

# **Guidelines and Beyond in AF Ablation**

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# Relationship with Industry

- Research support: Boston Scientific
- Consultant / Honoraria: Abbot Medical, Biosense, Medtronic, Boston Scientific, Boehringer Ingelheim

# Guidelines and Beyond in AF Ablation

- Review current guidelines as they pertain to AF ablation
- Review the recommendations made by the 2017 Consensus Document on AF Ablation
- Are updates needed ?

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# 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

*Developed in Collaboration With the Society of Thoracic Surgeons*

## Writing Group Members\*

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# Catheter Ablation

**CLINICAL PRACTICE GUIDELINE: FULL TEXT**

# 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation



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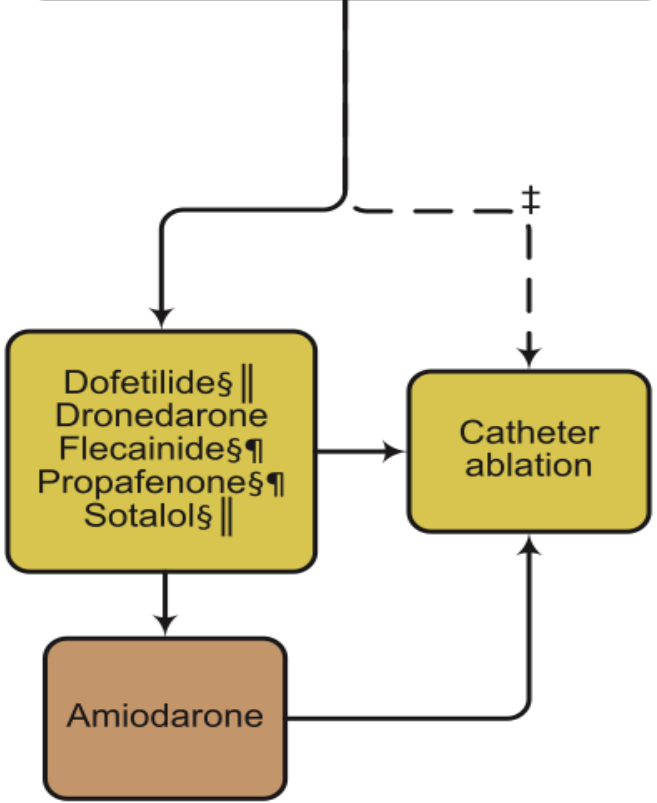
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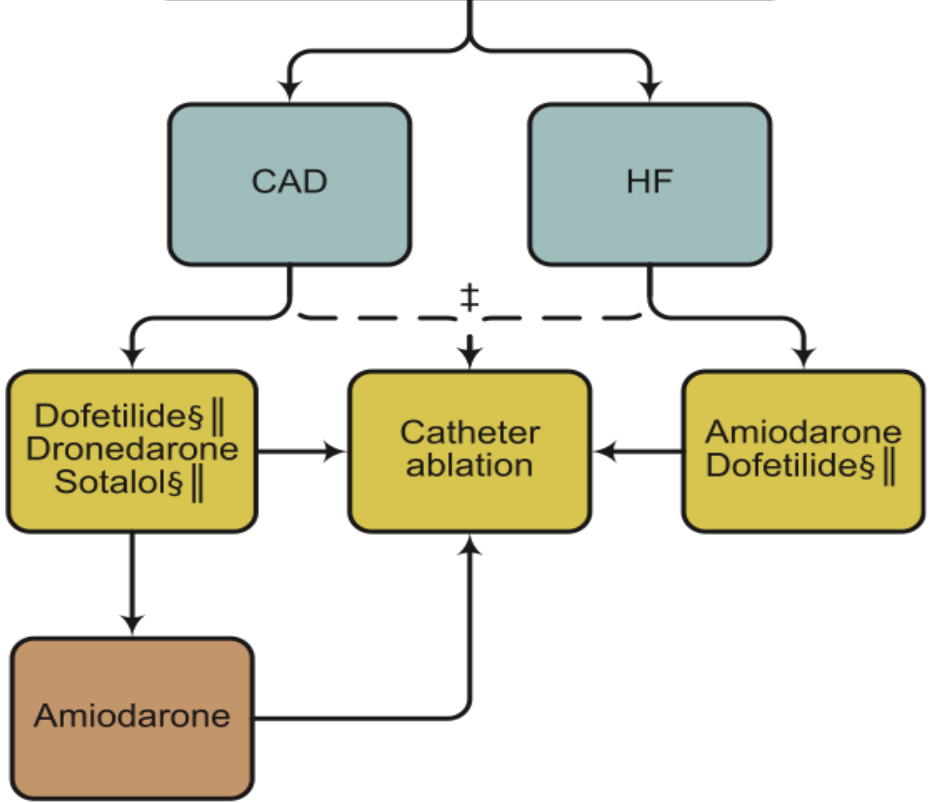
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†ACC/AHA Representative. ‡Heart Rhythm Society Representative.  
§ACC/AHA Task Force on Performance Measures Liaison. ||Society of Thoracic Surgeons Representative. ¶ACC/AHA Task Force on Practice Guidelines Liaison.

