Available online at *www.ujpronline.com*
Universal Journal of Pharmaceutical Research
An International Peer Reviewed Journal
ISSN: 2831-5235 (Print); 2456-8058 (Electronic)

RESEARCH ARTICLE

POSTOPERATIVE ATRIAL FIBRILLATION IN PATIENTS AFTER CARDIAC SURGERY AMONG YEMENI PATIENTS AT MILITARY CARDIAC CENTRE

Kamal Mohammed Al-Omari, Osama Al-Nono
Esmail Mohammed Saad Al-Dabis
Yemen Medical Specialist Council, Ministry of Health and population, Yemen.

Article Info:

Article History:
Received: 6 April 2026
Reviewed: 11 May 2026
Accepted: 8 June 2026
Published: 15 July 2026

Cite this article:
Al-Omari KM, Al-Nono O, Al-Dabis EMS. Postoperative atrial fibrillation in patients after cardiac surgery among Yemeni patients at Military Cardiac Centre. Universal Journal of Pharmaceutical Research 2026; 11(3): 1-7. *http://doi.org/10.22270/ujpr.v11i3.1563*

***Address for Correspondence:**
Kamal Mohammed Al-Omari, Yemen Medical Specialist Council, Ministry of Health and population, Yemen. Tel: +967-770785384
E-mail: *al-omari_km@yemen.net.ye*

Abstract

Background and aims: The most frequent side effect following heart surgery is postoperative atrial fibrillation (POAF).This study investigates the prevalence of atrial fibrillation among Yemeni patients at the Military Cardiac Centre from January 1 to June 30, 2024. It aims to identify the timing and predisposing factors of AF post-surgery and evaluate postoperative outcomes, including mortality, myocardial infarction, and stroke, in patients with POAF compared to those without.
Patients and methods: A descriptive retrospective study was conducted at the Military Cardiac Centre in Sana'a, Yemen, from January 1 to June 30, 2024. The study focused on patients who underwent cardiac surgery and developed new onset atrial fibrillation (POAF) during their hospitalization. Inclusion criteria required patients to have POAF, while those with prior atrial fibrillation or other arrhythmias were excluded. A structured questionnaire was used, alongside patient consent and clinical evaluations, including electrocardiography and blood tests.
Results: Current study of 107 cases at the Heart Centre over six months revealed a 26% prevalence of atrial fibrillation (AF) post-cardiac surgery. Most patients were aged 40-50 (36%) and 60+ (35%), with a significant correlation between age and AF (p=0.030). Males made up 70% of the cases, predominantly from rural areas (57%). Postoperative metrics such as left atrial volume, ejection fraction, and creatinine levels showed significant variations (p=0.003 to 0.007), as did complications like bleeding and infections between AF and non-AF cases.
Conclusions: In conclusion, key care outcomes, including reintubation, respiratory support, and extended ICU and hospital stays, are linked to postoperative atrial fibrillation, which increases resource utilization. Implementing strategies to identify at-risk patients and modifying risk factors through preventive measures and surgical technique adjustments may help reduce the incidence of atrial fibrillation and lower morbidity and mortality rates in cardiac surgery patients.
Keywords: Cardiac surgery, myocardial infarction, postoperative prevalent atrial fibrillation (POAF), predisposing factors.

INTRODUCTION

The most prevalent form of secondary atrial fibrillation (AF) and the most frequent consequence following heart surgery is postoperative atrial fibrillation (PO AF)[1]. POAF has been linked to a number of severe cardiovascular events (such as stroke, heart failure, and mortality) and dramatically raises in-hospital stays and expenses; however, it is unclear whether this is because of a simple correlation or a causal relationship[2-4]. Additionally, POAF dramatically raises the chance of recurrent AF in the years following surgery[5,6].

There is disagreement about the precise definition of POAF, although it is widely understood to be freshly occurring AF that occurs right after surgery. POAF has been defined by various authors as either any postoperative AF episode lasting more than 30 seconds, any postoperative AF episode lasting more than 10 minutes, or postoperative AF requiring treatment[7] (a definition that ignores patients with self-terminating arrhythmias and those with contraindi-cations to treatment, estimated at approximately 9600/ year in the USA[8]).

