Complete Summary

GUIDELINE TITLE

American College of Chest Physicians guidelines for the prevention and management of postoperative atrial fibrillation after cardiac surgery.

BIBLIOGRAPHIC SOURCE(S)

American College of Chest Physicians guidelines for the prevention and management of postoperative atrial fibrillation after cardiac surgery. Chest 2005 Aug;128(2 Suppl):1S-64S. [392 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

** REGULATORY ALERT **

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- February 28, 2008, Heparin Sodium Injection: The U.S. Food and Drug Administration (FDA) informed the public that Baxter Healthcare Corporation has voluntarily recalled all of their multi-dose and single-use vials of heparin sodium for injection and their heparin lock flush solutions. Alternate heparin manufacturers are expected to be able to increase heparin production sufficiently to supply the U.S. market. There have been reports of serious adverse events including allergic or hypersensitivity-type reactions, with symptoms of oral swelling, nausea, vomiting, sweating, shortness of breath, and cases of severe hypotension.
- August 16, 2007, Coumadin (Warfarin): Updates to the labeling for Coumadin to include pharmacogenomics information to explain that people's genetic makeup may influence how they respond to the drug.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Postoperative atrial fibrillation (AF) and atrial flutter (AFL)

GUIDELINE CATEGORY

Management
Prevention
Risk Assessment
Treatment

CLINICAL SPECIALTY

Cardiology
Critical Care
Internal Medicine
Preventive Medicine
Thoracic Surgery

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

- To provide a summary of the most current literature on the management of postoperative atrial fibrillation (AF) following cardiac surgery
- To provide recommendations for the prevention and management of postoperative atrial fibrillation following cardiac surgery based on the reported scientific data

TARGET POPULATION

Patients undergoing cardiac surgery

INTERVENTIONS AND PRACTICES CONSIDERED

Management/Treatment of Atrial Fibrillation (AF)/Flutter (AFL)

1. Anticoagulation (i.e., heparin, warfarin) after assessing risk of bleeding
2. Pharmacologic control of rhythm

- Amiodarone
- Sotalol
- Ibutilide
- Class 1A antiarrhythmic agents

Note: The following agents were considered, but not recommended: flecainide, digoxin, calcium channel blockers, dofetilide, class 1C antiarrhythmic agents.

3. Pharmacologic control of ventricular rate
    - Beta-blockers
    - Calcium-channel blockers (diltiazem or verapamil)

    Note: The following were considered, but not recommended: amiodarone as first-line or first-alternative choice, digoxin as first-line or first-alternative choice, proarrhythmic agents (i.e., propafenone or dofetilide).

Atrial Fibrillation/Flutter Prophylaxis

1. Management of intraoperative interventions
    - Use of mild hypothermia during surgery
    - Adjunctive posterior pericardiotomy
    - Use of heparin-coated circuits

    Note: The following were considered, but not recommended: off-pump coronary artery bypass graft (OPCAB), use of cardioplegia (intermittent aortic cross-clamping), use of thoracic epidural anesthesia (TEA), glucose-insulin-potassium (GIK) solution infusion.

2. Cardiac pacing
    - Biatrial pacing (BAP)

    Note: Right atrial (RA) pacing alone and left atrial (LA) pacing alone were considered, but not recommended.

3. Pharmacologic prophylaxis
    - Vaughan-Williams class II beta-blockers
    - Sotalol (Vaughan-Williams class III agent)
    - Amiodarone

    Note: The following were considered, but not recommended: calcium channel antagonists (i.e., verapamil and diltiazem), routine use of magnesium, digitalis monotherapy.

MAJOR OUTCOMES CONSIDERED

- Conversion to sinus rhythm
- Incidence of postoperative atrial fibrillation (AF) and/or atrial flutter (AFL)
- Relapse of AF or AFL
- Time to the first episode of AF or AFL following surgery
- Mean duration of AF

- Mortality (all-cause and cardiovascular disease-specific)
- Incidence of myocardial infarction, stroke, transient ischemic attack, ventricular or other arrhythmia
- Normal sinus rhythm at hospital discharge
- Length of intensive care unit stay
- Length of hospital stay
- Side effects of treatments for AF and AFL

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The Johns Hopkins University Evidence-Based Practice Center conducted a systematic review of the literature, using several sources to identify studies that were potentially relevant to the study questions. Electronic searches were conducted in PubMed and in CENTRAL, the Cochrane Collaboration database. These searches were augmented by a manual search of 26 cardiology, surgery, and anesthesia journals that were identified by the working group as being of high priority, of the reference lists of relevant review articles, and of the reference lists of selected studies included in the literature review.