# No Structural Heart Disease



# Structural Heart Disease





## 6.3. AF Catheter Ablation to Maintain Sinus Rhythm: Recommendations

### CLASS I

1. AF catheter ablation is useful for symptomatic paroxysmal AF refractory or intolerant to at least 1 class I or III antiarrhythmic medication when a rhythm-control strategy is desired (363,392-397). *(Level of Evidence: A)*
2. Before consideration of AF catheter ablation, assessment of the procedural risks and outcomes relevant to the individual patient is recommended. *(Level of Evidence: C)*

### CLASS IIa

1. AF catheter ablation is reasonable for some patients with symptomatic persistent AF refractory or intolerant to at least 1 class I or III antiarrhythmic medication (394,398-400). *(Level of Evidence: A)*
2. In patients with recurrent symptomatic paroxysmal AF, catheter ablation is a reasonable initial rhythm-control strategy before therapeutic trials of antiarrhythmic drug therapy, after weighing the risks and outcomes of drug and ablation therapy (401-403). *(Level of Evidence: B)*

### CLASS IIb

1. AF catheter ablation may be considered for symptomatic long-standing (>12 months) persistent AF refractory or intolerant to at least 1 class I or III antiarrhythmic medication when a rhythm-control strategy is desired (363,404). *(Level of Evidence: B)*
2. AF catheter ablation may be considered before initiation of antiarrhythmic drug therapy with a class I or III antiarrhythmic medication for symptomatic persistent AF when a rhythm-control strategy is desired. *(Level of Evidence: C)*

### CLASS III: HARM

1. AF catheter ablation should not be performed in patients who cannot be treated with anticoagulant therapy during and after the procedure. *(Level of Evidence: C)*
2. AF catheter ablation to restore sinus rhythm should not be performed with the sole intent of obviating the need for anticoagulation. *(Level of Evidence: C)*



# 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*

## Writing Group Members\*

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## 6.3. AF Catheter Ablation to Maintain Sinus Rhythm

### 6.3.4. Catheter Ablation in HF

#### Recommendation for Catheter Ablation in HF

Referenced studies that support the new recommendation are summarized in [Online Data Supplement 7](#).

COR	LOE	Recommendation
IIb	B-R	<p>1. AF catheter ablation may be reasonable in selected patients with symptomatic AF and HF with reduced left ventricular (LV) ejection fraction (HFrEF) to potentially lower mortality rate and reduce hospitalization for HF (S6.3.4-1, S6.3.4-2).</p> <p><b>NEW:</b> New evidence, including data on improved mortality rate, has been published for AF catheter ablation compared with medical therapy in patients with HF.</p>

# Guidelines and Beyond in AF Ablation

- Review current guidelines as they pertain to AF ablation
- Review the recommendations made by the 2017 Consensus Document on AF Ablation
- Are updates needed ?

# 2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation <sup>ⓔ</sup>

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*Heart Rhythm.* 2017 Oct;14(10):e275-e444. PMID: 28506916

