Enhanced Recovery After Surgery Cardiac Society turnkey order set for prevention and management of postoperative atrial fibrillation after cardiac surgery: Proceedings from the American Association for Thoracic Surgery ERAS Conclave 2023

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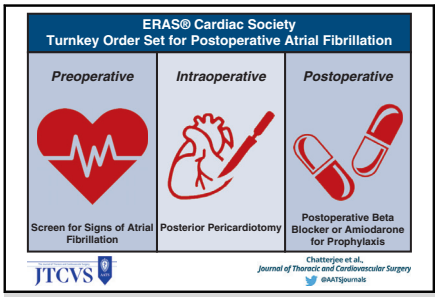
ABSTRACT

Background: Postoperative atrial fibrillation (POAF) is a prevalent complication following cardiac surgery that is associated with increased adverse events. Several guidelines and expert consensus documents have been published addressing the prevention and management of POAF. We aimed to develop an order set to facilitate widespread implementation and adoption of evidence-based practices for POAF following cardiac surgery.

Methods: Subject matter experts were consulted to translate existing guidelines and literature into a sample turnkey order set (TKO) for POAF. Orders derived from consistent class I or IIA or equivalent recommendations across referenced guidelines and consensus manuscripts appear in the TKO in bold type. Selected orders that were inconsistently class I or IIA, class IIB, or supported by published evidence appear in italic type.

Results: Preoperatively, the recommendation is to screen patients for paroxysmal or chronic atrial fibrillation and initiate appropriate treatment based on individual risk stratification for the development of POAF. This may include the administration of beta-blockers or amiodarone, tailored to the patient's specific risk profile. Intraoperatively, surgical interventions such as posterior pericardiotomy should be considered in selected patients. Postoperatively, it is crucial to focus on electrolyte normalization, implementation strategies for rate or rhythm control, and anticoagulation management. These comprehensive measures aim to optimize patient outcomes and reduce the occurrence of POAF following cardiac surgery.

Conclusions: Despite the well-established benefits of implementing a multidisciplinary care pathway for POAF in cardiac surgery, its adoption and implementation remain inconsistent. We have developed a readily applicable order set that incorporates recommendations from existing guidelines. (JTCVS Open 2024;18:118-22)



Key aspects of postoperative atrial fibrillation management across perioperative phases of care.

CENTRAL MESSAGE

A standardized order set incorporating various guideline recommendations may lead to meaningful implementation of comprehensive postoperative atrial fibrillation prophylaxis and management.

PERSPECTIVE

Multiple societies have published evidence-based expert consensus documents and guidelines for the prevention and management of postoperative atrial fibrillation (POAF) following cardiac surgery. Standardized adoption and implementation can be challenging. This "turnkey" order set was created by the Enhanced Recovery After Surgery (ERAS) Cardiac Society to aid clinicians in POAF best practices.

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Abbreviations and Acronyms

ACC = American College of Cardiology
AHA = American Heart Association
CABG = coronary artery bypass grafting
ERAS = enhancing recovery after surgery
POAF = postoperative atrial fibrillation
TKO = turnkey order set

Postoperative atrial fibrillation (POAF) occurs in 20% to 40% of patients after cardiac surgery; the incidence is highest in combined coronary artery bypass grafting (CABG) and valve procedures, followed by isolated valve surgery, and lowest after isolated CABG.[1] POAF has been associated with an increased risk of adverse outcomes, longer hospital length of stay, and reduced late survival.[2] Strategies to reduce the incidence of POAF may include pharmacologic management and surgical interventions. In general, current scoring systems are not accurate for predicting POAF after cardiac surgery; consequently, a general approach to POAF is needed, rather than a targeted approach to selectively identify patients at higher risk of developing POAF.[3]

Although multiple societal-based preoperative, intraoperative, and postoperative evidence-based recommendations have been published, the widespread use and standardization of these practices is lagging. This may be due in part to a poor awareness of "evidence-based" best practices, skepticism about the underlying evidence supporting these practices, conflicting research findings, variations in guideline recommendations and interpretations, and a paucity of granular mechanisms to facilitate bedside implementation.[4-8] A systematic integration of current literature is timely and essential to develop practical, easy-to-use turnkey order (TKO) sets that may be readily implemented into daily practice within the framework of cardiac enhanced recovery after surgery (ERAS).