Study Eligibility

The review was restricted to studies on adult patients undergoing cardiac surgery published between 1964 and December 2001. An abstract review form was developed to determine the eligibility of a study for review. Studies were eligible for review if they were controlled trials that addressed the management or prophylaxis of the postoperative onset of atrial fibrillation or atrial flutter in patients undergoing coronary artery bypass graft or valvular surgery. An additional search was performed to identify randomized trials that addressed the risks and benefits of perioperative anticoagulation therapy in patients undergoing coronary artery bypass grafting. Only human studies in the English language that reported directly on atrial fibrillation, atrial flutter, or both were included in the analysis.

NUMBER OF SOURCE DOCUMENTS

From the 941 abstracts reviewed, 802 were excluded, with the majority of abstracts being excluded because they reported on the surgical management of non-perioperative atrial fibrillation. The remaining 139 abstracts went through the article review process, and 128 studies were found to address one or more of the following issues: pharmacologic prophylactic therapy (70 studies); pacing (9 studies); intraoperative management (18 studies); treatment to achieve conversion (19 studies); heart rate-controlling agents (11 studies); and the

prevention of thromboembolism (12 studies). Of the 128 included studies, 14 studies addressed two of the questions.

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

Quality of Evidence

Good: Evidence based on good randomized controlled trials (RCTs) or metaanalyses

Fair: Evidence based on other controlled trials or randomized controlled trials with minor flaws

Low: Evidence based on nonrandomized, case-control, or other observational studies

Expert opinion: Evidence based on the consensus of a carefully selected panel of experts in the topic field. There were no studies that met the criteria for inclusion in the literature review.

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

Assessment of Study Quality

The form to assess study quality was based on a similar form that had been used in previous systematic reviews by the Johns Hopkins University Evidence-Based Practice Center on the management of atrial fibrillation (see the "Appendix" of the original guideline document). The final assessment form contained 23 questions that were related to study quality. These questions were grouped into the following five categories:

1. Representativeness
2. Bias and confounding
3. Intervention description
4. Outcomes and follow-up
5. Statistical methods and interpretation

Representativeness was assessed by determining whether the study population as well as the inclusion and exclusion criteria were clearly described. The method of randomization and the degree of masking were used to assess the potential impact of bias and confounding, with the highest quality scores given for those

studies in which investigators, treatment supervisors, patients, and outcomes assessors had been blinded. In judging the quality of the intervention description, the completeness of the protocol description and the important differences in ancillary treatment that might influence the outcomes were assessed. The rigor with which outcomes and follow-up were studied was assessed by looking for standardized evaluation techniques and objective outcome assessment procedures. The highest scores were given if there were clear definitions of each outcome and the method of assessment was objective (e.g., Holter monitors, head computed tomography [CT] scans, or head magnetic resonance imaging [MRI]). Finally, statistical quality and interpretation were graded by reviewing whether appropriate statistical techniques had been used, and whether appropriate adjustments for confounding factors had been made.

Content Form

An article content assessment form was developed to extract relevant information from eligible studies in a standardized fashion. Published reports of studies were reviewed by pairs of study investigators with experience in clinical research and a relevant clinical discipline (i.e., cardiac surgery, anesthesiology, cardiology, or internal medicine). Two members of the team independently evaluated the quality of each study using the standardized form. The two investigators reviewed any disagreements to achieve consensus. The reviewers were not masked with regard to the author, institution, and journal because such masking has been demonstrated to be ineffective in removing potential reviewer bias.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

A panel of recognized experts representing the American College of Chest Physicians, the American College of Cardiology, the American College of Surgeons, the Society of Cardiovascular Anesthesiologists, and the Society of Thoracic Surgeons developed a list of four specific issues to address:

1. Controlling the ventricular response rate in atrial fibrillation (AF) after cardiac surgery
2. Preventing thromboembolism and the role of anticoagulation therapy in the surgical patient
3. Converting the heart beat to normal sinus rhythm
4. Prophylaxis to prevent postoperative atrial fibrillation

Issue 4 was subdivided into the following three areas: perioperative pharmacologic therapy; pacing; and intraoperative management to reduce the incidence of atrial fibrillation.

A set of tables specific for each of the topic areas was developed. The evidence tables can be viewed on the American College of Chest Physicians (ACCP) Web site at http://www.chestnet.org. The panel was divided into subgroups for specific

topics, and a deliberate attempt was made to mix subspecialties so that each group would consist of experts including a cardiologist, an anesthesiologist, and a surgeon. This was done in an effort to prevent certain biases from dominating the recommendations.