*Europace.* 2017 Sep 15. doi: 10.1093 PMID: 29016840

*J Arrhythm.* 2017 Oct;33(5):369-409 PMID: 29021841



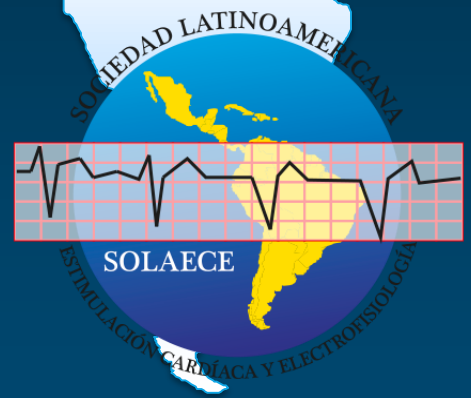
Heart  
Rhythm  
Society<sup>SM</sup>



ECAS  
securing life's rhythm



EUROPEAN  
Heart Rhythm  
ASSOCIATION



SOCIEDAD LATINOAMERICANA

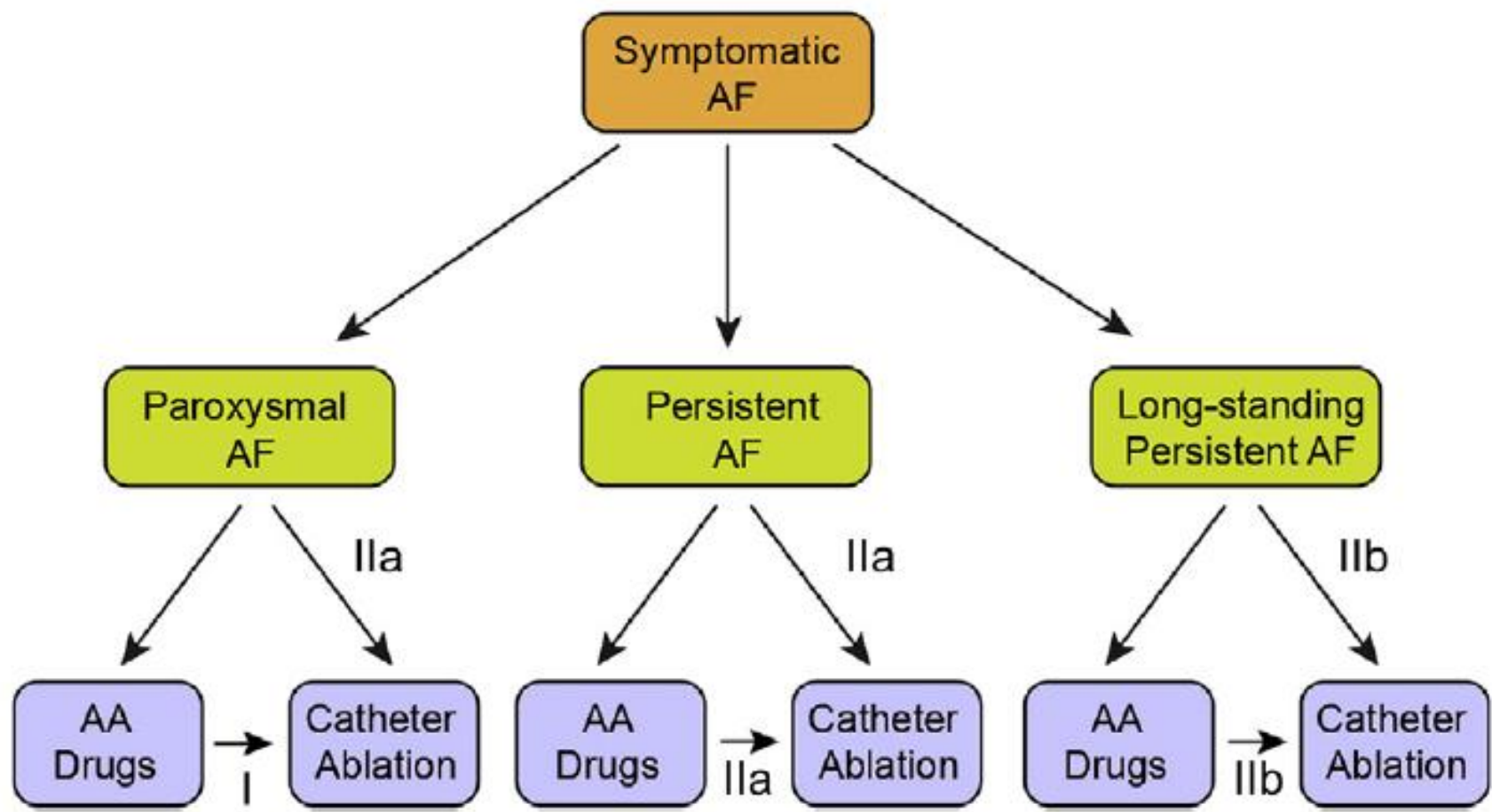
SOLAECE

ESTIMULACIÓN QUIRÚRGICA Y ELECTROFISIOLOGÍA



APHRS

# Indications for Catheter Ablation of Symptomatic Atrial Fibrillation



# Indications for Catheter Ablation of Atrial Fibrillation (cont)

## B. Indications for catheter atrial fibrillation ablation in populations of patients not well represented in clinical trials

Congestive heart failure	It is reasonable to use similar indications for AF ablation in selected patients with heart failure as in patients without heart failure.	IIa	B-R	233-237, 304, 386-395, 1042
Older patients (>75 years of age)	It is reasonable to use similar indications for AF ablation in selected older patients with AF as in younger patients.	IIa	B-NR	396-398, 401-404
Hypertrophic cardiomyopathy	It is reasonable to use similar indications for AF ablation in selected patients with HCM as in patients without HCM.	IIa	B-NR	385, 1043, 1044
Young patients (<45 years of age)	It is reasonable to use similar indications for AF ablation in young patients with AF (<45 years of age) as in older patients.	IIa	B-NR	405, 1045
Tachy-brady syndrome	It is reasonable to offer AF ablation as an alternative to pacemaker implantation in patients with tachy-brady syndrome.	IIa	B-NR	381-383
Athletes with AF	It is reasonable to offer high-level athletes AF as first-line therapy due to the negative effects of medications on athletic performance.	IIa	C-LD	370-372
Asymptomatic AF**	Paroxysmal: Catheter ablation may be considered in select patients.**	IIb	C-E0	416, 418
	Persistent: Catheter ablation may be considered in select patients.	IIb	C-E0	417



# Indications for Catheter Ablation of Atrial Fibrillation (cont)

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# Why Ablate Atrial Fibrillation ?

## Proven Benefits of AF Ablation

- 1) Eliminate AF and /or reduce AF burden
- 2) Improve quality of life

## Unproven / Potential Benefits of AF ablation

- 1) Reduce stroke risk
- 2) Prevent dementia
- 3) Improve cardiac function / prevent heart failure
- 4) Prolong life

# Recommendations Regarding Ablation Technique

	Recommendation	Class	LOE
PV isolation by catheter ablation	Electrical isolation of the PVs is recommended during all AF ablation procedures.	I	A
	Achievement of electrical isolation requires, at a minimum, assessment and demonstration of entrance block into the PV.	I	B-R
	Monitoring for PV reconnection for 20 minutes following initial PV isolation is reasonable.	IIa	B-R
	Administration of adenosine 20 minutes following initial PV isolation using RF energy with reablation if PV reconnection might be considered.	IIb	B-R
	Use of a pace-capture (pacing along the ablation line) ablation strategy may be considered.	IIb	B-R
	Demonstration of exit block may be considered.	IIb	B-NR