Our primary objective was to perform a systematic analysis of published guidelines to develop a meaningful and practical order set for the prevention and management of POAF following cardiac surgery. This order set, presented at the American Association for Thoracic Surgery ERAS Conclave in May 2023, is part of a series created by the ERAS Cardiac Society.[9,10]

METHODS

Key subject matter experts in atrial fibrillation and cardiovascular perioperative care were consulted to review and translate existing guidelines and peer-reviewed literature into a sample TKO for the prevention and management of POAF. Table 1 provides an overview of existing class I and IIA (or equivalent) recommendations from relevant guidelines and consensus statements. Table 2 translates the recommendations into a TKO. Orders derived from consistent class I, class IIA, or equivalent recommendations across referenced guidelines and consensus manuscripts appear in the TKO in bold type. Selected orders that were inconsistently class I or IIA or class IIB in these manuscripts or supported by evidence published in other peer-reviewed journals, are included in italic type. Our intent was not to recapitulate the evidence base justifying the recommendations, because this has been done by the guidelines and consensus statement writing committees, which are referenced. Decisions regarding order inclusion were made based on estimated benefit, risk, cost, implementation complexity, and generalizability. Each of these orders should be considered based on local institutional priorities, resources, practices, and expertise.

COMPARISON OF EXISTING GUIDELINES

Given the variability in the prevention and management of POAF strategies and recommendations across different professional societies, we a priori elected to focus on class I and class IIA guidelines from the following: (1) the American Heart Association (AHA), American College of Cardiology (ACC), and Heart Rhythm Society; (2) the European Society of Cardiology and European Association for Cardio-Thoracic Surgery; (3) the Society of Cardiovascular Anesthesiology and European Association of Cardiothoracic Anesthesiology; and (4) the Canadian Cardiovascular Society/Canadian Heart Rhythm Society.[11-15] The various guidelines were developed by various selected expert panels of diverse members representing a diversity of geographic regions, sexes, races, ethnicities, and clinical practice settings. Specific methodologic details are provided in the individual guidelines. Since the May 2023 American Association for Thoracic Surgery ERAS Conclave, an updated set of ACC/AHA/Heart Rhythm Society atrial fibrillation guidelines were published in November 2023,[15] which have been incorporated into these recommendations.

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TABLE 1. Comparison of class I/IIA or equivalent recommendations for cardiac surgery: POAF consensus and guideline publications

Recommendation	ACC/AHA/HRS (2014, 2019, 2023)	ESC/EACTS (2020)	SCA/EACTA (2018)	CCVC/CHRS (2020)
Preoperative beta-blocker				☒
Preoperative amiodarone to prevent POAF	☒	☒	☒	☒
Beta-blocker to prevent POAF	☒	☒	☒	☒
Perioperative amiodarone to prevent POAF	☒	☒	☒	☒
Nondihydropyridine calcium channel blocker when beta-blocker does not achieve rate control	☒		☒	☒
Amiodarone (antiarrhythmics) to treat POAF	☒		☒	☒
Antithrombotic medication for POAF to reduce thromboembolism	☒	☒	☒	
Ibutilide/elective direct-current cardioversion	☒		☒	
Direct-current cardioversion for hemodynamic instability	☒		☒	

POAF, Postoperative atrial fibrillation; *ACC*, American College of Cardiology; *AHA*, American Heart Association; *HRS*, Heart Rhythm Society; *ESC*, European Society of Cardiology; *EACTS*, European Association for Cardio-Thoracic Surgery; *SCA*, Society of Cardiovascular Anesthesiology; *EACTA*, European Association of Cardiothoracic Anesthesiology; *CCVC*, Canadian Cardiovascular Society; *CHRS*, Canadian Heart Rhythm Society.

