



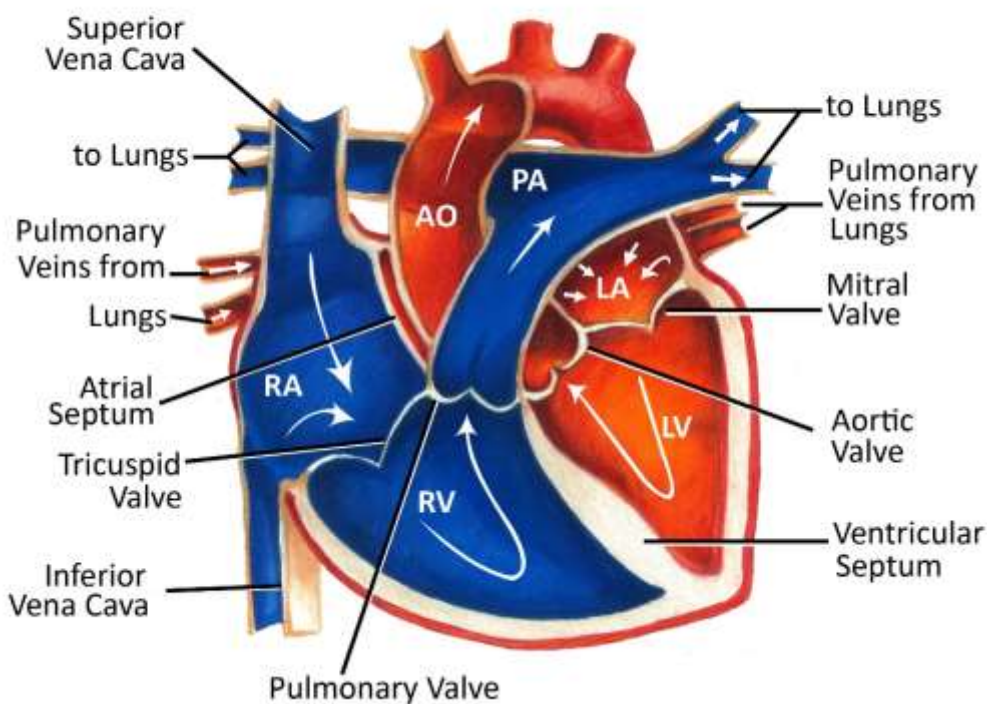
### Atrial Fibrillation

#### How does the heart work?

The heart is the organ responsible for pumping blood to and from all tissues of the body. The heart is divided into right and left sides. The job of the right side is to pump oxygen-deficient blood returning from the body into the lungs where fresh oxygen is collected and carbon dioxide is removed. The oxygen-rich blood returning from the lungs enters the left side of the heart where it is pumped into the aorta then to the rest of the body via the arterial system.

Each side of the heart has two chambers, an upper atrium and a lower ventricle. Between the atrium and ventricle on each side lies a valve – the tricuspid on the right and the mitral on the left – that regulates blood flow into the chambers. As the heart pumps, these valves act as one-way gates allowing blood to flow from the atrium above to the ventricle below and preventing blood from flowing back into the atrium. From the ventricles, blood is then forced to flow out into the pulmonary artery (on the right) or the aorta (on the left) through a second series of one-way valves called the pulmonic valve and the aortic valve, respectively.

