Anticoagulation Considerations with Cardioversion

For all patients with AF for > 48 hours, or when AF duration is unknown, 3 weeks of therapeutic anticoagulation before cardioversion is recommended. CV

TEE can be used to assess the LA for thrombi in an attempt to identify a patient who is at risk for stroke even if they are not known to have AF. CV

The CHADS2 score is a useful tool for predicting stroke risk in patients with AF. CV

CHADS2 Score

Congestive Heart Failure 1
Hypertension 1
Age > 75 Years 2
Diabetes Mellitus 1
Previous Stroke in the past 2

Score: 0-1 Low risk, 2-3 Intermediate risk, 4-6 High risk, 7-9 Very high risk

Antithrombotic therapy is recommended for patients with AF who are elderly and asymptomatic.

AF 360º is an initiative of the Heart Rhythm Society, the world’s largest professional society devoted to Atrial Fibrillation (AF). AF 360º is dedicated to sharing up-to-date and relevant information and education on Atrial Fibrillation (AF) and Heart Rhythm Management (HRM), including and open forum for the global discussion of current topics and future opportunities. The AF 360º website is a valuable resource for physicians, patients, and caregivers. More than 40,000 healthcare professionals from around the world visit the site each month. For more information, contact Heart Rhythm Society at www.HRSonline.org.

AF 360º provides a unique, trusted resource for physicians, patients, and caregivers interested in the latest information and treatment options available. The AF 360º website is a collaborative effort, with assistance from multiple organizations, including the Heart Rhythm Society, the American College of Cardiology, the American Heart Association, and the American Academy of Family Physicians. For more information, visit the Heart Rhythm Society website at www.HRSonline.org.

For updated information, contact Heart Rhythm Society at www.HRSonline.org.


Practical Rate and Rhythm Management: Updated April 2010

Adapted from the ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation www.HRSOnline.org

Rate and Rhythm Control

The ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation recommend a three-pronged approach to AF management:

(1) Rate Control, (2) Rhythm Control, and (3) Prevention of Thromboembolism.

A comprehensive treatment plan must address the three components of AF management: (1) control of ventricular rate, (2) control of atrial rates, and (3) prevention of thromboembolism.

Goals of the treatment protocol include: stroke prevention, and a reduction in hospitalizations.

Hospitalization should be considered in patients who are significantly symptomatic, hemodynamically unstable, or before initiation of antithrombotic therapy.

Electrical CV can be performed as an outpatient procedure.

When the rate of AF is atrioventricular (AV) conduction, no long-term therapy may be necessary.

Patients whose symptoms are severe and atrioventricular (AV) conduction is not sufficient to meet the patient’s needs may require an implantable cardioverter-defibrillator.

General Approach (Continued)

• Restoration and maintenance of sinus rhythm continues to be a reasonable long-term goal.

• If rate control offers inadequate symptomatic relief, restoration of SR may become a long-term goal.

• Antithrombotic therapy is recommended for patients with atrial flutter as for patients with AF.

• Anticoagulation must be continued for at least 4 weeks after treatment approach in many patients with AF.

• Patients with AF who have hypertrophic cardiomyopathy, mitral stenosis, or a mechanical valve should be treated with warfarin.

• Patients who are elderly and asymptomatic.

• Antithrombotic therapy to prevent thromboembolism is recommended for all patients with AF regardless of whether a rhythm or rate control strategy is chosen, except those with low thromboembolic risk.

• Aspirin alone is not a substitute for warfarin. However, in the ACTIVE-A trial, aspirin combined with warfarin was more effective than aspirin alone in preventing strokes in high-risk patients who were not suitable for warfarin therapy, but caused more bleeding than aspirin alone.

• Antithrombotic therapy is recommended for patients with atrial flutter as for those with AF.

• Patients with AF who do not have mechanical valves, it is reasonable to interrupt anticoagulation for a short period of time without withholding heparin for procedures that carry a risk of bleeding.