Grading System for Strength of Evidence and Levels of Recommendations

From the systematic review of the literature, subgroups graded the strength of evidence and established a grading level for each resulting recommendation. The table in the "Rating Scheme for the Strength of the Recommendations" field summarizes the American College of Chest Physicians (ACCP) grading system that was used to develop the recommendations.

A system was formulated to present guideline recommendations in a structured "level-of-evidence" fashion that reflects the quality of evidence on which a recommendation is based and places the recommendation in a clinical context. This system for grading evidence and establishing levels of evidence for guidelines recommendations accomplishes the following:

1. It clearly indicates the support behind each recommendation and, therefore, its strength.
2. It accounts for and explains, either separately or in a combined fashion, both the strength of the recommendation and the quality of the studies that went into the decision on that recommendation (e.g., rating of the articles vs. rating of the recommendation) or whether expert opinion was the primary deciding factor.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Table: Summary of the Relationship of Strength of Recommendations Scale to Quality of Evidence and Net Benefit to Patient

	Net Benefit					
Quality of Evidence	**Substantial**	**Intermediate**	**Small/Weak**	**None**	**Conflicting**	**Negative**
Good	A	A	B	D	I	D
Fair	A	B	C	D	I	D
Low	B	C	C	I	I	D
Expert Opinion	E/A	E/B	E/C	E/I	E/I	E/D

Strength of Recommendation

A: Strong recommendation

B: Moderate recommendation

C: Weak recommendation

D: Negative recommendation

I: No recommendation possible (inconclusive)

E/A: Strong recommendation based on expert opinion only

E/B: Moderate recommendation based on expert opinion only

E/C: Weak recommendation based on expert opinion only

E/D: Negative recommendation based on expert opinion only

Net Benefit

These levels of net benefit to the patient (adjusted for risk) are based on a clinical assessment of the intervention (e.g., a test of procedure), as follows:

- Substantial
- Intermediate
- Small/weak
- None
- Conflicting
- Negative

COST ANALYSIS

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

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Each recommendation is rated based on the levels of evidence (good, fair, low, and expert opinion) and the net benefit (substantial, intermediate, small/weak, none, conflicting, and negative to determine the grades of the recommendations (A, B, C, D, I, E/A, E/B, E/C, and E/D). Definitions are presented at the end of the "Major Recommendations" field.

Anticoagulation

Summary

While the risk for atrial thrombus formation and stroke must be considered, the potential major complications of postoperative atrial fibrillation (AF) and atrial flutter (AFL), anticoagulation must be considered in light of the complex alterations of coagulation and the risk for enhanced bleeding tendency associated with cardiac surgery and cardiopulmonary bypass. Thus, the relative merits of anticoagulation therapy in patients with AF after cardiac surgery must be weighed against (1) the potential risk for bleeding in a setting of an already enhanced bleeding tendency after major surgery and (2) the typically self-limited history of postoperative AF and AFL. Thus, recommendations for anticoagulation in postoperative patients with AF and AFL include the following (see "Summary of Recommendations" below).

Table: Risk Stratification Schemes for Primary Prevention of Thromboembolism in Patients with Nonvalvular Atrial Fibrillation (adapted from Fuster et al., 2001)

Source	High Risk	Intermediate Risk	Low Risk
Atrial Fibrillation Investigators (1994)	Age ≥65 years; history of hypertension, coronary artery disease, and diabetes		Age <65 years and no high-risk features
American College of Chest Physicians (1998)	Age >75 years; history of hypertension, left ventricular dysfunction; >1 intermediate risk factor	Age 65-75 years; diabetes, coronary artery disease, or thyrotoxicosis	Age <65 years and no risk factors
Stroke Prevention in Atrial Fibrillation (1995)	Women aged >75 years; systolic blood pressure >160 mm Hg; left ventricular dysfunction	History of hypertension and no high-risk features	No high-risk features and no history of hypertension

Summary of Recommendations

1. In optimally selected patients with chronic AF and in those patients in whom it is thought to be likely that AF will continue postoperatively, the expert panel recommends anticoagulation therapy **(strength of recommendation, A; evidence grade, good; net benefit, substantial)**.
2. In the high-risk patient with postoperative AF, such as those with a history of stroke or transient ischemic attack, the routine use of heparin should be considered **(strength of recommendation, C; evidence grade, low; net benefit, intermediate)**.
3. The expert panel recommends continuing anticoagulation therapy for 30 days after the return of normal sinus rhythm because of the prior demonstration of persistent impairment of atrial contraction and a presumably enhanced risk for thrombosis following the conversion of postoperative AF **(strength of recommendation, C; evidence grade, low; net benefit, intermediate)**.