#### Normal Heart

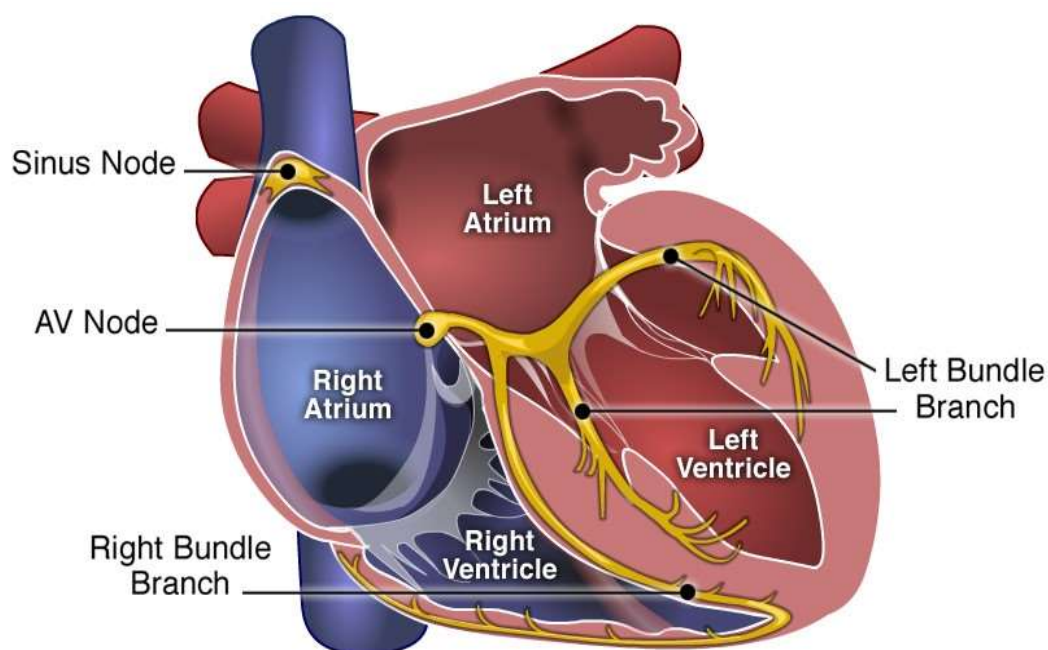


**Key:**  
RA: right atrium  
RV: right ventricle  
PA: pulmonic artery  
LA: left atrium  
LV: left ventricle  
AO: aorta



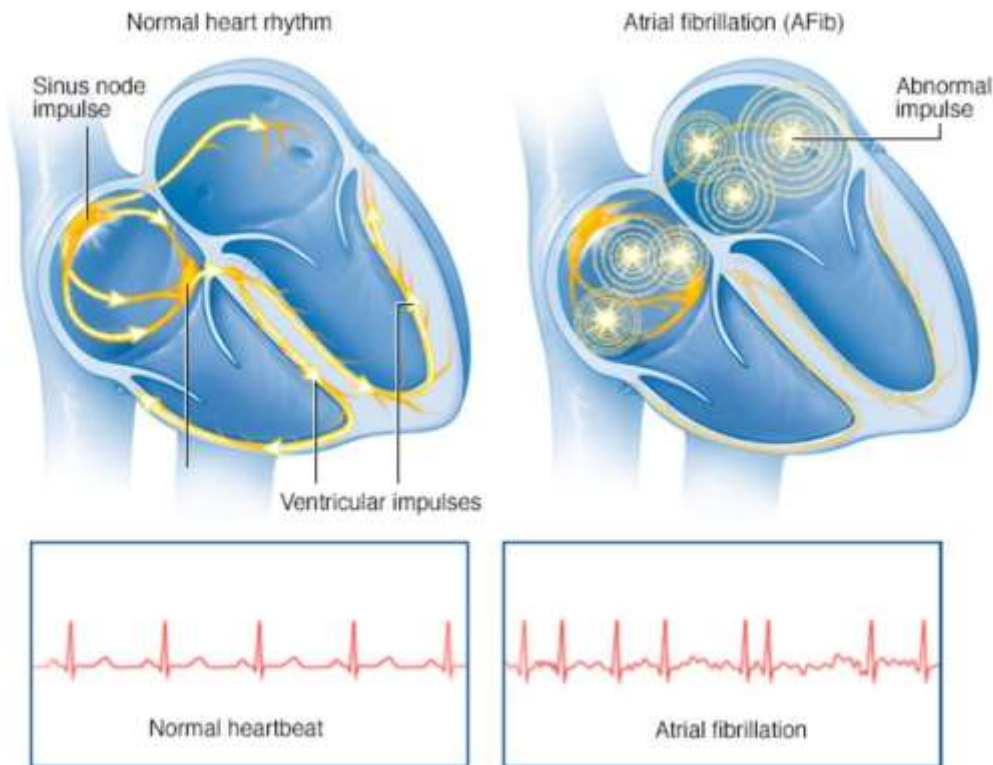


The heart muscles contract after they are stimulated by an electrical impulse. A small area of special tissue in the right atrium called the sinoatrial (SA) node starts an electrical impulse (it's like the heart's spark plug), that spreads out over both atria before reaching a region called the AV node. From here, the impulse travels down special electrical tracts (or 'wiring') within the ventricles (this is the conduction system of the heart). The electrical impulses cause the heart to contract in a coordinated fashion: the atria contract first and push blood into the ventricles; then the ventricles contract and push blood to either the lungs (right ventricle) or the rest of the body (left ventricle). This electrical impulse can be recorded on an electrocardiogram (ECG).



### What is Atrial Fibrillation?

Atrial fibrillation is an arrhythmia that causes the heart to beat irregularly. Instead of the SA node initiating and coordinating the electrical signal, multiple areas within the atria send out electrical impulses in a rapid, disorganised manner. These chaotic electrical impulses or wavelets spread out over the atrial tissue causing the atrial muscle to quiver or fibrillate, instead of contracting in an organised, structured manner. A small fraction of these electrical impulses travel through the heart's normal conduction system triggering the ventricles to contract. The pattern with which these abnormal atrial impulses travel through the conduction system is irregular making the heart and ventricles beat irregularly.



