Managing Atrial Fibrillation 2019: Diagnosis, Ablation

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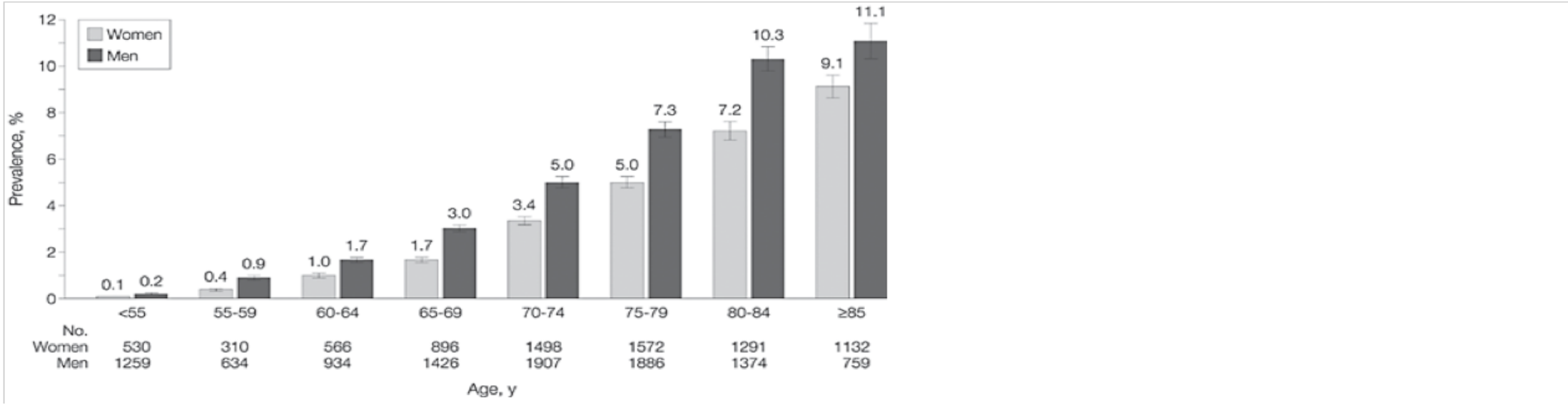
Chief Scientific Officer
CorVita Science Foundation

Prevalence of Diagnosed Atrial Fibrillation in Adults: National Implications for Rhythm Management and Stroke Prevention: the AnTicoagulation and Risk Factors In Atrial Fibrillation (ATRIA) Study FREE

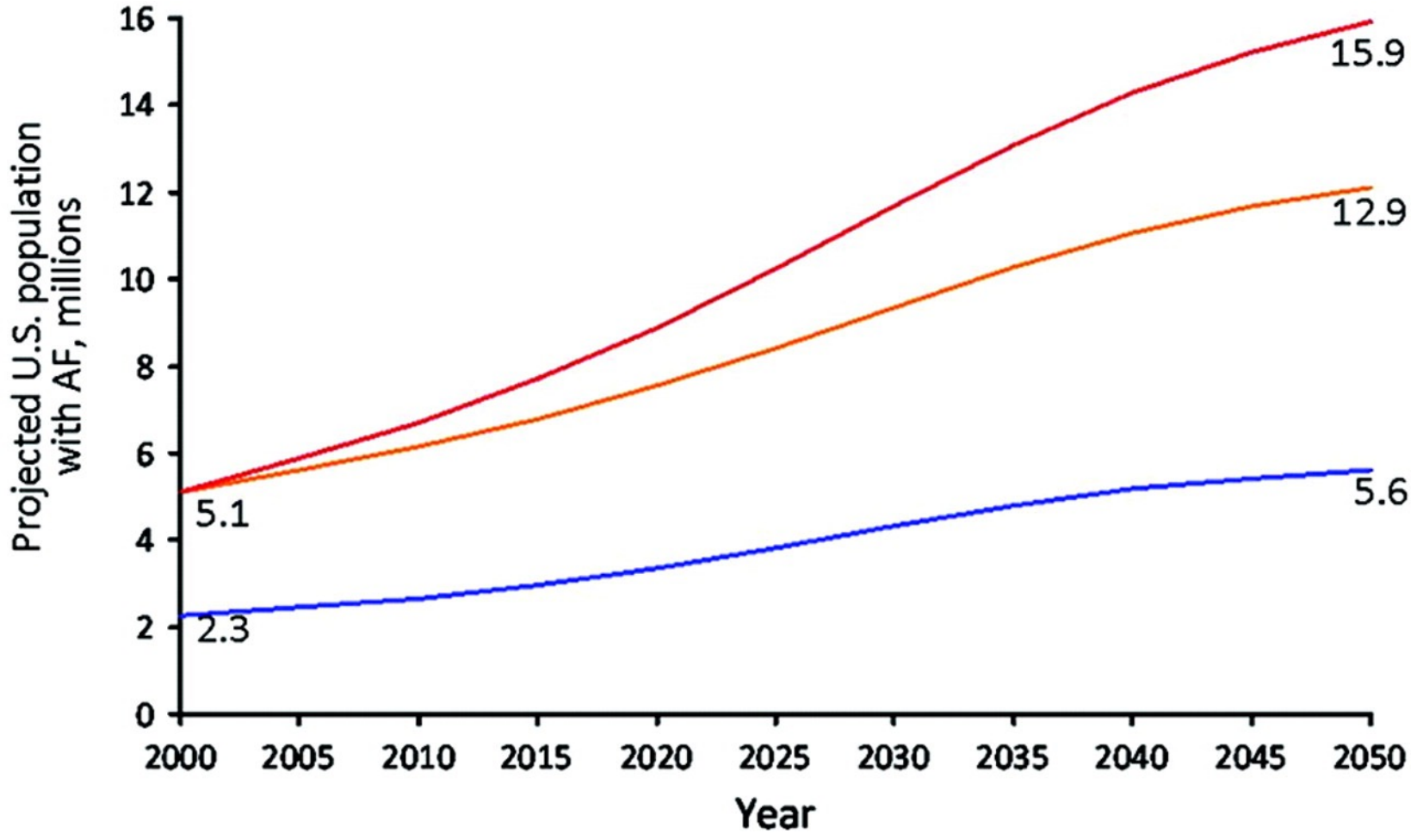
Alan S. Go, MD; Elaine M. Hylek, MD, MPH; Kathleen A. Phillips, BA; YuChiao Chang, PhD; Lori E. Henault, MPH; Joe V. Selby, MD, MPH; Daniel E. Singer, MD

JAMA. 2001;285(18):2370-2375. doi:10.1001/jama.285.18.2370.



- Prevalence of atrial fibrillation increases with age
- Prevalence is higher in men than women in all age groups

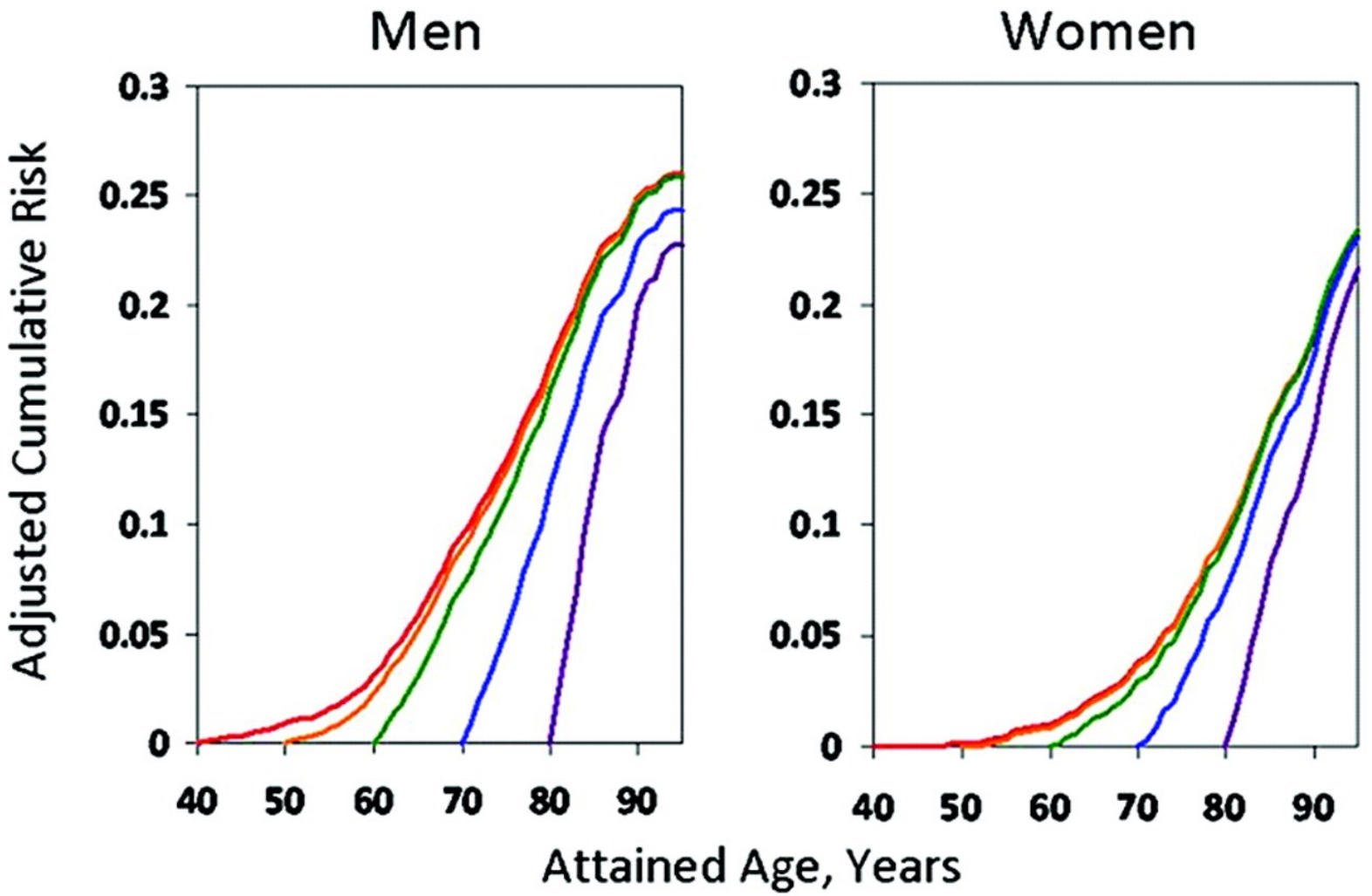
The estimated US prevalence of atrial fibrillation (AF) in the year 2050 ranges from 5.6 million to as high as 15.9 million individuals.



Jared W. Magnani et al. Circulation. 2011;124:1982-1993

American Heart Association.

Lifetime risk for developing atrial fibrillation (AF) from the Framingham Heart Study.



Jared W. Magnani et al. Circulation. 2011;124:1982-1993

American Heart Association.

Types of Atrial Fibrillation

TABLE 3 **Definitions of AF: A Simplified Scheme**

Term	Definition
Paroxysmal AF	• AF that terminates spontaneously or with intervention within 7 d of onset. • Episodes may recur with variable frequency.
Persistent AF	• Continuous AF that is sustained >7 d.
Long-standing persistent AF	• Continuous AF >12 mo in duration.
Permanent AF	• The term "permanent AF" is used when the patient and clinician make a joint decision to stop further attempts to restore and/or maintain sinus rhythm. • Acceptance of AF represents a therapeutic attitude on the part of the patient and clinician rather than an inherent pathophysiological attribute of AF. • Acceptance of AF may change as symptoms, efficacy of therapeutic interventions, and patient and clinician preferences evolve.
Nonvalvular AF	• AF in the absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve, or mitral valve repair.

AF indicates atrial fibrillation.

