

# Atrial Fibrillation

By Danielle Flint

# Outline

- Definition
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# Definition:

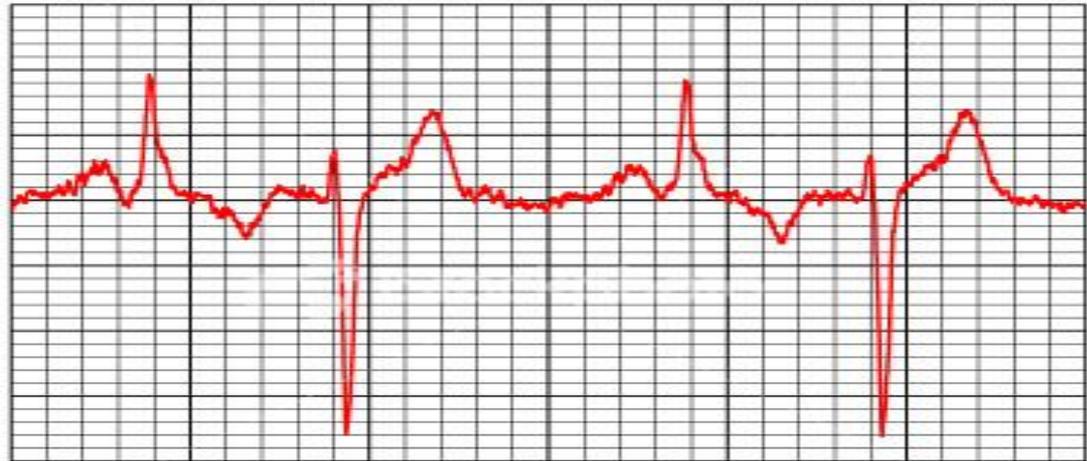
## What is Atrial Fibrillation?

- **Atrial Fibrillation (AF)** is a cardiac arrhythmia, or abnormal heart rhythm.
  - During an arrhythmia, the heart can beat too fast, too slow, or with an irregular rhythm.
- Fibrillating means “quivering” and is named in relation to the atria, the upper two chambers of the heart.
  - So in other words, AF is an irregular heart rhythm due to a disruption with the atrium. The atria quiver instead of beat effectively.

## Definition:

# What is Atrial Fibrillation? Cont...

- The internal electrical system controls the **rate** and **rhythm** of the heartbeat.
- To understand AF, it helps to understand the **internal electrical system** of the heart.



## Definition:

# What is Atrial Fibrillation? Cont...

### -internal electrical system

- In a **healthy individual without AF**, an electrical signal spreads from the top of the heart to the bottom with each heartbeat. As it travels, it causes the heart to contract and pump blood.
- Each electrical signal begins in the SA node in the right atrium and then travels through the right and left atria which causes the atria to contract and pump blood into the ventricles.
- The electrical signal then moves down to the AV node where it slows to allow the ventricles to finish filling with blood.
- Electrical signal then leaves the AV node and travels to the ventricles. This causes the ventricles to contract and pump blood out to the lungs and rest of the body. Ventricles relax, process starts all over again.

# Definition:

## -internal electrical system

- In an individual **with AF**, the heart's electrical signals don't begin in the SA node. Instead they begin in another part of the atria or in the nearby pulmonary veins.
- The signals don't travel normally and may spread throughout the atria in a rapid, disorganized way. Abnormal signals flood AV node with electrical impulses and as a result, the ventricles also begin to beat very fast, however, the AV node can't conduct the signals to the ventricles as fast as they arrive.
- This imbalance creates a fast and irregular rhythm.