POAF is a frequent and expensive complication following non-cardiac surgery, such as thoracic and general surgery, even though it has been best researched following cardiac surgery[9-11]. Patients who develop POAF have greater rates of both short-term and long-term adverse cardiovascular events, longer hospital and critical care stays, and higher hospital

expenses, regardless of the kind of surgical procedure performed[12-17]. Despite ongoing awareness of its impact on clinical outcomes and a variety of both new and old prevention interventions, the incidence of POAF has remained rather steady over time[18,19].

To the best of our knowledge, no research has been published to ascertain the prevalence of POAF in patients following heart surgery. In order to improve early, timely diagnosis and clinical consequences of the condition, this study offers insights into the clinical profile of patients presenting with POAF at the Military Cardiac Centre.

The main aim of the study is to determine the prevalence of atrial fibrillation following cardiac surgery among Yemeni patients at the Military Cardiac Centre during study period from 1 January - 30 June 2024. In addition, study aimed to identify the timing of AF following cardiac surgery, identify the predisposing factors of AF following cardiac surgery, and to evaluate the postoperative outcome including mortality, myocardial infarction and stroke in patients with POAF compared with patients with Non POAF.

SUBJECTS AND METHODS

Study setting: This study was conducted at the Military Cardiac Centre in Sana'a, Yemen. The Cardiac Centre was opened in 2008. It provides many diagnostics, therapeutic and surgical services for all Yemeni population.

Study design: Descriptive retrospective study during the period from 1 January - 30 June 2024. A structured questionnaire was prepared. Verbal consent was obtained from the patient before participation in the current study; and underwent clinical examination electrocardiography. Blood samples from vein were taken for essential hematologic and biochemical tests.

Population and sample of the study: All patients who underwent cardiac surgery in Military Cardiac Centre during the period of study **(**During period Six months from 1 January 2024 – 30 June 2024).

Inclusion and exclusion criteria:

Inclusion criteria: Any patient either male or female who developed new onset atrial fibrillation during the index hospitalization at the operating unit, ICU or at the post-operative word.

Exclusion criteria: Any patient either male or female who has atrial fibrillation before the cardiac surgery and/or patients with atrial fibrillation in the presence of other arrhythmias.

Statistical analysis: IBM SPSS 23.0 was used for statistical analysis. Frequency tables were used to determine the prevalence of categorical variables, and the mean and standard deviation were used to represent continuous variables. After then, the cases were categorized based on when POAF first appeared, and the traits of each group were compared. Cross tabulations were used to compare categorical variables, and Fisher's exact test or the Chi-square test were used to determine significance. The means of two groups' normal continuous variables were compared using the Student's t-test. Statistical significance was defined as a *p* value of less than 0.05.

The median value and interquartile range were used to reflect the study's secondary outcome regarding the length of ventilation, hospital stay, and intensive care unit stay. We used the Chi-square test or Fisher's exact test to determine significance after cross-tabulating the beginning of POAF with the newly classified groups. The prevalence of post-operative problems was also compared between patients who experienced POAF and those who did not using the same analysis. To find possible predictors, univariate analysis and multivariate logistic regression modeling were used.

Ethical consideration: The Military Cardiac Centre's ethics team granted permission to carry out this investigation. Patient identifying information was not included into the data collecting sheet in compliance with patient confidentiality rules, and each patient under study was given a unique patient identification number (PIN). Patient confidentiality could always be maintained because only the researcher knew the PIN.

RESULTS

Present study included a total of 107 cases that visited the Heart Centre over a six-month period (January 1 to June 30, 2024). The prevalence of atrial fibrillation after cardiac surgery was 28 cases (26%). Figure 1 shows the age distribution of cases, with the majority being in the 40-50 age group (39 cases, 36%), followed by the 60+ age group (37 cases, 35%). There was a statistically significant association between age and postoperative atrial fibrillation (POAF) with a *p* value of 0.030, where the mean age in cases without POAF (42.71±21.88 years) was lower than the mean age in cases with POAF (50.00±17.58 years).

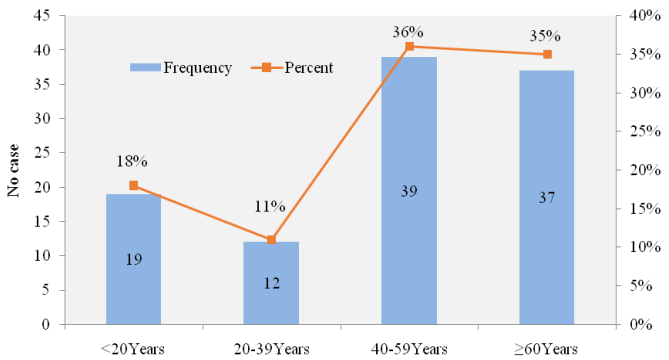

Figure 1: Distribution of study cases by age groups, n (107).

