



Complete Summary

GUIDELINE TITLE

Atrial fibrillation.

BIBLIOGRAPHIC SOURCE(S)

Institute for Clinical Systems Improvement (ICSI). Atrial fibrillation. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2008 Oct. 62 p. [91 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Atrial fibrillation. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2007 Feb. 64 p.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
CONTRAINDICATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY
DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

- Atrial fibrillation
- Atrial flutter

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Prevention

Risk Assessment
Treatment

CLINICAL SPECIALTY

Cardiology
Emergency Medicine
Family Practice
Internal Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Health Care Providers
Health Plans
Hospitals
Managed Care Organizations
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To increase the percentage of adult patients (age 18 years and older) who are accurately diagnosed with atrial fibrillation/flutter
- To improve the consistency of anticoagulation therapy in adult patients (age 18 years and older) with nonvalvular paroxysmal, persistent or permanent atrial fibrillation/atrial flutter
- To improve rate control in adult patients (age 18 years and older) with permanent atrial fibrillation
- To increase the percentage of adult patients (age 18 years and older) with a confirmed diagnosis of atrial fibrillation/atrial flutter who, along with their family, have received education around atrial fibrillation/flutter and anticoagulation therapy
- To reduce the percentage of patient harm associated with the use of anticoagulation therapy
- To increase the percentage of adult patients (age 18 years and older) with a confirmed diagnosis of atrial fibrillation/flutter, receiving dietary monitoring
- To increase the percentage of adult patients (age 18 years and older) with a confirmed diagnosis of atrial fibrillation/flutter who have a medication communication/reconciliation plan throughout the continuum of care

TARGET POPULATION

Adults (age 18 and over) with first detected episode and recurrent (paroxysmal, persistent or permanent) atrial fibrillation and atrial flutter

INTERVENTIONS AND PRACTICES CONSIDERED

Acute Episodes of Atrial Fibrillation

Evaluation

1. Two dimensional (2 D) echocardiogram
2. Thyroid-stimulating hormone (TSH) blood test
3. Estimation of risk of bleeding for short-term anticoagulation

Treatment

Warfarin (unless the short-term risk of bleeding exceeds the risk of thromboemboli [INR greater than or equal to 2.0 for 4 consecutive weeks]) prior to cardioversion and anticoagulation (INR 2.0-3.0) for 8 weeks following cardioversion

Note: Transesophageal echocardiography (TEE)-directed anticoagulation was considered but not recommended.

Chronic Atrial Fibrillation

Evaluation

1. Estimation of risk of thromboembolism—using the congestive heart failure, hypertension, age >75, diabetes, stroke or transient ischemic attack (CHADS2) score
2. Estimation of risk of bleeding for chronic anticoagulation

Treatment

1. Warfarin or aspirin (based on CHADS2 score, unless the long-term risk of bleeding exceeds the risk of thromboemboli)
2. Check international normalized ratio (INR) monthly and as needed.
3. Check resting pulse (less than 80) and assessment of heart rate in active patients
4. Prescribe digoxin alone only if beta-blockers and calcium-channel blockers are contraindicated
5. Rhythm control (with anticoagulation based on CHADS2 score) only if symptoms caused by atrial fibrillation are not adequately controlled with rate control alone.

Note: Warfarin use in patients who require aspirin and clopidogrel was considered but not recommended.

Any History of Atrial Fibrillation

Treatment - Probably Beneficial

1. Aspirin (or warfarin if appropriate) unless contraindicated
2. Beta-blocker
3. Angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB)
4. Statin

MAJOR OUTCOMES CONSIDERED

- Rates of cardioversion
- Symptom control
- Rate and rhythm control
- Rates of recurrence of atrial fibrillation or flutter
- Adverse effects of treatments
- Risk of thromboembolic complications or stroke or major bleeding

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

A literature search of clinical trials, meta-analysis, and systematic reviews is performed.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Key conclusions (as determined by the work group) are supported by a conclusion grading worksheet that summarizes the important studies pertaining to the conclusion. Individual studies are classed according to the system presented below, and are designated as positive, negative, or neutral to reflect the study quality.

Conclusion Grades:

Grade I: The evidence consists of results from studies of strong design for answering the question addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of any significant doubts about generalizability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to have adequate statistical power.

Grade II: The evidence consists of results from studies of strong design for answering the question addressed, but there is some uncertainty attached to the conclusion because of inconsistencies among the results from the studies or because of minor doubts about generalizability, bias, research design flaws, or

adequacy of sample size. Alternatively, the evidence consists solely of results from weaker designs for the question addressed, but the results have been confirmed in separate studies and are consistent with minor exceptions at most.

Grade III: The evidence consists of results from studies of strong design for answering the question addressed, but there is substantial uncertainty attached to the conclusion because of inconsistencies among the results of different studies or because of serious doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from a limited number of studies of weak design for answering the question addressed.

Grade Not Assignable: There is no evidence available that directly supports or refutes the conclusion.

Study Quality Designations:

The quality of the primary research reports and systematic reviews are designated in the following ways on the conclusion grading worksheets:

Positive: indicates that the report or review has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis.

Negative: indicates that these issues (inclusion/exclusion, bias, generalizability, and data collection and analysis) have not been adequately addressed.

Neutral: indicates that the report or review is neither exceptionally strong nor exceptionally weak.

Not Applicable: indicates that the report is not a primary reference or a systematic review and therefore the quality has not been assessed.

Classes of Research Reports:

A. Primary Reports of New Data Collection:

Class A:

- Randomized, controlled trial

Class B:

- Cohort study

Class C:

- Nonrandomized trial with concurrent or historical controls
- Case-control study
- Study of sensitivity and specificity of a diagnostic test
- Population-based descriptive study

Class D:

- Cross-sectional study
- Case series
- Case report

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

Class M:

- Meta-analysis
- Systematic review
- Decision analysis
- Cost-effectiveness analysis

Class R:

- Consensus statement
- Consensus report
- Narrative review

Class X:

- Medical opinion

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Guideline Development Process

Each guideline, order set, and protocol is developed by a 6- to 12-member work group that includes physicians, nurses, pharmacists, other healthcare professionals relevant to the topic, along with an Institute for Clinical Systems Improvement (ICSI) staff facilitator. Ordinarily, one of the physicians will be the leader. Most work group members are recruited from ICSI member organizations, but if there is expertise not represented by ICSI members, 1 or 2 members may be recruited from medical groups or hospitals outside of ICSI.

The work group will meet for seven to eight three-hour meetings to develop the guideline. A literature search and review is performed and the work group members, under the coordination of the ICSI staff facilitator, develop the algorithm and write the annotations and footnotes and literature citations.

Once the final draft copy of the guideline is developed, the guideline goes to the ICSI members for critical review.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Critical Review Process

Every newly developed guideline or a guideline with significant change is sent to ICSI members for Critical Review. The purpose of critical review is to provide an opportunity for the clinicians in the member groups to review the science behind the recommendations and focus on the content of the guideline. Critical review also provides an opportunity for clinicians in each group to come to consensus on feedback they wish to give the work group and to consider changes necessary across systems in their organization to implement the guideline.

All member organizations are expected to respond to critical review guidelines. Critical review of guidelines is a criterion for continued membership within the Institute for Clinical Systems Improvement (ICSI).

After the critical review period, the guideline work group reconvenes to review the comments and make changes, as appropriate. The work group prepares a written response to all comments.

Approval

Each guideline, order set, and protocol is approved by the appropriate steering committee. There is one steering committee each for Respiratory, Cardiovascular, Women's Health, and Preventive Services. The Committee for Evidence-based Practice approves guidelines, order sets, and protocols not associated with a particular category. The steering committees review and approve each guideline based on the following:

- Member comments have been addressed reasonably.