Am Coll Cardiol. 2014; 64 (21): 2246-2280

DUAL SUBSTRATES FOR AF

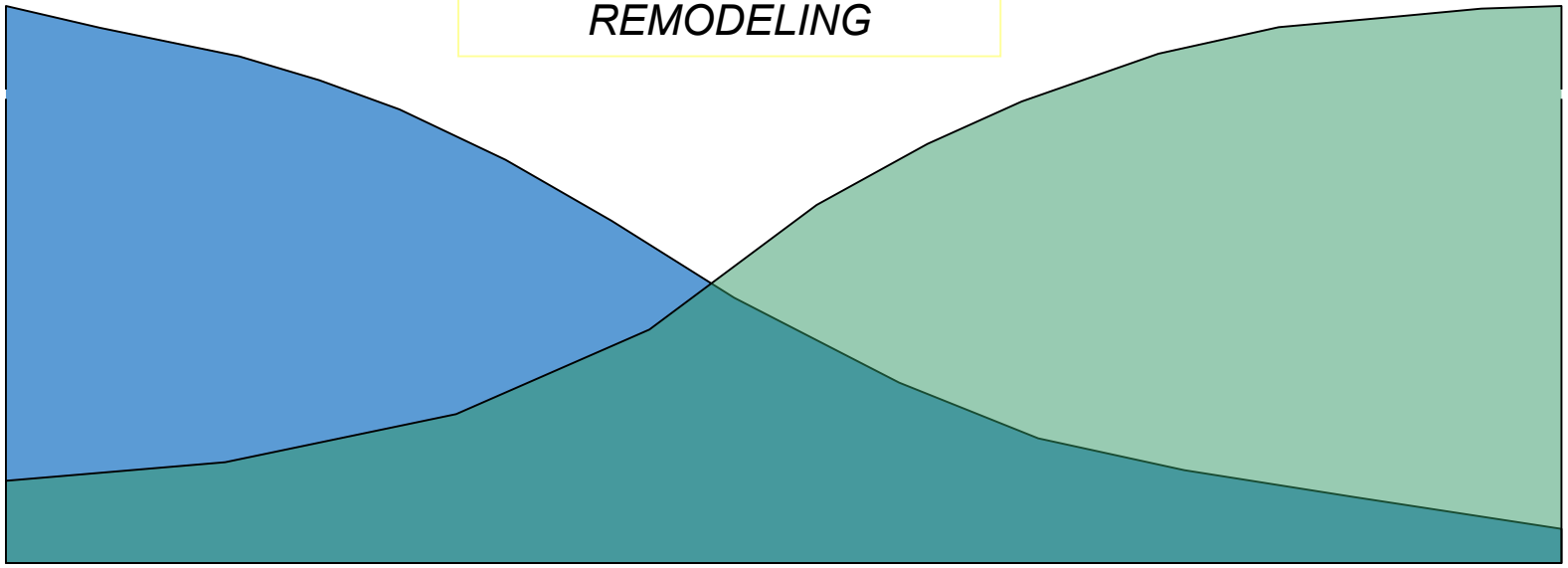
TRIGGERING

PV PACs
OTHER PACs
AT / SVT

MAINTENANCE

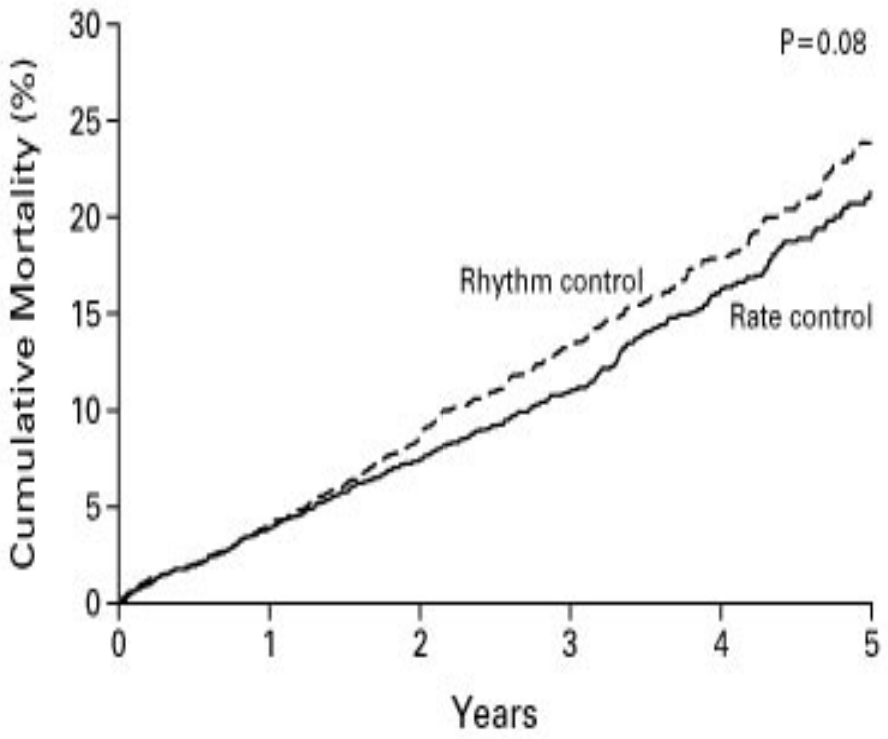
LOCAL ANISOTROPY
FIBROSIS / SCARRING
REPETITIVE TRIGGERING

MODULATORS
STRETCH
AUTONOMIC TONE
ELECTRICAL
REMODELING

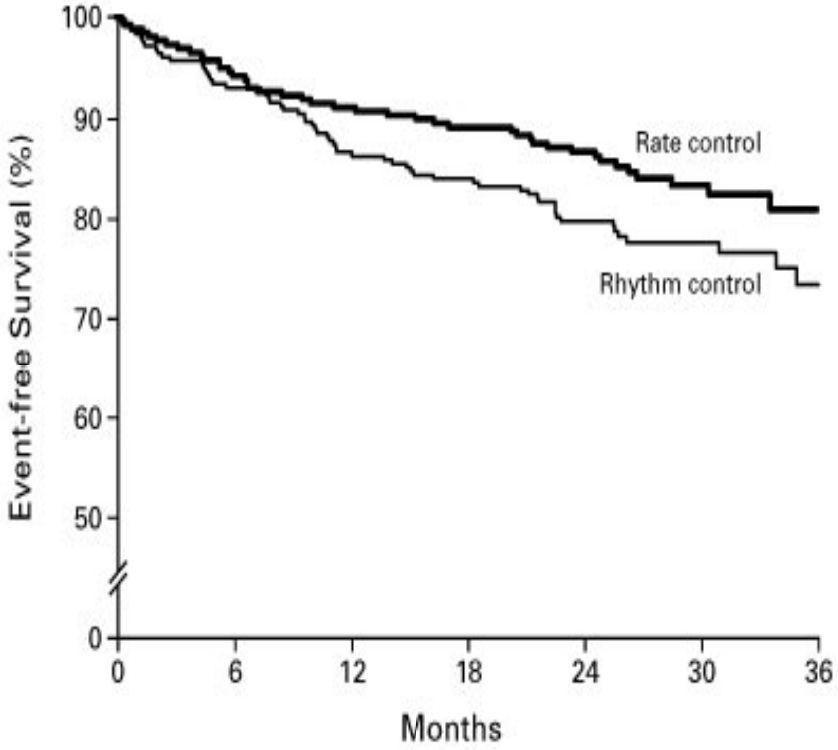


PAROXYSMAL AF **PERSISTENT AF** **PERMANENT AF**

Rate Control vs. Rhythm Control



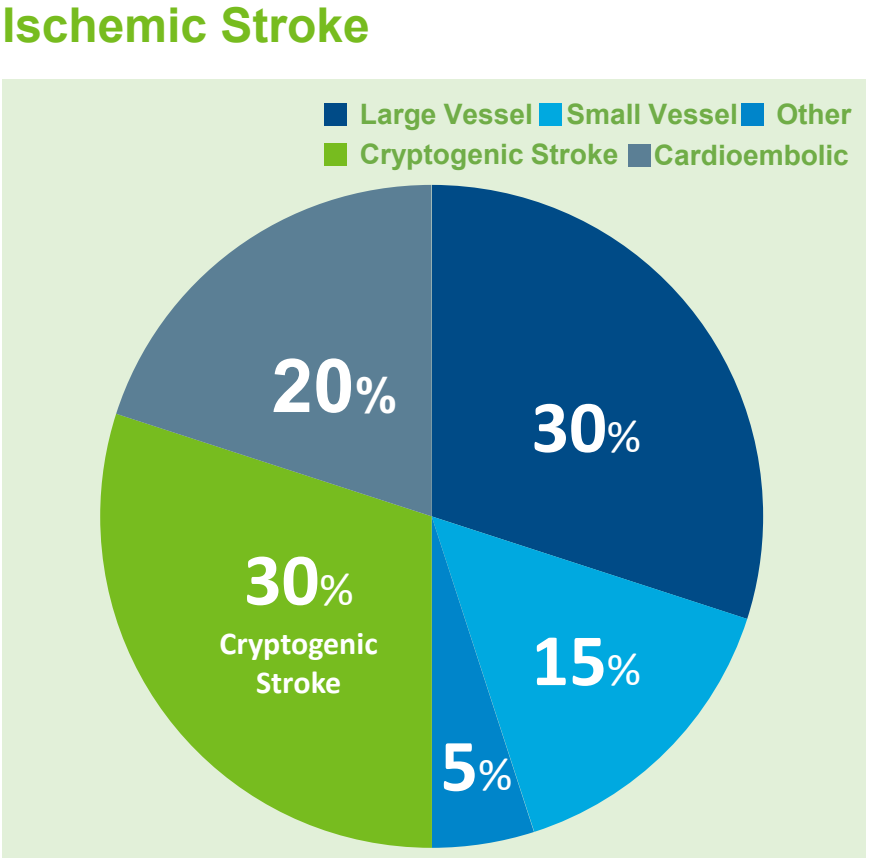
AFFIRM Investigators, NEJM 2002



Van Gelder, et al. NEJM 2002

Why Talk About Cryptogenic Stroke?

- 678,000 ischemic strokes every year in the US[1]
  - Leading cause of disability in the US and worldwide
- ~200,000 cryptogenic strokes yearly[1]
- Most cryptogenic stroke patients receive anti-platelet for secondary prevention[2]
- Long-term monitoring reveals AF in ~30% of cryptogenic stroke patients[3-9]
  - These patients benefit from anticoagulant therapy



[1] Mozzafarian D, et al. *Circulation.* 2015;131:e29-e322.
[2] Kernan WN, et al. *Stroke.* 2014;45:2160-2236.
[3] Sacco RL, et al. *Ann Neurol.* 1989;25:382-390.
[4] Petty GW, et al. *Stroke*. 1999;30:2513-2516.
[5] Kolominsky-Rabas PL, et al. *Stroke.* 2001;32:2735-2740.
[6] Schulz UG, et al. *Stroke.* 2003;34:2050-2059.
[7] Schneider AT, et al. *Stroke.* 2004;35:1552-1556.
[8] Lee BI, et al. *Cerebrovasc Dis.* 2001;12:145-151.
[9] Sanna T, et al. *N Engl J Med.* 2014;370:2478-2486.

Diagnosis Strategies

Holter Monitor

Event Recorder

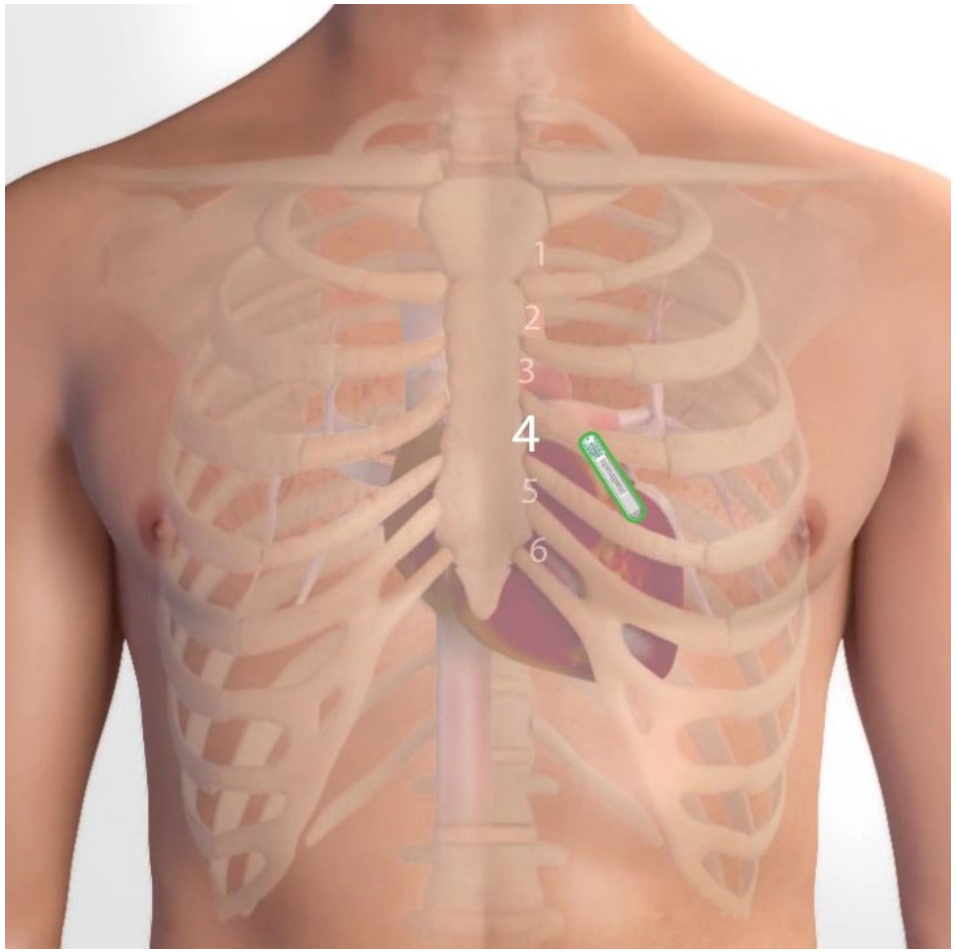
Mobile Cardiac Telemetry

24-48 hours of monitoring	Up to 30 days of monitoring	Up to 30 days of monitoring
External loop recorder	Event-triggered loop recorder	Ambulatory event monitor
Saves all cardiac rhythm data	Saves events only	Saves all cardiac rhythm data

Dependent on type of MCT.

1. Vasamreddy CR, et al. *J Cardiovasc Electrophysiol*. 2006;17:134-139;
2. Gladstone DJ, et al. *N Engl J Med*. 2014;370:2467-2477;
3. Rosenberg MA, et al. *Pacing Clin Electrophysiol.* 2013;36:328-333;
4. Kamel H, et al. *Stroke.* 2013;44:528-530.
5. Shinbane JS, et al. Heart Rhythm Society 2013 34th Annual Scientific Sessions, Volume 10, Issue 5S, 2013.

Reveal LINQ™ SYSTEM

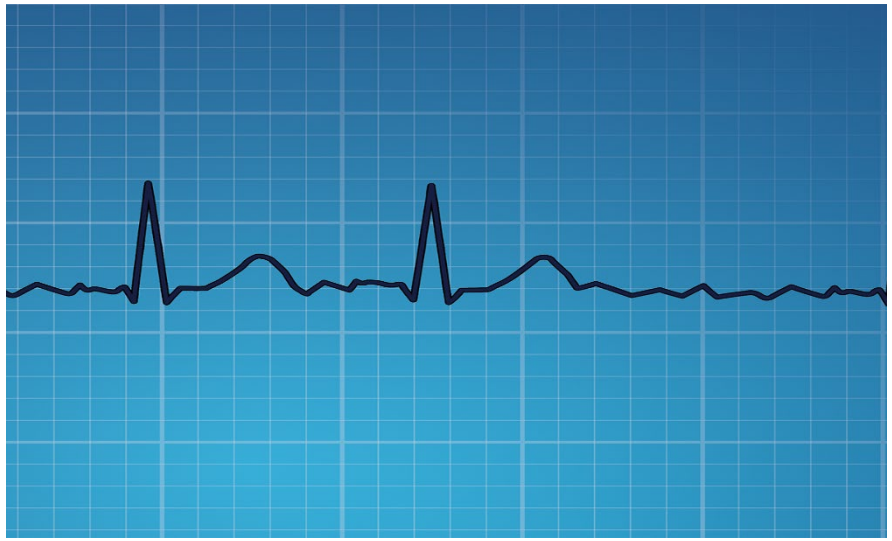


Best location: 45 degrees to sternum over 4th intercostal space, 2 cm from left edge of sternum