Table 1: Characteristics of the study cases and their association with POAF, n= (107).

Demographic	Totaln (%), mean± SD	Non-POAF, n (%)	POAF, n (%)	*p* value
Age (years)	44.64±21.01	42.71±21.88	50.00±17.58	0.030
Gender				
Male	75(70)	53(67)	22(79)	0.132
Female	32(30)	26(33)	6(21)	
Residence				
Urban	46(43)	34(43)	12(43)	0.495
Rural	61(57)	45(57)	16(57)	
Marital status				
Signal	19(18)	17(22)	2(7)	0.071
Married	88(82)	62(78)	26(93)	

Males accounted for 75 cases (70%), and most cases were from rural areas (61 cases, 57%), as shown in Table 1. Table 2 shows a statistically significant correlation between postoperative atrial fibrillation cases and preoperative characteristics, which include baseline left atrial dimensions, left ventricular ejection fraction, preoperative aortic regurgitation severity, preoperative aortic valve regurgitation severity, and preoperative tricuspid valve regurgitation severity, with *p* values ranging between 0.006, 0.059, 0.011, 0.006, and 0.004 respectively. Table 3 shows no statistically significant difference between postoperative POAF and non-POAF cases with respect to risk factors. Table 4 shows a statistically significant difference between POAF and non-POAF cases with respect to preoperative diagnosis, with a *p*-value of 0.018.

Table 2: Association between POAF and pre-operative characteristics of study cases, n (107).

Pre-operative characteristic	Total, n(%) mean± SD	Non-POAF, n(%), mean± SD	POAF, n(%), mean± SD	*p* value
Baseline LA DIMINSION	41.03±7.40 years	40.23±7.29 years	43.46±7.45 years	0.006
Left ventricular ejection fraction	52.37±11.8 years	53.79±12.17 years	48.93±10.33 years	0.059
Pre-operative aortic regurgitation severity				
I	2(10)	0(0)	2(33)	
II	2(10)	2(13)	0(0.0)	
III	4 (19)	4(27)	0 (0.0)	
II-III	2(10)	0(0)	2(33)	
IV	11(52)	9(60)	2(33)	
Pre-operative marital regurgitation severity				
I	22(34)	19(44)	3(14)	
I+	7 (11)	1(2)	6 (27)	
II	16(25)	12(28)	4(18)	
III	5(8)	3(7)	2(9)	
IV	15(23)	8(19)	7(32)	
Pre-operative tricuspid regurgitation severity				
I	6(35)	6(43)	0(0.0)	
I+	2(12)	0(0.0)	2(67)	
II	3(18)	3(21)	0(00)	
III	4(24)	4(29)	0(0.0)	
III-IV	1(6)	0(0.0)	1(33)	
IV	1(6)	1(7)	0(0.0)	

Table 3: Risk factors of POAF among study cases, n(107).

Risk factor	Total, n(%)	Non-POAF, n(%)	POAF, n(%)	*p* value
Hypertension	44(41)	30(38)	14(50)	0.139
Diabetes Mellitus	40(37)	26(33)	14(50)	0.059
Current smoker	48(45)	32(41)	16(57)	0.068
Ex-smoker	28(26)	23(29)	5(18)	0.128
Current khat chewing	70(65)	49(62)	21(75)	0.112
Ex-khat chewing	8(7)	7(9)	1(4)	0.204

Table 4: Association between POAF and diagnosis before surgery of study cases, n(107).

Diagnosis	Total, n(%)	Non-POAF, n(%)	POAF, n(%)	*p* value
Diagnosis before surgery				
CHD	22(21)	20(25)	2(7)	
IHD	58(54)	41(52)	17(61)	0.018
VHD	27(25)	18(23)	9(32)	

Table 5: Association between POAF and cases medication, n=(107).