# Definition

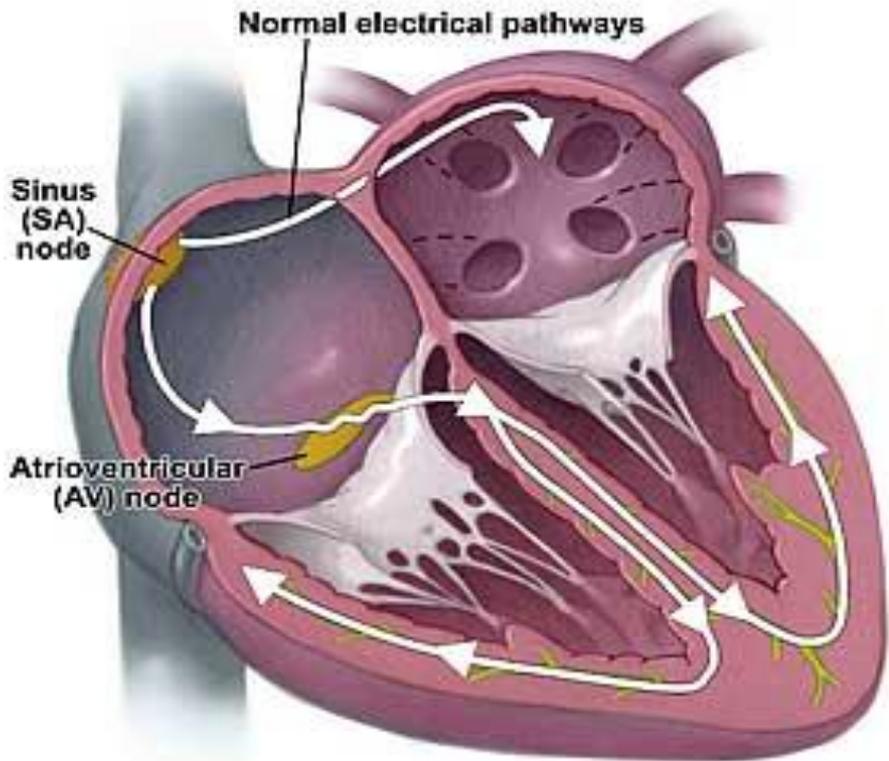
## -internal electrical system

### Healthy Individual

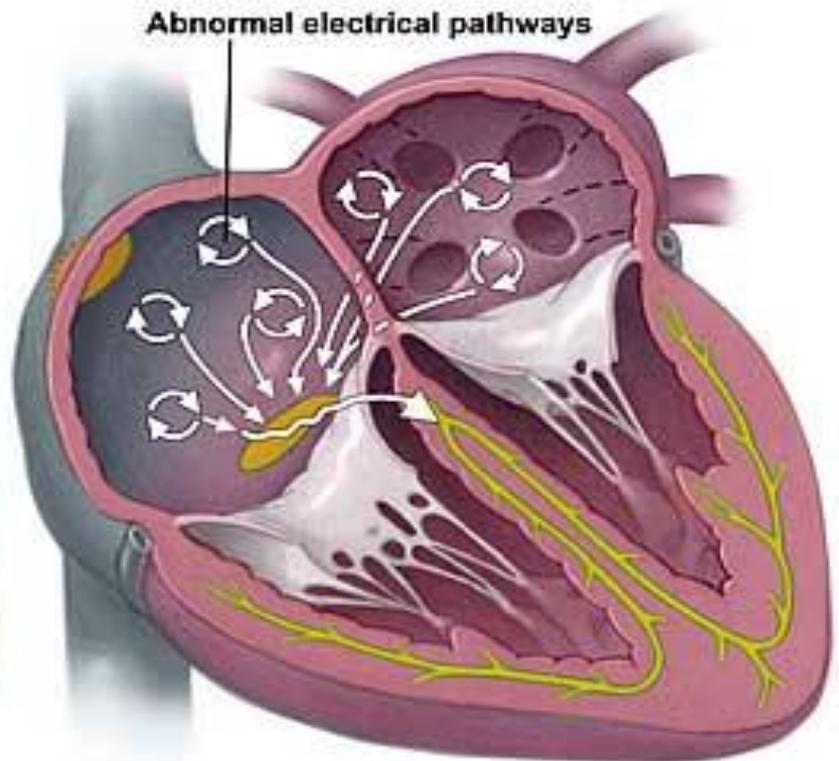
- Electrical signal begins in SA node, travels to right and left atria and then down to AV node. Signal slows, allowing time for ventricles to fill with blood, then moves down to ventricles.
- SA node fires off an electrical signal to begin a new heartbeat 60-100 times a minute.