• Alternatives to warfarin, including factor Xa and direct thrombin inhibitors, are being investigated.

• Patients with AF who have hypercoagulable states, mechanical valves, or a mechanical valve should be treated with warfarin.

Dosing Guide for Drugs Commonly Used to Treat AF

Heart Rate Control

<table>
<thead>
<tr>
<th>Drug</th>
<th>Loading Dose/IV Maintenance Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iabutil</td>
<td>1mg over 10 minutes, while observing for QTc prolongation and atrioventricular synchronous pacing. Do not repeat more than 10 minutes after the first dose or if the QTc interval increases.</td>
</tr>
<tr>
<td>Digoxin</td>
<td>0.5-2mg/day, up to 2mg/day to control heart rate</td>
</tr>
<tr>
<td>Metoprolol</td>
<td>120-480mg/day (slow release available and preferred)</td>
</tr>
<tr>
<td>Sotalol</td>
<td>80-160mg, to a maximum of 320mg every 12 hours</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125-25mg every 12 hrs (up to 50mg every 12 hrs for patients with heart failure)</td>
</tr>
<tr>
<td>Diltiazem</td>
<td>0.25 mg/kg (avg. 20mg) over 2 min (2nd bolus can be given if necessary)</td>
</tr>
<tr>
<td>Ibutilitide</td>
<td>1mg over 10 minutes, while observing for QTc prolongation and inhibition of the pacemaker to expose AF activity.</td>
</tr>
<tr>
<td>Flecainide</td>
<td>50-150 mg every 12 hrs</td>
</tr>
<tr>
<td>Dofetilide</td>
<td>125-500mcg every 12 hours, based on renal function</td>
</tr>
<tr>
<td>Dronedarone</td>
<td>400mg twice daily, with meals</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125-25mg every 12 hrs (up to 50mg every 12 hrs for patients with heart failure)</td>
</tr>
<tr>
<td>Metoprolol</td>
<td>2.5-5mg bolus over 2 min (up to 3 doses)</td>
</tr>
<tr>
<td>Esmolol</td>
<td>500 mcg/kg, then 50-200 mcg/kg/min</td>
</tr>
<tr>
<td>Ibutilitide</td>
<td>1mg over 10 minutes, while observing for QTc prolongation and inhibition of the pacemaker to expose AF activity.</td>
</tr>
<tr>
<td>Propafenone</td>
<td>150-300 mg every 4-6 hrs, or sustained release 800-1200mg every 12 hours</td>
</tr>
<tr>
<td>Sotalol</td>
<td>80-160mg, to a maximum of 320mg every 12 hours</td>
</tr>
<tr>
<td>Ibutilitide</td>
<td>1mg over 10 minutes, while observing for QTc prolongation and inhibition of the pacemaker to expose AF activity.</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125-25mg every 12 hrs (up to 50mg every 12 hrs for patients with heart failure)</td>
</tr>
</tbody>
</table>

General Approach to the Patient with AF

1. Establish an Accurate Diagnosis of AF
2. Determine Symptoms, Clinical History, and AF Pattern
3. Exclude Structural Heart Disease
4. Identify Correctable Secondary Causes
5. Develop a Treatment Strategy

CHADS2 Risk Criteria Score

- 1 point: Age ≥ 75 Years
- 1 point: Diabetes Mellitus
- 1 point: Hypertension
- 1 point: Congestive Heart Failure

Total Score

0 points: Minimal risk
1 point: Low risk
2 points: Intermediate risk
3-6 points: High risk

AV Nodal Reentry
**GENERAL APPROACH (CONTINUED)**

**Rate and Rhythm Control**

- **AFIRM, RACE, and AF-CHF trials have shown no mortality benefit to a rhythm control strategy compared to a rate control strategy.**
- **Therefore, a rate control strategy, without attempts at restoration or maintenance of sinus rhythm (SR), is reasonable. Patients with AF, especially those who are elderly and asymptomatic,**