## Ablation strategies to be considered for use in conjunction with PV isolation

If a patient has a history of typical atrial flutter or typical atrial flutter is induced at the time of AF ablation, delivery of a cavotricuspid isthmus linear lesion is recommended.	I	B-R	Posterior wall isolation might be considered for initial or repeat ablation of persistent or long-standing persistent AF.	IIb	C-LD
If linear ablation lesions are applied, operators should use mapping and pacing maneuvers to assess for line completeness.	I	C-LD	Administration of high-dose isoproterenol to screen for and then ablate non-PV triggers may be considered during initial or repeat AF ablation procedures in patients with paroxysmal, persistent, or long-standing persistent AF.	IIb	C-LD
If a reproducible focal trigger that initiates AF is identified outside the PV ostia at the time of an AF ablation procedure, ablation of the focal trigger should be considered.	IIa	C-LD	DF-based ablation strategy is of unknown usefulness for AF ablation.	IIb	C-LD
When performing AF ablation with a force-sensing RF ablation catheter, a minimal targeted contact force of 5 to 10 grams is reasonable.	IIa	C-LD	The usefulness of creating linear ablation lesions in the right or left atrium as an initial or repeat ablation strategy for	IIb	B-NR

Ablation strategies to be considered for use in conjunction with PV isolation

The usefulness of linear ablation lesions in the absence of macroreentrant atrial flutter is not well established.	IIb	C-LD
The usefulness of mapping and ablation of areas of abnormal myocardial tissue identified with voltage mapping or MRI as an initial or repeat ablation strategy for persistent or long-standing persistent AF is not well established.	IIb	B-R
The usefulness of ablation of complex fractionated atrial electrograms as an initial or repeat ablation strategy for persistent and long-standing persistent AF is not well established.	IIb	B-R
The usefulness of ablation of rotational activity as an initial or repeat ablation strategy for persistent and long-standing persistent AF is not well established.	IIb	B-NR
The usefulness of ablation of autonomic ganglia as an initial or repeat ablation strategy for paroxysmal, persistent, and long-standing persistent AF is not well established.	IIb	B-NR

Weight loss can be useful for patients with AF, including those who are being evaluated to undergo an AF ablation procedure, as part of a comprehensive risk factor management strategy. IIa B-R

It is reasonable to consider a patient's BMI when discussing the risks, benefits, and outcomes of AF ablation with a patient being evaluated for an AF ablation procedure. IIa B-R

It is reasonable to screen for signs and symptoms of sleep apnea when evaluating a patient for an AF ablation procedure and to recommend a sleep evaluation if sleep apnea is suspected. IIa B-R

Treatment of sleep apnea can be useful for patients with AF, including those who are being evaluated to undergo an AF ablation procedure. IIa B-R

The usefulness of discontinuation of antiarrhythmic drug therapy prior to AF ablation in an effort

IIb C-LD

## Nonablation strategies to improve outcomes

to improve long-term outcomes is unclear.

The usefulness of initiation or continuation of antiarrhythmic drug therapy during the postablation healing phase in an effort to improve long-term outcomes is unclear. IIb C-LD

## Strategies to reduce the risks of AF ablation

Careful identification of the PV ostia is mandatory to avoid ablation within the PVs. I B-NR

It is recommended that RF power be reduced when creating lesions along the posterior wall near the esophagus. I C-LD

It is reasonable to use an esophageal temperature probe during AF ablation procedures to monitor esophageal temperature and help guide energy delivery. IIa C-EO

# Anticoagulation Strategies

	Recommendation	Class	LOE
Preablation	For patients undergoing AF catheter ablation who have been therapeutically anticoagulated with warfarin or dabigatran, performance of the ablation procedure without interruption of warfarin or dabigatran is recommended.	I	A
	For patients undergoing AF catheter ablation who have been therapeutically anticoagulated with rivaroxaban, performance of the ablation procedure without interruption of rivaroxaban is recommended.	I	B-R
	For patients undergoing AF catheter ablation who have been therapeutically anticoagulated with a NOAC other than dabigatran or rivaroxaban, performance of the ablation procedure without withholding a NOAC dose is reasonable.	IIa	B-NR
	Anticoagulation guidelines that pertain to cardioversion of AF should be adhered to in patients who present for an AF catheter ablation procedure.	I	B-NR
	For patients anticoagulated with a NOAC prior to AF catheter ablation, it is reasonable to hold one to two doses of the NOAC prior to AF ablation with reinitiation postablation.	IIa	B-NR
	Performance of a TEE in patients who are in AF on presentation for AF catheter ablation and who have been receiving anticoagulation therapeutically for 3 weeks or longer is reasonable	IIa	C-E0
	Performance of a TEE in patients who present for ablation in sinus rhythm and who have not been anticoagulated prior to catheter ablation is reasonable.	IIa	C-E0
	Use of intracardiac echocardiography to screen for atrial thrombi in patients who cannot undergo TEE may be considered.	IIb	C-E0

# Anticoagulation Strategies

During ablation	Heparin should be administered prior to or immediately following transeptal puncture during AF catheter ablation procedures and adjusted to achieve and maintain an ACT of at least 300 seconds.	I	B-NR
	Administration of protamine following AF catheter ablation to reverse heparin is reasonable.	IIa	B-NR
Postablation	In patients who are not therapeutically anticoagulated prior to catheter ablation of AF and in whom warfarin will be used for anticoagulation postablation, low molecular weight heparin or intravenous heparin should be used as a bridge for initiation of systemic anticoagulation with warfarin following AF ablation*.	I	C-EO
	Systemic anticoagulation with warfarin* or a NOAC is recommended for at least 2 months postcatheter ablation of AF.	I	C-EO
	Adherence to AF anticoagulation guidelines is recommended for patients who have undergone an AF ablation procedure, regardless of the apparent success or failure of the procedure.	I	C-EO
	Decisions regarding continuation of systemic anticoagulation more than 2 months post ablation should be based on the patient's stroke risk profile and not on the perceived success or failure of the ablation procedure.	I	C-EO
	In patients who have not been anticoagulated prior to catheter ablation of AF or in whom anticoagulation with a NOAC or warfarin has been interrupted prior to ablation, administration of a NOAC 3 to 5 hours after achievement of hemostasis is reasonable postablation.	IIa	C-EO
	Patients in whom discontinuation of anticoagulation is being considered based on patient values and preferences should consider undergoing continuous or frequent ECG monitoring to screen for AF recurrence.	IIb	C-EO