- There is consensus among all ICSI member organizations on the content of the document.
- Within the knowledge of the reviewer, the scientific recommendations within the document are current.
- Either a critical review has been carried out, or to the extent of the knowledge of the reviewer, the changes proposed are sufficiently familiar and sufficiently agreed upon by the users that a new round of critical review is not needed.

Once the guideline, order set, or protocol has been approved, it is posted on the ICSI Web site and released to members for use. Guidelines, order sets, and protocols are reviewed regularly and revised, if warranted.

Revision Process of Existing Guidelines

ICSI scientific documents are revised every 12 to 36 months as indicated by changes in clinical practice and literature. Every 6 months, ICSI checks with the work group to determine if there have been changes in the literature significant enough to cause the document to be revised earlier than scheduled.

Prior to the work group convening to revise the document, ICSI members are asked to review the document and submit comments. During revision, a literature search of clinical trials, meta-analysis, and systematic reviews is performed and reviewed by the work group. The work group will meet for 1-2 three-hour meetings to review the literature, respond to member organization comments, and revise the document as appropriate.

If there are changes or additions to the document that would be unfamiliar or unacceptable to member organizations, it is sent to members to review prior to going to the appropriate steering committee for approval.

Review and Comment Process

ICSI members are asked to review and submit comments for every guideline, order set, and protocol prior to the work group convening to revise the document.

The purpose of the Review and Comment process is to provide an opportunity for the clinicians in the member groups to review the science behind the recommendations and focus on the content of the order set and protocol. Review and Comment also provides an opportunity for clinicians in each group to come to consensus on feedback they wish to give the work group and to consider changes needed across systems in their organization to implement the guideline.

All member organizations are encouraged to provide feedback on order sets and protocol, however responding to Review and Comment is not a criterion for continued membership within ICSI.

After the Review and Comment period, the work group reconvenes to review the comments and make changes as appropriate. The work group prepares a written response to all comments.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Note from the National Guideline Clearinghouse (NGC) and the Institute for Clinical Systems Improvement (ICSI): For a description of what has changed since the previous version of this guidance, refer to [Summary of Changes Report- October 2008](#).

The recommendations for atrial fibrillation are presented in the form of an algorithm with 24 components, accompanied by detailed annotations. An algorithm is provided for [Atrial Fibrillation](#) clinical highlights and selected annotations (numbered to correspond with the algorithms) follow.

Class of evidence (A-D, M, R, X) and conclusion grade (I-III, Not Assignable) definitions are repeated at the end of the "Major Recommendations" field.

Clinical Highlights

There are five key steps in the management of patients with atrial fibrillation or atrial flutter ("SALT-E"): stabilize, assess, label, treat, and educate.

After confirming the diagnosis of atrial fibrillation or atrial flutter with a 12-lead electrocardiogram (*Annotation #2*):

Stabilize

- Assess for hemodynamic instability (hypotension, myocardial ischemia, uncompensated congestive heart failure, altered medical status, or end-organ dysfunction). (*Annotation #6*)
- Treat hemodynamic instability with emergent direct current cardioversion and obtain an emergent cardiology or internal medicine consult. (*Annotation #6*)
- Establish adequate rate control. (*Annotation #6*)

Assess

- Assess for potentially reversible causes and for comorbidities of atrial fibrillation/atrial flutter (*Annotation #7*)
- Hypertension is one of the most common causes of atrial fibrillation. In addition, hypertension is one of the most common risk factors for thromboembolic complications associated with atrial fibrillation. Treatment for hypertension should be initiated early. (*Annotation #7*)

Label

- Label (classify) patients into one of three categories:
 - First Detected Episode, Duration Known \geq 48 hours or Duration Unknown
 - Recurrent atrial fibrillation
 - Paroxysmal

- Persistent
- Permanent
- Recurrent atrial flutter

Treatment options are determined by these three categories. (*Annotations #9, 14, 15, 18, 19, 20*)

Treat

First Detected Episode, Duration Known \geq 48 hours or Duration Unknown

- Patients with stable atrial fibrillation or atrial flutter with duration greater than 48 hours or duration unknown require appropriate anticoagulation (international normalized ratio greater than or equal to 2.0) for three weeks prior to electrical cardioversion or use of antiarrhythmics/chemical cardioversion. (*Annotation #9*)

Recurrent atrial fibrillation

- Patients with paroxysmal, persistent, or permanent atrial fibrillation require assessment for chronic anticoagulation (risk of thromboembolism compared with risk of bleeding) (*Annotation #14*) and adequate rate control (*Annotation #15*)
- Patients with persistent symptoms despite adequate rate control may require intermittent cardioversion, antiarrhythmic agents, and/or electrophysiology consultation. (*Annotation #20*)

Recurrent atrial flutter

- Patients with recurrent atrial flutter should be referred for an electrophysiology consultation. (*Annotation #20*)

Educate

Patient education is a critical component in the management of all patients with atrial fibrillation/atrial flutter. Patients who have experienced one or more episodes of atrial fibrillation should be taught to periodically monitor their pulse and have a plan for treatment if they detect an irregular pulse. (*Annotation #21*)

Atrial Fibrillation Algorithm Annotations

1. Patient Presentation: Symptoms or Physical Findings Suggestive of Atrial Fibrillation/Atrial Flutter or Incidental Electrocardiogram Finding

Key Points:

- Atrial fibrillation or atrial flutter can be symptomatic or asymptomatic – even in the same patient.

Atrial fibrillation or atrial flutter can be symptomatic or asymptomatic – even in the same patient. Symptoms may include:

- Palpitations
- Chest pain
- Dyspnea
- Fatigue
- Lightheadedness
- Confusion
- Syncope - syncope is a rare but serious complication that usually indicates a sinus node dysfunction, an accessory atrioventricular pathway, valvular aortic stenosis, hypertrophic cardiomyopathy, or cerebrovascular disease.

Physical findings may include:

- Irregular pulse
- Heart failure
- Hypoxia
- Thromboembolism

[R]

2. **Electrocardiogram Confirms Atrial Fibrillation and/or Atrial Flutter?**

An electrocardiogram is essential to establish the diagnosis and treatment of atrial fibrillation or atrial flutter.

Electrocardiogram Characteristics of Atrial Fibrillation

Atrial fibrillation is characterized by disorganized rapid atrial activity (greater than 350 beats per minute) and may be either coarse or fine. Ventricular complexes are irregular.

Electrocardiogram Characteristics of Atrial Flutter

Atrial flutter is an organized reentrant rhythm, which is characterized by quite regular atrial activity (flutter or F waves) which form a saw tooth pattern that is most prominent in electrocardiogram leads II, III, and AVF. Atrial rates are typically between 240-320 beats per minute in the untreated state, but can slow significantly with antiarrhythmic drug therapy. Ventricular rates can be either regular or irregular. Regular rates are commonly about 150 beats per minute with a 2:1 atrioventricular block. Atypical atrial flutter is also quite regular, but may differ in flutter wave morphology and rates. It is usually seen in patients who have had prior surgical atriotomies, particularly for correction of congenital heart disease.

Atrial flutter can degenerate into atrial fibrillation, atrial fibrillation can initiate atrial flutter, or the electrocardiogram patterns can alternate between atrial flutter and atrial fibrillation.

The distinction between atrial fibrillation and atrial flutter is particularly important in that typical atrial flutter can be easily ablated. See Annotation #20 "Consultation with a Physician with Cardiology Expertise for Treatment Options."