  - **If rate control offers inadequate symptomatic relief, restoration of SR may become a long-term goal.**

- **Ritiation and maintenance of sinus rhythm continues to be a reasonable treatment approach in many patients with AF.**

**Stoke Prevention**

- **Aspirin or clopidogrel is not a substitute for warfarin. However, in the ACTIVE-A trial, aspirin combined with clopidogrel was more effective than aspirin alone in preventing strokes in high-risk patients who were not suitable for warfarin therapy, but caused more excess bleeding than aspirin alone.**

- **Antithrombotic therapy is recommended for patients with atrial flutter as well as those with AF.**

  - **In patients with AF who do not have mechanical valves, it is reasonable to interrupt anticoagulation for interventional procedures that carry a risk of bleeding.**

  - **Alternatives to warfarin, including factor Xa and direct thrombin inhibitors, are being investigated.**

  - **Patients with AF who have hypertrophic cardiomyopathy, mitral stenosis, or a mechanical valve should be treated with warfarin.**

- **The CHADS2 scoring system can be used to risk stratify patients with nonvalvular AF to determine the need for warfarin. The annual risk of stroke with a CHADS2 score of 0 is 1.9%, but the annual risk of stroke with a CHADS2 score of 2 is 6.9%.**

**Anticoagulant Considerations with Cardioversion**

- **For all patients with AF for > 48 hours, or when AF duration is uncertain, 3 weeks of parenteral anticoagulation (preferably with warfarin) prior to CV.**

- **TEE can be used to assess the LA for thrombus or, alternatively, 3 weeks of anticoagulation, but, in principle, should be followed with concomitantly anticoagulated with warfarin or heparin at the time of CV.**

- **Anticoagulation must be maintained after the CV regardless of the use of TEE before CV. Anticoagulation after 6 weeks is dependent upon CHADS2 score.**

**DOSING GUIDELINE FOR DRUGS COMMONLY USED TO TREAT AF**

**Heart Rate Control**

**Vaughan Williams Class I**

- TIA: 100-120 mg every 12 hrs

- Paroxysmal: 150-300 mg every 8 hrs, or sustained releases 600-1200 mg over 12 hrs

**Vaughan Williams Class II**

- Ibutilide IV: 1 mg over 10 minutes, while observing for QTc prolongation and monitoring for AV nodal blocking

- Dofetilide IV: 300-600 mcg over 10 minutes, while monitoring for QTc prolongation and AV nodal blocking

- Flecainide IV: 150-225 mg every 12 hrs, or sustained releases 300-450 mg over 12 hrs

**Heart Rate Control**

**Diuretics**

- 1 mg over 10 minutes, while observing for AV block and with a loading dose of 10 mg over 30 minutes, the risk of AV block increases

- 1 mg over 10 minutes, a maximum of 3 mg every 2 hrs, based on renal function

- 1 mg over 10 minutes, based on renal function

- 1 mg/12 hours, based on renal function

- 1 mg/12 hours, based on renal function

**Digoxin IV**

- 0.25 mg q2hrs (up to 1.5 mg), then 0.125-0.375 mg daily

**Atenolol PO**

- 25-100 mg daily

**Drugs Used to Treat AF**

**AF 360º is an initiative of the Heart Rhythm Society, the world's leading professional society for improving the care of cardiac rhythm patients by promoting science, education and optimal patient care.**

**Practical Rate and Rhythm Management**

**UPDAtED JANUARY 2010**

Adapted from the ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation WWW.HRS ONLINE.ORG

**POCKET GUIDE**

**Practical Rate and Rhythm Management in Atrial Fibrillation**

**Editor: Bradley P. Knight, MD, FHRS**

Assistant Editors: Matthew Barnettino, MD, M. Craig DeLaughter, MD, Ph.D., Dipak P. Shah, MD