Pre-operative medication	Total, n(%)	Non-POAF, n(%)	POAF, n(%)	*p* value
ARNI	28(26)	17(22)	11(39)	0.039
ACE inhibitor	44(41)	31(39)	13(46)	0.257
Angiotensin receptor blocker	49(46)	33(42)	16(57)	0.085
ARBs	7(7)	7(9)	0(0.0)	0.055
Beta-Blocker	84(79)	61(77)	23(82)	0.305
Aspirin	58(54)	41(52)	17(61)	0.216
CCB	3(3)	2(3)	1(4)	0.384
Digoxin	3(75)	2(67)	1(100)	0.375
NITRATES	40(370)	30(38)	10(36)	0.422
SGLT2i	52(49)	34(43)	18(64)	0.029
Diuretics	56(52)	37(47)	19(68)	0.030

Table 6: Association between POAF and cases operative details, n=(107).

Operative details	Total, n(%)	Non-POAF, n(%)	POAF, n(%)	*p*-value
Type of surgery				
CABG	58(54)	41(38)	17(61)	0.046
Valve replacement	31(29)	22(28)	9(32)	
Other cardiac surgery	18(17)	16(20)	2(7)	
Cardiopulmonary bypass time	92±35	96±39	81.7±20	0.02
Cross-clamptime	62.7±28	66.6±31	52.4±12.8	0.002
Mechanical ventilation time (hrs)	11.9±6.26	9.9±4.8	17±6.6	0.001
Operation duration (hrs)	3.8±1.12	3.6±1.1	4.4±0.9	0.001

Table 5 shows a statistically significant difference between POAF and non-POAF cases with respect to the use of angiotensin receptor blockers (ARNIs), sodium-glucose cotransporter 2 (SGLT2i) inhibitors, and diuretics, with *p* values of 0.039, 0.029, and 0.030, respectively. Table 6 shows a statistically significant difference between postoperative POAF and non-POAF cases with respect to the type of surgery, with a probability value (*p*) of 0.046. Table 7 shows a statistically significant difference between post-operative POAF and non-POAF cases in terms of length of stay in the intensive care unit (ICU), hospital stay, and ICU readmission, with a *p* value of 0.001. The mean time between surgery and POAF was 3 days (standard deviation ± 1), and most cases experienced POAF for less than 48 hours, totaling 20 cases (71%). Most POAF cases were single episodes, total 19 cases (68%), and 18 cases (64%) underwent pharma-cological cardioversion, as detailed in Table 8. Table (9) shows a statistically significant difference between postoperative atrial fibrillation and postoperative non-atrial fibrillation measurements, postoperative left atrial volume, and postoperative left ventricular ejection fraction, with *p* values ranging from 0.003 to 0.045, respectively.

Table 7: Association between POAF and duration of stay in ICU, n=(107).

Durations	Total, n(%)	Non-POAF, n(%)	POAF, n(%)	*p* value
Duration in ICU inday	3.0±1.7	2.6±1.3	4.5±2.0	0.001
Duration of hospital stay in days	11.0±7.0	9.5±5.6	15.4±8.6	0.001
Readmission into ICU	23(21)	6(8)	17(61)	0.001

Table 8: Characteristics of POAF among study cases, n(28).

Characteristicsof AF	n(%)
Time from surgery to POAF (day)	Mean 3 day±1.5
Duration (hours)	
<48	20(71)
>48	8(29)
Number of episodes	
Single	19(68)
Multiple	9(32)
Atrial fibrillation on discharge	0(0.0)
POAF chemical cardio version	18(64)

Table 9: Association between POAF and post- operative characteristics of study cases.

Post-operative characteristic	Total, n(%)	Non-POAF, n(%)	POAF, n(%)	*p* value
Post-operative LA DIMINSION	39.3±5.60	38.4±5.8	41.5±4.5	0.003
Post-operative Left ventricular ejection fraction	49.4±10.8	51.0±10.7	46.0±10.6	0.045
Post-operative beta blocker	87(85)	65(88)	22(79)	0.131

Table 10: Association between POAF and laboratory results of study cases.

Post-operative lab results	Total, n(%)	Non-POAF n(%)	POAF n(%)	*p* value
Baseline creatinine	0.79±0.28	0.77±0.29	0.85±0.27	0.394
Post-operative creatinine	1.18±0.49	1.01±0.34	1.64±0.57	0.007
HbA1C	6.4±1.81	6.2±1.7	6.8±1.9	0.110
T3	2.92±0.61	2.9±0.63	2.8±0.56	0.261
T4	2.1±3.47	2.5±4.0	1.24±0.28	0.396
TSH	2.5±2.0	2.1±1.34	3.4±3.19	0.323

Table 11: Association between POAF and post-operative outcomes, (n=107).