Preoperative

Among the individual guidelines, several preoperative strategies consistently received strong recommendations. Screening questions regarding any history of potential symptoms of atrial fibrillation (palpitations, syncope, others) are recommended to determine the potential of undiagnosed atrial fibrillation and thus the potential benefit of concomitant surgical ablation. Strategies to manage patients with preexisting atrial fibrillation undergoing cardiac surgery will be covered in a future TKO.

Continuation of preoperative beta-blockers is advised, including on the morning of surgery. They are recommended particularly for patients undergoing CABG, even if they are not part of the patient's regular medication regimen prior to surgery. Amiodarone may be used preoperatively to prevent POAF, particularly in patients at high risk of POAF, including older patients, patients with previous valve surgery, and patients with higher CHA_2DS_2-VASc scores.[16] Other patients would include those with a previous episode of atrial fibrillation or a large left atrium on echocardiography.[17] In the Prophylactic Amiodarone for the Prevention of Arrhythmias that Begin Early After Revascularization, Valve Replacement, or Repair (PAPABEAR) trial, 6 days of preoperative amiodarone demonstrated a significant reduction in POAF, from 30% to 16% (hazard ratio, 0.52; 95% confidence interval (CI), 0.34-0.69; $P < .001$).[12] Patients with bradycardia (heart rate <60 bpm) should avoid routine beta-blockers or amiodarone.

Intraoperative

For patients with no history of atrial fibrillation, posterior pericardiotomy has been demonstrated to significantly reduce pericardial effusion and subsequent POAF (odds ratio, 0.45; 95% CI, 0.32-0.64; $P < .0001$) without added morbidity risk.[14,18] Posterior pericardiotomy has been issued a class IIA (B-NR) recommendation in the most recent 2023 ACC/AHA guidelines for the prevention of POAF after cardiac surgery.[15] Concomitant prophylactic surgical left atrial appendage closure at the time of cardiac surgery has not been shown to reduce the risk of stroke or incidence of POAF in patients without atrial fibrillation.[13,19]

Postoperative

The 2 primary pharmacologic strategies used to prevent POAF are beta-blockers and amiodarone. Typically, beta-blockers are started on the first postoperative day, based on the patient's hemodynamic profile. Amiodarone may be used with beta-blockers or as an alternative if beta-blockers cannot be tolerated (ongoing need for vasoactive medications). Patients with bradycardia (heart rate <60 bpm) should avoid routine beta blockers or amiodarone. Amiodarone can be administered in either intravenous or oral formulations with comparable efficacy.

The treatment of POAF follows a rate or rhythm control strategy, with no significant difference in clinical outcomes between the 2 approaches. In a CTSNet trial. The 2 strategies resulted in comparable hospital length of stay, complication rates, and low rates of persistent atrial fibrillation at 60 days, indicating no demonstrated clinical advantage of one treatment approach over the other.[20] Other commonly used drugs include calcium channel blockers and, less often, digoxin. The role of anticoagulation is still evolving. Although guidelines recommend initiation of anticoagulation for POAF, the optimal duration of the paroxysmal atrial fibrillation that triggers initiation of this therapy is a subject of controversy,[21] as is the use of novel oral anticoagulants versus warfarin.[22]

PUTTING THE GUIDELINES TOGETHER: A TURNKEY ORDER SET

This turnkey order set (Table 2) provides an evidence-based framework to assist bedside providers in the prevention and management of POAF. The order set may be adopted or