97%

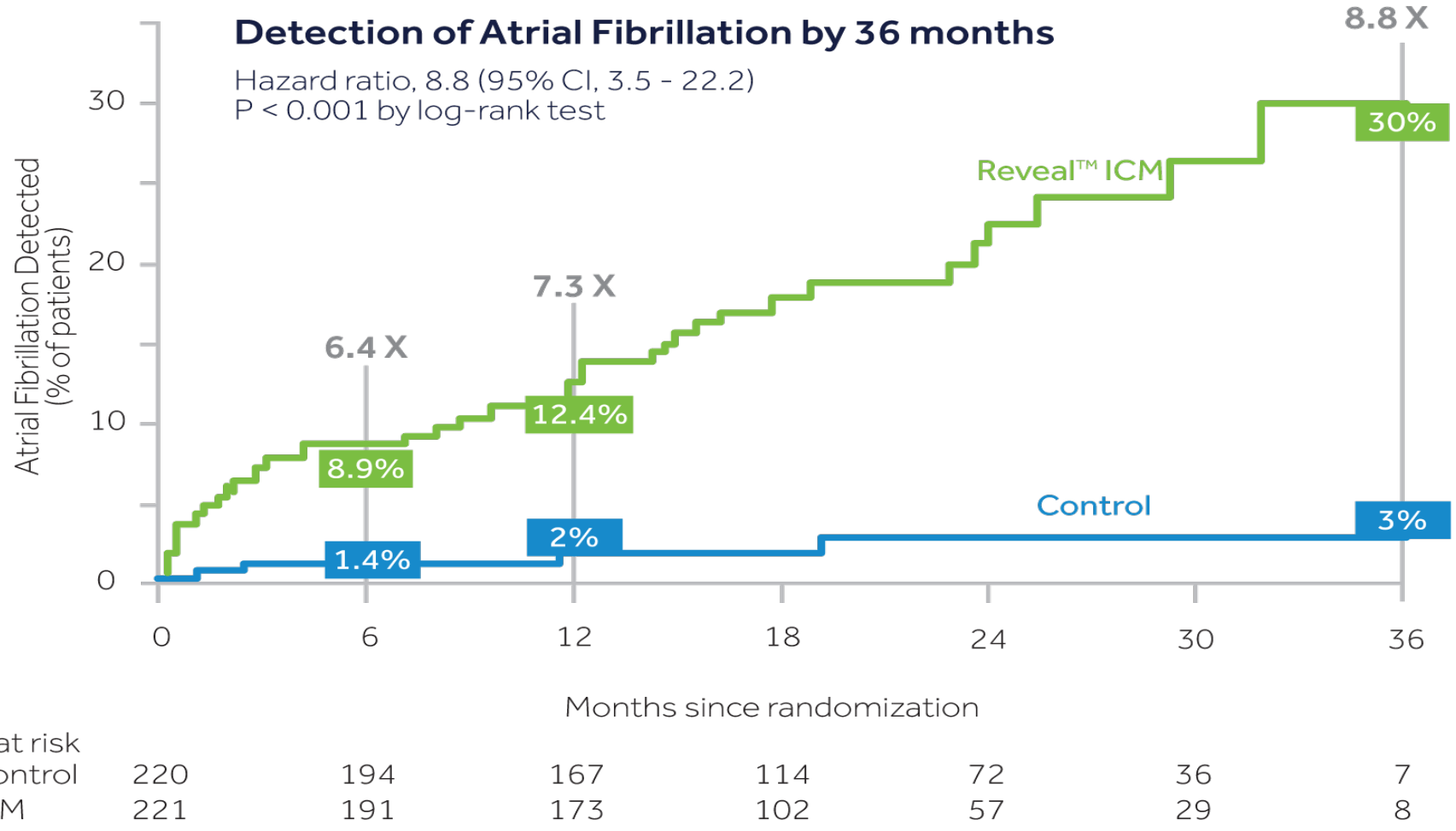
of physicians found the insertion tool simple and intuitive.[1]

Requires minimal procedure time and clinical resources



Reveal LINQ Usability Study. Medtronic data on file. 2013.
Burke MC et al. J Electrocardiology 2003

CRYSTAL AF: monitoring with ICM superior to SOC



1. Sanna T, et al. *N Engl J Med*. 2014;370:2478-2486.

CHADS2-Vasc Score

- CHADS2VASC increases the number of patients who meet criteria for anticoagulation therapy and more accurately identifies truly low risk patients

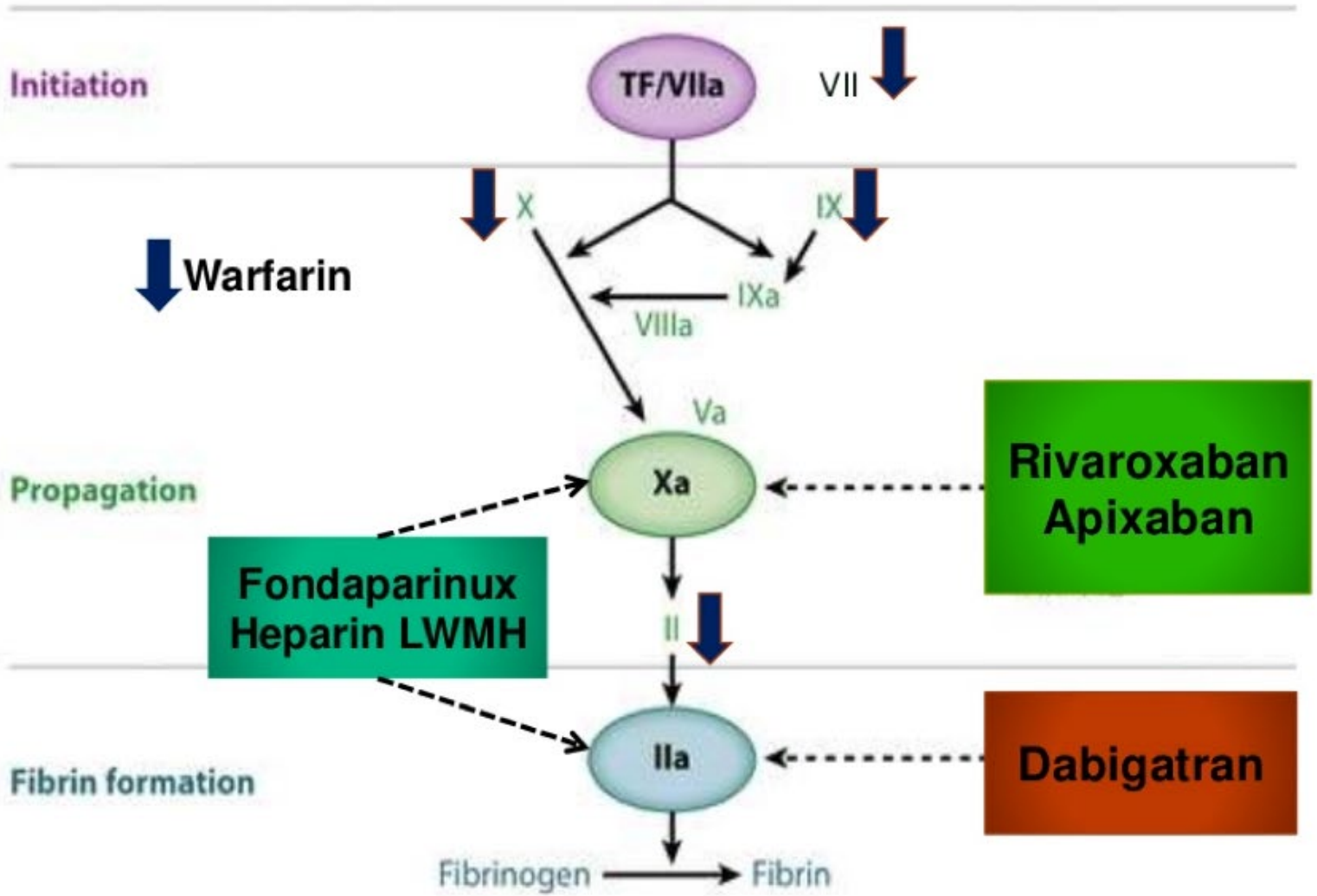
- More people who were considered low risk before (ie females, age 65-74, vascular dx) are moved to the higher risk categories to better reflect risk of embolization.

TABLE 6 Comparison of the $CHADS_2$ and CHA_2DS_2-VASc Risk Stratification Scores for Subjects With Nonvalvular AF

Definition and Scores for $CHADS_2$ and CHA_2DS_2-VASc		Stroke Risk Stratification With the $CHADS_2$ and CHA_2DS_2-VASc Scores	
	Score		Adjusted Stroke Rate (% per y)
$CHADS_2$		$CHADS_2$*	
Congestive HF	1	0	1.9
Hypertension	1	1	2.8
Age ≥75 y	1	2	4.0
Diabetes mellitus	1	3	5.9
Stroke/TIA/TE	2	4	8.5
Maximum score	6	5	12.5
		6	18.2
CHA_2DS_2-VASc		CHA_2DS_2-VASc†	
Congestive HF	1	0	0
Hypertension	1	1	1.3
Age ≥75 y	2	2	2.2
Diabetes mellitus	1	3	3.2
Stroke/TIA/TE	2	4	4.0
Vascular disease (prior MI, PAD, or aortic plaque)	1	5	6.7
Age 65–74 y	1	6	9.8
Sex category (i.e., female sex)	1	7	9.6
Maximum score	9	8	6.7
		9	15.20

Am Coll Cardiol. 2014; 64 (21): 2246-2280

Anticoagulant Mechanisms of Action



Adapted from Eriksson, *Ann Rev Med 62:41, 2011*

HAS-BLED

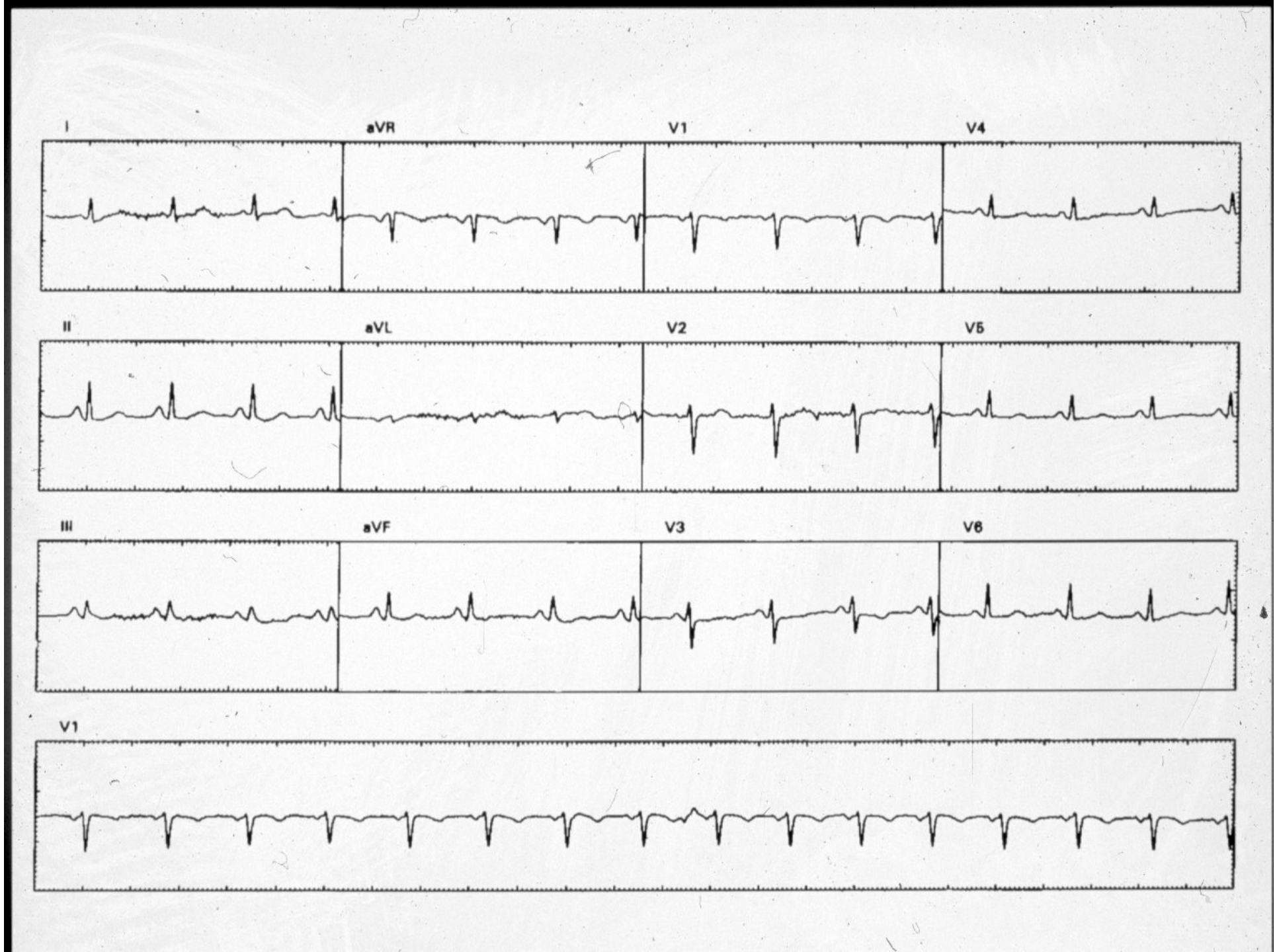
Letter	Clinical Characteristic	Points
H	Hypertension	1
A	Abnormal Liver or Renal Function	1 or 2
S	Stroke	1
B	Bleeding	1
L	Labile INR	1
E	Elderly (age > 65)	1
D	Drugs or Alcohol	1 or 2
Maximum Score		9

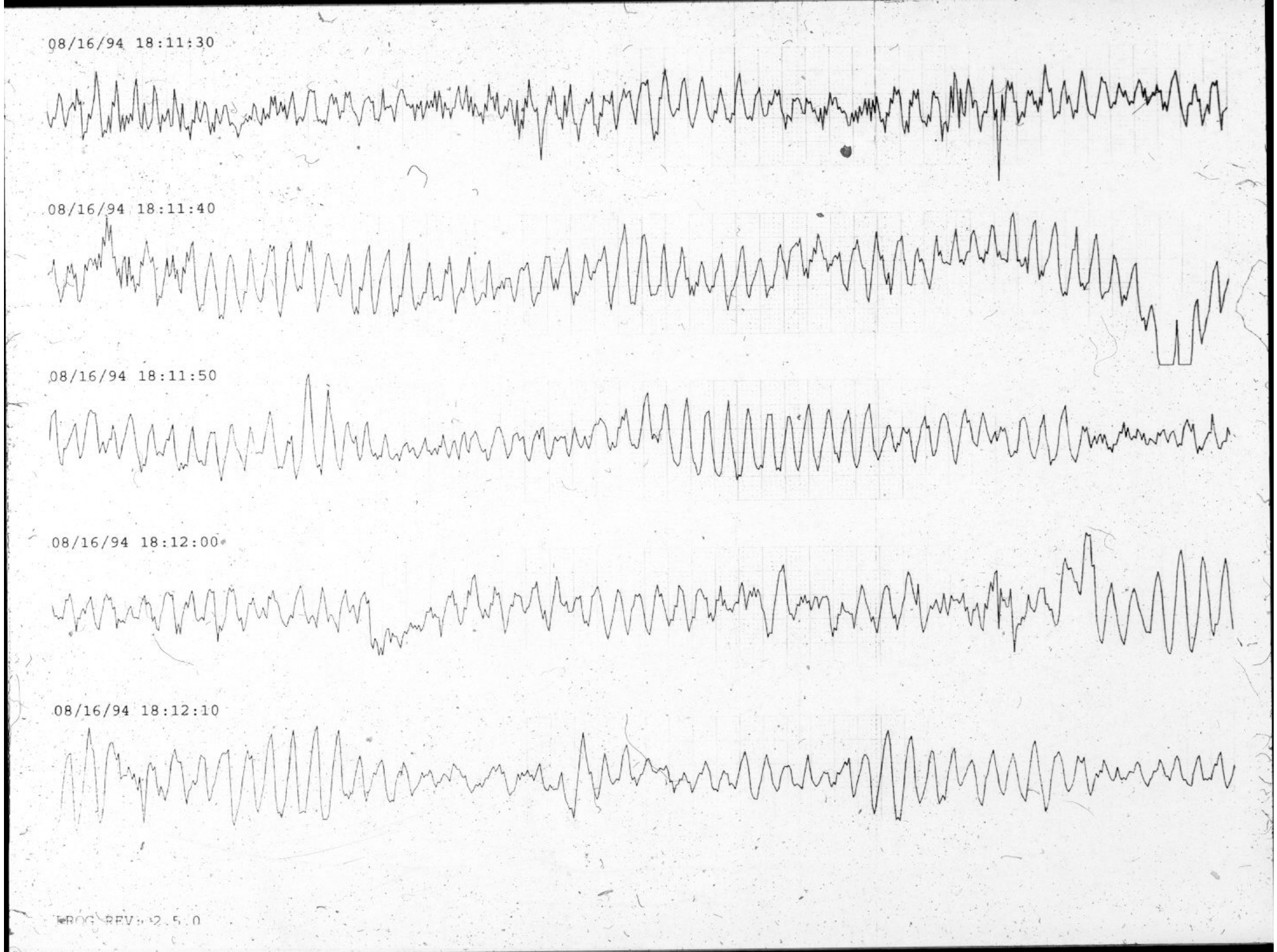
Ruff, C on ACC.com *Which Risk Score Best Predicts Bleeding With Warfarin in Atrial Fibrillation?*