Post-operative outcomes	Total, n (%)	Non-POAF (n 79) n(%)	POAF (n28) n(%)	*p* value
Reoperation	10(9)	6(8)	4(14)	0.163
Bleeding	11(10)	1(1)	10(36)	0.001
Chest infection	22(21)	5(6)	17(61)	0.001
Pleural effusion	5(5)	1(1)	4(14)	0.008
Sepsis	8(7)	2(3)	6(21)	0.002
R.I	25(23)	3(4)	22(79)	0.001
ICVA	4(4)	0(0)	4(14)	0.001
Pericardial effusion	6(6)	3(4)	3(11)	0.111
Tracheostomy	1(1)	1(1)	0(0)	0.369
Death after operation	14(13)	6(8)	8(29)	0.005
Death during Operation	2(2)	2(3)	0(0)	0.271

Table 10 shows a statistically significant difference between postoperative atrial fibrillation and post-operative non-atrial fibrillation measurements and postoperative creatinine levels, with a *p* value of 0.007. Other laboratory test results did not show any statistically significant difference. Table 11 shows that there is a statistically significant difference between post-operative atrial fibrillation/postoperative non atrial fibrillation cases and bleeding, chest infection, pleural effusion, sepsis, renal failure, ICVA, and postoperative death with *p* values of (0.001-0.001-0.008-0.002-0.001-0.00-0.005) respectively.

DISCUSSION

Prevalence of postoperative atrial fibrillation (POAF) at the military cardiac centre is reported at 26% in this study, aligning with typical incidences observed in larger studies around 30%. This is the first investigation of POAF in Yemen, limiting comparison with prior studies. A recent study in Singapore reported an incidence of 17.3%, which may be attributed to stricter inclusion criteria, as they only considered AF episodes exceeding one hour, unlike our study which included all documented AF episodes regardless of duration[20,21].

Postoperative atrial fibrillation (POAF), as described in previous studies, is characterized by transient episodes of atrial fibrillation, typically occurring two to four days postoperatively, with a high frequency of occurrence[22]. The characteristics of the POAF episodes observed in our study are similar to those described in previous studies. In our study, the mean onset of POAF was three days postoperatively, with the majority of the first episodes occurring within two days of surgery[23]. Understanding the characteristics of POAF will enable healthcare professionals to better predict its occurrence and be more vigilant in monitoring and management. We chose a 48-hour threshold for the duration of POAF to classify patients, rather than the more common 24-hour threshold, in an effort to identify patients requiring prophylactic anticoagulation. In total, 8 of our patients had atrial fibrillation lasting more than 48 hours, and pro-phylactic anticoagulation therapy was recommended to be initiated to prevent blood clots in accordance with management guidelines[24,25].

Advancing age is a significant preoperative risk factor for post-operative atrial fibrillation (POAF), with studies indicating that patients over 70 experiences a 75% increase in odds of developing POAF for every 10-year age increment. This association is not limited to the postoperative context, as a higher incidence of atrial fibrillation (AF) is noted in the general elderly population (2–4%) compared to younger individuals (0.4%). Age-related cardiac anatomical changes and increased co-morbid conditions contribute to this susceptibility, while cardiac surgeries may further trigger the development of AF in older patients[25-27].

Left ventricular ejection fraction indicates heart function, with a high ejection fraction linked to lower odds of developing postoperative atrial fibrillation (POAF). Contrary to previous studies that suggested beta-blockers reduce POAF risk, a study in Malaysia found patients on beta-blockers were 61% more likely to develop POAF. This contradiction may stem from a rebound effect post-surgery when patients are often taken off beta-blockers. Additional factors linked to increased POAF risk include left atrial enlargement, longer bypass and cross-clamp times, and pre-existing conditions like hypertension, diabetes, and COPD[28-31]; however, these were not confirmed in the current study.