Atrioventricular Node Conduction (Atrial Fibrillation/Atrial Flutter)

Ventricular response to atrial fibrillation and atrial flutter depends on the ability of the atrioventricular node to conduct electrical impulses to the ventricle. Atrioventricular nodal conduction is affected by intrinsic properties of the atrioventricular node, parasympathetic (vagal) inputs, sympathetic (adrenergic) inputs, drugs that depress atrioventricular nodal conduction such as beta-blockers, calcium blockers and digoxin and drugs that may enhance conduction.

Associated Cardiac Conditions That May Influence Therapy

The electrocardiogram should also be examined for other underlying cardiac conditions, which may influence choice of therapy:

- Pre-excitation/Wolff-Parkinson-White syndrome
- Bundle branch block
- Left ventricular hypertrophy
- Acute myocardial infarction
- Prior acute myocardial infarction
- QT prolongation
- P-wave duration and morphology or fibrillatory waves
- Other atrial arrhythmias

[R]

5. Atrial Fibrillation with Pre-Excitation/Wolff-Parkinson-White Syndrome

Atrial fibrillation in patients with Wolff-Parkinson-White syndrome is characterized on the electrocardiogram by an irregular wide complex tachycardia (pre-excited QRS complexes conducted over the accessory atrioventricular pathway). Often there may be interspersed narrow QRS complexes from beats conducted over the atrioventricular node. The ventricular response can be dangerously rapid (R-R intervals greater than 250 milliseconds) with the potential for degeneration to ventricular fibrillation. Differential diagnosis includes ventricular tachycardia, which is usually regular when monomorphic, or polymorphic when irregular. Atrial fibrillation with bundle branch block aberrancy is also in the differential. Comparison with old electrocardiograms should show a short PR interval with a delta wave for Wolff-Parkinson-White.

Recognition of atrial fibrillation with pre-excitation is critical. The drugs commonly used to control ventricular response such as diltiazem, verapamil and digoxin are ineffective and can facilitate conduction through the accessory pathway, increasing the risk for ventricular fibrillation. Direct

current cardioversion is commonly the treatment of choice due to hemodynamic compromise related to rapid rates and risk of ventricular fibrillation. In less severely affected patients, rate can be controlled with intravenous amiodarone, intravenous ibutilide or intravenous procainamide by depressing accessory pathway conduction. Patients should be referred to an electrophysiologist for consideration of accessory pathway ablation. Ablation removes the potential for life-threatening rapid ventricular response and may decrease the likelihood of recurrent atrial fibrillation.

[R]

6. Stabilize Patient

Key Points:

- Hemodynamically unstable patients represent a unique group that often has underlying structural or electrical cardiopulmonary disease.
- Hemodynamically unstable patients require hospitalization and emergent consultation from a physician with cardiology expertise, and if indicated, emergent direct current cardioversion.

Hemodynamic Stabilization

Hemodynamically unstable patients may exhibit the following symptoms:

- Hypotension
- Myocardial ischemia
- Uncompensated heart failure
- Altered mental status
- End-organ dysfunction
- Clinical deterioration

These patients represent a unique group that often has underlying structural or electrical cardiopulmonary disease including Wolff-Parkinson-White syndrome, severe stenosis of the mitral or aortic valves, hypertrophic obstructive cardiomyopathy, cardiac tamponade/pericarditis, severe coronary artery disease [C] or pulmonary embolism.

Additional evaluation of patients with atrial fibrillation/atrial flutter presenting with hemodynamic instability may include:

- Emergent echocardiography
- Computed tomography scan of the chest
- Coronary/pulmonary angiography

Hemodynamically unstable patients require hospitalization and emergent consultation from a physician with cardiology expertise, and if indicated, emergent cardioversion.

Additional urgent treatments may include:

- Radiofrequency catheter ablation
- Internal cardioversion
- Balloon valvuloplasty
- Percutaneous transluminal coronary angioplasty
- Pericardiocentesis
- Septal ablation (alcohol or surgical)
- Pulmonary embolectomy
- Coronary bypass or valve replacement/repair

Antithrombotic is favored prior to and following emergent cardioversion if there are not specific contraindications, although little evidence exists [R]. Initiation of intravenous unfractionated heparin in addition to warfarin should be considered for the following:

- Patients who have been in atrial fibrillation for a few days and then develop hemodynamic instability
- Patients in whom recurrent atrial fibrillation is likely because of past experience
- Patients with mitral valve disease or left ventricular dysfunction
- Patients who, following cardioversion, demonstrate spontaneous echocardiogram contrast in the left atrium or left atrial appendage

Heparin should be continued until the international normalized ratio is greater than 2.0. There is little experience reported on the use of low-molecular-weight heparins following cardioversion.

For more information on anticoagulation, refer to the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement (ICSI) [Antithrombotic Therapy Supplement](#) guideline.

[R]

Acute Rate Control

Adequate rate control may help relieve symptoms including palpitations, chest pain, dyspnea, fatigue, or lightheadedness. Patients with acute myocardial infarction or acute coronary symptoms require lower ventricular rates to decrease myocardial oxygen demand and limit the infarction size [R].

Amiodarone has become a popular antiarrhythmic choice but its use should be reserved for patients with coronary artery disease with heart failure or with substantial left ventricular hypertrophy. Refer to Table 11, "Medications Used for Rate Control," in the original guideline document.

Acute Rate Control Agents

Beta-blockers are generally favored for pharmacologic rate control. Beta-blockers control heart rate at rest and with exercise, and also provide cardioprotective benefits. They may be used with caution with asthma or chronic obstructive pulmonary disease. Beta-blockers are preferred for patients with atrial fibrillation and heart failure.

Calcium channel blockers are alternative rate control agents when beta-blockers are contraindicated. Calcium channel blockers control heart rate at rest and with exercise, but may exacerbate heart failure. Calcium channel blockers should not be administered in the presence of wide QRS/Wolff-Parkinson-White/pre-excitation.

Concomitant use of a beta-blocker with a calcium channel blocker can, in rare circumstances, cause profound negative dromotropic, chronotropic and inotropic effects. These effects may be further exacerbated by type I or type III antiarrhythmic agents or underlying structural heart disease.

Digoxin is a third-line agent for rate control. Digoxin does not lower blood pressure and has a positive inotropic effect, but works more slowly than beta-blockers and calcium channel blockers, has no effect on the sympathetically mediated enhancement of atrioventricular node conduction during exercise [A], and is no better than placebo for conversion to normal sinus rhythm. Digoxin should not be administered with wide QRS/Wolff-Parkinson-White/pre-excitation, hypokalemia, hypomagnesemia, and renal impairment.

Amiodarone is a first-line agent for patients with decompensated heart failure. Amiodarone has side effects including thyroid disease, hepatic dysfunction, lung disease, neurologic dysfunction and bradycardia and should be reserved for patients with coronary artery disease with heart failure, moderate to severe systolic dysfunction, or hypertension with significant left ventricle hypertrophy.

If ventricular response remains rapid despite attempts to control rate with beta-blockers, calcium channel blockers, and/or digoxin, consultation from a physician with cardiology expertise is recommended. Treatment options include immediate cardioversion if the risk of thromboembolism is acceptable.