Bleeding Risk

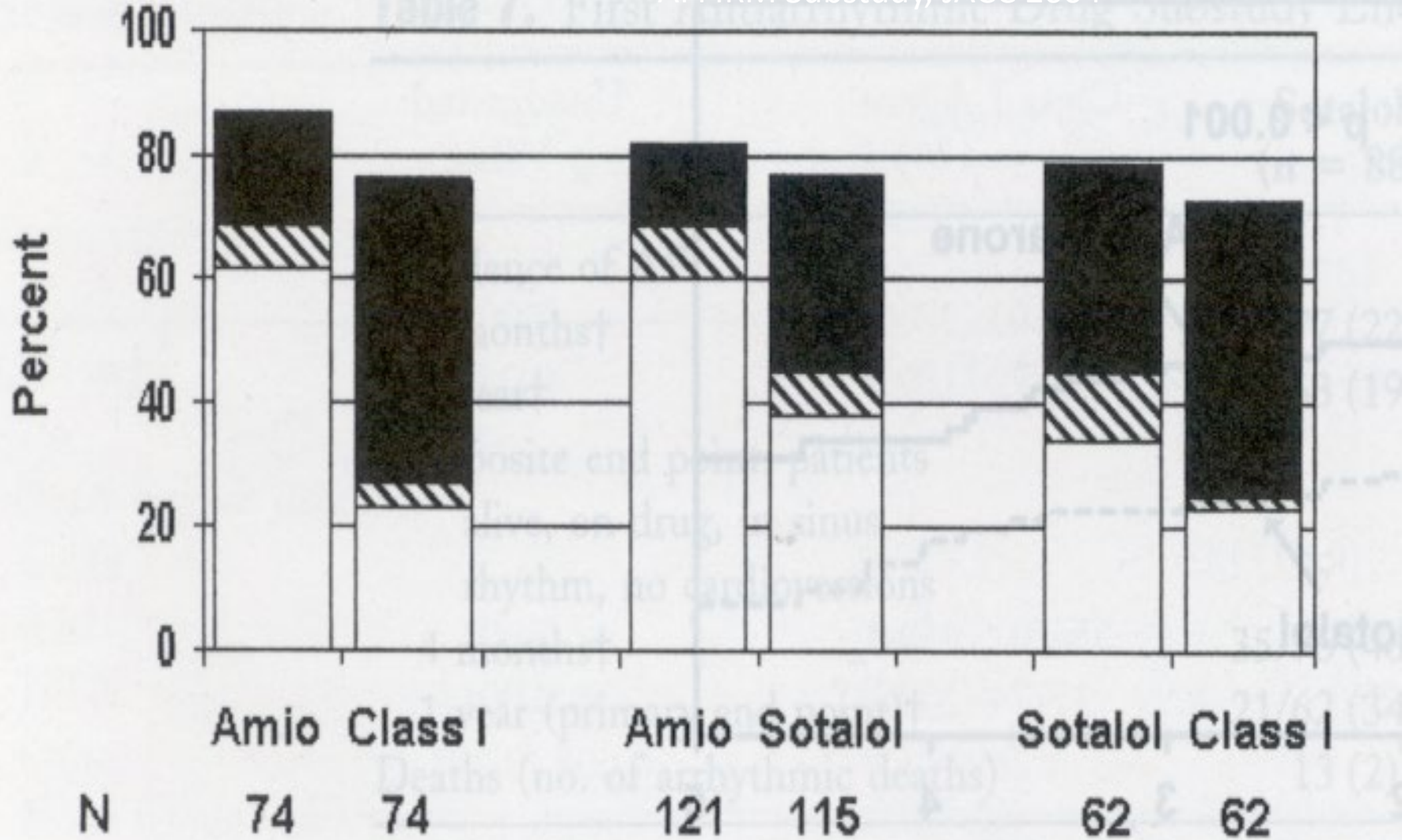
- Annual rate of major bleeding range between 2.1% to 3.6%
- Fatal bleeding occurs in up to 0.5%
- Major bleeding is associated with higher mortality
  - 30-day mortality after major bleeding episode 13% with warfarin and 9% with dabigatran

J AM Coll Cardiol. 2015; 65 (13): 1340-1360


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1


08/16/94 18:11:30
08/16/94 18:11:40
08/16/94 18:11:50
08/16/94 18:12:00
08/16/94 18:12:10
PROG REV: 2.5.0

AFFIRM Substudy, JACC 2004



AFFIRM SUBSTUDY CIRC 2002

Managing Atrial Fibrillation: Diagnosis, Ablation and LAA Occlusion

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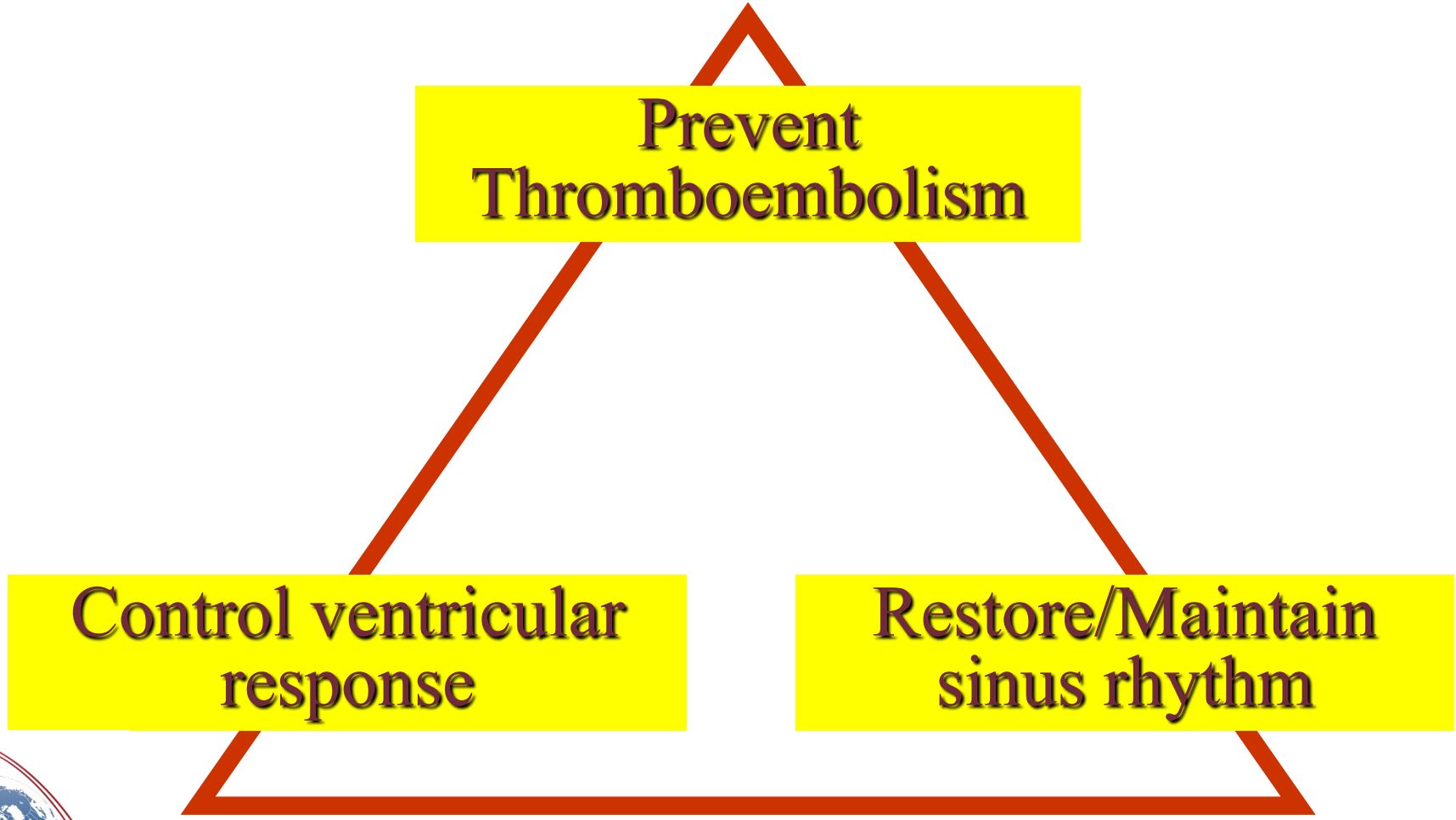
Disclosures

- Educational and clinical research grants
  - Astra Zeneca
  - Biosense Webster
  - Medtronic
  - Boston Scientific
  - Abbott
  - Pfizer

Therapy for AF



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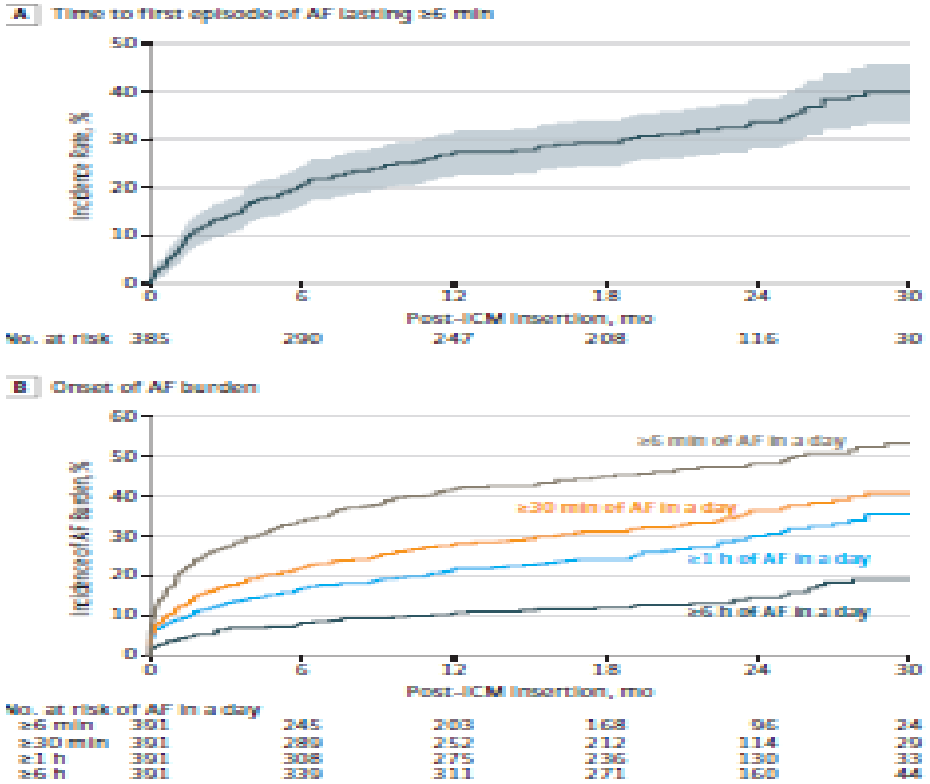
JAMA Cardiology | Original Investigation

Incidence of Previously Undiagnosed Atrial Fibrillation Using Insertable Cardiac Monitors in a High-Risk Population The REVEAL AF Study

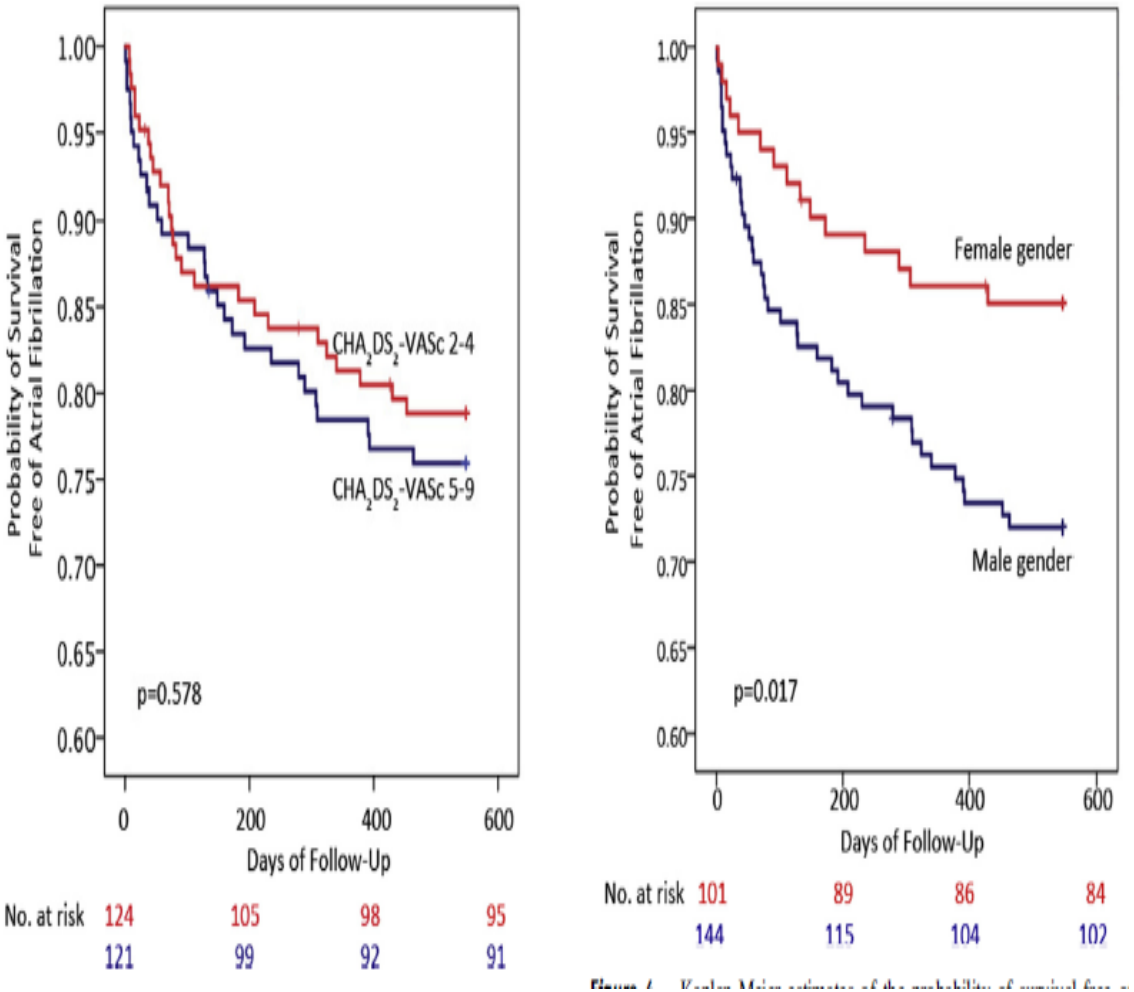
James A. Reiffel, MD; Atul Verma, MD; Peter R. Kowey, MD; Jonathan L. Halperin, MD; Bernard J. Gersh, MB, ChB, DPhil; Rolf Wachter, MD; Erika Pouliot, MS; Paul D. Ziegler, MS; for the REVEAL AF Investigators