**AF 360º provides a single, trusted resource for practitioners and their patients.**

**The Practical Rate and Rhythm Management in Atrial Fibrillation Pocket Guide was adapted from the ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation (www.HRSonline.org) and the 2006 AF 360º Guidelines for Practical Rate and Rhythm Management in Atrial Fibrillation.**

**For more information, contact Heart Rhythm Society at www.HRSonline.org.**

**AF 360º is a registered trademark of the Heart Rhythm Society.**

**©2010 Heart Rhythm Society.**

**For additional information, contact the Heart Rhythm Society at www.HRSonline.org.**
**Anticoagulation Considerations with Cardioversion**

**GENERAL APPROACH TO THE PATIENT WITH AF**

- Establish an Accurate Diagnosis of AF
  - AF is characterized by representation of consistent P waves with fibrillatory waves, varying in amplitude, shape, and timing.
  - The ventricular response is chaotic and frequently rapid when atrioventricular conduction is intact.
  - In patients with paroxysmal, diagnosis of AF may require temporary inhibition of the pacemaker to expose AF activity.
  - AF should be distinguished from atrial flutter, which has regular organized atrial activity with a rate typically between 240 and 250 bpm, multiform atrial tachycardia, which has a slow and irregular multiple atrial focus, atrial fibrillation in each QRS, and regular supraventricular tachycardias such as AV nodal reentry.

- Determine Symptoms, Clinical History, and AF Pattern
  - Clinical type of AF should be classified as:
    - Paroxysmal (≤7 days), which requires intervention for termination.
    - Persistent (≥7 days), which requires intervention for termination.
    - Permanent, which is refractory to cardioversion (CV) or accepted as a final rhythm.
  - The onset of the current episode, if persistent
  - Presence and nature of symptoms associated with AF
  - Frequency, distribution, precipitating factors, and mode of termination of AF
  - Presence of other symptoms that might indicate an etiology
  - History of prior evaluation and response to prior management
  - An event recorder can be useful when trying to correlate symptoms with rhythms

- Exclude Structural Heart Disease
  - Patients who initially present with AF should be evaluated for concomitant structural heart disease. The presence or absence of heart disease will help individualize AF management.
  - Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF

- Identify Correctable Secondary Causes
  - Rule out potentially correctable causes such as sleep apnea, hypertension, WPIV, and drug or alcohol use

- Develop a Treatment Strategy
  - Management Principles
    - A comprehensive treatment plan must address the three cornerstones of AF management: (1) control of AF; (2) rhythm control; and (3) prevention of thromboembolism.
    - Goals of therapy include symptom control, stroke prevention, and a reduction in hospitalizations.
    - Hospitalization should be considered in patients who are significantly symptomatic, hemodynamically unstable, or before initiation of any chronic antiarrhythmic therapy.
    - Electrical CV can be performed as an outpatient procedure.
    - When the rate of AF is over 150 bpm after cardiac surgery, no long-term therapy may be necessary.
    - Patients who have chronic atrial fibrillation and are difficult to manage should be referred to an electrophysiologist.
**VENTRICULAR RATE CONTROL**

Principles of Rate Control Strategy

- Adequate control of the ventricular rate during AF can significantly improve symptoms and preserve preserved left ventricular function during a heart attack.
- Most patients have managed using a rhythm control strategy also require medications to control ventricular rate.

**Rate Control per the ACC/AHA Guidelines**

- For the AFFIRM trial, adequate control was defined as an average HR up to 85 ppm. For the Atrial Fibrillation Follow-Up Investigation of Rhythm Management (AFFIRM) trial, adequate control was defined with no more than 50% of the maximum age-adjusted predicted exercise HR, or 120 ppm if the patient had a low exercise capacity.
- In the RACE trial, rate control was defined as less than 100 ppm at rest. Only 5% of patients had mean AV block to achieve adequate rate control.