### Individual with AF

- Electrical signal begins in a part of the atria or nearby pulmonary veins. Signals spread throughout atria in a rapid, disorganized way and flood AV node with impulses. AV node can't conduct them to ventricles as fast as they arrive.
- In AF, the ventricles may beat 100-175 times a minute.



**Normal sinus rhythm**



**Atrial fibrillation**



Video

# So, what's the problem in AF?

- The concern in individuals with atrial fibrillation is that the uncoordinated act of the two upper and two lower chambers doesn't allow the heart to pump blood effectively out of them.
- The amount of blood pumped out of the ventricles to the body is based on the randomness of the atrial beats so the body may get rapid small amounts of blood at some times or occasional larger amounts of blood at others.

# So what's the problem in AF?

- While often not life-threatening on its own, this inadequate supply of blood increases the risk of experiencing major complications such as stroke and heart attack.
- The leading type of atrial fibrillation occurs when the heart's two upper chambers contract improperly and can cause blood to back up into the heart, possibly leading to clot formation.
  - Clot formation is one of the biggest “scars” of atrial fibrillation because it can travel to the brain and cause a stroke to occur.

# Epidemiology

- Most common arrhythmia found in clinical practice.
- Accounts for 1 / 3 of hospital admissions for cardiac rhythm disturbances.
- Strokes from AF account for 6-24% of all ischemic strokes.
- Approximately 2.2 million individuals in U.S have AF.
- Incidence of AF increases with age.
- Prevalence over age 80 is about 8%.
  - Number of patients with AF is likely to increase during next 50 years due to the growing proportion of elderly individuals.
- Men are more likely to have AF, although women have a higher, long-term risk of complications causing premature death.

# Causes

- Hypertension
- Primary heart diseases (CAD, mitral stenosis, congenital heart disease, etc.)
- Previous heart surgery
- Lung diseases
- Excessive alcohol consumption
- Hyperthyroidism
- Carbon Monoxide Poisoning
- Dual-chamber pacemakers
- Family history of AF can increase likeliness
- Sometimes the cause is unknown



# Risk Factors

- Risk increases as you age
- MAJOR- CAD, heart failure, rheumatic heart disease, structural heart defects, pericarditis (membrane sac around heart is inflamed)
- Other risk factors- obesity, high blood pressure, sleep apnea, metabolic syndrome, high dose steroid therapy treatments (asthma), hyperthyroidism, diabetes, lung disease, alcohol, and even caffeine in some people can trigger AF.

# Types of Atrial Fibrillation

- 3 types of atrial fibrillation
  - **Paroxysmal AF-** the abnormal electrical signals and rapid heart rate begin suddenly and then stop on their own. Symptoms can be mild or severe and last for seconds, minutes, hours, or days
  - **Persistent AF-** when the abnormal heart rhythm continues until it's stopped with treatment.
  - **Permanent AF-** normal heart rhythm can't be restored with the usual treatments. Both paroxysmal and persistent AF may become more frequent and, over time, result in permanent AF.