*Pre*dicting *D*eterminants of *A*trial Fibrillation or Flutter for *T*herapy *E*lucidation in Patients at Risk for Thromboembolic Events (PREDATE AF) Study

Javed M. Nasir, MD,*† William Pomeroy, MD,† Adam Marler, MD,† Matthew Hann, MD,† Tina Baykaner, MD, MPH,* Ronald Jones, MD,*† Richard Stoll, RN,† Katherine Hursey, BSN,† Angela Meadows, MSN,† Jennifer Walker, MSN,† Steve Kindsvater, MD†‡

*From the *Stanford University, Stanford, California, †Keesler Medical Center, Biloxi, Mississippi, and ‡Baylor Heart Hospital, Plano, Texas.*



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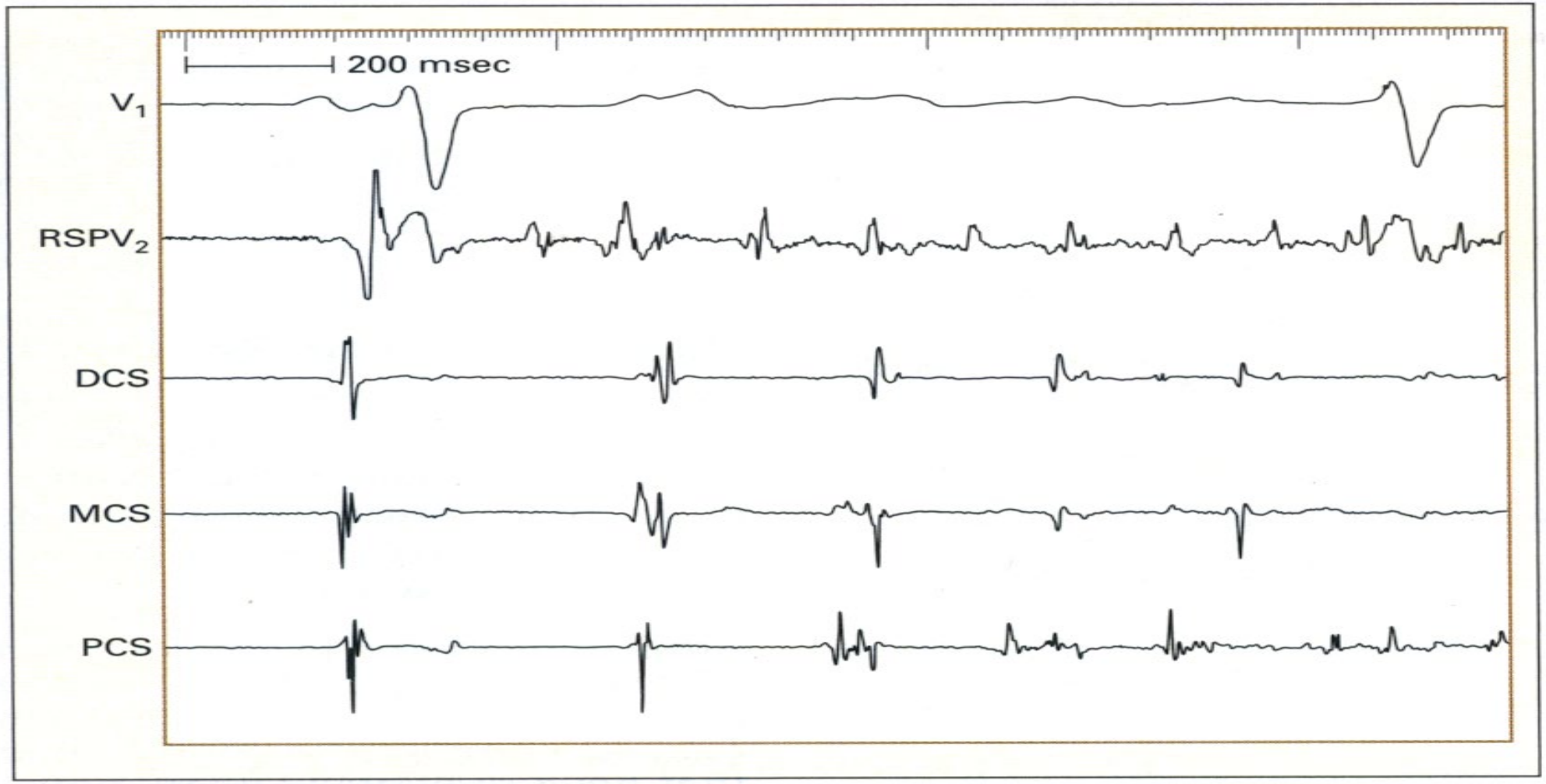
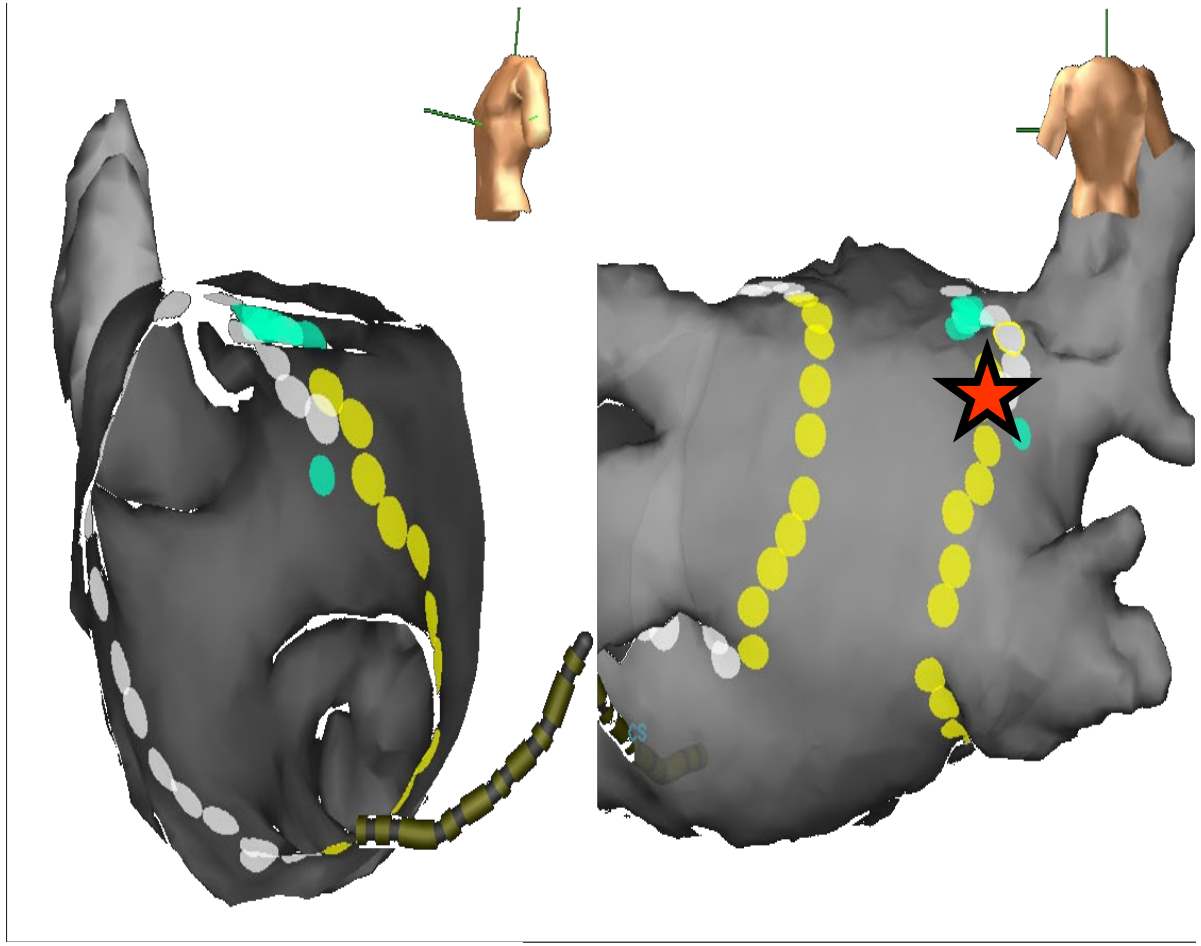


Electrocardiographic and Intracardiac Recordings at the Onset of Atrial Fibrillation.

NEJM 2007

Pulmonary Vein isolation Strategy



PERSONAL COLLECTION

Isolation of RCPV

Atria remain in AF

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RSPV dissociated potential initially after isolation

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Lots to know… without lots of consensus

- Strategies
  - Focal
  - Segmental
  - WACA/LACA/WEPV
  - Lines lines lines
  - Non-PV triggers, CFAE, rotors, GPs
- Procedure/Techniques
  - Irrigated v. non-irrigated RF
  - Non-RF energy sources
  - Imaging/mapping
  - Sheaths
  - Anesthesia
  - Peri-procedural anticoagulation
- Endpoints
  - Entrance block
  - Exit block
  - Organization/conversion to SR
  - Inducibility

Pulmonary veins are the "cornerstone"

Avoid complications!

"I" is for isolation

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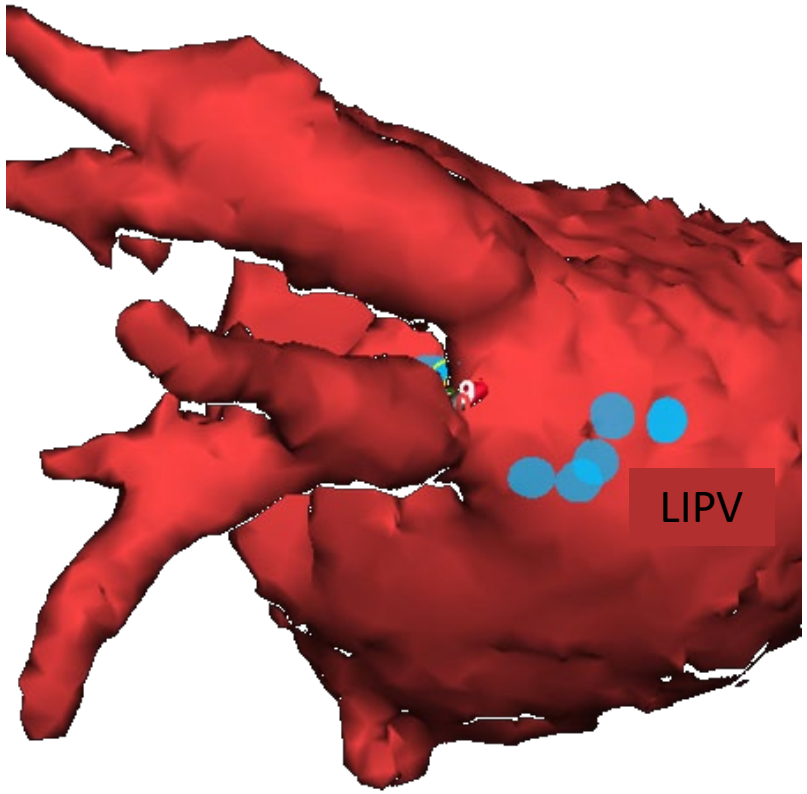
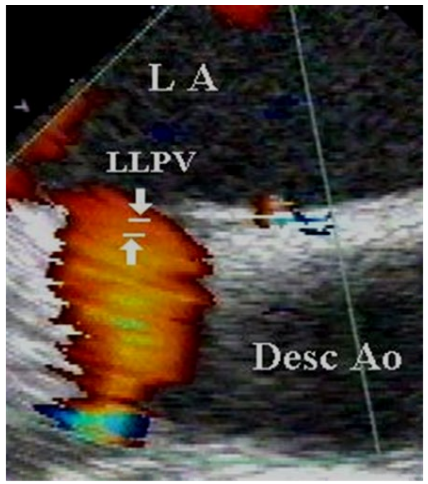
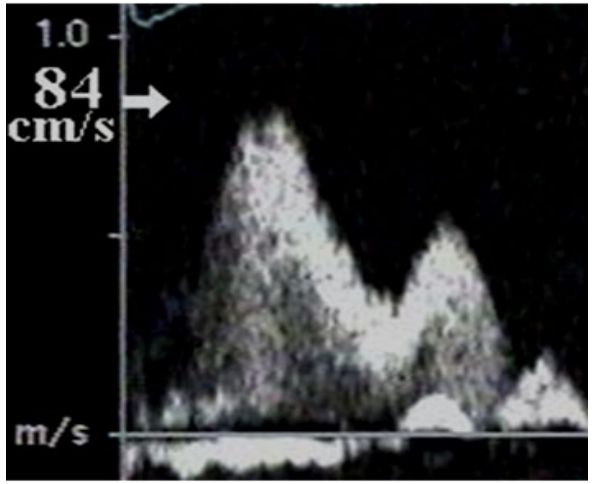
One problem with targeting APDs inside PVs…