The mortality rate observed in our study was 28%, which is higher than the mortality rates observed in other studies. The mortality rate in the group of patients with postoperative atrial fibrillation was 4.9%, compared to 1.8% in the group without it, a statistically significant difference. This represents an almost threefold increase in mortality among patients with

atrial fibrillation compared to those without it. A similar difference in mortality rates has been observed in other studies[32,33]. Postoperative atrial fibrillation affects not only short-term mortality but also long-term mortality. This finding demonstrates the serious nature of this cardiac arrhythmia. The mechanisms by which postoperative atrial fibrillation is associated with mortality remain uncertain. It may be due to circulatory dysfunction and heart failure resulting directly from the loss of atrial conduction function. In the long term, establishing the mechanistic and causal links is difficult. Possibilities include the development of heart failure and the associated risk of death, the occurrence of a disabling stroke or other embolic disasters, and side effects of medications, such as irregular heartbeat with antiarrhythmic drugs or bleeding with anti-coagulants[31,33].

It was observed that all surgical complications examined were more prevalent in the group of patients with postoperative atrial fibrillation compared to the control group. One of the most serious complications of atrial fibrillation was an increased incidence of chest infections. The statistically significant findings included hemorrhage, renal failure requiring dialysis, pulmonary complications, and sepsis. Due to the nature of our study, caution should be exercised when interpreting the results of postoperative atrial fibrillation, as a temporal relationship cannot be established. Since atrial fibrillation does not directly influence the mechanism of these complications, the possibility that these complications may precipitate atrial fibrillation cannot be ruled out. These complications are generally inflammatory in nature. Furthermore, patients undergoing a second surgery are exposed to more cardioprotective medications and surgical trauma, while patients with renal failure are more prone to electrolyte imbalances and fluid overload, conditions that may play a role in the mechanism of atrial fibrillation.

Current study showed that patients with postoperative atrial fibrillation (POAF) had significantly longer ICU and hospital stays (p<0.001). Their duration of mechanical ventilation was also significantly longer. The longer ICU stay for POAF patients may be due to the need for increased monitoring, management, and nursing care to stabilize hemodynamics, correct hypoxia, and convert POAF to a sinus rhythm.

Furthermore, higher rates of ICU readmission, overall hospital readmission, and general hospital readmission were recorded in the POAF patient group, with the first two rates being statistically significant. This is common because POAF patients are more likely to develop other conditions requiring prolonged care, such as mechanical ventilation. Consequently, the longer hospital stay and mechanical ventilation use by POAF patients leads to increased hospital resource utilization, resulting in higher costs for both patients and the hospital.

Limitations of the study

Limitations include the short study duration, as six-month period results in a smaller sample size, limiting the statistical power needed to definitively determine rare outcomes, such as certain types of stroke or myocardial infarction. Additionally, the study's single-centre design, conducted exclusively at the Military Heart Centre, means the results may be influenced by local surgical techniques, patient demographics, and centre-specific practices, making it difficult to generalize the findings to all Yemeni hospitals. Finally, the retrospective nature of the study means that data on the immediate causes of death may be incomplete or heavily dependent on the accuracy of hospital records.

CONCLUSIONS

The preoperative and intraoperative predictive indicators identified in this study are consistent with findings from studies conducted in other countries. All measurable care outcomes, such as the need for reintubation, respiratory support, and prolonged ICU and hospital stays, were associated with postoperative atrial fibrillation, leading to increased resource utilization. Strategies for identifying at-risk patients and modifying these risk factors through effective preventive measures, as well as changes in surgical techniques, can contribute to reducing the incidence of atrial fibrillation and lowering morbidity and mortality rates in patients undergoing cardiac surgery.

ACKNOWLEDGEMENTS

The authors are grateful to Sana'a City's Military Hospital for their kind cooperation.

AUTHOR'S CONTRIBUTIONS

Al-Omari KM: formal analysis, conceptualisation, data organisation, clinical exams, writing original draft. **Al-Nono O:** supervision. **Al-Dabis EMS:** data analysis, manuscript writing. **Al-Shamahy HA:** data analysis, manuscript writing. Final manuscript was checked and approved by all authors.

DATA AVAILABILITY

The related author can provide the empirical data supporting the study's conclusions upon request.

CONFLICT OF INTEREST

There are no conflicts of interest in regard to this project.