TABLE 2. POAF turnkey order set

Preoperative
• *Screen for preoperative paroxysmal/persistent/permanent atrial fibrillation (questions/exam: any history of atrial fibrillation or palpitations, pulse check, electrocardiogram, etc).*
• ***If currently on beta-blocker, then continue the current regimen. Last dose given morning of surgery.***
• *If beta-blocker naïve, administer oral metoprolol 12.5-25 mg preoperatively the morning of surgery (hold for HR <60 bpm, SBP <100 mm Hg).*
• ***Patients at high risk of developing POAF (age >65 years, valve surgery, higher CHA_2DS_2-VASc score, etc), consider oral amiodarone 10 mg/kg (400-800 mg) daily for 6 d before and after surgery.***
Intraoperative
• *Consider posterior pericardiotomy at the time of surgery.*
Postoperative (first 24-48 h)
• *Prophylaxis*: ○ *Diligent electrolyte normalization ($K+ \geq 4$, $Mg^{2+} \geq 2$* ○ ***Oral metoprolol 12.5-25 mg twice daily starting on postoperative day 1 (hold for HR <60 bpm, SBP <100 mm Hg) for patients not on vasoactive medications*** ○ ***Or oral amiodarone 400 mg thrice daily for 5 d, then oral amiodarone 200 mg twice daily for 5 d, then 200 mg daily. Hold if bradycardic (HR <60 bpm); hold for QTc >450)*** ○ ***Or amiodarone 150 mg IV loading dose followed by 1 mg/min for 6 h, then 0.5 mg/min for 18 h.*** *Transition to maintenance dosage.* ○ *Amiodarone should be considered in patients unable to tolerate beta blockers; review for interactions with other medications.*
• *Atrial fibrillation rate control options:* ○ ***Metoprolol 5 mg IV every 3-5 min (total 15 mg) and/or titrated oral beta blockade*** ○ ***Diltiazem 0.25 mg/kg IV bolus, followed by diltiazem infusion 10 mg/hr titrated to HR <100 bpm; hold for HR <60 bpm or SBP <100 mm Hg*** ○ *Digoxin 500 μg IV, followed by 250 μg IV every 8 h for 2 doses*
• *Atrial fibrillation rhythm control options:* ○ ***Administer amiodarone 150 mg IV loading dose, followed by 1 mg/min for 6 h, then 0.5 mg/min for 18 h.*** *Transition to oral amiodarone 200 mg twice daily for 5 d, then 200 mg daily. Hold if bradycardic (heart rate <60 bpm). Total amiodarone load, 10 g.* ○ ***Direct current cardioversion (for hemodynamic instability*** *or elective cardioversion as needed)*
• *Anticoagulation options:* ○ ***Warfarin or DOAC should be used if atrial fibrillation is the predominant rhythm (or after weighing the benefit of thromboembolism prevention vs risk of postoperative bleeding).*** ○ *Unfractionated heparin infusion with titration to goal aPTT (2-3 times normal)* ○ *If on dual antiplatelet therapy, strongly consider holding one medication if triple-therapy bleeding risk exceeds benefit.* • *Apixaban 5 mg twice daily for nonvalvular atrial fibrillation patients (or alternative DOAC)* ○ *If patient meets 2 of the following 3 criteria, the dose may need to be reduced to 2.5 mg* ○ *Age ≥80, weight ≤60 kg, creatinine ≥1.5 g/dL.* • *Warfarin (consider the interaction with amiodarone)* ○ *Consider heparin drip to bridge in appropriate patients.* ○ *Goal INR 2-3*
• *Outpatient cardiology follow-up recommended within 4-6 wk.*

Orders in bold type are class I or IIA or equivalent in multiple sets of recommendations. Orders in italic type were inconsistently class I or IIA, class IIB, or supported by evidence published in peer-reviewed journals. *POAF*, Postoperative atrial fibrillation; *HR*, heart rate; *SBP*, systolic blood pressure; *IV*, intravenous; *DAPT*, dual antiplatelet therapy; *DOAC*, direct oral anticoagulant; *INR*, international normalized ratio; *aPTT*, activated partial thromboplastin time.

modified according to local clinical needs and constraints. This order set is meant to facilitate programmatic implementation of evidence-based best practices to achieve effective prevention and timely management of POAF.