7. Assess Patient for Potentially Reversible Causes and Comorbidities

Cardiovascular

- Hypertension
- Heart failure
- Primary pulmonary hypertension
- Acute myocardial infarction or unstable coronary syndrome
- Atrioventricular node reentry/paroxysmal supraventricular tachycardia
- Accessory pathway/Wolff-Parkinson-White
- Pericarditis/myocarditis
- Mitral valve disease/tricuspid disease
- Amyloidosis
- Congenital heart disease
- Hypertrophic cardiomyopathy

Pulmonary

- Pulmonary embolus
- Chronic obstruction pulmonary disease

- Carbon monoxide poisoning
- Obstructive sleep apnea

Metabolic

- Postoperative state/high catecholamine state
- Hyperthyroidism

Drugs

- Alcohol
- Caffeine
- Medications including antiarrhythmic and anticholinergic
- Illicit drugs including phencyclidine (PCP) cocaine and other stimulants
- Absence of any of the risk factors listed above

[R]

Other

- Perioperative period
- Pregnancy

Patients presenting with a first detected episode of atrial fibrillation/atrial flutter should be assessed with:

- Chest x-ray
- Echocardiogram

Patients presenting with a first detected episode of atrial fibrillation/atrial flutter or with difficult rate control or with unexpected recurrence after cardioversion should also have:

- Thyroid function tests

9. First Detected Episode Duration Known >48 Hours or Duration Unknown

Key Points:

- Antithrombotic with warfarin (international normalized ratio greater than or equal to 2.0 for three weeks) is recommended before electrical or pharmacologic cardioversion back to sinus rhythm.
- Transesophageal echocardiography-guided cardioversion without traditional pre-cardioversion anticoagulation cannot be routinely recommended.
- Amiodarone is the most effective antiarrhythmic drug for maintenance of normal sinus rhythm. However, it also is associated with the highest potential for non-cardiac toxicity, and requires regular scheduled medical follow-up.

- Angiotensin-converting enzyme (ACE)-inhibitors and angiotensin receptor blockers have a role as adjunctive medical therapies to antiarrhythmic drugs for maintenance of normal sinus rhythm.

General Recommendations

When the duration of atrial fibrillation or atrial flutter is unknown, the risk of thromboembolic complications is as high as 7% following cardioversion without anticoagulation. Thus, in this setting, anticoagulation with warfarin is required (international normalized ratio greater than or equal to 2.0 for three consecutive weeks). Though not a consistent clinical practice, the American College of Chest Physicians also recommends anticoagulation with warfarin (international normalized ratio greater than or equal to 2.0 for three consecutive weeks) prior to the initiation of antiarrhythmics.

Alternatively, the patient and/or physician may also opt for chronic anticoagulation (see Annotation #14, "Assess Patient for Chronic Anticoagulation") and chronic rate control (see Annotation #15, "Assess Patient for Rate Control Agents"). However, if this represents the first episode of persistent atrial fibrillation for the patient, there is general consensus that most patients deserve one trial of conversion back to normal sinus rhythm, given the high likelihood of initial success.

Short-Term Antithrombotic Issues Prior to and Following Cardioversion

Whenever possible, cardioversion should be undertaken with conventional anticoagulation prior to and following cardioversion.

When anticoagulation is temporarily contraindicated (refer to Table 1 in the original guideline document and "Contraindications" field in this summary), cardioversion should be delayed if possible until appropriate anticoagulation can be given prior to and following cardioversion.

When anticoagulation is contraindicated and cardioversion cannot be delayed, transesophageal echocardiography may identify high-risk patients but may not change therapeutic decisions.

However, if transesophageal echocardiography is used to guide anticoagulant therapy, the patient must be anticoagulated with therapeutic (not prophylactic) levels of heparin and warfarin. Heparin should be continued until the international normalized ratio is greater than or equal to 2.0 for two consecutive days. Warfarin should be continued a minimum of four weeks following successful cardioversion.

At this time, there is insufficient evidence to recommend routine transesophageal echocardiography to guide anticoagulant therapy prior to or following cardioversion [*Conclusion Grade III: See Conclusion Grading Worksheet A - Annotation #9 (Transesophageal Echocardiography and Anticoagulation Therapy) in the original guideline document.*] [A], [D], [M]

There is little experience reported on the use of low-molecular-weight heparins prior to or following cardioversion (with or without transesophageal echocardiography). A pilot study of transesophageal echocardiography-guided enoxaparin plus warfarin versus transesophageal echocardiography-guided unfractionated heparin plus warfarin (ACUTE II) is in progress. Unfortunately, this trial does not include a conventional therapy group, which is a significant omission in light of the ACUTE trial results.

For additional information on anticoagulation with warfarin, refer to the NGC summary of the ICSI [Antithrombotic Therapy Supplement](#) guideline.

As atrial fibrillation persists for longer periods of time, the efficacy of pharmacologic cardioversion decreases. Though direct current cardioversion requires conscious sedation, pharmacologic cardioversion is less effective and may cause serious arrhythmias, including torsades de pointes. Antiarrhythmics like ibutilide or propafenone may be administered prior to direct current cardioversion to increase the likelihood of its success [A], [D].

Direct Current Cardioversion

Direct current cardioversion has been used to treat a variety of rhythm disturbances including atrial fibrillation and atrial flutter since the early 1960s [D], [R]. The success of external direct current cardioversion depends on patient selection and cardioversion technique. Success rates range from 65% to 95%. Success of cardioversion is increased if the left atrium is less than 60 mm (3 cm/m² body surface area and if the arrhythmia is of short duration.

Transthoracic cardioversion of atrial fibrillation may now be performed with biphasic waveform defibrillation. It typically requires less energy and may have greater efficacy than monophasic wave forms [A].

A recent study has shown that an anterior-posterior paddle position is superior to an anterior-lateral position in success of cardioversion. The anterior-posterior position also required lower energy levels for success [A]. If the first position is unsuccessful, paddle relocation should be considered.

Complications of direct current cardioversion are uncommon but include embolization, pulmonary edema, and arrhythmias including ventricular fibrillation and asystole [D]. Direct current cardioversion should be avoided in patients with known or suspected digoxin toxicity. It is unnecessary to interrupt digoxin therapy for cardioversion in patients without manifestations of toxicity.

See the original guideline document for specifics on direct current cardioversion technique and information on comparing electrical and chemical cardioversion.

Antiarrhythmic/Chemical Cardioversion [R]

All antiarrhythmics used to treat atrial fibrillation/atrial flutter can cause serious complications including the life-threatening arrhythmia torsades de

pointes in up to 8% of patients [R]. Therefore, antiarrhythmics should be initiated in the presence of a physician or nurse with expertise in the administration of antiarrhythmics with telemetry monitoring for at least 4 hours, or longer if QT remains prolonged.

Risk factors for proarrhythmia include:

- Pre-existing bradycardia or atrioventricular block
- Underlying structural heart disease
- Active heart failure or ischemia- hypokalemia or hypomagnesemia, and
- Drug dosages (e.g., lower doses for quinidine and higher doses for sotalol)

Pharmacologic therapy aimed at restoring sinus rhythm is often helpful in patients with atrial fibrillation. As a general rule, regardless of the agent or route used, the conversion rate of atrial fibrillation of less than 48 hours duration is 60%-90%. Conversion rates drop to 15%-30% if present 48 hours or longer [R]. Successful conversion of atrial flutter is generally higher than for atrial fibrillation.

A summary of the agents with proven efficacy for pharmacologic cardioversion of atrial fibrillation of up to seven days duration or atrial fibrillation present for more than seven days is described in the tables below.

Table. Pharmacological Cardioversion Up to Seven Days

Recommendations for Pharmacological Cardioversion of Atrial Fibrillation of Up to Seven Days	
Agents with proven efficacy	Dofetilide, flecainide, ibutilide, propafenone and amiodarone
Less effective or incompletely studied patients	Disopyramide, flecainide, procainamide, propafenone and quinidine
Agents should not be administered	Digoxin and sotalol

Adapted from the American College of Cardiology (ACC)/American Heart Association (AHA) Atrial Fibrillation 2006 guideline (pages e299 and e300)

Table. Pharmacological Cardioversion for More Than Seven Days

Recommendations for Pharmacological Cardioversion of Atrial Fibrillation Present for More Than Seven Days	
Agents with proven efficacy	Dofetilide, amiodarone, ibutilide
Less effective or incompletely studied patients	Disopyramide, flecainide, procainamide, propafenone and quinidine
Agents should not be	Digoxin and sotalol

Recommendations for Pharmacological Cardioversion of Atrial Fibrillation Present for More Than Seven Days	
administered	

Adapted from the American College of cardiology (ACC)/American heart Association (AHA) Atrial Fibrillation 2006 guideline (pages e299 and e300)

Reported success rates vary in part because of the heterogeneity of patient populations– particularly with respect to the duration of atrial fibrillation in the published trials. Of the intravenous agents, only ibutilide is approved by the Food and Drug Administration for this indication.