# Clinical Trial Recommendations

**Table 10** Definitions for use when reporting outcomes of AF ablation and in designing clinical trials of catheter or surgical ablation of AF

Acute procedural success (pulmonary vein isolation)	Acute procedural success is defined as electrical isolation of all pulmonary veins. A minimal assessment of electrical isolation of the PVs should consist of an assessment of entrance block. If other methods are used to assess PVI, including exit block and/or the use of provocative agents such as adenosine or isoproterenol, they should be prespecified. Furthermore, it is recommended that the wait time used to screen for early recurrence of PV conduction once initial electrical isolation is documented be specified in all prospective clinical trials.
Acute procedural success (not related by pulmonary vein isolation)	Typically, this would apply to substrate ablation performed in addition to PVI for persistent AF. Although some have proposed AF termination as a surrogate for acute procedural success, its relationship to long-term success is controversial. Complete elimination of the additional substrate (localized rotational activation, scar region, non-PV trigger, or other target) and/or demonstration of bidirectional conduction block across a linear ablation lesion would typically be considered the appropriate endpoint.
One-year success*	One-year success is defined as freedom from AF/AFL/AT after removal from antiarrhythmic drug therapy as assessed from the end of the 3month blanking period to 12 months following the ablation procedure. Because cavotricuspid isthmus-dependent atrial flutter is easily treated with cavotricuspid isthmus ablation and is not an iatrogenic arrhythmia following a left atrial ablation procedure for AF, it is reasonable for clinical trials to choose to prespecify that occurrence of isthmus-dependent atrial flutter, if confirmed by entrainment maneuvers during electrophysiology testing, should not be considered an ablation failure or primary effectiveness endpoint.
Alternative one-year success	Although the one-year success definition provided above remains the recommended end point that should be reported in all AF ablation trials, and the endpoint for which the objective performance criteria listed below were developed, the Task Force recognizes that alternative definitions for success can be used if the main goal of therapy in the study is to relieve AF-related symptoms and to improve patient QOL. In particular, it is appropriate for clinical trials to define success as freedom from only symptomatic AF/AFL/AT after removal from antiarrhythmic drug therapy as assessed from the end of the 3-month blanking period to 12 months following the ablation procedure if the main goal of therapy in the study is to relieve AF-related symptoms and to improve patient QOL. However, because symptoms of AF can resolve over time, and because studies have shown that asymptomatic AF represents a greater proportion of all AF postablation than prior to ablation, clinical trials need to continue to report freedom from both symptomatic and asymptomatic AF even if this alternative one year success definition is used as the primary trial endpoint.
Clinical/partial success*	It is reasonable for clinical trials to define and incorporate one or more secondary definitions of success that can be referred to as "clinical success" or "partial success." If these alternative definitions of success are included, they should be defined prospectively. In prior Consensus Documents the Task Force has proposed that clinical/partial success be defined as a "75% or greater reduction in the number of AF episodes, the duration of AF episodes, or the % time a patient is in AF as assessed with a device capable of measuring AF burden in the presence or absence of previously ineffective antiarrhythmic drug therapy." Because there is no firm scientific basis for selecting the cutoff of 75% rather than a different cutoff, this prior recommendation is provided only as an example of what future clinical trials may choose to use as a definition of clinical/partial success.

# Training Recommendations

## Procedural Experience

The 2015 American College of Cardiology/American Heart Association/Heart Rhythm Society Advanced Training Statement on Clinical Cardiac Electrophysiology proposed a minimum of 5 five focal ATs, 30 macroreentrant ATs (including 20 isthmus- and 10 nonisthmus-dependent/complex macroreentry) and 50 AF ablation procedures for those who undergo fellowships in clinical cardiac electrophysiology.<sup>1284</sup>

The writing group members are supportive of the requirement that trainees perform at least 50 AF ablation procedures and at least 30 macroreentrant ATs (including 20 isthmus- and 10 nonisthmus-dependent/complex macroreentry) during fellowship training. Furthermore, the writing group recommends that those performing the procedure perform at least several AF ablation procedures per month to maintain competence.

# Guidelines and Beyond in AF Ablation

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- Are updates needed ?