# Clinical Aspects

- **Signs and Symptoms**

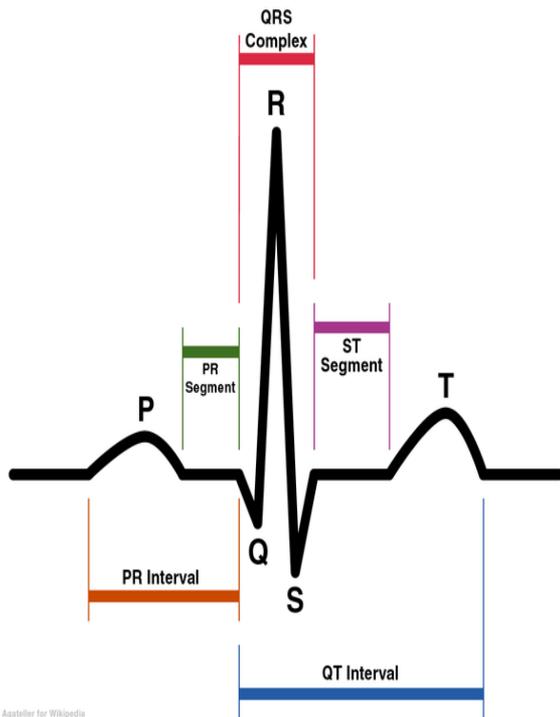
- Palpitations- feel like your heart is fluttering, skipping a beat, etc.
- Shortness of breath
- Weakness or difficulty exercising
- Chest pain
- Dizziness or fainting
- Fatigue
- Confusion



# Clinical Aspects

- Diagnosis
  - For those without symptoms it is generally discovered in a physical exam. Once it has been discovered, there are many diagnostic tests and procedures:
    - EKG
    - Holter and Event Monitor
    - Stress Test
    - Echocardiography
    - Transeophageal Echocardiography
    - Chest X Ray
    - Blood tests

# EKG



Agateller for Wikipedia  
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- Most useful test for diagnosing AF. Measures hearts electrical activity.
- Remember:
  - P waves represent depolarization of atria which causes atrial contraction
  - QRS complex reflects depolarization of ventricles
  - T wave reflects repolarization of muscle fibers in ventricles.
- In AF **there are no P waves**; instead there are bizarre and irregular deflections referred to as fibrillation or “f” waves. They have no rhythmic patterns.



Atrial Fibrillation



Healthy Individual w/o AF

# Holter and Event Monitors

- Two most common types of portable EKGs
  - Carry heart's electrical activity for a full 24 or 48 hour period.
  - You may wear an event monitor for 1 to 2 months, or as long as it takes to get a recording of your heart during symptoms.

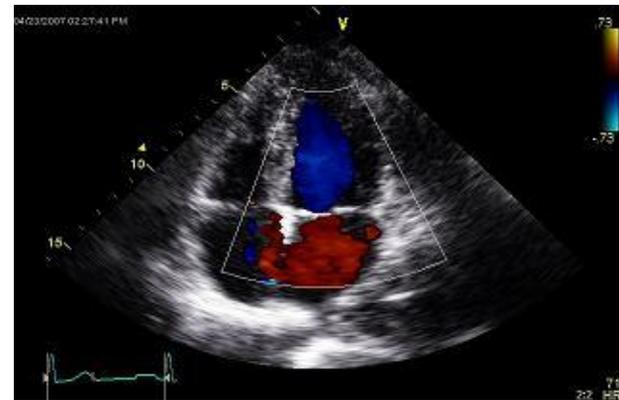


# Stress Test

- AF may be easier to diagnose when the heart is forced to work harder during exercise.
- During stress tests you exercise to increase your heart rate while heart tests are done. Ex. while wearing an EKG.

# Echocardiography

- Uses sound waves to create a moving picture of your heart. Test provides information about the size and shape of your heart and how well your heart chambers and valves are working.
- The sound waves bounce off the structures of your heart, and a computer converts them into pictures on a screen.



# Transesophageal Echocardiography

- TEE takes pictures of your heart through the esophagus. This can be more effective than a thoracic echocardiography.
- During this test the transducer is attached to the end of a flexible tube that's guided down your throat and into your esophagus. Medicine is usually given to relax before procedure.
- TEE can also detect blood clots that may be developing in the atria because of AF.