Intraoperative Interventions

Recommendations

AF remains a significant complication following cardiac surgery. This arrhythmia is associated with an increased hospital length of stay, increased costs, and an increased risk for thromboembolic complications. On the basis of the findings of this and the other reports in this series, the expert panel suggests that a multifactorial approach, involving appropriate prophylaxis and treatment for this arrhythmia, will best serve cardiac surgery patients. Below are the recommendations for the management of intraoperative interventions. A summary of these clinical recommendations and grades of evidence is presented in Table 2 of the chapter titled "Intraoperative Interventions" in the original guideline document.

1. The expert panel recommends the use of mild, rather than moderate, hypothermia to reduce the frequency of postoperative AF **(strength of recommendation, A; evidence grade, fair; net benefit, substantial)**.
2. Posterior pericardiotomy may be a useful adjunct to help reduce the incidence of postoperative atrial arrhythmias; however, this recommendation is based on a single, small-scale randomized, controlled trial. Posterior pericardiotomy is not currently standard of care and is not widely used as an adjunct to reduce postoperative AF **(strength of recommendation, B; evidence grade, fair; net benefit, intermediate)**.
3. Off-pump coronary bypass graft (OPCAB) cannot be recommended to decrease postoperative AF because of conflicting results reported from randomized, controlled trials or large-scale concurrent cohort studies **(strength of recommendation, I; evidence grade, fair; net benefit, conflicting)**.
4. No specific recommendations can be made regarding which type of cardioplegia (or intermittent aortic cross-clamping) best reduces the incidence of postoperative AF **(strength of recommendation, I; evidence grade, good; net benefit, none)**.
5. No recommendation can be made regarding the use of thoracic epidural anesthesia (TEA) as an adjunct to conventional general anesthesia to prevent postoperative AF after cardiac surgery **(strength of recommendation, I; evidence grade, fair; net benefit, conflicting)**.
6. The expert panel cannot recommend glucose-insulin-potassium (GIK) solution infusion to prevent postoperative AF because of conflicting results from the identified randomized, controlled trials **(strength of recommendation, I; evidence grade, fair; net benefit, conflicting)**.
7. The expert panel recommends the use of heparin-coated circuits to reduce the rate of postoperative AF **(strength of recommendation, B; evidence grade, fair; net benefit, intermediate)**.

The Role of Cardiac Pacing

Summary of Recommendations

Atrial pacing appears to reduce the incidence of AF after cardiac surgery in some studies. Biatrial pacing (BAP) appears to be the most efficacious. Right atrial (RA) pacing alone may reduce the incidence of AF, while left atrial (LA) pacing alone does not appear to reduce the incidence, at least based on the limited data currently available. The recommendations are also summarized in Table 1 of the chapter titled "The Role of Cardiac Pacing" in the original guideline document.

1. The expert panel does not recommend right atrial pacing alone to reduce postoperative AF after cardiac surgery **(strength of recommendation, I; evidence grade, fair; net benefit, small/weak)**.
2. The expert panel does not recommend isolated left atrial pacing to prevent postoperative AF following cardiac surgery **(strength of recommendation, I; evidence grade, fair; net benefit, none)**.
3. The expert panel recommends biatrial pacing to help prevent postoperative AF **(strength of recommendation, B; evidence grade, good; net benefit, small/weak)**.

Pharmacologic Prophylaxis

A number of antiarrhythmic drugs and classes of drugs have been found to demonstrate varying degrees of efficacy in preventing new-onset AF after cardiac surgery.

