Policy Brief

Cost-Effectiveness of 3D-EAM Guided Radiofrequency Ablation for The Management of Patients with Atrial Fibrillation and Heart Failure in India

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Recommendations

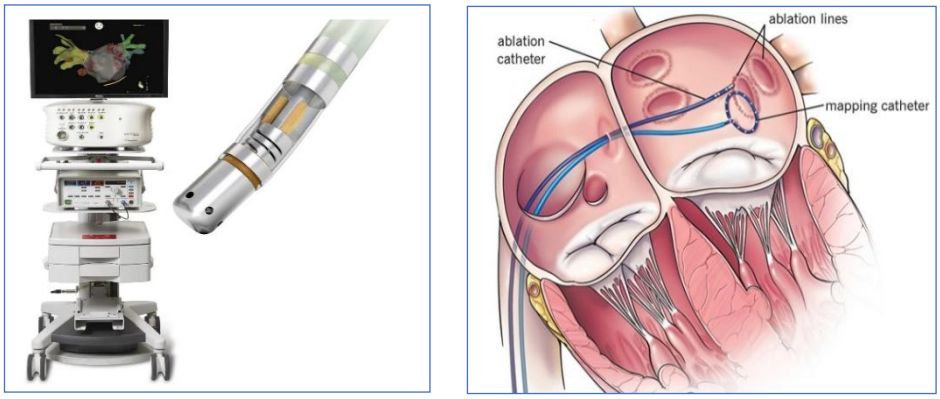
3D-Electro-Anatomical-Guided Radiofrequency Ablation (3D - RFA) is recommended as a cost-effective treatment option compared to anti-arrhythmic drugs (AADs), for the management of patients with atrial fibrillation (AF) and heart failure (HF) having LVEF≤35%.

Key Findings

- Single ablation (Base-Case): ICER was ₹1,46,600 per QALY gained.
- One-time repeat ablation: ICER was ₹1,60,535 per QALY gained.
- Both scenarios were cost-effective at a willingness-to-pay (WTP) threshold of one-time GDP per capita (₹2,09,599).
- Probabilistic Sensitivity Analysis (PSA):
  - Probability of 3D RFA being Cost Effective (pCE) was 89% for single ablation
  - For One-Time Repeat Ablation, 3D RFA pCE reduced to 83%
- Budget Impact Analysis (BIA):
  - Additional budget for 3D-RFA at utilization rates of 10%, 20% and 30% among eligible population would be ₹38.12 crores, ₹76.23 crores and ₹114.35 crores, respectively.

Background

- Atrial Fibrillation (AF) is a common heart rhythm disorder, often co-existing with Heart Failure (HF), leading to high morbidity and mortality[1,2].
- 30 million people globally[3], including 1.6 million in India[4], are affected with AF annually – with a significant burden in rural areas.
- Anti-arrhythmic drugs (AADs) are standard treatment but often lead to recurrence and adverse effects[5,6].
- 3D Electro-Anastomic Mapping-guided Radiofrequency Ablation (3D-RFA) offers superior clinical outcomes[7] and may eliminate long-term dependence on anti-arrhythmic drugs (AADs)[8,9].
- It provides better visualization, enhanced accuracy, reduced radiation exposure, and improved safety, especially in pulmonary vein isolation procedures, compared to conventional ablation techniques[10,11].
- The study aimed to undertake the Cost-Effectiveness and budget impact analysis (BIA) to reimburse 3D-RFA vs. AADs in the Indian context.



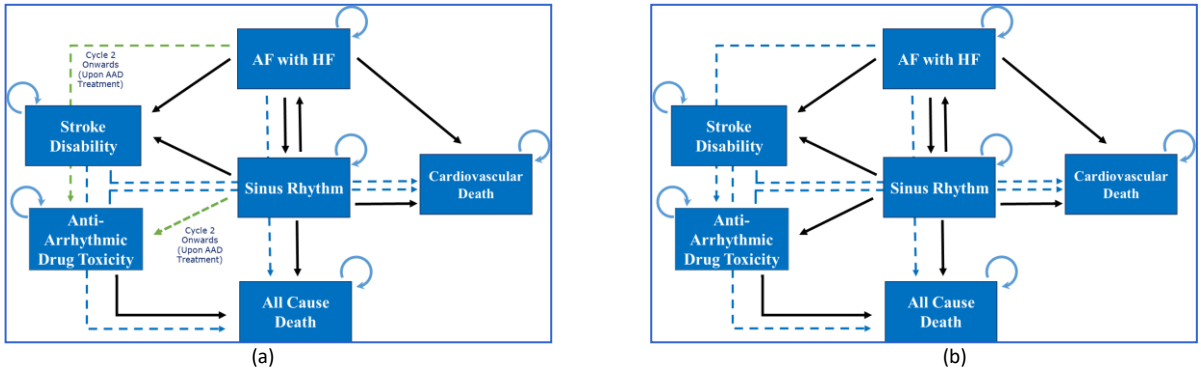
(a) (b)

