Evaluating the Incidence and Outcomes for Post-Operative Atrial Fibrillation in Adult Congenital Heart Disease Patients After Cardiac Surgery

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BACKGROUND

- Atrial fibrillation occurs in about 30% of patients in the general population who undergo cardiac or valvular surgery[2]
- Baseline rates of atrial arrythmias are up to 3x more prevalent in ACHD patients.[3]
- Post-operative atrial fibrillation has been associated with increased morbidity and mortality, including increased duration of hospital stays and risk of stroke[1]
- There is little evidence evaluating the incidence, management, and outcomes of post-op a-fib specifically in the ACHD population after cardiac surgery

METHODS

- A retrospective cohort study was conducted of ACHD patients at the University of Colorado and Children's Hospital Colorado from 2017-2021
- The Society of Thoracic Surgeons (STS) surgical registry was used to identify medical records of cohort patients for review
- Data was recorded and stored in a REDCap database managed by the University of Colorado
- Patients were included who were age greater than 18 years old, carried a formal ACHD diagnosis, and underwent cardiac surgery
- Patients were excluded who were patients undergoing a heart transplant, catheter-based procedures, or cardiac surgery not requiring cardiopulmonary bypass
- Atrial fibrillation was defined by progress note and/or discharge summary

Results

Table 1. Demographic and clinical characteristics of the study population

Variable	Total Population (n = 168)	Atrial Fibrillation (n = 41, 25%)	No Atrial Fibrillation (n = 127, 75%)	p-value
Age (years)[a]	36 (28–48)	46 (36–54)	33 (28–42)	<0.001
Body Mass Index (BMI)[a]	25.6 (22.5–30.1)	26.6 (22.8–34.2)	25.4 (21.9–29.5)	0.150
Sex (Female), n (%)	81 (48)	23 (56)	58 (45)	0.283
ACHD Anatomical Classification				0.030
Mild	7 (4)	1 (2)	6 (5)	
Moderate	150 (90)	34 (83)	116 (92)	
Severe	10 (6)	6 (15)	4 (3)	

Note. [a] Values are reported as median (interquartile range).

Table 1. Demographic and clinical characteristics of the study population.
Baseline characteristics are presented for the total cohort (n = 168) and stratified by the presence or absence of post-operative atrial fibrillation (AF). Patients who developed AF were significantly older than those without AF ($p < 0.001$). ACHD anatomical classification differed between groups ($p = 0.030$), with a greater proportion of severe cases in the AF group.

Table 2. Multivariate analysis by logistic regression

Variable	Odds Ratio (95% CI)	p-value
Age (years)	1.07 (1.03, 1.11)	<0.001
Prior history of supraventricular tachycardia	6.69 (2.65, 17.99)	<0.001
In-hospital hypokalemia	6.10 (2.32, 18.12)	<0.001
Arrhythmia during surgery	7.27 (2.69, 21.21)	<0.001

Table 2. Multivariate logistic regression analysis of predictors of post-operative atrial fibrillation (POAF).
Adjusted odds ratios (OR) with 95% confidence intervals (CI) are presented for variables independently associated with POAF. Increasing age was associated with a modest but significant increase in risk (OR = 1.07, $p < 0.001$). Prior history of supraventricular tachycardia, in-hospital hypokalemia, and intraoperative arrhythmia were all strong independent predictors of POAF, each associated with over six-fold increased odds (all $p < 0.001$).

Table 3. Clinical outcomes stratified by post-operative atrial fibrillation (AF) status

Outcome	Total Population (n = 168)	Atrial Fibrillation (n = 41, 25%)	No Atrial Fibrillation (n = 127, 75%)	p-value
Mortality, n (%)	3 (2)	1 (2)	2 (2)	0.571
Stroke, n (%)	1 (1)	0 (0)	1 (1)	1.000
Length of Stay (days)[a]	5 (4–8)	8 (6–10)	5 (4–6)	<0.001
Bleeding Event, n (%)	15 (9)	3 (7)	12 (10)	1.000

Note. [a] Values are reported as median (interquartile range).

Table 3. Clinical outcomes stratified by post-operative atrial fibrillation (AF) status.
Outcomes are presented for the total cohort (n = 168) and compared between patients with and without post-operative AF. There were no significant differences between groups in mortality, stroke, or bleeding events (all $p > 0.05$). However, patients with AF had a significantly longer hospital length of stay compared to those without AF ($p < 0.001$).

Table 4. Recurrence of atrial fibrillation following discharge

Timepoint	Total Population	Atrial Fibrillation	No Atrial Fibrillation	p-value	Odds Ratio (95% CI)
30 days	20/159 (13)	12/38 (32)	8/121 (7)	<0.001	6.52[a] (2.45–18.23)
1 year	33/117 (28)	15/31 (48)	18/86 (21)	0.005	3.54[a] (1.48–8.60)
Total[b]	45/168 (27)	19/41 (46)	26/127 (21)	0.002	3.35[a] (1.58–7.15)

Note. [a] Odds ratio p-value < 0.05. [b] Average follow-up time of 2.0 years.

Table 4. Recurrence of atrial fibrillation following hospital discharge.
Rates of atrial fibrillation (AF) recurrence are presented at 30 days, 1 year, and across the total follow-up period for the overall cohort and stratified by initial post-operative AF status. Patients who developed post-operative AF had significantly higher rates of recurrence at all time points compared to those without AF (all $p < 0.01$), with the greatest risk observed at 30 days (OR = 6.52).

CONCLUSIONS

- Post-operative atrial fibrillation (POAF) is a common complication in adults with congenital heart disease (ACHD),
- Independent risk factors include older age, history of supraventricular tachycardia, intra-operative arrhythmias, and post-operative hypokalemia, highlighting both patient-specific and modifiable contributors.
- POAF is associated with significantly longer hospital stays and a higher likelihood of recurrent atrial fibrillation after discharge,
- While POAF was not linked to increased mortality, stroke, or bleeding in this cohort, its association with increased healthcare burden underscores the need for close monitoring and management.
- Findings emphasize the importance of improved risk stratification, prevention strategies, and targeted management protocols, while acknowledging limitations such as small sample size and single-center design.

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