Torsades de pointes is a potentially life-threatening arrhythmia and requires prompt evaluation and treatment. See Table 7 in the original guideline document for treatment of torsades de pointes.

Refer to Annotation #20, Table 13, "Antiarrhythmic Agents," in the original guideline document for more information on antiarrhythmic agents.

Ibutilide has been studied extensively for the conversion of recent onset atrial fibrillation and atrial flutter. Efficacy rates between 30% and 40% have been quoted in acute reversal of recent onset atrial fibrillation. Generally patients convert within 30 minutes. Significant adverse effect of torsades de pointes was noted in 4.3% of patients, 1.7% requiring electrical termination. There were no deaths or severe morbidities [A], [R].

Refer to Table 6 in the original guideline document for more information on use of ibutilide.

Proarrhythmia associated with initiation of membrane antiarrhythmic agents relates to the presence of underlying structural heart disease as well as the type of drug initiated. The drugs sotalol, dofetilide, and quinidine should be initiated in all patients under telemetry guidance. These drugs should not be allowed to prolong QTc (similar to sotalol and dofetilide) to longer than 500 milliseconds. The QTc prolongation maybe associated with torsades de points. Refer to Table 7 in the original guideline document for treatment of torsades de points.

Amiodarone, the other class III drug, is the subject of several articles regarding its efficacy in conversion of recent onset and permanent atrial fibrillation. Amiodarone is effective in converting atrial fibrillation both acutely and chronically. It has been studied by both the oral and intravenous routes. Amiodarone can be started at maintenance doses in the outpatient setting; when high-dose loading is required or the drug is initiated in patients with structural heart disease, hospitalization should be advised. The Class I-C drugs propafenone and flecainide can also be initiated in the outpatient setting with appropriate follow-up of QRS duration that should not lengthen more than 25%. For patients with structural heart disease, these agents should also be initiated in the inpatient setting [A].

Oral flecainide (300 mg single dose) has similar conversion rates compared to oral propafenone (600 mg single dose) when used in patients with atrial fibrillation of acute onset (approximately 72%-78% conversion rate at eight hours) [A].

Failed Cardioversion Treatment Options

If initial attempts to restore normal sinus rhythm for atrial fibrillation fail, cardioversion can be repeated following a parenteral or oral loading dose of an appropriate antiarrhythmic agent [A], [R]. However, this approach should be avoided in patients with ejection fractions less than 30% because of the increased risk of torsades de pointes.

Furthermore, it should be noted that this is not a strategy to maintain normal sinus rhythm but only a means to enhance conversion back to sinus rhythm. Appropriate anticoagulation practices are required prior to and following cardioversion if the duration of atrial fibrillation exceeds 48 hours. If atrial fibrillation continues despite these attempts, cardiology consultation is advised.

The patient and/or physician may also opt for chronic anticoagulation and chronic rate control at this point - though the general consensus is that most patients with a first episode of atrial fibrillation or atrial flutter have a high likelihood of successful conversion back to normal sinus rhythm.

Transthoracic cardioversion of atrial fibrillation may be achieved by applying biphasic waveform for defibrillation. It has been shown to be equally effective and to use less energy than monophasic waveforms.

Maintenance of Sinus Rhythm Following Conversion

Several antiarrhythmic drugs have been demonstrated to improve sinus rhythm maintenance following cardioversion, including amiodarone, propafenone, disopyramide, sotalol, flecainide, dofetilide, and quinidine [M].

It is essential to establish adequate rate control before administering antiarrhythmics. Class 1A drugs can accelerate ventricular rates via anticholinergic effects on the atrioventricular node. Class 1C drugs can also accelerate ventricular rates by organizing and slowing atrial activity allowing 1:1 conduction. Additional drugs to slow atrioventricular nodal conduction are recommended when using Class 1C drugs. Amiodarone has been shown to be the single most effective agent of the lot, although it also contributes the most to noncardiac drug-related toxicity [A]. When administered at 800 mg per day for 2 weeks prior to elective cardioversion, amiodarone chemically converts one-fifth of patients with persistent atrial fibrillation, and when continued for eight weeks at 200 mg per day, doubled the number of patients in normal sinus rhythm at that time [A].

Non-Antiarrhythmic Medical Therapies for Maintenance of Sinus Rhythm

Both the ACE inhibitor, enalapril, and angiotensin receptor blocker, irbesartan, have been demonstrated to enhance the maintenance of normal sinus rhythm after cardioversion when added to amiodarone [A]. A meta-analysis of studies using this class of compounds has added further credence to these initial observations [M].

There has been a demonstrated correlation between stroke risk and inflammatory marker (C-reactive peptide [CRP]) elevation in patients with non-valvular atrial fibrillation [B]. Retrospective and prospective studies of lipid lowering with statin therapies [A], [D] have demonstrated beneficial effects for the prevention of atrial fibrillation, both postcoronary artery bypass graft and de novo. Fish oil also has been demonstrated in small randomized control trials to have a significant beneficial effect [R].

Intravenous hydrocortisone has been revealed to have an antiarrhythmic effect for post-cardiac surgery [A], while dexamethasone demonstrated no such effect [A].

Further study of all these adjunctive medications will be required to assess their appropriate roles, post-coronary artery bypass graft, postdirect current cardioversion, postablation, and as primary prevention tools.

14. Assess Patients for Chronic Anticoagulation

Key Point:

- All patients with paroxysmal, persistent, or permanent atrial fibrillation should be assessed for chronic anticoagulation -- balancing the long-term risk of thromboembolism against the long-term risk of bleeding.

Indications for Chronic Use of Anticoagulants in Atrial Fibrillation Patients

Patients with either paroxysmal or persistent atrial fibrillation may benefit from anticoagulation. The long-term risk of thromboembolic complications must be balanced against the long-term risk of bleeding.

Risk factors from many trials were identified that maximized the benefits of vitamin K antagonist therapy. These have been summarized in a scoring system that accurately reflects the relative risks of thromboembolic stroke when following atrial fibrillation patients. This has been termed the CHADS2 score and is calculated as in Table 8 of the original guideline document.

Patients with chronic atrial fibrillation (and perhaps most or all patients with paroxysmal atrial fibrillation) should be given warfarin or aspirin based on their CHADS2 score – unless the long-term risk of bleeding from warfarin or aspirin exceeds the long-term risk of thromboemboli. Trials evaluating the efficacy of warfarin in patients with non-valvular atrial fibrillation excluded 80% of patients on the basis of factors presumed to increase their risk of bleeding [R].

Recommendation from the 2006 consensus paper for warfarin versus aspirin therapy in patients with atrial fibrillation are shown in Table 8 of the original guideline document. These recommendations translate to warfarin therapy for patients with CHADS2 scores of two or more, while aspirin is a reasonable alternative in CHADS 2 = 0 patients. For those with a score of one, either approach is reasonable.

In patients who are at moderate risk for bleeding, current trends favor use of anticoagulation in light of the defined benefits for anticoagulation and poorly defined criteria for bleeding risk.