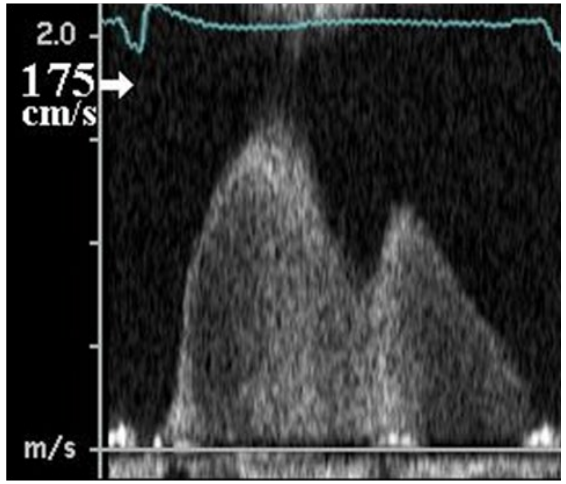




Pre-ablation

Post-ablation





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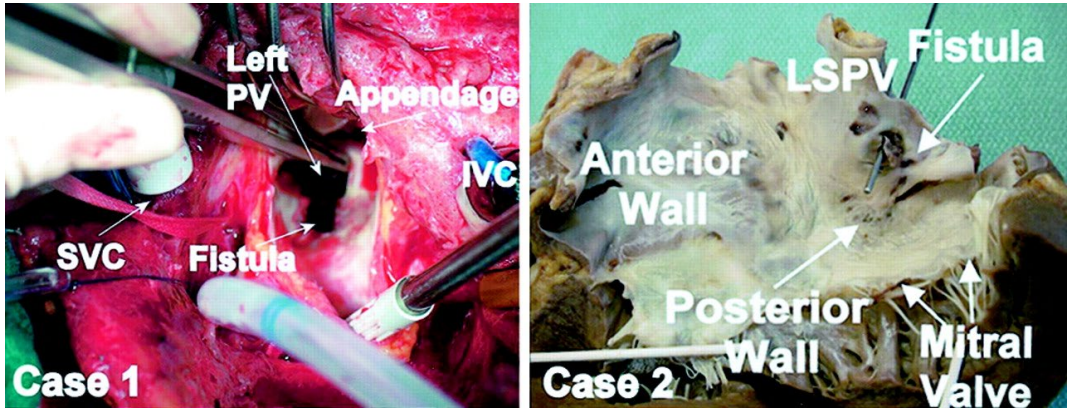
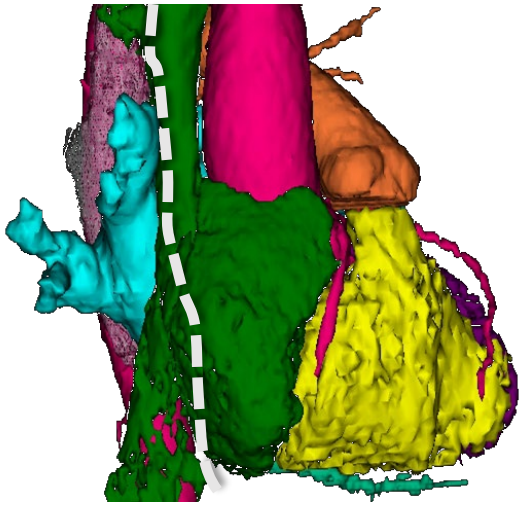
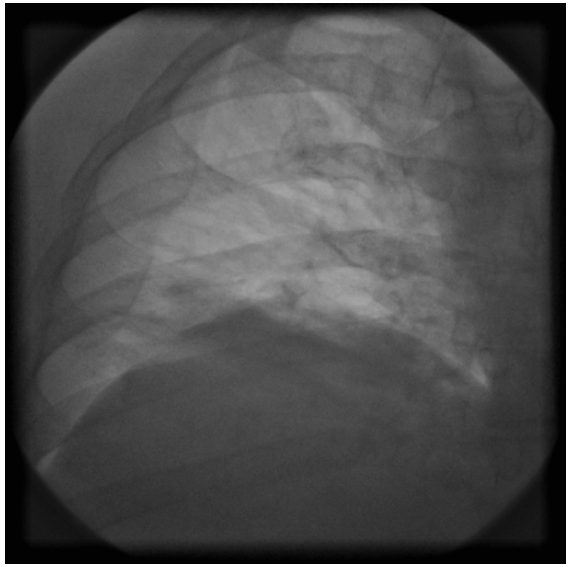
Regardless of technique or endpoint, stay cognizant of universal risks



Pappone C, Oral H et al. *Circulation* 2004; 109: 2724

Endocarditis symptoms 2-3d post-op; extensive septic/air emboli +/- hematemesis over next weeks

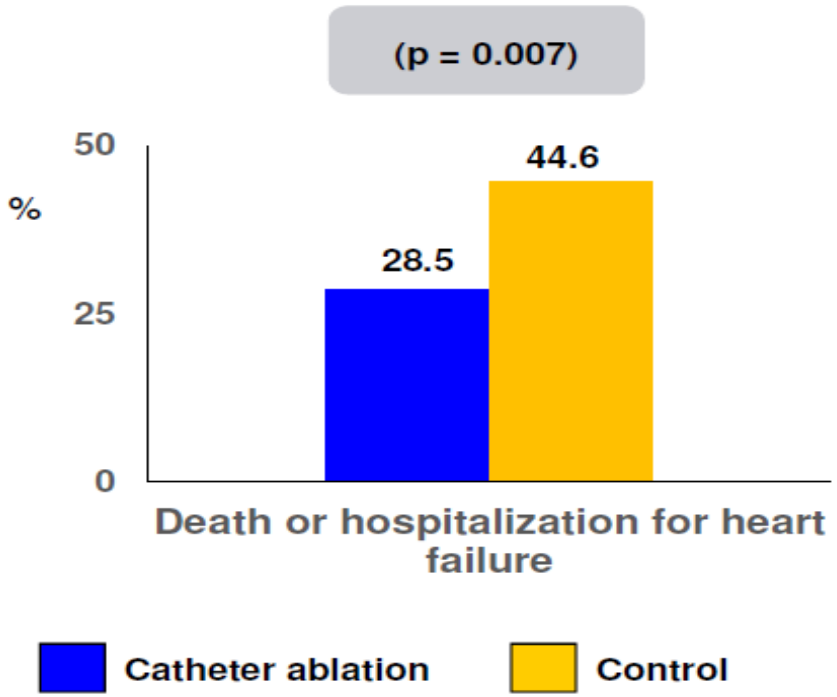




Courtesy F. Garcia, MD

CASTLE-AF

Trial design: Patients with left ventricular dysfunction and atrial fibrillation were randomized to catheter ablation (n = 179) vs. conventional treatment (n = 184).



Results

- Death or hospitalization for heart failure: 28.5% of the catheter ablation group vs. 44.6% of the control group (p = 0.007)

Conclusions

- Among patients with left ventricular dysfunction and atrial fibrillation, catheter ablation was associated with a reduction in deaths or hospitalizations for heart failure

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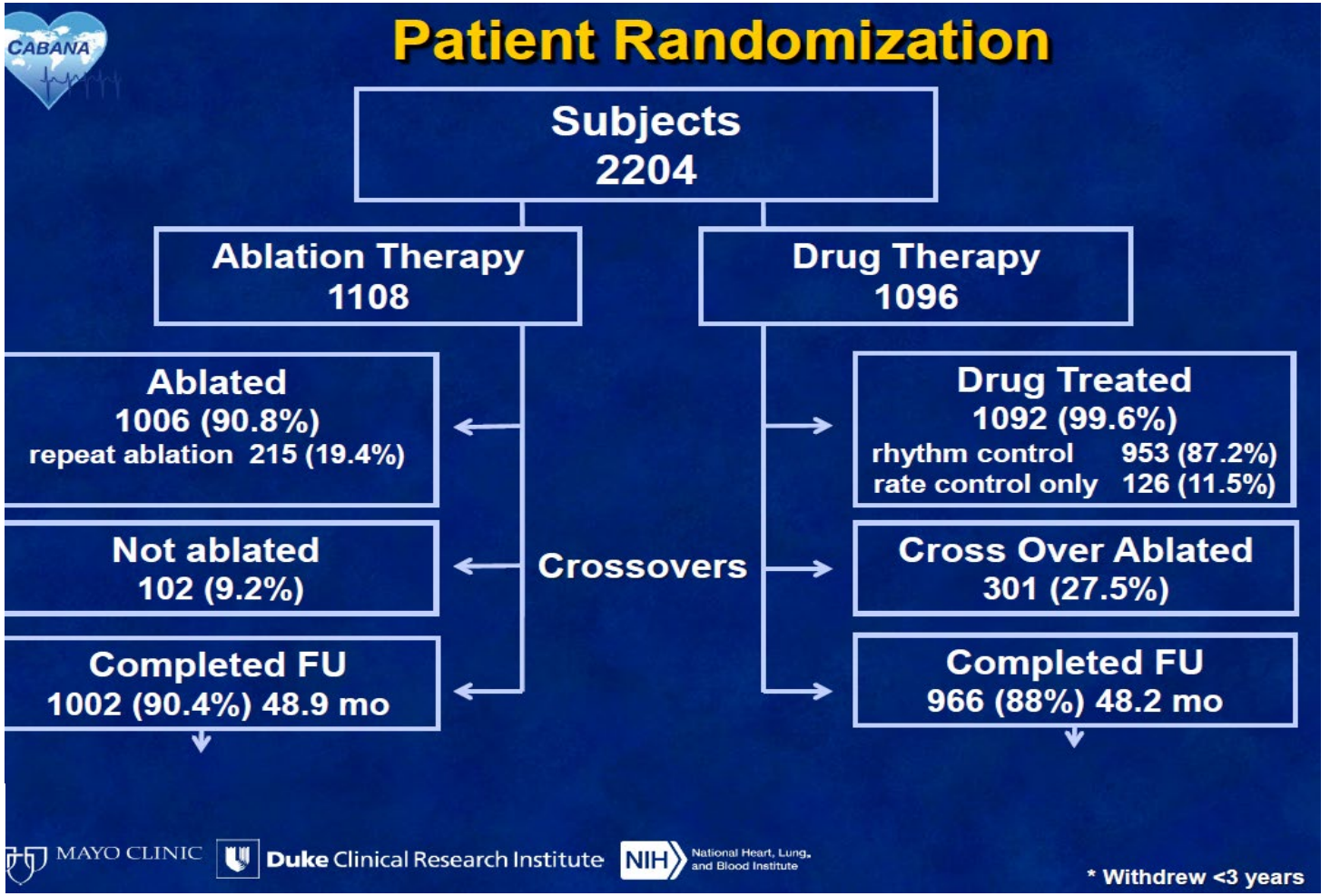
Marrouche et al. JN Engl J Med 2018; 378:417-427 DOI: 10.1056/NEJMoa1707855

CABANA TRIAL



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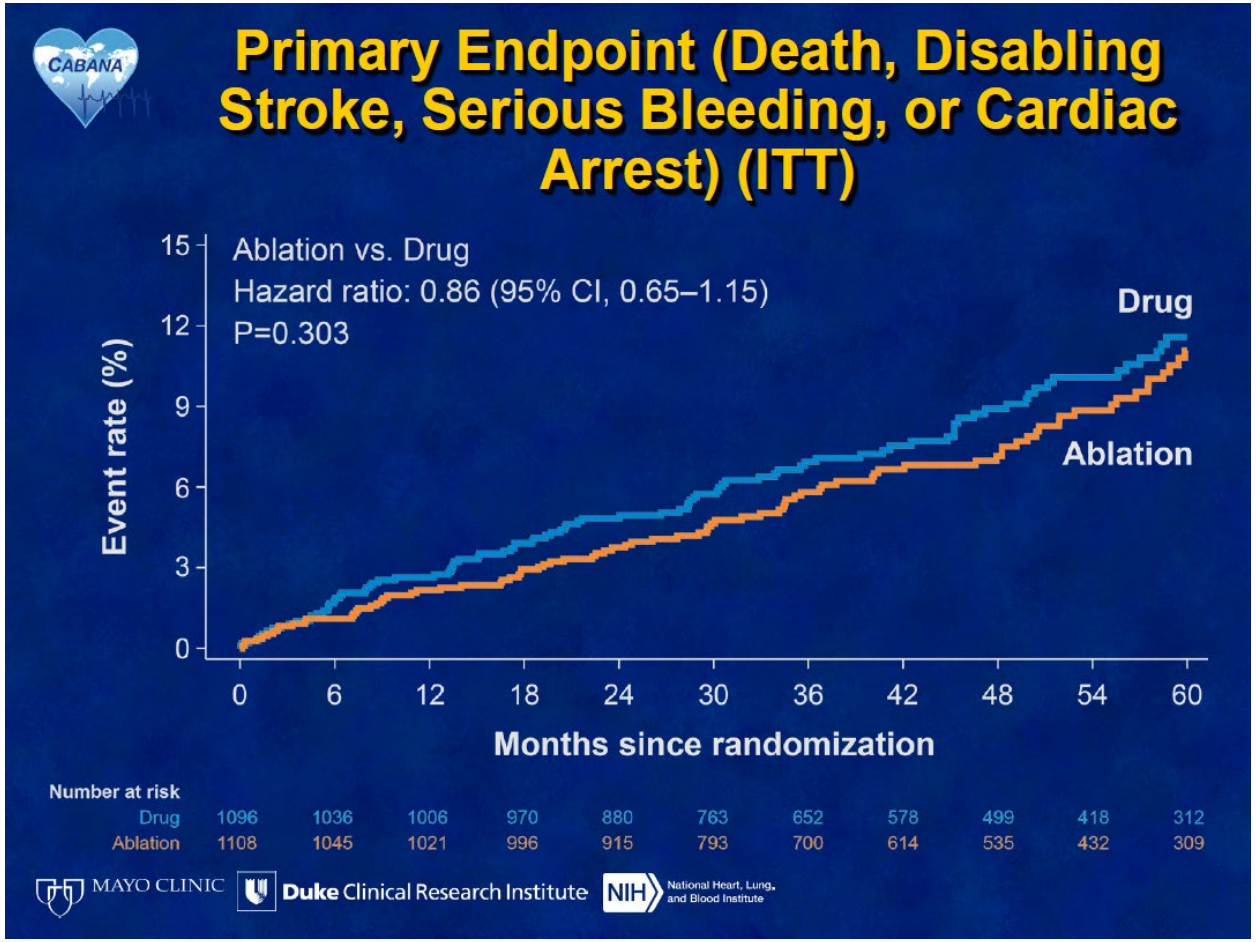
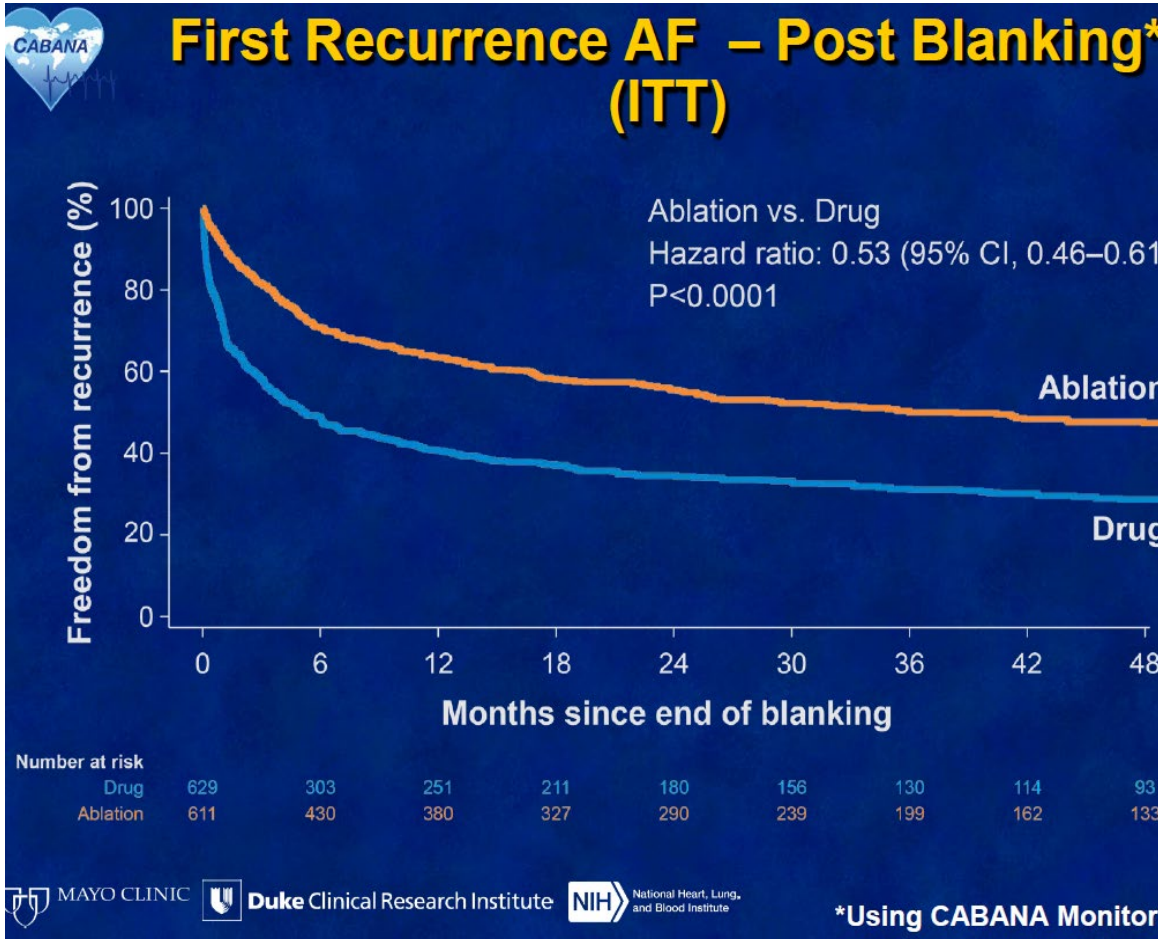
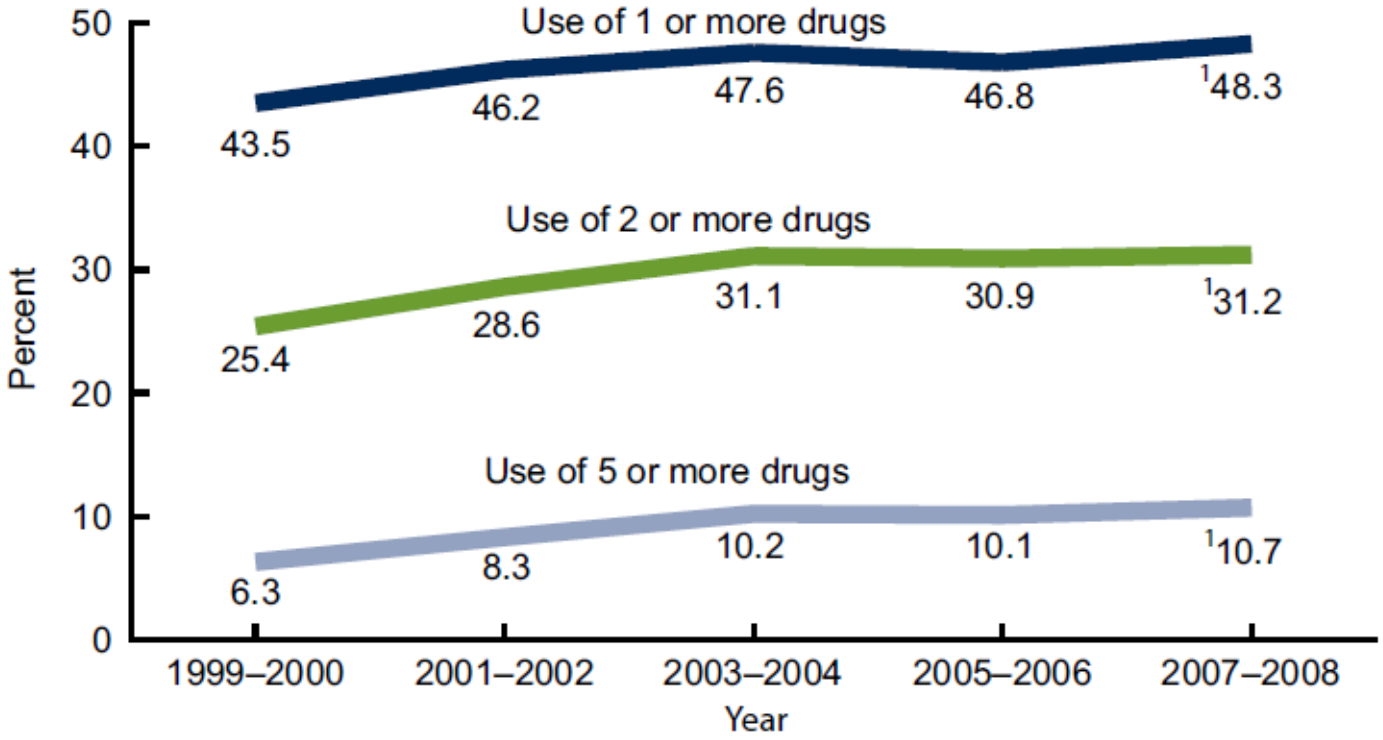
CABANA TRIAL