**Drugs to Control the Ventricular Response**

- Beta blockers are the most effective drug class for rate control.
- Digoxin is often used as a diuretic in patients with AF, but it may also have some rate control effects.
- Ventricular blocking agents (e.g., diltiazem, verapamil) can also be used.

**What is Adequate Rate Control?**

- Ventricular rate control
  - Criteria for rate control vary with patient age but usually involve achieving ventricular rates between 60 and 80 ppm at rest and between 90 and 115 ppm during moderate exercise.

**MAINTENANCE OF SINUS RHYTHM**

Principles of Antithrombotic Drug Therapy

- Pharmacological therapy to maintain sinus rhythm may be considered in patients who have a significant stroke or thromboembolism risk.
- Electrical CV is contraindicated in patients with digitalis toxicity or hypokalemia.
- Catheter ablation of the AV node should not be attempted without a prior trial of rate control therapy to control the rate.

**SPECIFIC ANTIARRHYTHMIC DRUGS**

Flecainide / Propafenone

- Flecainide is a class IC drug that delays conduction velocity by blocking sodium channels. Propafenone is also a class IC drug that also exerts mild beta-blocking effects. These drugs can prolong the sinus node firing time to prevent recurrence of AF. They are especially useful in patients with ischemic heart disease or left ventricular dysfunction, or if the risk of poor outcome is high.

- Rate control during AF results in a higher risk of proarrhythmia. This is especially true when used with amiodarone.

Sotalol

- Sotalol is a mixed beta-blocker and class III antiarrhythmic agent. It prolongs atrial effective refractory period and prolongs the atrial refractory period by blocking class III activity of the drug.

- It is contraindicated in patients with NYHA Class IV heart failure, with a CHADS2 score > 1 regardless of the outcome after ablation.

Dronedarone

- Dronedarone is a nonselective beta-blocking drug with class III antiarrhythmic activity that can be used as an antiarrhythmic agent for the prevention of atrial fibrillation. It is also used to prevent recurrence of atrial fibrillation. Dronedarone should be avoided in patients with atrioventricular conduction disease and in patients with a CHADS2 score > 1.

- Long-term oral anticoagulation should be considered in patients with atrial fibrillation and if the patient is at high risk of cardioembolic stroke.

- Dronedarone is a drug with many contraindications, including atrial fibrillation.

- Patients should be anticoagulated with warfarin for at least two months after discontinuation of antiarrhythmic therapy. Dronedarone is contraindicated in patients with atrial fibrillation who are at high risk of cardioembolic stroke and have a CHADS2 score > 1.

- Catheter ablation of the atrial fibrillation is an option for patients who have rapid ventricular rates despite sinus rhythm drug therapy.

**CATHETER ABLATION FOR AF**

- The pulmonary veins (PVs) are an important source of triggered activity and reentry in patients with AF. Electrical PV isolation from the LA using catheter ablation eliminates AF in some patients.

- Catheter ablation of the AV node requires transvenous catheterization and has evolved from early attempts to target individual ectopic foci within the PV to complete isolation of the PVs. There are many catheter ablation and surgical techniques available, each with its own benefits and risks.

- Catheter ablation has been proven to be effective and is currently considered a first-line therapy in patients who continue to be both highly symptomatic despite a trial of one or more antiarrhythmic drugs.

- In patients, especially young individuals with a very high risk of mortality, AF ablation may be preferred over years of drug therapy.

- The success rate for isolation varies from 60% to 90%, with a repeat procedure rate of 30% to 40%.

- Catheter ablation is recommended as an option for patients who have rapid ventricular rates despite sinus rhythm drug therapy.

- Catheter ablation of the atrial fibrillation is an option for patients who have rapid ventricular rates despite sinus rhythm drug therapy.

- Catheter ablation of the PVs is an option for patients who have rapid ventricular rates despite sinus rhythm drug therapy.