REFERENCES

1. Lubitz SA, Yin X, Rienstra M, *et al.* Long-term outcomes of secondary atrial fibrillation in the community: The Framingham heart study. Circulation 2015;131:1648–1655. *https://doi.org/10.1161/CIRCULATIONAHA.*
2. Gaudino M, Di Franco A, Rong LQ, *et al.* Pericardial effusion provoking atrial fibrillation after cardiac surgery. J Am Coll Cardiol 2022;79:2529–2539. *https://doi.org/10.1016/j.jacc.2022.04.029*
3. van Boven WJ, de Groot JR, Kluin J. A short cut to prevent postoperative atrial fibrillation. Lancet Lond Engl 2021;398:2052–2053. *https://doi.org/10.1016/S0140-6736(21)02435-1*

4. Van den Berg NWE, Neefs J, Kawasaki M, *et al.* Extracellular matrix remodelling precedes atrial fibrillation: Results of the PREDICT-AF trial. Heart Rhythm 2021;18:2115–2125. *https://doi.org/10.1016/j.hrthm.2021.07.059*
5. Lee SH, Kang DR, Uhm JS, *et al.* New-onset atrial fibrillation predicts long-term newly developed atrial fibrillation after coronary artery bypass graft. Am Heart J 2014;167:593–600.e1. *https://doi.org/10.1016/j.ahj.2013.12.010*
6. Melduni RM, Schaff HV, Bailey KR, *et al.* Implications of new-onset atrial fibrillation after cardiac surgery on long-term prognosis: A community-based study. Am Heart J 2015;170:659–668. *https://doi.org/10.1016/j.ahj.2015.06.15*
7. Frendl G, Sodickson AC, Chung MK, *et al.* AATS guidelines for the prevention and management of perioperative atrial fibrillation and flutter for thoracic surgical procedures. J Thorac Cardiovasc Surg 2014;148:e153–e193. *https://doi.org/10.1016/j.jtcvs.2014.06.036*
8. Filardo G, Pollock BD, da Graca B, *et al.* Underestimation of the incidence of new-onset post-coronary artery bypass grafting atrial fibrillation and its impact on 30-day mortality. J Thorac Cardiovasc Surg 2017;154:1260–1266. *https://doi.org/10.1016/j.jtcvs.2017.05.104*
9. 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: 2075–2083. *https://doi.org/10.1016/S0140-6736(21)02490-9*
10. Carter-Storch R, Dahl JS, Christensen NL, *et al.* Postoperative atrial fibrillation after aortic valve replacement is a risk factor for long-term atrial fibrillation. Interact Cardiovasc Thorac Surg 2019;29:378–385. *https://doi.org/10.1093/icvts/ivz094*
11. Zangrillo A, Landoni G, Sparicio D, *et al.* Predictors of atrial fibrillation after off-pump coronary artery bypass graft surgery. J Cardiothorac Vasc Anesth 2004;18:704–708. *https://doi.org/10.1053/j.jvca.2004.08.005*
12. Greenberg JW, Lancaster TS, Schuessler RB, *et al.* Postoperative atrial fibrillation following cardiac surgery: a persistent complication. Eur J Cardiothorac Surg 2017;52: 665–672. *https://doi.org/10.1093/ejcts/ezx039*
13. Steinberg BA, Zhao Y, He X, *et al.* Management of postoperative atrial fibrillation and subsequent outcomes in contemporary patients undergoing cardiac surgery: Insights from the Society of Thoracic Surgeons CAPS-Care atrial fibrillation registry. Clin Cardiol 2014;37:7–13. *https://doi.org/10.1002/clc.22230*
14. Ahlsson A, Fengsrud E, Bodin L, Englund A. Postoperative atrial fibrillation in patients undergoing aortocoronary bypass surgery carries an eightfold risk of future atrial fibrillation and a doubled cardiovascular mortality. Eur J Cardiothorac Surg 2010;37:1353–1359. *https://doi.org/10.1016/j.ejcts.2009.12.033*
15. Fuller JA, Adams GG, Buxton B. Atrial fibrillation after coronary artery bypass grafting. Is it a disorder of the elderly? J Thorac Cardiovasc Surg 1989;97:821–825. *https://doi.org/10.1016/S0022-5223(19)34483-6*
16. Lahtinen J, Biancari F, Salmela E, *et al.* Postoperative atrial Fibrillation is a major cause of stroke after on-pump coronary artery bypass surgery. Ann Thorac Surg 2004;77:1241–1244. *https://doi.org/10.1016/j.athoracsur.2003.09.077*