1. In patients in whom prophylaxis against post-cardiac surgery AF is indicated, including those patients receiving long-term therapy with beta-blockers prior to surgery for whom therapy should be reinstated, the expert panel recommends the use of Vaughan-Williams class II beta-blockers **(strength of recommendation, A; evidence grade, fair; net benefit, substantial)**.
2. Sotalol (Vaughan-Williams class III agent) therapy may be considered for postoperative AF prophylaxis but is associated with increased toxicity **(strength of recommendation, B; evidence grade, good; net benefit, intermediate)**.
3. In individual patients for whom therapy with class II beta-blockers are contraindicated, therapy with amiodarone should be considered **(strength of recommendation, B; evidence grade, good; net benefit, intermediate)**.
4. To prevent AF/AFL in patients following cardiac surgery, the expert panel recommends against the use of calcium channel antagonists (i.e., verapamil and diltiazem) **(strength of recommendation, D; evidence grade, low; net benefit, none)**.
5. For the prevention of AF/AFL in patients following cardiac surgery, the expert panel recommends against routine treatment with magnesium **(strength of recommendation, D; evidence grade, low; net benefit, none)**.
6. For reducing the incidence of post-surgical AF, the expert panel does not recommend digitalis for use as monotherapy **(strength of recommendation, I; evidence grade, low; net benefit, none)**.

Table 1 in the chapter titled, "Pharmacologic Prophylaxis" in the original guideline document provides the results and evidence grades for other prophylactic therapies evaluated in a few small studies. These therapies include dexamethasone, insulin-induced cardioplegia, triiodothyronine, procainamide, alinidine, quinidine, and glucose-insulin-potassium. The merits of these agents in preventing postoperative AF are unclear because of the limited evidence. Therefore, these agents, although cited in the text and in Table 1, were not included in the above summary of recommendations.

Pharmacologic Control of Rhythm

Summary of Recommendations

In patients who do not require emergent cardioversion, pharmacologic agents for control of postoperative AF and AFL are selected for use due to their efficacy in converting AF to normal sinus rhythm in the immediate postoperative period and in maintaining normal sinus rhythm postoperatively (see Table 4 in the chapter titled, "Pharmacologic Control of Rhythm" in the original guideline document). Antiarrhythmic drugs that are administered to maintain normal sinus rhythm are customarily continued for 4 to 6 weeks postoperatively. Because of a dearth of high-quality evidence regarding pharmacologic therapy for the maintenance of postoperative normal sinus rhythm after conversion of postoperative AF or AFL, recommendations for the pharmacologic maintenance of normal sinus rhythm postoperatively were extrapolated from recommendations for non-surgical patients with AF. In all instances, the choice of a drug or drugs to convert postoperative AF or AFL and subsequently to maintain normal sinus rhythm must be determined for each patient based on individual clinical characteristics. It is advisable to restore and maintain sinus rhythm for patients with postoperative AF or AFL that is complicated by significant symptoms or hemodynamic instability. Early cardioversion within 48 hours should be considered in patients with a contraindication to anticoagulation therapy. When these clinical conditions are absent, a strategy of rate control may be equivalent to one of rhythm control.

Torsades de pointes and bradycardia are major complications of antiarrhythmic therapy. Patients should be monitored closely by continuous telemetry and should have access to a defibrillator when therapy with antiarrhythmic drugs is started during AF. Epicardial or transvenous pacing may be helpful to prevent torsades de pointes, pauses, or bradycardia.

Table 1 of the chapter titled "Pharmacologic Control of Rhythm" in the original guideline document summarizes the various agents used for rhythm control in AF with conversion and relapse rates. Tables 2 and 3 of that same chapter in the original guideline document list the doses and toxicities for drugs used for the conversion to and maintenance of sinus rhythm, respectively. Finally, Table 4 provides a summary of the evidence and strength of recommendations for each intervention.

1. In patients with depressed left ventricular function in whom maintaining sinus rhythm is important, the expert panel recommends therapy with amiodarone **(strength of recommendation, E/C; evidence grade, low; net benefit, intermediate)**.
2. In patients without heart failure, the expert panel recommends therapy with amiodarone, sotalol, or ibutilide, or, alternatively, class 1A agents for the conversion of AF following cardiac surgery **(strength of recommendation, C [E/C for amiodarone]; evidence grade, low; net benefit, intermediate)**.
3. In patients with AF after cardiac surgery, the expert panel recommends 4 to 6 weeks of antiarrhythmic therapy **(strength of recommendation, E/C; evidence grade, low; net benefit, small/weak)**.
4. In patients with AF following cardiac surgery, the expert panel cannot at this time recommend using flecainide, digoxin, or calcium channel blockers for the purpose of conversion to sinus rhythm **(strength of recommendation, I; evidence grade, low; net benefit, none)**.
5. In patients with AF following cardiac surgery, the expert panel recommends against therapy with dofetilide and class 1C agents for conversion to sinus

rhythm **(strength of recommendation, D; evidence grade, low; net benefit, negative)**.