For detailed discussion of assessing risk factors for bleeding, refer to the NGC summary of the ICSI [Antithrombotic Therapy Supplement](#) guideline.

Refer to Tables 9 and 10 in the original guideline document for exclusion criteria used in trials evaluating the efficacy and safety of warfarin in patients with non-valvular atrial fibrillation and for information on risk factors for bleeding for long-term use of warfarin.

It is critical that the international normalized ratio be regularly determined to enhance effectiveness of anticoagulation and avoid bleeding given the narrow therapeutic index of warfarin. See Figure 1 in the original guideline document.

Refer to the NGC summary of the ICSI [Antithrombotic Therapy Supplement](#) guideline for a more complete discussion of the use of aspirin and warfarin.

Antiplatelet/Anticoagulant Management for Patients with Paroxysmal or Persistent Atrial Fibrillation Who Require Percutaneous Coronary Intervention

A rapidly emerging area of uncertainty is the optimal management of patients with paroxysmal or persistent atrial fibrillation who require percutaneous coronary intervention. For patients undergoing percutaneous coronary intervention, research has shown less restenosis with drug-eluting stents compared with uncoated stents. Unfortunately, recent experience has identified a prolonged risk of coronary thrombosis following implantation of drug-eluting stents. Warfarin alone does not reduce the risk of coronary thrombosis associated with stents. Aspirin and/or clopidogrel reduce the risk of thromboembolic complications associated with atrial fibrillation but are inferior to warfarin. The combination of aspirin and clopidogrel and warfarin cause more hemorrhagic complications than any one of these drugs alone [A], [M].

See original guideline document for a discussion of the areas requiring further research.

15. Assess Patient for Rate Control Agents

Key Point:

- Drugs that can be used for rate control of chronic atrial fibrillation include: beta-blockers, non-dihydropyridine calcium channel blockers, and digitalis.

Beta-blockers are generally favored for pharmacologic rate control. Beta-blockers control heart rate at rest and with exercise and also provide cardioprotective benefits. They may be used with caution with asthma or chronic obstructive pulmonary disease. Beta-blockers are preferred for patients with atrial fibrillation and heart failure.

Calcium channel blockers are alternative rate control agents when beta-blockers are contraindicated. Calcium channel blockers control heart rate at rest and with exercise but may exacerbate systolic heart failure. Calcium channel blockers should not be administered in the presence of wide QRS/Wolff-Parkinson-White/pre-excitation.

Concomitant use of a beta-blocker with a calcium channel blocker can, in rare circumstances, cause profound negative dromotropic, chronotropic and inotropic effects. These effects may be further exacerbated by type I or type III antiarrhythmic agents or underlying structural heart disease.

Digoxin is a third-line agent for rate control. Digoxin can be utilized for patients with significant systolic congestive heart failure, but is inferior for exercise rate control compared to the other agents [A]. Digoxin does not lower blood pressure and has a positive inotropic effect, but works more slowly than beta-blockers and calcium channel blockers, has no effect on the sympathetically mediated enhancement of atrioventricular node conduction during exercise, and is no better than placebo for conversion to normal sinus rhythm. Digoxin should not be administered with wide QRS/Wolff-Parkinson-White/pre-excitation, hypokalemia, hypomagnesemia, and renal impairment.

Refer to Table 11 in the original guideline document for more information on medications used for rate control.

17. Inadequate Rate Control?

Key Point:

- Adequate atrial fibrillation rate control should be assessed both at rest and exercise to eliminate symptoms and prevent the development of heart failure from tachycardia-induced cardiomyopathy.

Adequate rate control may help relieve symptoms including palpitations, chest pain, dyspnea, fatigue, or lightheadedness. Also, tachycardia-induced cardiomyopathy is an important reversible complication of inadequate rate control. Tachycardia-induced cardiomyopathy can produce symptomatic congestive heart failure, thromboembolic complications, and potentially fatal ventricular arrhythmias. Thus, it is essential to maintain adequate rate control both at rest and during exercise. Patients with an acute myocardial infarction or acute coronary symptoms may require lower ventricular rates to decrease myocardial oxygen demand and limit infarction size.

At rest, the heart rate should be similar to individuals in sinus rhythm (less than 80-90 beats per minute). During exercise, the maximum rate should be no greater than the maximum set for individuals in sinus rhythm [$0.7 \times (220 - \text{age})$] and should not be reached during light exercise. A six-minute office walk, exercise stress test or Holter monitor (24 hour average less than 100 beats per minute) can assess this [R].

If ventricular response remains rapid despite attempts to control rate with beta-blockers, calcium channel blockers, and/or digoxin, consultation from a physician with cardiology expertise is recommended. When pharmacologic therapies fail, radiofrequency ablation of the atrioventricular node/His bundle followed by placement of a permanent pacemaker may be considered in medically refractory patients. It should be emphasized that the latter approach is irreversible and the patients may become pacemaker dependent. Right ventricular pacing may also induce dyssynchrony leading to future risk for developing heart failure although this problem occurs infrequently. For further information, refer to Annotation #20, "Consultation with a Physician with Cardiology Expertise for Treatment Options."

18. Inadequate Symptom Control?

Key Point:

- For the older patient over 65 years of age, rate control is an equal strategy to rhythm control for long-term management of atrial fibrillation.

Patients presenting with paroxysmal or persistent atrial fibrillation should be assessed for symptoms and for underlying cardiac disease. Restoration of sinus rhythm with cardioversion and/or suppression of atrial fibrillation with antiarrhythmic drugs is a reasonable initial strategy, particularly in younger patients. Patients should be reassessed for symptoms, side effects of treatment and recurrence of atrial fibrillation with potential reconsideration of rate control strategy if appropriate. Patient with significant symptoms associated with atrial fibrillation may warrant repeated trials with antiarrhythmic drugs, possibly in combination with permanent pacing. Ablative therapies for symptomatic atrial fibrillation refractory to pharmacological management are emerging and promising [A], [R].

There is no observed survival advantage to strategies aimed at restoring sinus rhythm over strategies to control rate in older patients with relatively asymptomatic atrial fibrillation based on the limited data available from studies that have compared these strategies. [Conclusion Grade II: See Conclusion Grading Worksheet B - Annotation #15 (Rhythm versus Rate Control) in the original guideline document]. [R]

20. Consultation with a Physician with Cardiology Expertise for Treatment Options

Key Points:

- Patients with recurrent atrial fibrillation should be reassessed for symptoms during atrial fibrillation, side effects to treatment and review of past therapeutic results to plan future therapy.
- Antiarrhythmic agents used for atrial fibrillation suppression are chosen based on risk of proarrhythmia related to underlying heart disease and potential side effects. Drugs should be used in adequate doses with the reduction of the frequency and severity of symptomatic atrial fibrillation episodes as the primary treatment goal.
- Cardiac pacing may allow the use of antiarrhythmic drugs that are contraindicated due to bradycardia and also may provide definitive rate control when coupled with His ablation in patients with poorly controlled ventricular response.
- Isthmus-dependent atrial flutter can be readily controlled with radiofrequency ablation.
- Catheter-based and surgically based pulmonary vein isolation procedures show great promise in the suppression of atrial fibrillation, with better outcomes expected as techniques and experience develop.

Intermittent Cardioversion

- Intermittent electrical or chemical cardioversion may be considered for:
 - Infrequent recurrences
 - Hemodynamic instability (see Annotation #6, "Stabilize Patient"), or
 - Failure of an antiarrhythmic agent
- Evaluate for potentially reversible causes.
- Assess for chronic anticoagulation.
- Future treatment option: implantable atrial defibrillator.

