multidisciplinary team

At the Center for Atrial Fibrillation, nationally renowned specialists from many diverse disciplines join together to offer patients the highest quality care and the best possible outcomes. This multidisciplinary team includes:

**Cardiac Electrophysiologists**
- William Belden, MD
- Christopher Bonnet, MD
- John Chenarides, MD
- Kenneth Judson, MD
- Emerson Liu, MD
- Amit Thosani, MD

**Cardiac Surgeons**
- Stephen Bailey, MD
- Walter McGregor, MD
- Thomas Maher, MD
- Robert Moraca, MD

**Interventional Cardiologist**
- David Lasorda, MD
How do I schedule an appointment to see an atrial fibrillation specialist?

Many patients who have undergone treatment at the Center for Atrial Fibrillation are enjoying a tremendous improvement in their quality of life. We look forward to discussing treatments that may be able to help you.

For more information or to make an appointment with a specialist at the Center for Atrial Fibrillation, call 412.359.6444, or visit AHN.ORG.
The Cardiovascular Institute

Allegheny General Hospital’s Cardiovascular Institute blends pathways of care into one streamlined method for more effectively combating cardiac and vascular diseases. We provide cardiovascular services at each of our Network’s hospitals, including Allegheny General, Allegheny Valley, Canonsburg, Forbes, Jefferson, Saint Vincent, and West Penn hospitals.

From initial consultation with the patient, to state-of-the-art imaging and testing, to the most effective medical or surgical treatment options, the Cardiovascular Institute offers compassionate, patient-focused care. Our team of physicians, nurses, technicians and support staff treat each patient as an individual while offering world-class technologies with a team approach.

Pittsburgh Symphony Orchestra violist Paul Silver got his rhythm back after being treated by physicians of the Cardiovascular Institute at Allegheny General Hospital.