FUTURE STUDIES

Current strategies to prevent POAF have limitations. There are several areas in need of further investigation, including examination of the appropriate timing, duration, and need for anticoagulation in POAF. The ongoing Anticoagulation for New-Onset Post-Operative Atrial Fibrillation After CABG (PACES Trial. ClinicalTrials.gov identifier NCT04045665) should complete enrollment by December 2024 and may offer important insights into the effectiveness and safety of adding anticoagulation to background antiplatelet therapy in patients who develop new-onset POAF after isolated CABG surgery, aiming to balance the prevention of thromboembolic events with the risk of bleeding. A confirmatory multicenter trial to test the effect of left posterior pericardiotomy is in preparation. The

current guidelines place insufficient emphasis on identification of patients that would most benefit from POAF prevention and anticoagulation. Identifying these patient populations may help tailor treatment plans, ultimately improving patient outcomes.

CONCLUSIONS

Existing guidelines represent an important and valuable tool in our concerted efforts toward POAF prevention and management[4-6,8,23] Treatment of POAF remains variable. Using these recommendations, we have developed an easily implemented TKO to facilitate the optimal management and prevention of POAF following cardiac surgery.

Conflict of Interest Statement

S.C. reports serving on advisory boards for Edwards Lifesciences, La Jolla Pharmaceutical, Eagle Pharmaceuticals, and Baxter Pharmaceuticals. A.R. is a consultant for Edwards Lifescience. R.S. discloses consulting/advising for Terumo, Edwards Life Sciences, Zimmer Biomet, Innoviva Specialty Therapeutics, Atricure, Encare, and the Society for the Advancement of Patient Blood Management. R.C.A. reports honoraria from Edwards LifeSciences and HLS Therapeutics and serving on an advisory board for Renibus Therapeutics. V.M.B. serves as a consultant to Abbott (nonremunerative) and on a speaker's bureau for Edwards Lifesciences. S.H. discloses a consulting relationship with Encare. D.T.E. reports serving on the device safety monitoring board for Edwards Lifesciences Medical and advisory boards of Astellas Pharma, Alexion, Terumo, Medela, and Renibus Therapeutics. A.J.G. reports speaking and advisory activities for Edwards LifeSciences. K.W.L. discloses consulting for Abiomed, Alexion, Medela, Medtronic, and Renibus. N.A. reports serving as a consultant for Medtronic, AtriCure, LivaNova USA, and Left Atrial Appendage Occlusion, LLC and serving on advisory boards for Vascular Graft Solutions and CardioSight. J.P. reports consulting for Medtronic, Medistim, VGS, and Scanlan. V.S.R. reports consulting for Atricure and Edwards Lifesciences. All other authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