Antiarrhythmics

Antiarrhythmic agents should be individualized for the patient's anticipated proarrhythmia risks, based on underlying cardiac conditions and other comorbidities while attempting to minimize organ toxicity. Optimal antiarrhythmic drug therapy should be effective in reducing symptoms, preventing recurrent atrial fibrillation and should have a low incidence of toxicity and proarrhythmia. Refer to Fig 2 in the original guideline document for specifics. For patients with antiarrhythmic drug therapy, monitoring for side effects such as proarrhythmia, bradycardia or other systemic side effects is essential.

Refer to Table 12 in the original guideline document for information on drugs with a risk of QT prolongation and/or torsades de points. Refer to Table 13 in the original guideline document for dosage information of antiarrhythmic agents. Refer to Table 14 in the original guideline document for considerations when antiarrhythmic drug therapy fails.

Electrophysiology Consult

Non-pharmacologic treatment modalities for patients requiring such therapy have expanded in the last decade and include ablation, pacing, implantable defibrillation, and surgery.

Options:

- Cardiac pacing
 - Single site atrial pacing
 - Dual site atrial pacing
 - Implantable atrial defibrillator
- Atrial fibrillation ablative therapies (non-atrioventricular node)
- Catheter based ablative therapies
 - His ablation with permanent pacemaker implantation
 - Ablation for atrial flutter
- Pulmonary vein isolation techniques
- Surgical maze procedure

Refer to the original guideline document for more information on these options.

21. Aggressive Management of Patient Comorbidities (Hypertension)/Monitor for Recurrence/Patient Education

Key Points:

- Patients can monitor for recurrence of atrial fibrillation and should be given a treatment plan for managing recurrence of episodes of atrial fibrillation.
- Patient education is essential for the successful management of atrial fibrillation and atrial flutter.
- Education should begin at the time of diagnosis, and should occur and be documented at every visit.
- An important part of patient education is defining expectations -- chronicity of disease, empiric treatment, and frequent recurrences despite therapy.

Monitoring for Recurrence

- Pulse Self-Monitoring

Patients who have experienced one or more episodes of atrial fibrillation should be taught to periodically monitor their pulse. They should also be given a plan of treatment (elective versus urgent evaluation, "pill-in-the-pocket") if they detect an irregular pulse.

[M]

- Adjunctive Monitoring

Holter monitors and event monitors may be helpful to monitor for the recurrence of atrial fibrillation in selected patients. Adjunctive

monitoring is not required for all patients with a history of atrial fibrillation.

Patient Education

Patient education is essential for the successful management of atrial fibrillation and atrial flutter. Patients should be encouraged and empowered to play an active role in the self-management of their disease. Self-management is best initiated and sustained through an education partnership between the patient and the multidisciplinary health care team.

Education should begin at the time of diagnosis and should occur and be documented at every visit. Atrial fibrillation in and of itself is not a life-threatening arrhythmia, provided proper anticoagulation is used to prevent thromboembolic complications.

Best patient education should include:

- Description of atrial fibrillation/atrial flutter including causes and symptoms
- Risks associated with untreated atrial fibrillation/atrial flutter
- Review of individual treatment plan
- Medication education
- Reason for taking medication and action
 - How to take
 - Side effects
 - Drug interactions
 - Mechanism of action of warfarin; it depletes certain coagulation factor proteins in the blood
 - Time of day to take warfarin: it should be taken at approximately the same time each day. Due to the short half-life of factor VII and its influence on the international normalized ratio, this is especially important if the patient will have an international normalized ratio drawn the next morning
- How to take a pulse
- Explanation of international normalized ratio, target range, and regular testing
- When to call the clinic:
 - Signs and symptoms of bleeding and that the provider should be contacted immediately if bleeding signs are present
 - Need to notify provider if illness, injury, or change in physical status occurs
 - Need to inform all health care providers of anticoagulation therapy, especially if potentially undergoing an invasive procedure, surgery, or dental work
- When to go to the hospital:
 - Signs and symptoms of stroke
 - Chest pain
 - Loss of consciousness
 - Signs of significant bleeding

Drug Interactions

- What to do if a new medication is initiated or a medication is discontinued, especially if the interaction with warfarin is unknown: check international normalized ratio within three to four days
- Drugs that affect the absorption of warfarin
- Drugs that increase or decrease the effect of warfarin
- Common over-the-counter medication interactions including aspirin, nonsteroidal anti-inflammatory drugs, acetaminophen, natural or herbal remedies, laxatives, antacids, and multivitamin preparations containing vitamin K
 - Role of vitamin K and the importance of consistency of vitamin K-rich foods in the diet rather than avoidance of vitamin K-rich foods
 - Importance of minimizing trauma risk associated with activities at high risk for injury
 - Effect of exercise: increased activity results in decreased effect of the drug
 - Effect of personal habits: alcohol, chewing tobacco, etc.
 - Effect of certain conditions: congestive heart failure, thyroid disease, gastroenteritis, and diarrhea
 - Importance of self-monitoring: maintain a log of international normalized ratios, dose of warfarin, etc.
 - Medic Alert bracelet/necklace and warfarin identification card

Definitions:

Conclusion Grades:

Grade I: The evidence consists of results from studies of strong design for answering the question addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of any significant doubts about generalizability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to have adequate statistical power.

Grade II: The evidence consists of results from studies of strong design for answering the question addressed, but there is some uncertainty attached to the conclusion because of inconsistencies among the results from the studies or because of minor doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from weaker designs for the question addressed, but the results have been confirmed in separate studies and are consistent with minor exceptions at most.

Grade III: The evidence consists of results from studies of strong design for answering the question addressed, but there is substantial uncertainty attached to the conclusion because of inconsistencies among the results from different studies or because of serious doubts about generalizability, bias, research design flaws, or adequacy of sample size. Alternatively, the evidence consists solely of results from a limited number of studies of weak design for answering the question addressed.

Grade Not Assignable: There is no evidence available that directly supports or refutes the conclusion.

Classes of Research Reports:

A. Primary Reports of New Data Collection:

Class A:

- Randomized, controlled trial

Class B:

- Cohort study

Class C:

- Nonrandomized trial with concurrent or historical controls
- Case-control study
- Study of sensitivity and specificity of a diagnostic test
- Population-based descriptive study

Class D:

- Cross-sectional study
- Case series
- Case report

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

Class M:

- Meta-analysis
- Systematic review
- Decision analysis
- Cost-effectiveness analysis

Class R:

- Consensus statement
- Consensus report
- Narrative review

Class X:

- Medical opinion

CLINICAL ALGORITHM(S)

A detailed and annotated clinical algorithm is provided for [Atrial Fibrillation](#).

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is classified for selected recommendations (see "Major Recommendations").

In addition, key conclusions contained in the Work Group's algorithm are supported by a grading worksheet that summarizes the important studies pertaining to the conclusion. The type and quality of the evidence supporting these key recommendations (i.e., choice among alternative therapeutic approaches) is graded for each study.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate diagnosis and treatment for adult patients with atrial fibrillation or atrial flutter that present in primary care, emergency room and the inpatient settings

POTENTIAL HARMS

All antiarrhythmics used to convert atrial fibrillation/atrial flutter to sinus rhythm can cause serious complications, including life-threatening torsades de pointes and require the presence of a physician or nurse with expertise in the administration of rate control agents and treatment of their complications for at least four hours and until the QTc interval returns to normal.