Pharmacologic Control of Ventricular Rate

The pharmacologic management of the ventricular rate in postoperative AF or AFL patients with a rapid ventricular response is a problem that must frequently be addressed after cardiac surgery. A summary of the evidence grade, net benefit, and overall strength of the recommendations for pharmacologic agents is presented in the Table 2 in the chapter titled, "Pharmacologic Control of Ventricular Rate" in the original guideline document. The pharmacologic management of ventricular rate must be considered in the total context of the management of postoperative AF and AFL.

1. In patients with postoperative AF and AFL who do not need urgent cardioversion and have no contraindication to anticoagulation therapy, therapy with beta-blockers is recommended as the first-line pharmacologic choice for ventricular rate control (Andrews et al., 1991; Balser et al., 1998; Maisel, Rawn, & Stevenson, 2001). This recommendation is based on a limited amount of evidence, but the recommendation is made in consideration of the hyperadrenergic state that typically exists after surgery and the effect of beta-blockers on adrenergic tone **(strength of recommendation, B; evidence grade, low quality; net benefit, intermediate)**.
2. For patients with postoperative AF and AFL, the expert panel recommends the calcium channel blockers diltiazem and verapamil as second-line choices for ventricular rate control **(strength of recommendation, B; evidence grade, low quality; net benefit, intermediate)**.
3. In the setting of postoperative AF or AFL, the expert panel does not consider amiodarone to be a first-line or first-alternative choice for ventricular rate control. While amiodarone may be used as an alternative to beta-blockers or calcium channel blockers, limited evidence suggests that excessive bradycardia or respiratory dysfunction (Ashrafian & Davey, 2001) may be side effects in some patients **(strength of recommendation, I; evidence grade, low; net benefit, small/weak)**.
4. In the setting of postoperative AF or AFL, digoxin is not considered to be a first-line or first-alternative choice for ventricular rate control. Although digoxin is widely used to treat postoperative AF and AFL, it has no effect on adrenergic tone and therefore may not be as efficacious for rate control in patients with AF or AFL. Limited evidence indicates that digoxin may not be more effective than diltiazem or amiodarone in controlling ventricular rate in patients with postoperative AF **(strength of recommendation, I; evidence grade, low; net benefit, none)**.
5. For the control of ventricular rate in patients with postoperative AF or AFL, the expert panel recommends against the use of any drugs that may be, or have been shown to be, proarrhythmic. While propafenone may be efficacious in controlling ventricular rate in patients with postoperative AF or AFL, it has a potential to cause bradycardia and should not be given to patients with coronary artery disease (Roy et al., 2000). Dofetilide is not considered to be efficacious and may be proarrhythmic **(strength of recommendation, D; evidence grade, low quality; net benefit, negative)**.

Definitions:

Quality of Evidence

Good: Evidence based on good randomized controlled trials (RCTs) or metaanalyses

Fair: Evidence based on other controlled trials or randomized controlled trials with minor flaws

Low: Evidence based on nonrandomized, case-control, or other observational studies

Expert opinion: Evidence based on the consensus of a carefully selected panel of experts in the topic field. There were no studies that met the criteria for inclusion in the literature review.

Strength of Recommendation

A: Strong recommendation

B: Moderate recommendation

C: Weak recommendation

D: Negative recommendation

I: No recommendation possible (inconclusive)

E/A: Strong recommendation based on expert opinion only

E/B: Moderate recommendation based on expert opinion only

E/C: Weak recommendation based on expert opinion only

E/D: Negative recommendation based on expert opinion only

Net Benefit

These levels of net benefit to the patient (adjusted for risk) are based on a clinical assessment of the intervention (e.g., a test of procedure), as follows:

- Substantial
- Intermediate
- Small/weak
- None
- Conflicting
- Negative

Table: Summary of the Relationship of Strength of Recommendations Scale to Quality of Evidence and Net Benefit to Patient

	Net Benefit					
Quality of Evidence	**Substantial**	**Intermediate**	**Small/Weak**	**None**	**Conflicting**	**Negative**
Good	A	A	B	D	I	D
Fair	A	B	C	D	I	D
Low	B	C	C	I	I	D
Expert Opinion	E/A	E/B	E/C	E/I	E/I	E/D

CLINICAL ALGORITHM(S)

An algorithm is provided in the original guideline document for rhythm control for postoperative atrial fibrillation (AF).