# **What New Data Concerning AF Ablation Has Been Published Since 2017 ?**

**And Do the Results of these Studies Impact  
the Recommendations Made in the 2017  
Consensus Document ?**

**For the Most Part the Answer is**

**NO**

**But, some refinement in the definition of success and the value of AF burden as a marker of success is warranted.**

# CIRCA DOSE TRIAL

EHRA MEETING 2019

- 346 patients randomized to 2 min cryo, 4 min cryo, or RF
- All patients had implantable monitor
- One year AF free was 54%, 52% and 52% by Linq monitor
- One year AF free by symptomatic AF: 85%
- Median reduction in AF burden was > 99% in all groups
- Majority of patients had a post ablation burden of 0%

# Association of Burden of Atrial Fibrillation With Risk of Ischemic Stroke in Adults With Paroxysmal Atrial Fibrillation

## The KP-RHYTHM Study

Alan S. Go, MD; Kristi Reynolds, PhD, MPH; Jingrong Yang, MA; Nigel Gupta, MD; Judith Lenane, RN, MHA; Sue Hee Sung, MPH; Teresa N. Harrison, SM; Taylor I. Liu, MD, PhD; Matthew D. Solomon, MD, PhD

**RESULTS** Among 1965 adults with paroxysmal atrial fibrillation, the mean (SD) age was 69 (11.8) years, 880 (45%) were women, 496 (25%) were persons of color, the median ATRIA stroke risk score was 4 (interquartile range [IQR], 2-7), and the median CHA<sub>2</sub>DS<sub>2</sub>-VASc score was 3 (IQR, 1-4). The median burden of atrial fibrillation was 4.4% (IQR, 1.1%-17.23%). Patients with a higher burden of atrial fibrillation were less likely to be women or of Hispanic ethnicity, but had more prior cardioversion attempts compared with those who had a lower burden. After adjusting for either ATRIA or CHA<sub>2</sub>DS<sub>2</sub>-VASc stroke risk scores, the highest tertile of atrial fibrillation burden ( $\geq 11.4\%$ ) was associated with a more than 3-fold higher adjusted rate of thromboembolism while not taking anticoagulants (adjusted hazard ratios, 3.13 [95% CI, 1.50-6.56] and 3.16 [95% CI, 1.51-6.62], respectively) compared with the combined lower 2 tertiles of atrial fibrillation burden. Results were consistent across demographic and clinical subgroups.

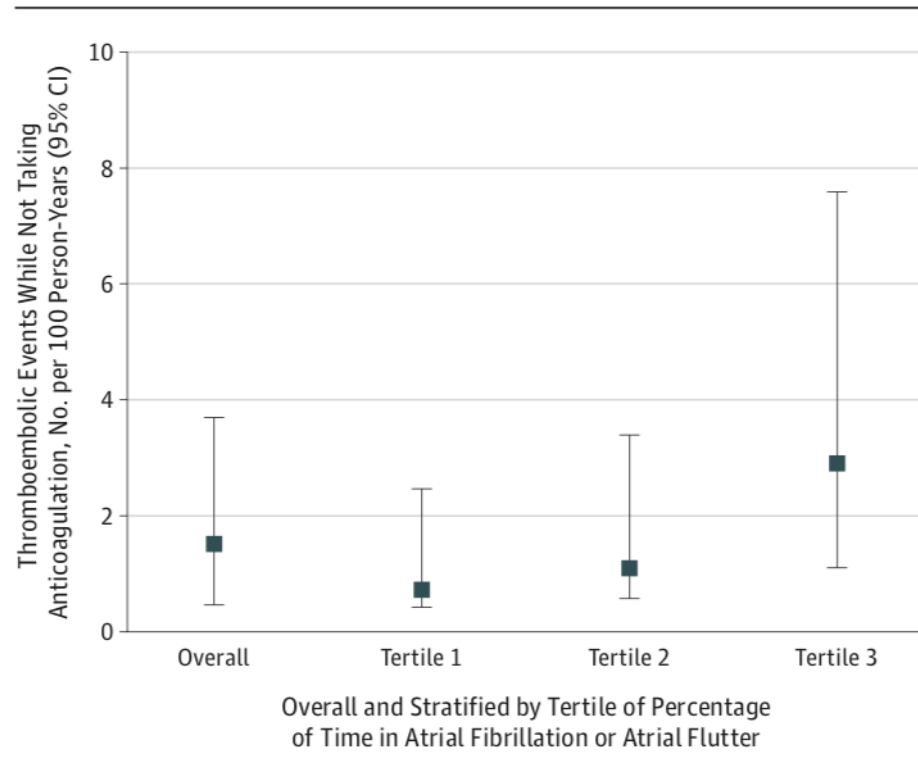


# Association of Burden of Atrial Fibrillation With Risk of Ischemic Stroke in Adults With Paroxysmal Atrial Fibrillation

## The KP-RHYTHM Study

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Figure 3. Thromboembolic Event Rates While Not Taking Anticoagulation, Overall and Stratified by Atrial Fibrillation (AF) Burden Tertile in 1965 Adults With Confirmed Paroxysmal AF



***Some may argue that we need stronger recommendations concerning operator procedure volume and center procedure volume to maintain competence.***

But I think the available data supports our recommendation of several per month.

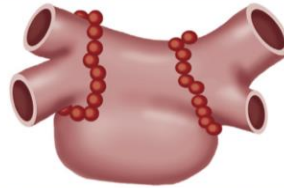
Adding center volume is warranted.