Risk factors for proarrhythmia include:

- Preexisting bradycardia or atrioventricular block
- Underlying structural heart disease
- Active heart failure or ischemia-hypokalemia or hypomagnesemia
- Drug doses (e.g., lower doses for quinidine and higher doses for sotalol)

Side effects for rate control agents include:

- Beta-blockers may be used with caution with asthma or chronic obstructive pulmonary disease.
- Calcium channel blockers and digoxin should not be administered to patients with wide QRS/Wolff-Parkinson-White/preexcitation. The drugs commonly used to control ventricular response – such as diltiazem, verapamil and digoxin – are ineffective and can facilitate conduction through the accessory pathway, increasing the risk for ventricular fibrillation
- Concomitant use of a beta-blocker with a calcium channel blocker can, in rare circumstances, cause profound negative dromotropic, chronotropic, and inotropic effects. These effects may be further exacerbated by type I or type III antiarrhythmic agents or underlying structural heart disease.

Other potential adverse reactions and interactions to rate control and antiarrhythmic medications are outlined in Tables 11 and 13 of the original guideline document.

- Anticoagulant medication: Bleeding is the major side effect. The combination of aspirin and clopidogrel and warfarin cause more hemorrhagic complications than any one of these drugs alone. For more information, see the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement (ICSI) [Antithrombotic Therapy Supplement](#) guideline.
- Complications of electrical direct current cardioversion include embolization, pulmonary edema and arrhythmias including ventricular fibrillation and asystole. Direct current cardioversion should be avoided in patients with known or suspected digoxin toxicity.
- Placement of a permanent pacemaker is irreversible and the patient may become pacemaker dependent.

CONTRAINDICATIONS

CONTRAINDICATIONS

Contraindications to chemical cardioversion include:

- Hemodynamic instability
- Acute coronary ischemia
- Marked bradycardia, digoxin toxicity
- QTc 460 milliseconds or more
- Marked left ventricular hypertrophy
- Marked left ventricular failure
- Hypokalemia
- Hypomagnesemia
- Currently on an antiarrhythmic

Relative contraindications to chemical cardioversion include:

- Duration greater than one month

Relative contraindications to direct current cardioversion include:

- Fresh chest wound
- Fear of direct current cardioversion

Temporary contraindications to anticoagulation include:

- Active significant bleeding
- Craniotomy within two weeks
- History of intracerebral hemorrhage within two weeks
- Active intracranial lesions/neoplasms/monitoring devices
- Vascular access/biopsy sites inaccessible to hemostatic control within 24 hours
- Bacterial endocarditis, proliferative retinopathy

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These clinical guidelines are designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and are not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition. A guideline will rarely establish the only approach to a problem.
- This clinical guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. Patients are urged to consult a health care professional regarding their own situation and any specific medical questions they may have.
- This document is not intended to replace the comprehensive guideline, American College of Cardiology (ACC)/American Heart Association (AHA)/European Society of Cardiology (ESC) 2006 Guidelines for the Management of Patients with Atrial Fibrillation, which the interested provider is encouraged to review.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Once a guideline is approved for release, a member group can choose to concentrate on the implementation of that guideline. When four or more groups choose the same guideline to implement and they wish to collaborate with others, they may form an action group.

In the action group, each medical group sets specific goals they plan to achieve in improving patient care based on the particular guideline(s). Each medical group shares its experiences and supporting measurement results within the action group. This sharing facilitates a collaborative learning environment. Action group learnings are also documented and shared with interested medical groups within the collaborative.

Currently, action groups may focus on one guideline or a set of guidelines such as hypertension, lipid treatment, and tobacco cessation.

Detailed measurement strategies are presented in the original guideline document to help close the gap between clinical practice and the guideline recommendations. Summaries of the measures are provided in the National Quality Measures Clearinghouse (NQMC).

Key Implementation Recommendations

The following system changes were identified by the guideline work group as key strategies for health care systems to incorporate in support of the implementation of this guideline.

1. Develop a process for accurate diagnosis of atrial fibrillation/flutter:

- Documentation of an electrocardiogram along with results in the medical record.
 - Process for communicating to physicians that a diagnosis of atrial fibrillation/flutter was confirmed by electrocardiogram.
2. Develop a process for implementing the five key steps in the management of atrial fibrillation/flutter ("SALT-E"):
 - Stabilize
 - Assess
 - Label
 - Treat
 - Educate
 3. Patient education is essential in the treatment of atrial fibrillation/flutter. Patients and caregivers should be informed of signs and symptoms that require contact with their health care provider.
 4. Develop a process to assure that patients who are diagnosed with atrial fibrillation/flutter and are initiated on warfarin have a baseline international normalized ratio that is documented in the medical record.
 5. Develop and implement a defined anticoagulation management program.
 6. Develop a process for appropriate referral to specialty; this should include a process for communication across the continuum of care.
 7. Develop a process that will assure the completion of a patient medication list for the purpose of communicating to the next provider of service, when the patient is referred, or transferred to another setting, service, practitioner or level of care within or outside the organization.

IMPLEMENTATION TOOLS

Clinical Algorithm
 Pocket Guide/Reference Cards
 Quality Measures

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

RELATED NQMC MEASURES

- [Atrial fibrillation: percentage of patients \(without contraindications to anticoagulation\) with paroxysmal, persistent, or permanent atrial fibrillation/flutter with risk factors for thromboembolism who are taking warfarin.](#)
- [Atrial fibrillation: percentage of patients with non-valvular atrial fibrillation/flutter with risk factors for thromboembolism having a CHADS2 score of 2 or greater \(without contraindications to anticoagulation therapy\) who are receiving warfarin.](#)

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
 Living with Illness

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Institute for Clinical Systems Improvement (ICSI). Atrial fibrillation. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2008 Oct. 62 p. [91 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Oct (revised 2008 Oct)

GUIDELINE DEVELOPER(S)

Institute for Clinical Systems Improvement - Private Nonprofit Organization

GUIDELINE DEVELOPER COMMENT

Organizations participating in the Institute for Clinical Systems Improvement (ICSI): Affiliated Community Medical Centers, Allina Medical Clinic, Altru Health System, Aspen Medical Group, Avera Health, CentraCare, Columbia Park Medical Group, Community-University Health Care Center, Dakota Clinic, ENT Specialty Care, Fairview Health Services, Family HealthServices Minnesota, Family Practice Medical Center, Gateway Family Health Clinic, Gillette Children's Specialty Healthcare, Grand Itasca Clinic and Hospital, HealthEast Care System, HealthPartners Central Minnesota Clinics, HealthPartners Medical Group and Clinics, Hutchinson Area Health Care, Hutchinson Medical Center, Lakeview Clinic, Mayo Clinic, Mercy Hospital and Health Care Center, MeritCare, Mille Lacs Health System, Minnesota Gastroenterology, Montevideo Clinic, North Clinic, North Memorial Care System, North Suburban Family Physicians, Northwest Family Physicians, Olmsted Medical Center, Park Nicollet Health Services, Pilot City Health Center, Quello Clinic, Ridgeview Medical Center, River Falls Medical Clinic, Saint Mary's/Duluth Clinic Health System, St. Paul Heart Clinic, Sioux Valley Hospitals and Health System, Southside Community Health Services, Stillwater Medical Group, SuperiorHealth Medical Group, University of Minnesota Physicians, Winona Clinic, Ltd., Winona Health

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GUIDELINE COMMITTEE

Cardiovascular Steering Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

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GUIDELINE STATUS

This is the current release of the guideline.

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Electronic copies: Available from the [Institute for Clinical Systems Improvement \(ICSI\) Web site](#).

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AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Atrial fibrillation. Executive summary. Bloomington (MN): Institute for Clinical Systems Improvement, 2008 Oct. 2 p. Electronic copies: Available from the [Institute for Clinical Systems Improvement \(ICSI\) Web site](#).
- ICSI pocket guidelines. May 2007 edition. Bloomington (MN): Institute for Clinical Systems Improvement, 2007.

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PATIENT RESOURCES

None available

NGC STATUS

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