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate management and prevention of postoperative atrial fibrillation (AF) and/or flutter (AFL) following cardiac surgery

POTENTIAL HARMS

- Early anticoagulation therapy reduces the risk of stroke but carries the risk of bleeding and cardiac tamponade.
- Sotalol and amiodarone are associated with potentially significant side effects. Sotalol therapy may result in life-threatening proarrhythmia, especially if prescribed for elderly patients with structural heart disease and with the concomitant use of diuretics in the setting of renal insufficiency.
- Tables 2 and 3 of the chapter titled "Pharmacologic control of rhythm" in the original guideline document list the toxicities of drugs used for conversion of atrial fibrillation (AF) and drugs used for maintenance of sinus rhythm after conversion of AF, respectively.

CONTRAINDICATIONS

CONTRAINDICATIONS

- It must also be recognized that class IC drugs are contraindicated in patients with coronary artery disease.
- Dofetilide is contraindicated in patients with a creatinine clearance <20 mL/min.
- Disopyramide is contraindicated in patients with existing glaucoma.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

In the ever-changing field of medicine, it is important and necessary to have access to up-to-date information. New studies that may have become available late in the process of guideline development may not be incorporated into this document. Therefore, the reader is encouraged to seek out newer information that might impact the diagnostic and treatment recommendations contained within the guideline. Clinical practice guidelines are developed to enhance the clinician's ability to practice evidence-based medicine and also to provide an opportunity for the busy clinician to receive the latest evidence on a particular topic. The information provided in the guideline should be used in conjunction with clinical judgment. Although the guideline provides recommendations that are based on evidence from studies involving various populations, the recommendations may not apply to every individual patient. It is important for the physician to take into consideration the role of patient preferences and the availability of local resources.

The American College of Chest Physicians (ACCP) is sensitive to concerns that nationally and/or internationally developed guidelines are not always applicable in local settings. Further, guideline recommendations are just that: recommendations, not dictates. In treating patients, individual circumstances, preferences, and resources play a role in the course of treatment at every decision level. Although the science behind evidence-based medicine is rigorous, there are always exceptions. The recommendations are intended to guide health-care decisions. These recommendations can be adapted to be applicable at various levels.

Limitations

Intraoperative Interventions

It is important to keep in mind that the recommendations are based on a relatively small number of studies. In the case of posterior pericardiotomy and the use of mild hypothermia, the recommendations are based on only single randomized controlled studies. The panel understands that, when making clinical decisions for the individual patient, the reader must place the recommendations in the proper context.

Pharmacologic Prophylaxis

This chapter has compiled and reviewed the results of 91 trials. There are multiple limitations with this type of evidence summary. Trials varied in patient inclusion and exclusion criteria as well as in the time of initiation of prophylactic therapy

during hospitalization. Also, atrial fibrillation (AF) definitions differed. For example, among the sotalol trials, the minimum duration for an AF episode to be counted as an arrhythmic event was 30 seconds in one trial and 30 minutes in another. The methods used to detect arrhythmias also varied widely, including nurse evaluations, telemetry, telemetry with automatic alarms/recordings, and continuous Holter monitoring. Last, these trials were performed over several decades. Naturally, the knowledge base and technology progressed with each trial. These limitations, however, do not overshadow the lessons learned from prophylaxis studies.

Pharmacologic Control of Rhythm

Little evidence exists to identify the best pharmacologic strategy to achieve rhythm control in patients with AF or atrial flutter (AFL) following cardiac surgery. The panel is unable to definitively state the relative efficacy of various agents because of the inability to ensure comparable subjects, comparable outcome measures, and comparable monitoring methods. Additionally, many of the trials were underpowered to achieve definitive conclusions. Recommendations should be considered in light of these data limitations. The final recommendations have evolved from a consensus using those studies that are available for data extraction.

Pharmacologic Control of Ventricular Rate

There are suggestions in the literature that the use of many ventricular rate-controlling agents is better than placebo, at least in the early course of AF or AFL. However, these studies are marked by significant limitations. Very few randomized controlled trials are available, and, in particular, few placebo-controlled trials exist. Additionally, none of the rate control agents received a grade of evidence better than low quality. These issues limit the ability of the panel to make firm recommendations based on randomized controlled trial data.

Another serious limitation is the heterogeneity of the methods and outcome measures used. Many of the trials failed to define the ancillary medications that were administered to subjects, and some trials allowed the concomitant use of multiple rate-controlling agents (e.g., beta-blockers and digoxin). Last, the generalizability of the results is limited because many of the studies excluded patients who make up a large and growing portion of the population of patients with postoperative arrhythmias such as those with congestive heart failure, decreased left ventricular function, and conduction abnormalities.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Implementation tools are being developed, including a quick reference guide in print and personal digital assistant format, and educational slide presentations for physicians and other health-care practitioners.