Figure 1: (a) 3D-EAM Guided Radiofrequency Ablation Device System[12] (b) 3D mapping Guided Radiofrequency Ablation of Cardiac Arrhythmias[13]

PICO

Population	• Adult Patient with AF and HF (LVEF≤35%)
Intervention	• Catheter Ablation (3D - EAM guided RFA)
Comparison	• Anti-Arrhythmic Drugs (Amiodarone, Sotalol)
Outcomes	• ICER (Cost per LY and per QALY Gained)
Time horizon	• Lifetime

Model Structure



(a) (b)

Figure 2: Model Structure illustrating the flow of patients through various health states in (a) 3D-RFA Arm and (b) AADs arm

Results:

3D - RFA:	Higher Cost ↑	Better Outcomes ↑
AADs:	Lower Cost ↓	Inferior Outcomes ↓

1. Cost-Effectiveness Analysis

Scenario 1: Without Re-Ablation (Base-Case)

	LYs	QALYs	Total cost (₹)
3D-RFA	7.16	4.73	3,60,803
AADs	5.12	2.73	66,971
	ICER (LYs)	ICER (QALYs)	
	1,44,041	1,46,600	

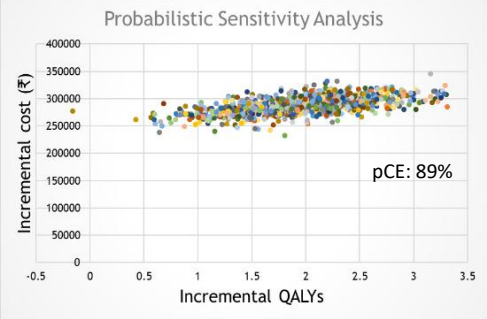
Scenario 2: With Re-Ablation

	LYs	QALYs	Total cost (₹)
3D-RFA	7.16	4.73	3,88,612
AADs	5.12	2.73	66,971
	ICER (LYs)	ICER (QALYs)	
	1,57,669	1,60,535	

2. Probabilistic Sensitivity Analysis

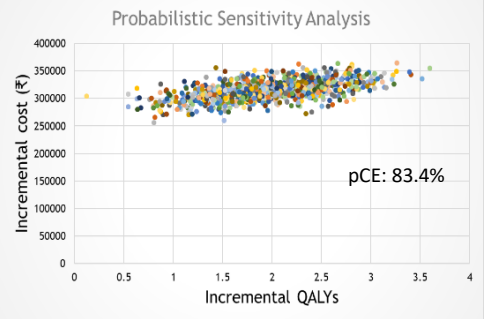
Figure 3: PSA Scatterplot of Incremental Cost Vs. Incremental QALYs on a Cost-Effectiveness Plane (a) Without Re-Ablation Probability of 3D-RFA being Cost Effective (pCE) was 89% (b) With One-Time Repeat Re-Ablation pCE was 83.4%

Scenario 1: Without Re-Ablation (Base-Case)



(a)

Scenario 2: With Re-Ablation



(b)

3. Budget Impact Analysis

Additional Budget Required With 3D-RFA at Different Utilization Rates Among the Eligible Population

Utilization Rates of RFA	Additional Budget Required (₹)	% of Total Health Expenditure (₹ 9.04 Lakh Cr.)	% of GDP of India (₹ 173.82 Lakh Cr.)
10% Utilization	38.12 Cr.	0.012%	0.00065%
20% Utilization	76.23 Cr.	0.025%	0.00130%
30% Utilization	114.35 Cr.	0.037%	0.00195%

Conclusion

- Incremental Cost Effectiveness Ratio (ICER) is below the Willingness to Pay (WTP) Threshold of 1 time GDP per Capita i.e. ₹ 2,09,599 (May 2025). Thus, 3D EAM-guided Radiofrequency Ablation (3D-RFA) is cost-effective for treating patients with atrial fibrillation and heart failure (LVEF ≤35%) compared to antiarrhythmic drugs (AADs) in both scenarios with and without ablation.
- Scaling up this intervention for the eligible Indian population would require: ₹38.12 crores at 10% utilization, ₹76.23 crores at 20% utilization and ₹114.35 crores at 30% utilization over one year.

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