# Risk of Mortality Following Catheter Ablation of Atrial Fibrillation



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George Thomas, MD,<sup>a</sup> James E. Ip, MD,<sup>a</sup> Luke K. Kim, MD,<sup>a</sup> Bruce B. Lerman, MD,<sup>a</sup> Jim W. Cheung, MD<sup>a</sup>

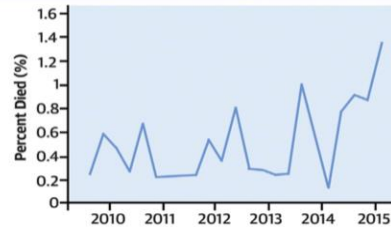
**Catheter Ablation of Atrial Fibrillation, 2010-2015**



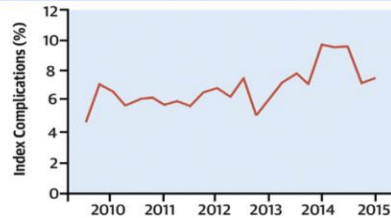
- 60,203 admissions
- 0.46% early mortality, with over half occurring during 30-day readmission

**Trends Associated With AF Ablation**

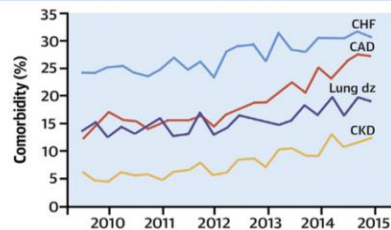
**↑Trend in Early Mortality**



**↑Trend in Complications**



**↑Trend in Comorbidities**



**Risk Factors for Early Mortality Post-AF Ablation**

**Procedural Complications**



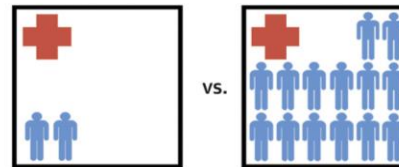
aOR 4.06; p < 0.001

**Congestive Heart Failure**



aOR 2.20; p = 0.011

**Low AF Ablation Hospital Volume**



aOR 2.35; p = 0.003

- Hospitals volume:
  - Low volume: <21 ablations/year
  - Middle volume: 21-52 ablations/year
  - High volume: >52 ablations/year

**TABLE 3** Predictors of Early Mortality After Atrial Fibrillation Ablation

	Univariate		Multivariable	
	Unadjusted OR (95% CI)	p Value	Adjusted OR (95% CI)	p Value
Any index procedural complication	4.88 (2.98–7.97)	<0.001	4.06 (2.40–6.85)	<0.001
CHF	5.31 (3.50–8.06)	<0.001	2.20 (1.20–4.03)	0.011
Anemia	4.86 (3.09–7.65)	<0.001	1.83 (1.13–2.96)	0.015
Coagulopathy	5.45 (2.83–10.49)	<0.001	2.14 (1.04–4.39)	0.039
Age	1.07 (1.05–1.10)*	<0.001	1.04 (1.00–1.07)*	0.046
Hospital procedural volume				
Low-volume tertile	4.51 (2.58–7.87)	<0.001	2.35 (1.33–4.15)	0.003
Middle-volume tertile	2.01 (1.12–3.62)	0.020	1.65 (0.91–2.98)	0.099
High-volume tertile	1.00 (reference)		1.00 (reference)	
CAD	2.53 (1.67–3.83)	<0.001		
CKD	3.90 (2.48–6.13)	<0.001		
Previous PPM	3.04 (1.90–4.88)	<0.001		
Nonelective procedure	2.46 (1.61–3.77)	<0.001		
Length of stay $\geq$ 3 days	3.50 (2.23–5.51)	<0.001		
Chronic pulmonary disease	2.24 (1.38–3.65)	0.001		
Pulmonary hypertension	3.51 (1.46–8.42)	0.005		
Previous CABG	2.57 (1.23–5.36)	0.012		
Previous ICD	2.29 (1.10–4.80)	0.028		
Urban	1.39 (1.00–1.93)	0.048		
HTN	0.66 (0.43–1.00)	0.052		
Previous PCI	0.53 (0.26–1.10)	0.088		
Median household income				
Quartile 1 (lowest)	2.14 (1.28–3.61)	0.186		
Quartile 2	2.51 (1.34–4.68)	0.079		
Quartile 3	1.74 (1.03–2.95)	0.974		
Quartile 4 (highest)	1.00 (reference)			
Insurance				
Medicare	1.00 (reference)			
Medicaid	0.61 (0.22–1.71)	0.186		
Private including HMO	0.30 (0.18–0.50)	0.003		
Self-pay/no charge/other	1.28 (0.30–5.46)	0.284		

## **Arrhythmia/Electrophysiology**

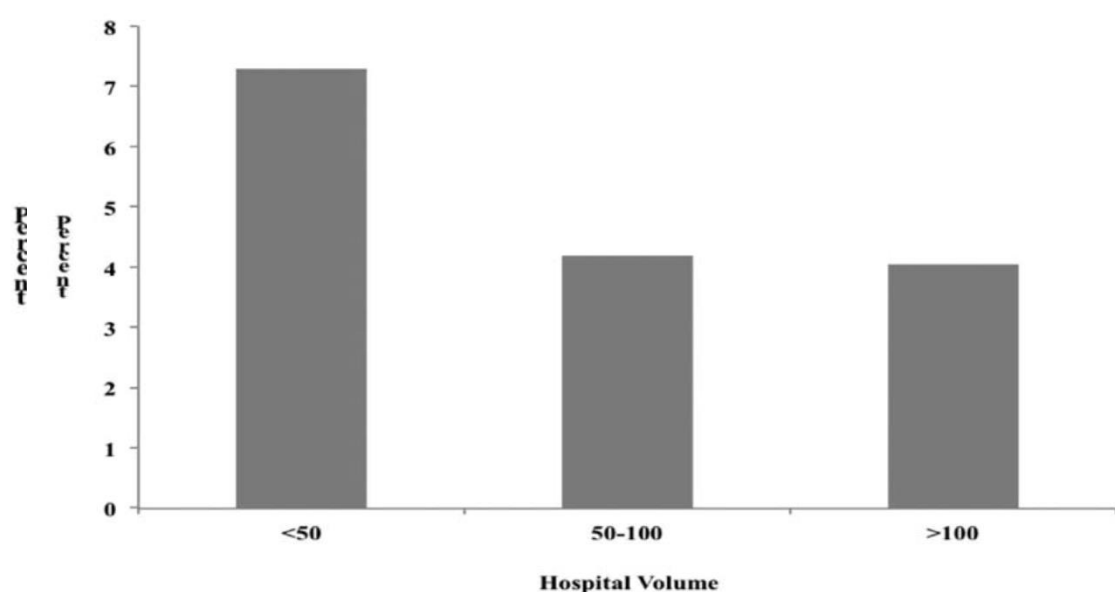
# **In-Hospital Complications Associated With Catheter Ablation of Atrial Fibrillation in the United States Between 2000 and 2010**