## What causes Atrial Fibrillation?

In people, atrial fibrillation can occur for no apparent reason (often in athletes or older people). This is because the size of our hearts is large enough to allow such abnormal rhythms to develop (this is seen in horses). However, most pets have much smaller hearts than humans, so for atrial fibrillation to occur in your pet, the atrial chambers must usually be bigger than normal. This enlargement of the atrial chambers occurs with many types of heart disease, such as degenerative valve disease, dilated cardiomyopathy and hypertrophic cardiomyopathy. Generally, the smaller your pet, the more significant the heart disease must be to cause atrial fibrillation. Thus, atrial fibrillation is much less common in cats than in dogs.

Occasionally, giant and large breed dogs develop atrial fibrillation without any underlying heart disease. This is termed 'lone atrial fibrillation' and occurs because the natural size of their atria is large.



## **How is Atrial Fibrillation diagnosed?**

Often, the first idea that your pet has atrial fibrillation is when your veterinarian detects an irregular heart rhythm during auscultation with a stethoscope. However, to confirm the diagnosis, an electrocardiogram (ECG) needs to be performed (because other arrhythmias can also cause the heart to beat irregularly). There are specific ECG criteria which must be met prior to making the diagnosis of atrial fibrillation.

At times, a pet with heart disease may suddenly become weaker (or even collapse) or have a relapse of heart failure upon development of atrial fibrillation, prompting you to visit your veterinarian. Again, your veterinarian will auscultate the abnormal rhythm and diagnose atrial fibrillation via an ECG examination.

In giant breeds with lone atrial fibrillation, the arrhythmia may be detected on routine examination – often the owners are unaware that any problem exists. Some dogs may develop mild exercise intolerance with lone atrial fibrillation.

## **What happens when your pet develops Atrial Fibrillation?**

People with lone atrial fibrillation generally require treatment to re-establish a normal heart rhythm, because they usually have exercise intolerance or shortness of breath, symptoms of palpitations, and are at an increased risk of having a stroke. However, dogs with lone atrial fibrillation uncommonly show exercise intolerance or shortness of breath, and do not suffer from strokes, so treatment is not often required. Their overall heart rate remains normal in most cases.

However, in a pet with serious heart disease, atrial fibrillation causes a worsening of clinical signs, and can further damage the heart. Cardiac output, or the amount of blood pumped out of the heart to the rest of the body, is reduced and often congestive heart failure develops or recurs. These pets usually have very fast heart rate (more than 200 beats per min) which, if not controlled, can lead to additional heart muscle damage and dysfunction.

## **How is Atrial Fibrillation treated?**

Treatment of atrial fibrillation in people is often aimed at re-establishing and maintaining a normal rhythm, because this greatly reduces the risk of strokes. This can be done by delivering an electrical 'shock' to the heart (termed 'electrical cardioversion'), or by using antiarrhythmic drugs.

In pets, cardioversion is not commonly performed. The only veterinary patients that are sometimes candidates for electrical cardioversion are large and giant breed dogs with lone atrial fibrillation and associated clinical signs (e.g. exercise intolerance).



However, cardioversion in dogs requires general anaesthesia, and maintenance of a normal rhythm following cardioversion requires long-term medical therapy (which often has side-effects) and multiple repeat cardioversion procedures.

Pets with severe heart disease are not candidates for cardioversion. In these pets, a normal rhythm cannot be re-established long-term. Instead, the veterinarian attempts to reduce the high heart rate with antiarrhythmic drugs. By reducing heart rate, the heart can pump more efficiently and damage to the heart muscle is minimised. Additionally, clinical signs associated with the development of atrial fibrillation, (e.g. congestive heart failure) often improve or resolve when the rate is controlled. The drugs that decrease heart rate need to be given indefinitely to maintain rate control and will generally be added to drugs already being administered.

### **What is the prognosis?**

The prognosis of dogs with atrial fibrillation is dependent on the underlying cardiac disease that lead to the development of atrial fibrillation in the first place. However, in saying this, the development of atrial fibrillation is often regarded as a negative prognostic indicator in dogs with underlying heart disease.

Dogs with lone atrial fibrillation have a better prognosis than dogs with atrial fibrillation secondary to severe underlying heart disease. However, there is some evidence that certain large-breed dogs with long-standing lone atrial fibrillation, can eventually develop heart muscle dysfunction and disease (therefore it is recommended these dogs have annual cardiac reassessments).

### **Additional Resource:**

<http://vetmed.tufts.edu/heartsmart/>

This is a very useful and well-written resource, providing pet owners with a clear and credible source of information about veterinary cardiology.