# Chest X Ray & Blood Tests

- Chest X Rays can show fluid buildup in the lungs and other complications of AF.
- Blood Tests check the level of thyroid hormone and the balance of your body's electrolytes.

# Treatment

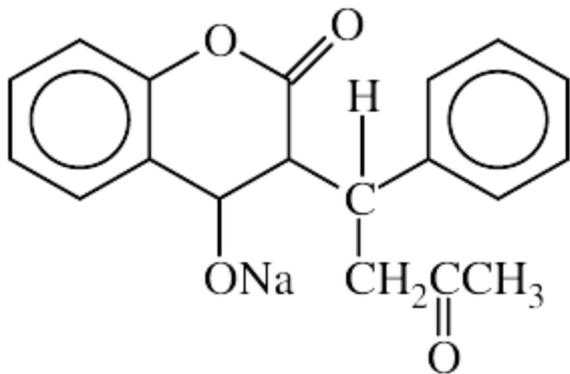
- Goals of treatment:
  - Prevention of blood clots from forming, thereby reducing risk of stroke.
  - Controlling how many times a minute the ventricles contract (rate control). With this the irregular heart rhythm continues, but the person feels better & has fewer symptoms.
  - Restoring normal heart rhythm (rhythm control).
  - Treating underlying disorder that's causing or raising the risk of AF, ex. Hyperthyroidism.

# Treatment

- Who needs treatment?
  - People who have AF but don't have symptoms may not need treatment.
  - AF may even go back to a normal heart rhythm on its own.
  - Some doctors may choose to use an electrical procedure or medicine to restore the heart rhythm to normal in those who have AF for the first time.
  - Those who have persistent or permanent AF need treatment to control their heart rates and prevent complications.

# Treatment

- **Blood Clot Prevention-** arguably the most important part of treating AF.
  - Blood-thinning medicines including:
    - Warfarin- most effective and must have regular blood tests to check how well medicine is working.
    - Heparin
    - Aspirin



WARFARIN (SODIUM)



# Treatment

- **Rate Control-** medicines can be prescribed to help bring the heart rate to a normal level.
  - Rate control is the recommended treatment for most patients who have AF, even though abnormal heart rhythm continues. Most people feel better and can function when their heart rates are well-controlled.
  - Medicines include:
    - Beta blockers (metoprolol and atenolol)
    - Calcium channel blockers (diltiazem and verapamil)
    - Digitalis (digoxin).

# Treatment

- **Rhythm Control**- this treatment approach is recommended for people who aren't functioning well with rate control treatment or who have just started having AF.
  - The longer you have AF, the less likely that an abnormal heart rhythm can be restored to normal. Especially if  $> 6$ mos.
  - Medicines
    - Amiodarone, sotalol, flecainide, propafenone, dofetilide, and ibutilide.