Introduction adherence

- Prescription drug use United States

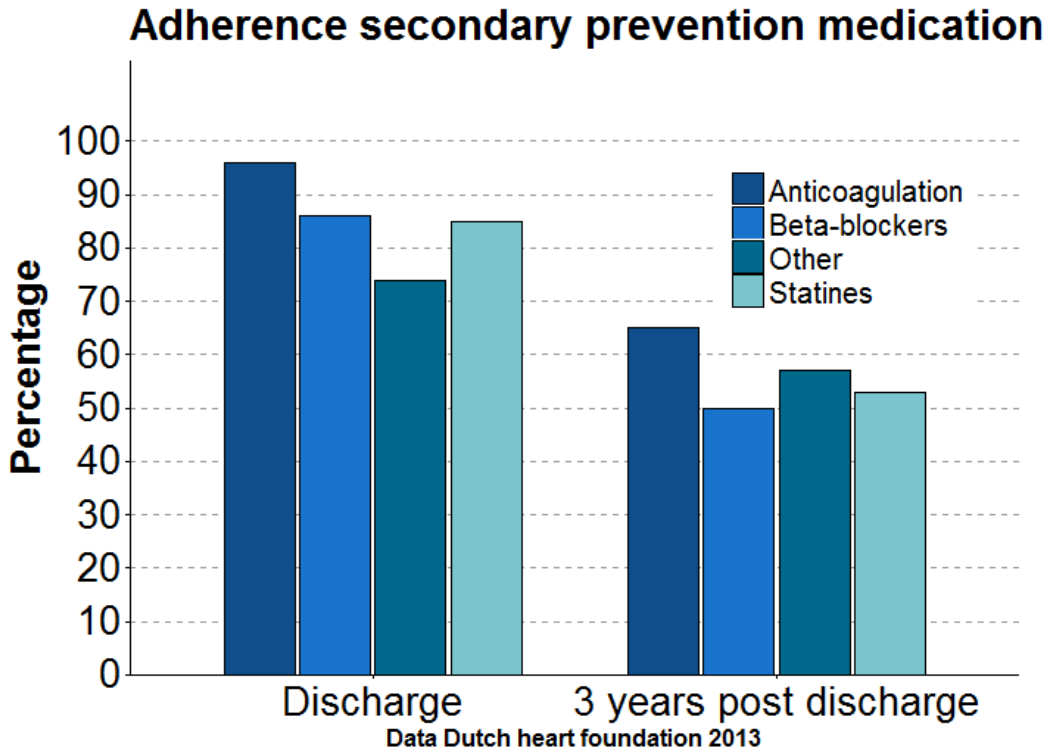


NCHS data brief Sept 210

Introduction adherence

- Cardiovascular drugs improve patient outcomes

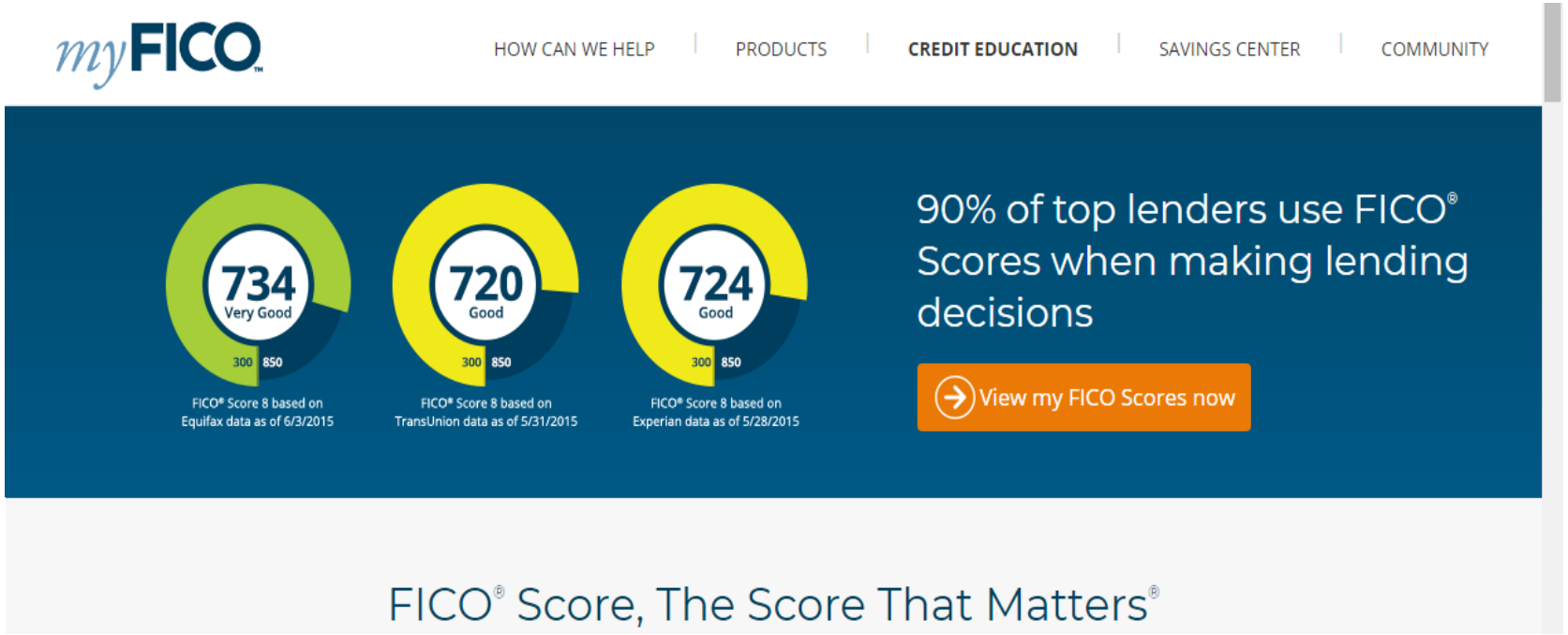
- Sufficient adherence >80% time
  - 60% patients adherent[1]
  - Non-adherence costs $300 bill
    - Disease progress
    - Avoidable hospitalizations



1. Chowdhury Eur Heart J 2013

FICO

- Fair Isaac Corporation San Jose California
- 10 billion credit scores per year
- Scores used to gauge creditworthiness: loan down payment behavior



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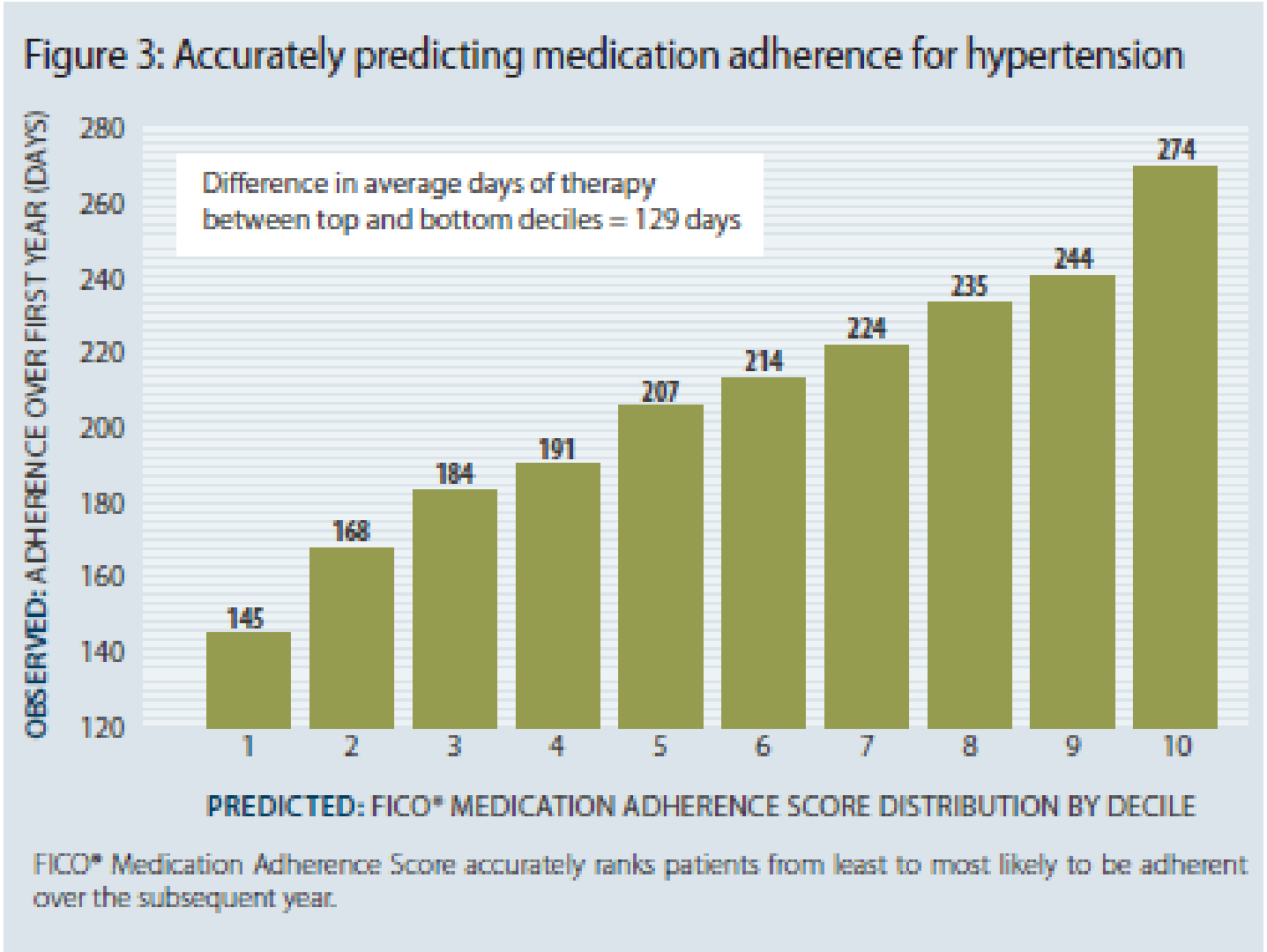
Medication Adherence Score (MAS)

- Predict adherence behavior:
  - Predictors: financial, socio-economic, employment status, household status variables
  - Outcome: refill behavior (Med-impact)
  - Prediction model build using data of >800.000 patients