- Patients with paroxysmal atrial fibrillation may be suitable for catheter ablation, but the long-term success rate is lower than with patients with persistent atrial fibrillation.
**VENTRICULAR RATE CONTROL**

**Principles of Rate Control Strategy**

- Adequate control of the ventricular response during AF can significantly improve symptoms and survival in patients during a heart attack.
- Most patients managed using a rhythm control strategy also require medications to control the ventricular rate.

- Rate control during atrial flutter is more difficult than during AF.

**What is Adequate Rate Control?**

- Adequate control of the ventricular response is important if patients are to maintain sinus rhythm.
- Rate control is also required in the absence of sinus rhythm.

**Drugs to Control the Ventricular Response**

- Rate control may be achieved by a combination of drugs or an electrical cardioversion.
- The use of a biphasic defibrillator should be considered.
- Direct-current cardioversion is more effective than pharmacological cardioversion.

- Be prepared for significant sinus bradycardia after cardioversion.
- The primary disadvantage of electrical cardioversion is that it requires sedation or anesthesia.

**Pharmacological Cardioversion**

- Rate control during atrial flutter tends to be more difficult than during AF.

**Principles of Cardioversion**

- In cases of early relapse of AF after CV, repeated direct-current CV attempts may be necessary.
- The use of a biphasic defibrillator should be considered.

**AV Nodal Ablation**

- There is growing concern about the negative effects of long-term RV pacing.
- Catheter ablation of the AV node should not be attempted without a prior trial of medical management to control the rate.

**MAINTENANCE OF SINUS RHYTHM**

**Principles of Antiarrhythmic Drug Therapy**

- The reasons for ineffective antiarrhythmic therapy are multifactorial.
- Drug choice should be individualized to the patient's needs.

**SPECIFIC ANTIARRHYTHMIC DRUGS**

- Sotalol: A nonselective beta-blocking drug with class III antiarrhythmic activity that is useful as a monotherapy for maintenance of sinus rhythm.
- Dronedarone: A novel antiarrhythmic drug that is not indicated for treatment failure of rhythm control.

**Restoration of Sinus Rhythm**

- Propafenone is a class IC drug that delays conduction velocity by blocking sodium channels.
- Propafenone also exerts mild beta-blocking effects.

**Atrial Tachyarrhythmias**

- Atrial fibrillation is the most common tachyarrhythmia in patients with heart failure.
- Propafenone is a nonselective beta-blocking drug that also exerts mild beta-blocking effects.

**Dofetilide**

- Dofetilide is a pure class III drug that prolongs the APD and refractory period of the AV node.
- Dofetilide is generally reserved for patients with paroxysmal or persistent AF who have failed other antiarrhythmic therapy.

**Rate Control When AF Recurs**

- Rate control when AF recurs can be achieved by a combination of drugs or electrical cardioversion.

**CATHETER ABLATION FOR AF**

- The pulmonary veins (PVs) are an important source of triggered activity and reentry in patients with AF.
- Electrical cardioversion from the LA using catheter ablation eliminates AF in some patients.

- Catheter ablation for AF requires transseptal catheterization and has evolved from early attempts to target individual ectopic foci in the PV to continuous or sequential ablation of PV triggers.
- There are many catheter and surgical techniques available, including surgical pulmonary vein isolation.

- Catheter ablation has been proven to be effective and is currently considered a second-line therapy in patients who continue to be highly symptomatic despite a trial of one or more antiarrhythmic drugs.

- In some patients with AF, especially young individuals with very symptomatic AF, ablation may be preferred over years of drug therapy.

- Catheter ablation is associated with arrhythmia recurrence rates from 40% to 60%.

- Catheter ablation is a repeatable procedure in patients with recurrence.

- Patients with paroxysmal AF and minimal heart disease have better outcomes compared to patients with long-standing persistent AF and left atrial enlargement.

- The major complications range from 2-3%.

- Complications include cardiac tamponade, vascular access complications, PV stenosis, stroke, left atrial appendage rupture, phrenic nerve injury, catheter entanglement in the mitral valve, and left atrial flutter.