References

1. Eikelboom R, Sanjanwala R, Le ML, Yamashita MH, Arora RC. Postoperative atrial fibrillation after cardiac surgery: a systematic review and meta-analysis. *Ann Thorac Surg*. 2021;111(2):544-554.
2. Woldendorp K, Farag J, Khadra S, Black D, Robinson B, Bannon P. Postoperative atrial fibrillation after cardiac surgery: a meta-analysis. *Ann Thorac Surg*. 2021; 112(6):2084-2093.
3. Segar MW, Marzec A, Razavi M, et al. Incidence, risk score performance, and in-hospital outcomes of postoperative atrial fibrillation after cardiac surgery. *Tex Heart Inst J*. 2023;50(5):e238221.
4. January CT, Wann LS, Alpert JS, et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines and the Heart Rhythm Society. *Circulation*. 2014;130(23):2071-2104.
5. January CT, Wann LS, Calkins H, et al. 2019 AHA/ACC/HRS focused update of the 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on clinical practice guidelines and the Heart Rhythm Society in collaboration with the Society of Thoracic Surgeons. *Circulation*. 2019;140(2):e125-e151.
6. Kirchhof P, Benussi S, Kotecha D, et al. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. *Eur J Cardiothorac Surg*. 2016;50(5):e1-e88.
7. Neumann FJ, Sousa-Uva M, Ahlsson A, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J*. 2019;40(2):87-165.
8. Muehlschlegel JD, Burrage PS, Ngai JY, et al. Society of Cardiovascular Anesthesiologists/European Association of Cardiothoracic Anaesthetists practice advisory for the management of perioperative atrial fibrillation in patients undergoing cardiac surgery. *Anesth Analg*. 2019;128(1):33-42.
9. Salenger R, Hirji S, Rea A, et al. ERAS® cardiac society turnkey order set for patient blood management: proceedings from the AATS ERAS Conclave 2023. *J Thorac Cardiovasc Surg*. October 20, 2023 [Epub ahead of print].
10. Engelman DT, Shaw AD. A turnkey order set for prevention of cardiac surgery-associated acute kidney injury. *Ann Thorac Surg*. 2023;115(1):11-15.
11. Ad N, Damiano RJ Jr, Badhwar V, et al. Expert consensus guidelines: examining surgical ablation for atrial fibrillation. *J Thorac Cardiovasc Surg*. 2017;153(6): 1330-1354.e1.
12. Mitchell LB, Exner DV, Wyse DG, et al. Prophylactic oral amiodarone for the prevention of arrhythmias that begin early after revascularization, valve replacement, or repair: PAPABEAR: a randomized controlled trial. *JAMA*. 2005;294(24):3093-3100.
13. Whitlock RP, Belley-Cote EP, Paparella D, et al. Left atrial appendage occlusion during cardiac surgery to prevent stroke. *N Engl J Med*. 2021;384(22):2081-2091.
14. Soletti G Jr, Perezgrovas-Olaria R, Harik L, et al. Effect of posterior pericardiotomy in cardiac surgery: a systematic review and meta-analysis of randomized controlled trials. *Front Cardiovasc Med*. 2022;9:1090102.
15. Joglar JA, Chung MK, Armbruster AL, et al. 2023 ACC/AHA/ACCP/HRS Guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association Joint Committee on clinical practice guidelines. *Circulation*. 2024;149(1):e1-e156.
16. Burgos LM, Seoane L, Parodi JB, et al. Postoperative atrial fibrillation is associated with higher scores on predictive indices. *J Thorac Cardiovasc Surg*. 2019; 157(6):2279-2286.
17. Osranek M, Fatema K, Qaddoura F, et al. Left atrial volume predicts the risk of atrial fibrillation after cardiac surgery: a prospective study. *J Am Coll Cardiol*. 2006;48(4):779-786.
18. Gaudino M, Sanna T, Ballman KV, et al. Posterior left pericardiotomy for the prevention of atrial fibrillation after cardiac surgery: an adaptive, single-centre, single-blind, randomised, controlled trial. *Lancet*. 2021;398(10316):2075-2083.
19. Gerdisch MW, Garrett HE Jr, Mumtaz MA, et al. Prophylactic left atrial appendage exclusion in cardiac surgery patients with elevated CHA_2DS_2-VASc score: results of the randomized ATLAS trial. *Innovations (Phila)*. 2022;17(6):463-470.
20. Gillinov AM, Bagiella E, Moskowitz AJ, et al. Rate control versus rhythm control for atrial fibrillation after cardiac surgery. *N Engl J Med*. 2016;374(20):1911-1921.
21. Chatterjee S, Ad N, Badhwar V, Gillinov AM, Alexander JH, Moon MR. Anticoagulation for atrial fibrillation after cardiac surgery: do guidelines reflect the evidence? *J Thorac Cardiovasc Surg*. 2024;167(2):694-700.
22. Manuel L, Fong LS, Ang ZH, Grant P. Comparison of novel oral anticoagulants versus warfarin for post-operative atrial fibrillation after coronary artery bypass grafting. *Ann Med Surg (Lond)*. 2020;58:130-133.
23. Andrade JG, Aguilar M, Atzema C, et al. The 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society comprehensive guidelines for the management of atrial fibrillation. *Can J Cardiol*. 2020;36(12):1847-1948.

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