17. Likosky DS, Caplan LR, Weintraub RM, *et al.* Intraoperative and postoperative variables associated with strokes following cardiac surgery. Heart Surg Forum 2004;7:E271–E276. *https://doi.org/10.1532/HSF98.20041035*
18. Fernandez FG, Shahian DM, Kormos R, *et al.* The Society of Thoracic Surgeons National Database 2019 Annual Report. Ann Thorac Surg 2019;108:1625–1632. *https://doi.org/10.1016/j.athoracsur.2019.09.034*
19. Mathew JP, Fontes ML, Tudor IC, *et al.* A multicentre risk index for atrial fibrillation after cardiac surgery. JAMA 2004; 291:1720–1729. *https://doi.org/10.1001/jama.291.14.1720*
20. Shahim B, Malaisrie SC, George I, *et al.* Postoperative atrial fibrillation or flutter following transcatheter or surgical aortic valve replacement: PARTNER 3 trial. JACC Cardiovasc Interv 2021;14:1565–1574. *https://doi.org/10.1016/j.jcin.2021.05.26*
21. AlTurki A, Marafi M, Proietti R, *et al.* Major adverse cardiovascular events associated with postoperative atrial fibrillation after noncardiac surgery: a systematic review and meta-analysis. Circ Arrhythm Electrophysiol 2020;13:e007437. *https://doi.org/10.1161/CIRCEP.119.007437*
22. Polanczyk CA, Goldman L, Marcantonio ER, *et al.* Supraventricular arrhythmia in patients having noncardiac surgery: Clinical correlates and effect on length of stay. Ann Intern Med 1998;129:279–285. *https://doi.org/10.7326/0003-4819-129-4-199808150-00003*
23. Batra GS, Molyneux J, Scott NA. Colorectal patients and cardiac arrhythmias were detected on the surgical high-dependency unit. Ann R Coll Surg Engl 2001;83:174–176.
24. Christians KK, Wu B, Quebbeman EJ, *et al.* Postoperative atrial fibrillation in noncardiothoracic surgical patients. Am J Surg 2001;182:713–715.
25. Walsh SR, Tang T, Wijewardena C, *et al.* Postoperative arrhythmias in general surgical patients. Ann R Coll Surg Engl 2007;89:91–95. *https://doi.org/10.1308/003588407X168253*.
26. Merritt RE, Shrager JB. Prophylaxis and management of atrial fibrillation after general thoracic surgery. Thorac Surg Clin 2012;221:13–23. *https://doi.org/10.1016/j.thorsurg.2011.08.016*
27. Sohn GH, Shin D-H, Byun KM, *et al.* The incidence and predictors of postoperative atrial fibrillation after noncardiothoracic surgery. Korean Circ J 2009;39:100–104. *https://doi.org/10.4070/kcj.2009.39.3.100*
28. Prince-Wright LH, Akinyemi O, Nnorom SO, *et al.* Postoperative atrial fibrillation following non-cardiac surgery: predictors and risk of mortality. Am J Surg 2022;22:1062–1067. *https://doi.org/10.1016/j.amjsurg.2022.07.010*
29. Ishii Y, Schuessler RB, Gaynor SL, *et al.* Inflammation of the atrium after cardiac surgery is associated with inhomogeneity of atrial conduction and atrial fibrillation. Circulation 2005;111:2881–2888. *https://doi.org/10.1161/CIRCULATIONAHA.104.475194*
30. Bruins P, Velthuis H, Yazdanbakhsh AP. Activation of the complement system during and after cardiopulmonary bypass surgery: postsurgery activation involves C-reactive protein and is associated with postoperative arrhythmia. Circulation 1997;96: 3542–3548. *https://doi.org/10.1161/01.cir.96.10.3542*
31. Ho KM, Tan JA. Benefits and risks of corticosteroid prophylaxis in adult cardiac surgery: A dose-response meta-analysis. Circulation 2009;119:1853–1866.
32. Imazio M, Brucato A, Ferrazzi P. Colchicine reduces postoperative atrial fibrillation: Results of the colchicine for the Prevention of the Postpericardiotomy Syndrome. (COPPS) atrial fibrillation substudy. Circulation 2011;124:2290–2295. *https://doi.org/10.1161/CIRCULATIONAHA.111.026153*
33. Ryu K, Li L, Khrestian CM, *et al.* Effects of sterile pericarditis on connexins 40 and 43 in the atria: Correlation with abnormal conduction and atrial arrhythmias. Am J Physiol Heart Circ Physiol 2007;293:H1231–H1241. *https://doi.org/10.1152/ajpheart.00607.2006.*