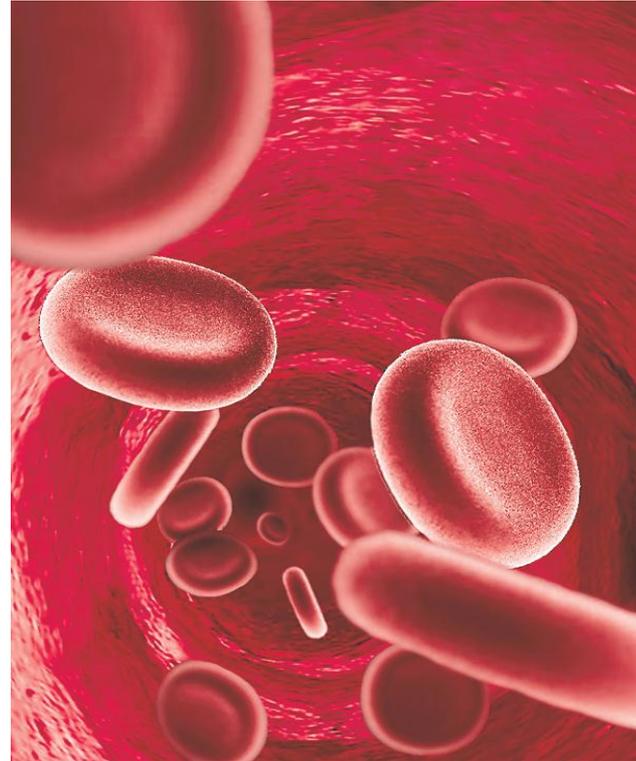
# Treatment

- **Procedures**

- Electrical cardioversion- procedure to restore a fast or irregular heartbeat to a normal rhythm. Low-energy shocks are given to your heart to trigger a normal rhythm. Temporarily put to sleep before the shocks are given.
- [http://www.youtube.com/watch?v=dC\\_i8zuclmQ](http://www.youtube.com/watch?v=dC_i8zuclmQ)

# Treatment

- Transesophageal echocardiography (TEE)- may be performed before electrical cardiography to rule out blood clots in the atria. If blood clots are discovered then a blood-thinning medication may be taken for a time to get rid of the clots before electrical cardiography can take place.



# Treatment

- Catheter ablation- during this procedure a wire is inserted through a vein in the leg or arm and threaded to the heart. Radio wave energy is sent through the wire to destroy abnormal tissues that may be disrupting the normal flow of electrical signals.
  - Sometimes used to destroy AV node where a pacemaker must then surgically be implanted to maintain a normal heart rhythm.

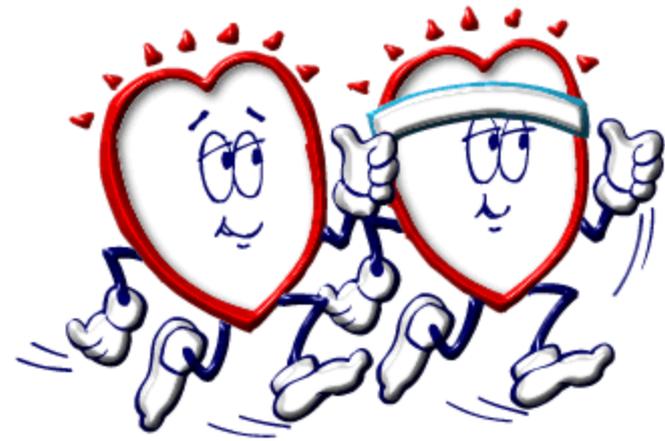
# Treatment

- “Maze” surgery- surgeon makes small cuts or burns in the atria that prevent the spread of disorganized electrical signals.
  - Requires open-heart surgery so is usually only performed when a person requires heart surgery for another reason.



# Effects of Exercise

- People who have AF can live normal, active lives.
- Exercise is one of the best ways to prevent AF.
- However, because AF causes reduced cardiac output, exercise capacity, and fatigue, it may be difficult for an individual with AF to exercise.



# Effects of Exercise

- Most notable feature in clients with AF is a rapid, irregular ventricular response.
- HR in individuals with AF is comparatively high at any level of exercise.
- It is important to take into consideration any medications they may be taking, such as beta blockers, etc. and the effect that these have on exercise.
- Exercise tolerance is typically 20% lower than age-matched normal subjects.
- However, AF alone (no underlying CAD) achieve peak oxygen consumption values typical of age-matched subject in normal sinus rhythm.
- Determination of systolic blood pressure can be difficult.

# Effects of Exercise Training

- Insufficient scientific literature is available concerning the effects of exercise training specifically in patients with AF.
- Major concern in terms of exercise training in clients with AF is the underlying heart disease, particularly valvular disease, chronic heart failure, and CAD.
  - The presence of these underlying diseases should be the foremost consideration in exercise programming for individuals with AF.