## **Analysis of 93801 Procedures**

Abhishek Deshmukh, MD; Nileshkumar J. Patel, MD; Sadip Pant, MD; Neeraj Shah, MD;  
Ankit Chothani, MD; Kathan Mehta, MD; Peeyush Grover, MD; Vikas Singh, MD;  
Srikanth Vallurupalli, MD; Ghanshyambhai T. Savani, MD; Apurva Badheka, MD;  
Tushar Tuliani, MD; Kaustubh Dabhadkar, MD; George Dibbu, MD; Y. Madhu Reddy, MD;  
Asif Sewani, MD; Marcin Kowalski, MD; Raul Mitrani, MD; Hakan Paydak, MD;  
Juan F. Viles-Gonzalez, MD

**Table 2. Trends in Complications for AF Ablations**

	Overall	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	PValue
Any procedure										5.93	6.49	7.48	0.108
In hospital										0.27	0.52	0.47	0.492
Vascular										1.02	0.97	1.33	0.500
Postoperative										3.75	3.46	4.90	<0.001
Postoperative										0.65	0.44	1.03	0.020
Vascular										0.03	0.04	0.04	0.060
Cardiac										2.90	3.06	3.53	<0.001
Intraoperative										1.33	0.93	1.76	0.050
Pericardial										1.84	2.14	2.24	<0.001
Myocardial										0.37	0.32	0.26	0.650
Requiring										0.24	0.36	0.47	0.460
Respiratory										1.16	1.09	0.77	0.109
Pneumonia										0.31	0.24	0.04	0.020
Postoperative										0.68	0.85	0.73	0.575
Other iatrogenic respiratory complications	0.18	0.15	0.33	0.11	0.30	0.09	0.24	0.20	0.43	0.20	0.00	0.00	0.030
Neurological complications (postop stroke/TIA)	1.02	0.89	1.11	1.79	1.57	1.13	0.68	1.39	0.53	0.78	0.93	1.20	0.013
Postop infectious complications	0.38	0.15	0.11	0.21	0.45	0.43	0.29	0.50	0.72	0.24	0.40	0.43	0.235





# What About CABANA?

JAMA | **Original Investigation**

## Effect of Catheter Ablation vs Antiarrhythmic Drug Therapy on Mortality, Stroke, Bleeding, and Cardiac Arrest Among Patients With Atrial Fibrillation The CABANA Randomized Clinical Trial

Douglas L. Packer, MD; Daniel B. Mark, MD, MPH; Richard A. Robb, PhD; Kristi H. Monahan, RN; Tristram D. Bahnson, MD; Jeanne E. Poole, MD; Peter A. Noseworthy, MD; Yves D. Rosenberg, MD, MPH; Neal Jeffries, PhD; L. Brent Mitchell, MD; Greg C. Flaker, MD; Evgeny Pokushalov, MD; Alexander Romanov, MD; T. Jared Bunch, MD; Georg Noelker, MD; Andrey Ardashev, MD; Amiran Revishvili, MD; David J. Wilber, MD; Riccardo Cappato, MD; Karl-Heinz Kuck, MD; Gerhard Hindricks, MD; D. Wyn Davies, MD; Peter R. Kowey, MD; Gerald V. Naccarelli, MD; James A. Reiffel, MD; Jonathan P. Piccini, MD, MHS; Adam P. Silverstein, MS; Hussein R. Al-Khalidi, PhD; Kerry L. Lee, PhD; for the CABANA Investigators

## What About CABANA?

- 1) Cabana provides more data on the safety and efficacy of AF ablation.
- 2) This likely will strengthen the recommendations for catheter ablation in paroxysmal and persistent AF.
- 3) CABANA provides data behind some features of AF ablation that we always know: older patients, obese patients, and those with long standing persistent AF do worse.

# Conclusions

- There are a number of guidelines and consensus documents that pertain to AF ablation.
- The 2017 HRS/ EHRA/ ECAS Expert Consensus Statement on catheter and surgical ablation of AF is unique in that it provides detailed recommendations on all aspects of AF ablation.
- No major urgent revisions are needed now.
- But in several years modifications are likely to be warranted focused on:
  - Endpoints for success – AF burden
  - Revised stronger indications for AF ablation.
  - Stronger recommendations on center experience.

**THANK YOU!**