- Atrial tachycardia may recur within the first two months after ablation due to incomplete ablation of the PVs or atrial flutter.

- Patients should be anticoagulated with warfarin for at least two months after ablation and maintained at a target INR of 2.0–3.0, or with a CHADS2 score > 1 regardless of the outcome after ablation.

- A left atrial appendage exclusion device is recommended for patients with a CHADS2 score ≥ 1 or symptomatic atrial fibrillation.

- Catheter ablation of the cavotricuspid isthmus should be considered first line therapy for patients with typical atrial flutter.

**Atrial Fibrillation: Why Is It Such a Big Problem?**

- AF is a common and serious heart rhythm disorder that affects millions of people worldwide.

- AF can increase the risk of stroke, heart failure, and other serious health problems.

- The cause of AF is not fully understood and can be triggered by various factors such as heart disease, hypertension, or stress.

- The treatment of AF depends on the severity of symptoms and the underlying cause.

- The most common treatments include medication, lifestyle changes, and procedures such as pacemakers or heart surgeries.

- It is important to consult with a healthcare professional to determine the best course of action for managing AF.
**DIRECT CURRENT CARDBIOVERSION**

- Electrical CV is contraindicated in patients with digitalis toxicity or hypokalemia.
- In case of early relapse of AF after CV, repeated direct-current CV attempts may be attempted.
- IV ibutilide is an effective drug available to convert AF.
- The more recent the onset of AF, the more effective is pharmacological CV.
- The risk of thromboembolism or stroke does not differ between pharmacological and electrical CV.
- It is contraindicated when a history of bradycardia after CV in patients on high-dose AV nodal blocking drugs.

**MAINTENANCE OF SINUS RHYTHM**

- Beta-blockers and calcium channel antagonists should be used cautiously in patients with asthma, HF, renal insufficiency, or QT prolongation.
- Amiodarone should rarely be used for AF, despite its efficacy in conversion, because it has a risk of prolonging QT interval and the risk of cardiomyopathy.
- Asthma, HF, abnormal cardiac conduction, atrial fibrillation, atrial flutter, or congenital heart disease are relative contraindications.
- Dronedarone is effective in reducing atrial fibrillation episodes in patients with persistent AF, but it is associated with a higher risk of severe adverse events than other antiarrhythmic drugs.
- Atrial fibrillation should be treated with a combination of rate and rhythm control, including anticoagulation, beta-blockers, and/or amiodarone.
- Antiarrhythmic drugs that are used to maintain sinus rhythm, such as sotalol, dronedarone, and amiodarone, also provide some control of the ventricular response when patients are in AF.
Restoration of Sinus Rhythm

Principles of Rhythm Control
- Adequate control of the ventricular response during AF can significantly improve symptoms and in some cases restore sinus rhythm.
- Many patients are managed using a rhythm control strategy, often supported by catheter ablation to achieve better control.

- Rate control during atrial flutter is substantially more difficult than during AF.

What is Rate-Adaptive Control?
- Continuous atrial fibrillation can improve both long and medium-term outcomes.

- No consistent method for assessment of heart rate (HR) control has been established.

- Most patients managed using a rhythm control strategy also require medications other than antiarrhythmic drugs for maintenance of sinus rhythm.

Drugs to Control the Ventricular Response
- Amiodarone blocks the most effective drug class for rate control.
- Digoxin provides relatively poor control of heart rate and should be reserved for patients with systolic dysfunction.

- For the AFBMR trial, adequate control was defined as an average HR up to 81 bpm on digitalis and up to 110 bpm on beta blockers with no rate above 100% of the maximum age-adjusted predicted exercise HR, or 100% for women.
- In the RACE trial, rate control was defined as less than 100 bpm at rest. Only about 5% of patients failed to achieve adequate AV nodal block to achieve better control.

For catheter ablation, the AV node should not be ablated without a prior trial of medications to control the rate.
Anticoagulation Considerations with Cardioversion

**GEnERAL APPRoACH (Continued)**

• If rate control offers inadequate symptomatic relief, restoration of SR may become a long-term goal.