# Exercise Testing

- Maximal exercise testing can be safely performed to objectively characterize the functional capabilities of individuals with AF.
- Exercise testing can be helpful in determining the effectiveness of rate control therapy.
- Reduction in exercise capacity associated with AF is a direct function of the underlying heart disease.
  - Therefore, moderately incremented protocols such as the Naughton or ramp are recommended.
  - Contraindications to exercise testing related to comorbidities and other underlying conditions, such as stability of chronic heart failure, etc. should take precedence over AF itself.
  - In absence of other clinical indications for stopping, clients with AF may be safely taken to fatigue or shortness of breath endpoints.

# Exercise Testing

- Age- predicted maximal heart rate targets are particularly USELESS in AF because of the rapid and highly variable ventricular response. HR most accurately measured using calipers over at least a 6 s rhythm strip during exercise.
- BP may also be difficult to receive.

# Exercise Testing

Methods	Measures	Endpoints
Aerobic- cycle (ramp protocol 10-15 W/min; staged protocol 20-30 W/min stage)	12-lead ECG, HR	<ul style="list-style-type: none"> <li>•Serious dysrhythmias</li> <li>•&gt;2 mm ST-segment depression or elevation</li> <li>•Ischemic threshold</li> <li>•T-wave inversion with significant ST change</li> <li>•SBP 250 mmHG or DBP &gt;115 mmHg</li> <li>•+3 or greater on +1 to +4 angina scale</li> </ul>
Endurance- 6 min walk	Distance walked	Rest stops allowed; note stops in record
Flexibility- goniometry	Angle of flexion/extension	

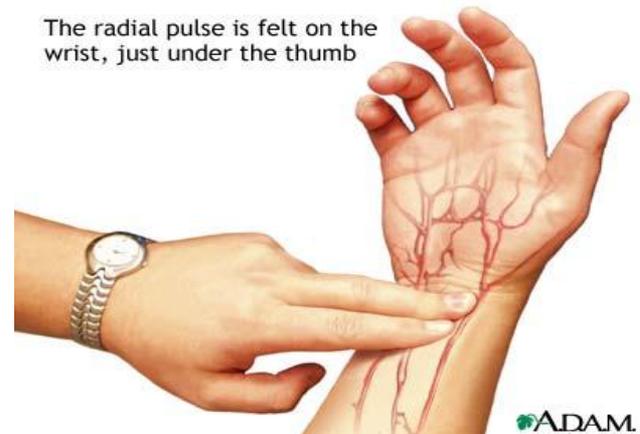
# Exercise Prescription

- As population ages, # of individuals with AF will increase. 2 major factors to consider in exercise programming are:
  - 1. Concomitant or underlying heart disease
  - 2. Inherent unreliability of the pulse rate for prescribing exercise intensity.
- Goals can also change if patient has experienced a stroke.
- Exercise intensity should be prescribed based on work rate and perceived exertion levels (RPE).
- Frequency, duration, intensity, and progression of exercise are similar to those for clients in normal sinus rhythm referred to a rehabilitation program.

# Exercise Prescription

- AF can be intermittent and therefore the rhythm should be determined on a daily basis.
- Many patients with AF will be elderly and comorbid conditions such as osteoporosis, diabetes, obesity, etc. must be considered.
- Longer sampling of the pulse may be needed for reliable HR.

The radial pulse is felt on the wrist, just under the thumb



# Exercise Prescription

Modes	Goals	Int/Freq/Dur	Time to goal
Aerobic- large muscle activities •Arm/leg ergometry	•Increase VO2 peak •Increase ADLs	•RPE 11-16/20 •50-80% VO2 peak or HR reserve •3-7 days/week •30-45 min/session	3 months
Resistance- Weight machines	Increase strength	•High reps, low resistance (12-15 reps) •2-3 nonconsecutive days/week	2-3 months
Flexibility- upper & lower body ROM activities	•Increase flexibility •Reduce risk of injury	•3-5 days/week	2-4 months