- Adoption of score by pharma companies
  - To determine co-payment rates

- No adoption MAS hospitals and physicians
  - Release coincided with Affordable Care Act
  - No scientific evidence to support the score

FICO Medication Adherence Score (MAS)



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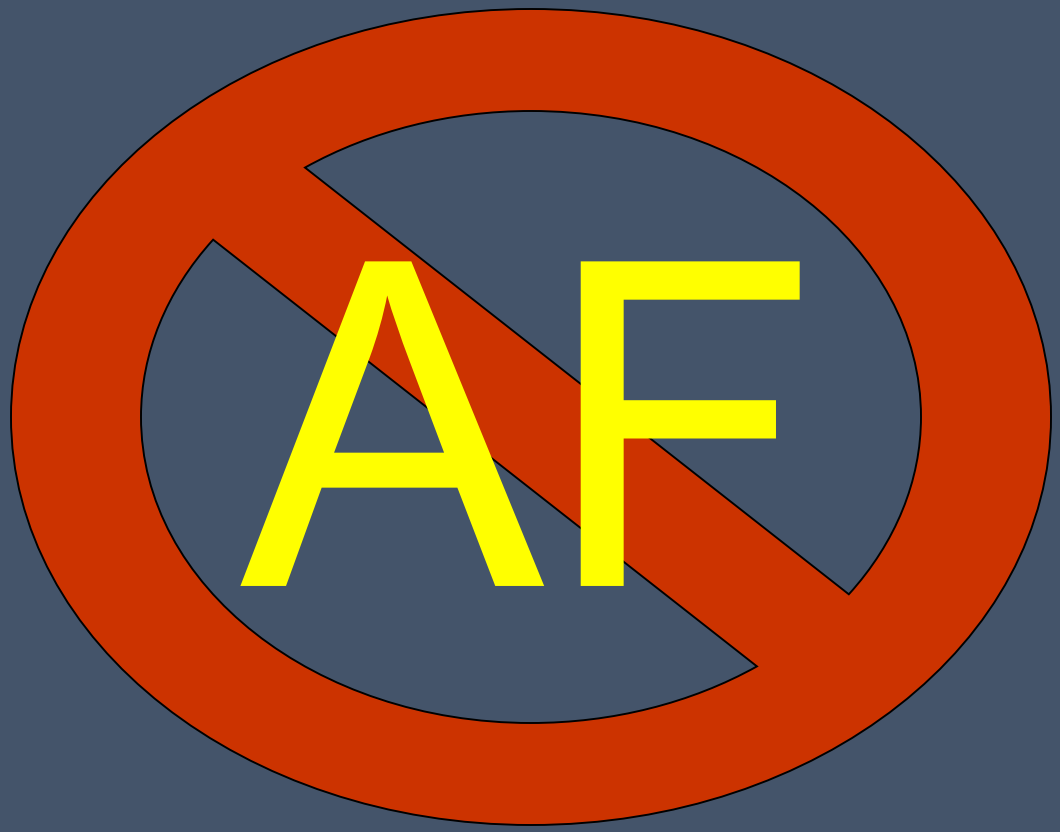
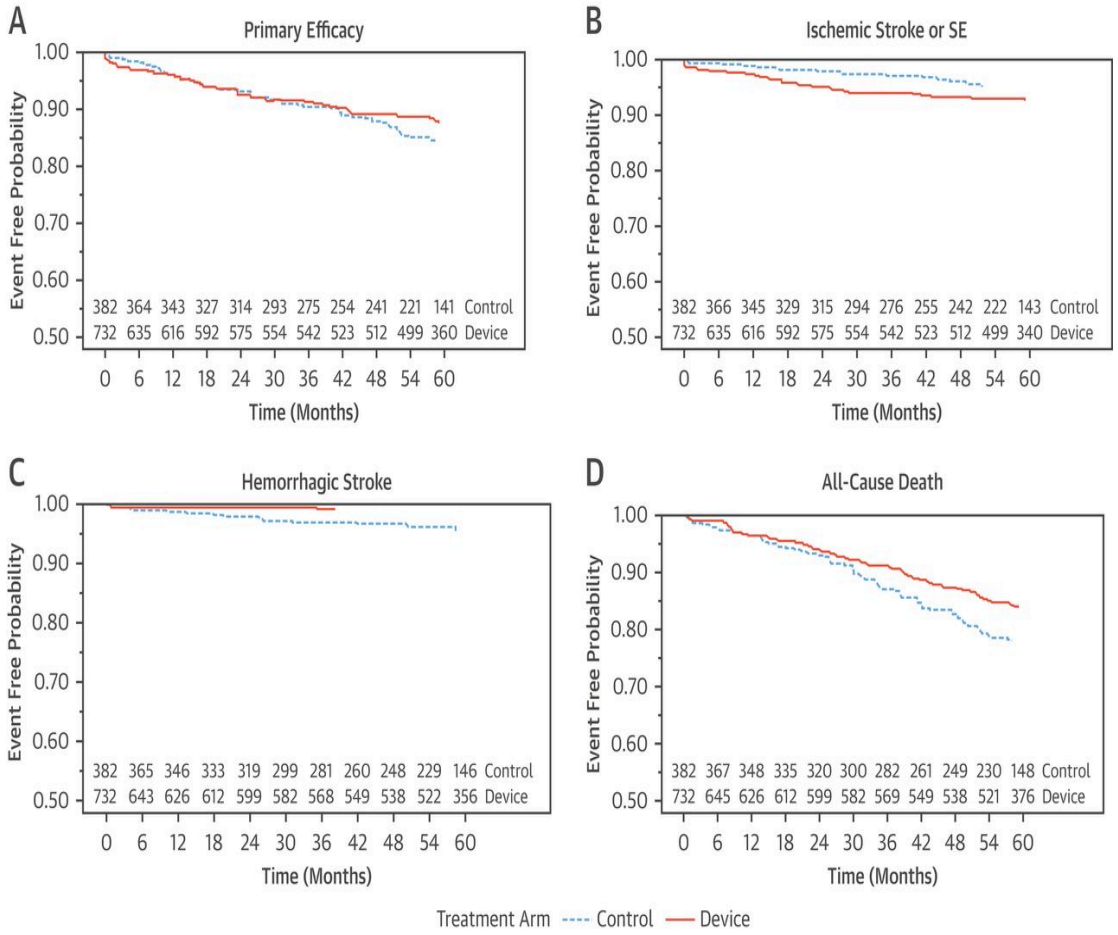
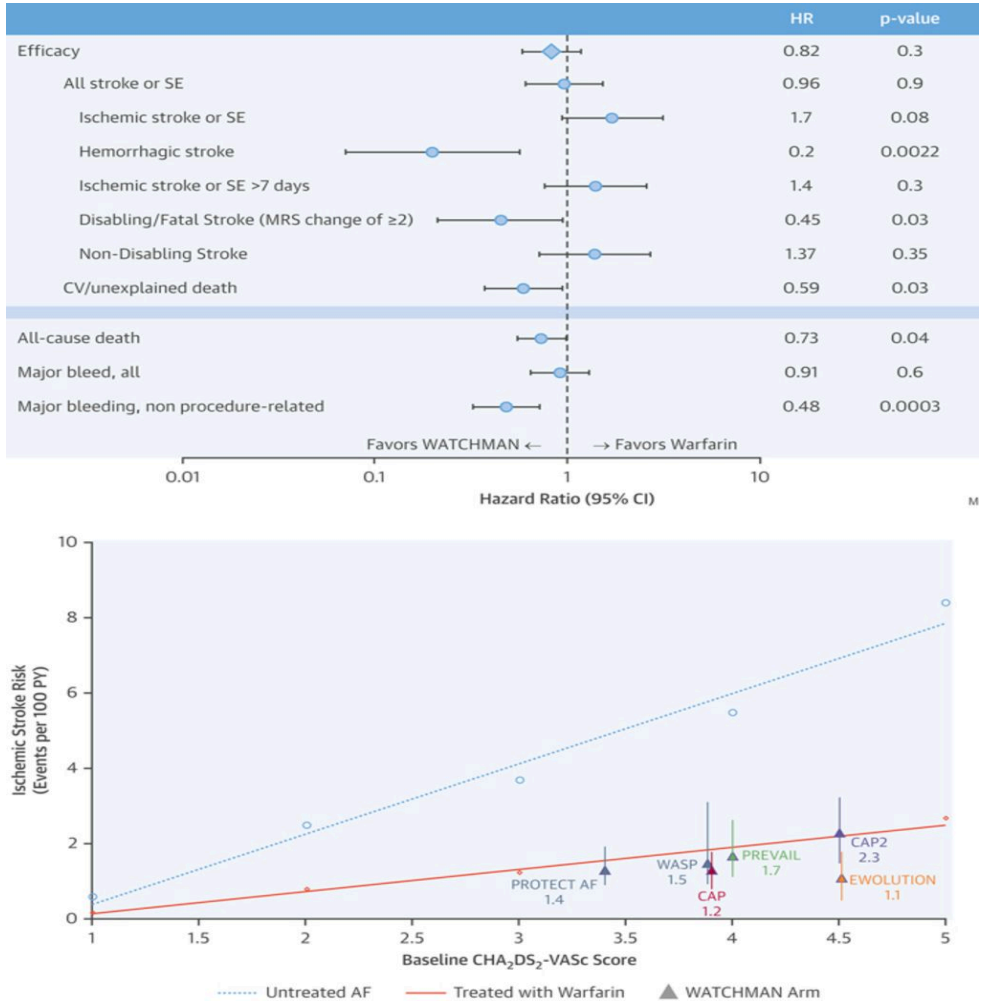
Thank You for Your Attention



PREVAIL -5: WATCHMAN META-ANALYSIS





1.Holmes D.R. Jr.., et al. (2014) Prospective randomized evaluation of the Watchman Left Atrial Appendage Closure device in patients with atrial fibrillation versus long-term warfarin therapy: the PREVAIL trial. J Am Coll Cardiol **64**:1–12.

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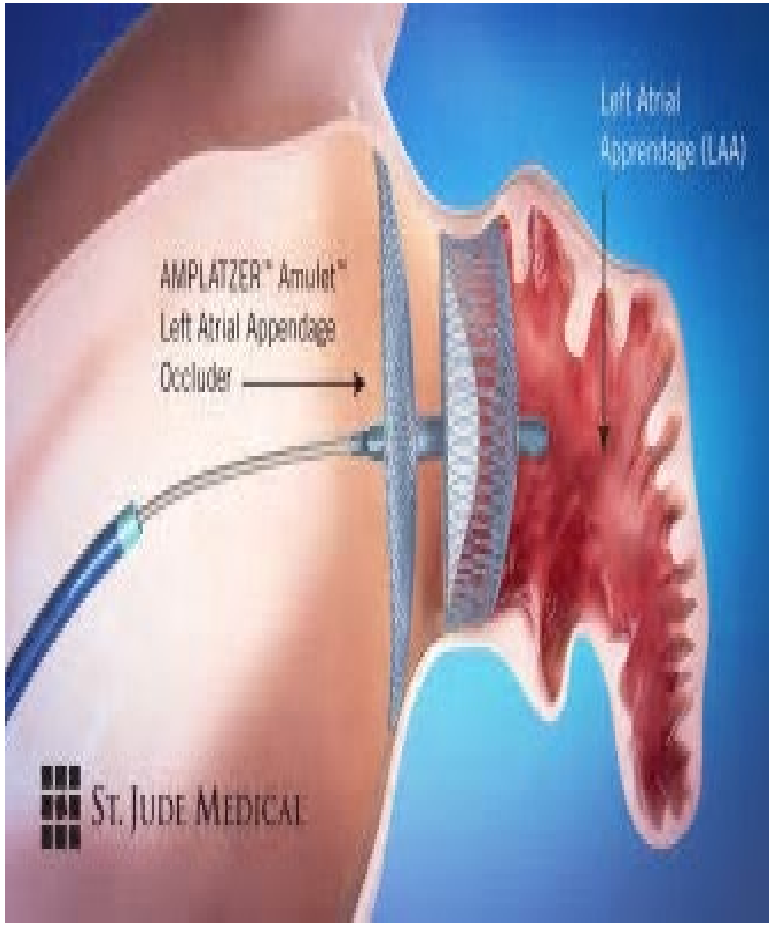
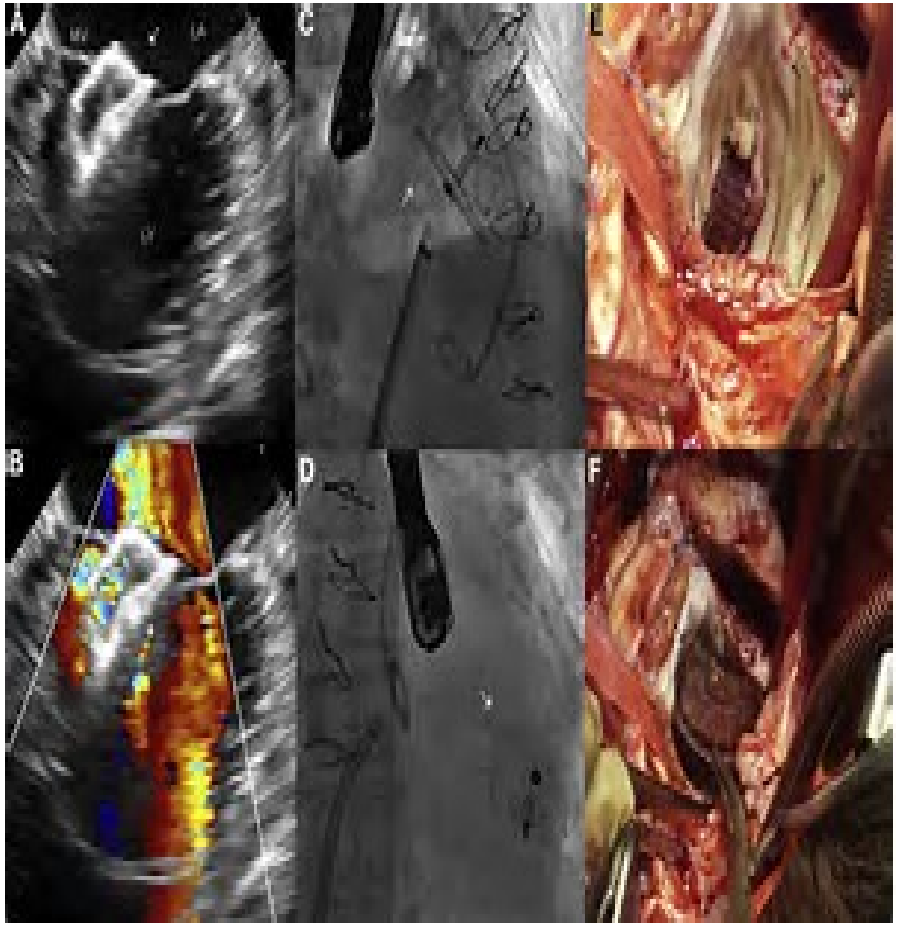
Minimally Invasive Endocardial Procedure

Need to Collaborate with CT Surgery





Left Atrial Appendage Closure or Occlusion