• Restoration and maintenance of sinus rhythm continues to be a reasonable treatment approach in many patients with AF.

**Stoke Prevention**

• Antithrombotic therapy to prevent thromboembolism is recommended for all patients with AF, regardless of whether a rhythm or rate control strategy is chosen, except those with low stroke risk and without a high bleeding risk.

• Aspirin plus clopidogrel is not a substitute for warfarin. However, in the ACTIVE-A trial, aspirin combined with clopidogrel was more efficacious than aspirin alone in preventing strokes in high-risk patients who were not suitable for warfarin therapy, but caused more major bleeding than aspirin alone.

• Antithrombotic therapy is recommended for patients with atrial flutter as well as those with AF.

• In patients with AF who do not have mechanical valves, it is reasonable to interrupt anticoagulation for up to 1 week without substituting heparin for warfarin therapy, but causes more major bleeding than aspirin alone.

• Anticoagulation with warfarin or heparin at the time of CV.

**Heart Rate Control**

**Vaughan-Williams Class I**

- Flecainide IV: 150-300 mg every 6-8 hours
- Propafenone PO: 150-300 mg every 8 hrs, or sustained release
- Sotalol PO: 80-160 mg, to a maximum of 320 mg every 12 hours
- Amiodarone IV: 150 mg over 10 min, then 0.5-1 mg/min

**Vaughan-Williams Class II**

- Verapamil IV: 0.075-0.15 mg/kg over 2 min
- Esmolol IV: 500 mcg/kg, then 50-200 mcg/kg/min
- Metoprolol IV: 2.5-5 mg bolus over 2 min
- Digoxin IV: 0.25 mg q2hrs (up to 1.5mg), then 0.125-0.375 mg daily

**DRUG HRS IV LOADING DOSE & IV MAINTENANCE DOSE**

- Propafenone: 150 mg over 10 min, then 0.5-1mg/min
- Verapamil: 0.075-0.15 mg/kg over 2 min
- Esmolol: 500 mcg/kg, then 50-200 mcg/kg/min
- Metoprolol: 2.5-5 mg bolus over 2 min
- Digoxin: 0.25 mg q2hrs (up to 1.5mg), then 0.125-0.375 mg daily

**Heart Rhythm Control**

**Diagnosis of Drugs Commonly Used to Treat AF**

**HRS LV Loading DOSE & IV Maintenance DOSE**

**Heart Rate Control**

- Flecainide IV: 300 mg loading dose 300 mg/m2/hr
- Propafenone PO: 150 mg PO every 6 hours
- Sotalol PO: 40-80 mg every 6 hours
- Amiodarone IV: 150 mg over 10 min, then 0.5 mg/min
- Verapamil IV: 0.075 mg/kg over 2 min
- Esmolol IV: 500 mcg/kg, then 50-200 mcg/kg/min
- Metoprolol IV: 2.5-5 mg bolus over 2 min
- Digoxin IV: 0.25 mg q2hrs (up to 1.5mg), then 0.125-0.375 mg daily

**Prevention**

- Patients with AF who have hypertrophic cardiomyopathy, mitral stenosis, or a mechanical valve should be treated with warfarin.

- The CHADS2 scoring system can be used to risk stratify patients with nonvalvular AF to determine the need for anticoagulation. The annual risk of stroke with CHADS2 score of 0 is 1.9%, but the annual risk of stroke with a CHADS2 score of 2 or more is dependent upon CHADS2 score.

- AF is characterized by replacement of consistent P waves with fibrillatory waves, varying in amplitude, shape, and timing.

- AV nodal reentry.

- WPW, and drug or alcohol use.

- Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF.

- Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF.

- Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF.

- Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF.

- Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF.

- Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF.

- Coronary artery disease should be excluded in patients with risk factors but is rarely a reversible cause of AF.