# Summary

- Atrial fibrillation is the most common cardiac arrhythmia that has to do with a disruption in the internal electrical system of the heart. The two upper chambers and lower chambers no longer work in a coordinated fashion.
- Concern in AF individuals is blood is not able to adequately be pumped out of the heart. Complications can be heart damage resulting in a heart attack as well as clots that can travel as an embolus to the brain and cause a stroke.
- 2.2 million individuals in U.S. Incidence increases with age and prevalence is 8% over 80 yrs. Males more likely.
- Causes can include hypertension, primary heart disease, previous heart surgery, hyperthyroidism, and family history.
- Risk factors include obesity, high BP, sleep apnea, metabolic syndrome, high steroid therapy treatment, hyperthyroidism, diabetes, alcohol, caffeine.
- 3 types of atrial fibrillation. Paroxysmal, Persistent, Permanent
- Signs/symptoms- palpitations, shortness of breath, weakness, difficulty exercising, chest pain, dizziness or fainting, fatigue, confusion

# Summary

- Diagnosis can be by an EKG, stress test, echocardiography, TEE, chest x ray, blood tests.
- Treatments can include blood clot prevention with blood thinners, rate control, rhythm control
- Procedures include electrical cardioversion, TEE, catheter ablation, “maze” surgery.
- Effects of exercise reduced cardiac output & ex. Capacity. Fatigue. Rapid & irregular ventricular response. Increased heart rate.
- Need to remember to take into consideration any medications. 20% lower exercise tolerance
- Major concern in ex. Training is underlying HD.
- In exercise testing you cannot rely on age related HR values. BP can be unreliable as well. RPE.
- Foremost concern is underlying heart disease and if ruled out, safe to test AF clients to shortness of breath or fatigue. Naughton or ramp tests.
- Exercise prescription should take into consideration the individual and any underlying issues that may come with them.

# References

- Durstine, Larry J., Moore, Geoffrey E., Painter, Patricia L. (2009). ACSM'S Exercise Management for Persons With Chronic Diseases and Disabilities. United States of America: Kerry O'Rourke.
- Snow, Vincenza, Weiss, Kevin B., LeFebvre, Michale, McNarmara, Robert, Bass, Eric, Green, Lee A., Michl, Keith, Owens, Douglas K., Susman, Jeffrey, Allen, Deborah I., Mottur-Pilson, Christel. (2003). Management of Newly Detected Atrial Fibrillation: Clinical Practice Guideline from the American Academy of Family Physicians and the American College of Physicians. *Annals of Internal Medicine*, 139, 1009-1015.
- Fluster, Valentin, Ryden, Lars E., Crikns, Harry J., Ellenbogen, Kenneth A., Kay, Neal G., Prystowsky, Eric N. (2006). ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation. *ACC/AHA/ESC Practice Guidelines*, 114, 257-354
- Atrial Fibrillation. *National Heart Lung and Blood Institute* . Retrieved February 3, 2011 from: [http://www.nhlbi.nih.gov/health/dci/Diseases/af/af\\_what.html](http://www.nhlbi.nih.gov/health/dci/Diseases/af/af_what.html)
- How Exercise Helps Atrial Fibrillation. *Heart Health Center*. (2008). Retrieved February 3, 2011 from: <http://heartdisease.about.com/lw/Health-Medicine/Conditions-and-diseases/How-Exercise-Helps-Atrial-Fibrillation>
- Atrial Fibrillation. *American Heart Association*. (2011). Retrieved February 3, 2011 from: <http://www.americanheart.org/presenter.jhtml?identifier=4451>
- Atrial Fibrillation. *Wikipedia*. (2011). Retrieved February 1, 2011 from: [http://en.wikipedia.org/wiki/Atrial\\_fibrillation](http://en.wikipedia.org/wiki/Atrial_fibrillation)
- Ehrat, Karen S. (1978). THE ART OF ADULT AND PEDIATRIC EKG INTERPRETATION A Self-Instructional Text for Health Care Professionals and Related Genera. Tucson, Arizona: Kendall/Hunt Publishing Company.