IMPLEMENTATION TOOLS

Clinical Algorithm

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

American College of Chest Physicians guidelines for the prevention and management of postoperative atrial fibrillation after cardiac surgery. Chest 2005 Aug;128(2 Suppl):1S-64S. [392 references] PubMed

ADAPTATION

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

DATE RELEASED

2005 Aug

GUIDELINE DEVELOPER(S)

American College of Chest Physicians - Medical Specialty Society

SOURCE(S) OF FUNDING

American College of Chest Physicians

GUIDELINE COMMITTEE

American College of Chest Physicians (ACCP) Expert Panel on the Prevention and Management of Postoperative Atrial Fibrillation after Cardiac Surgery

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Peter P. McKeown, MBBS, MPH, MPA, FCCP (Chair) Consulting Professor of Surgery, Duke University, Department of Surgery, Asheville Veterans Affairs Medical Center, Asheville, NC; John C. Alexander, Jr., MD, FCCP, Hackensack University Medical Center, Hackensack, NJ; Lawrence L. Cresswell, MD, Division of Cardiothoracic Surgery, University of Mississippi Medical Center, Jackson, MS; Emile G. Daoud, MD, Mid-Ohio Cardiology and Vascular Consultants, Columbus, OH; Andrew E. Epstein, MD, Division of Cardiovascular Disease, University of Alabama at Birmingham, Birmingham, AL; T. Bruce Ferguson, Jr., MD, Division of Cardiothoracic Surgery, Louisiana State University School of Medicine, New Orleans, LA; David D. Gutterman, MD, FCCP, Department of Internal Medicine, Medical College of Wisconsin, Milwaukee, WI; Charles W. Hogue, Jr., MD, Department of Anesthesiology, Washington University School of Medicine, St. Louis, MO; Alan Lisbon, MD, FCCP, Department of Anesthesia and Critical Care Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA; Eric N. Prystowsky, MD, The Care Group, Indianapolis, IN; David P. Schroeder, MD, FCCP, Asheville Cardiology Association, Asheville, NC; J. Marcus Wharton, MD, Medical University of South Carolina, Charleston, SC; Peter Zimetbaum, MD, Beth Israel Deaconess Medical Center, Boston, MA

Johns Hopkins University Evidence-Based Practice Center Staff: Eric B. Bass, MD, MPH, Departments of Medicine, Epidemiology, and Health Policy and Management, Johns Hopkins University, Baltimore, MD; David Bradley, MD, Department of Medicine, Johns Hopkins University, Baltimore, MD; Lee A. Fleisher, MD, Department of Anesthesia, University of Pennsylvania Health System, Philadelphia, PA; Lisa H. Lubomski, PhD, Quality and Safety Research Group, Johns Hopkins School of Medicine, Baltimore, MD; William H. Maisel, MD, MPH, Cardiovascular Division, Brigham and Women's Hospital, Boston, MA; Elizabeth Martinez, MD, Departments of Anesthesia, Critical Care Medicine, and Surgery, Johns Hopkins Medical Institution, Baltimore, MD; and Rachel Slacum

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The American College of Chest Physicians (ACCP) finds it imperative to include individuals who are experts in their respective fields on guideline development committees. The recommendations and publications that are the products of these committees will have far-reaching significance that may affect multiple aspects of the practice of chest medicine throughout the world; therefore, it is essential that the ACCP have full disclosure of outside interests from those individuals serving on policy development committees, including liaison representatives from outside organizations. Both real and potential conflicts of interest may actually affect or appear to affect impartial or objective decisions.

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available to subscribers of Chest - The Cardiopulmonary and Critical Care Journal.

Print copies: Available from the American College of Chest Physicians, Products and Registration Division, 3300 Dundee Road, Northbrook IL 60062-2348.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on November 17, 2005. The information was verified by the guideline developer on November 28, 2005. This summary was updated by ECRI on March 6, 2007 following the U.S. Food and Drug Administration (FDA) advisory on Coumadin (warfarin sodium). This summary was updated by ECRI Institute on June 22, 2007 following the U.S. Food and Drug Administration (FDA) advisory on heparin sodium injection. This summary was updated by ECRI Institute on September 7, 2007 following the revised U.S. Food and Drug Administration (FDA) advisory on Coumadin (warfarin). This summary was updated by ECRI Institute on March 14, 2008 following the updated FDA advisory on heparin sodium injection.

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