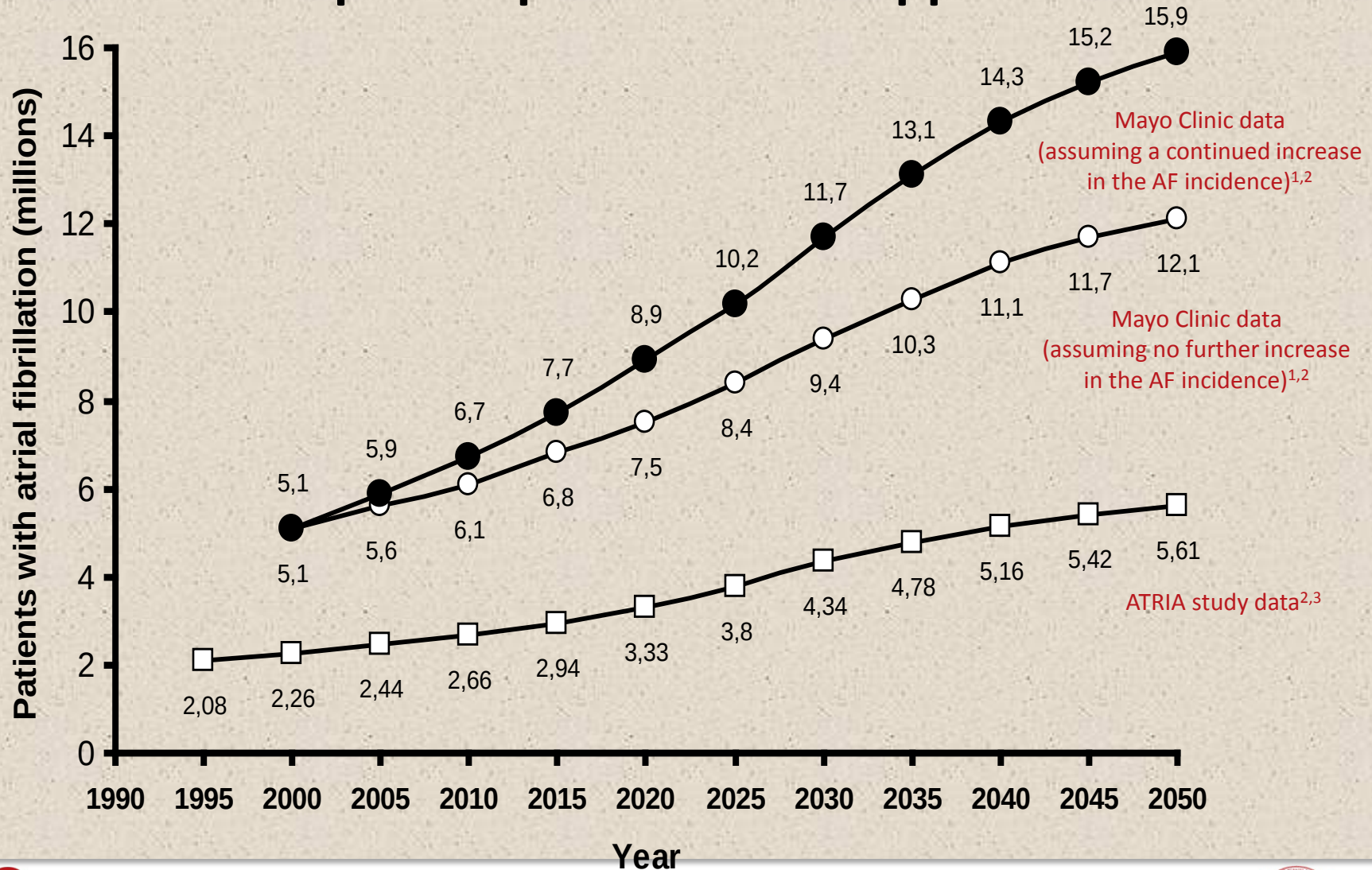


The interplay between atrial fibrillation and sudden cardiac death

Prof. Dr. Martin Borggrefe
Mannheim

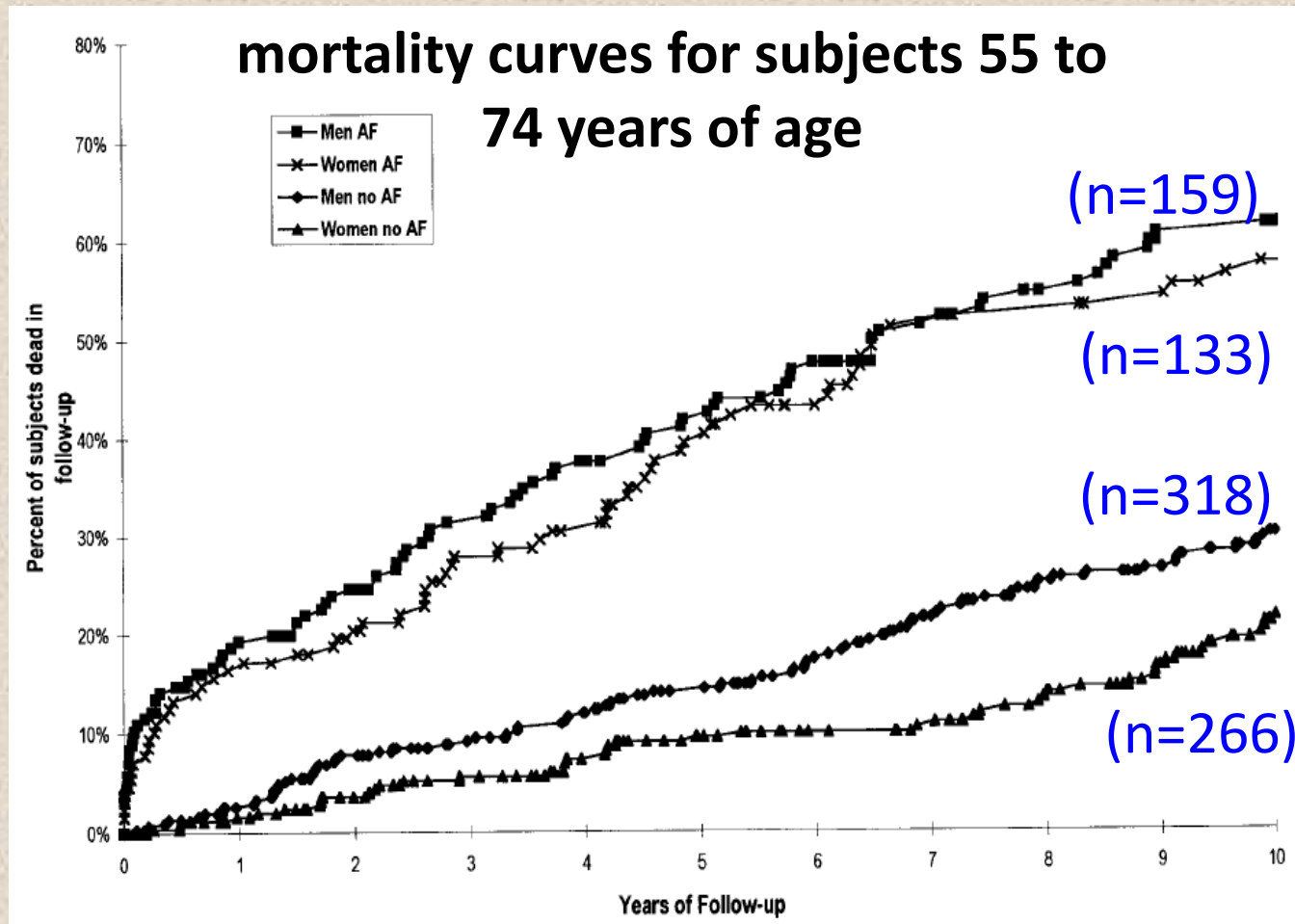
Management of atrial fibrillation

Expected prevalence of apparent AF



Management of atrial fibrillation

Burden of disease : AF The Framingham Heart Study



Benjamin et al, Circulation 1998;98:946-952



Worldwide Epidemiology of Atrial Fibrillation

A Global Burden of Disease 2010 Study

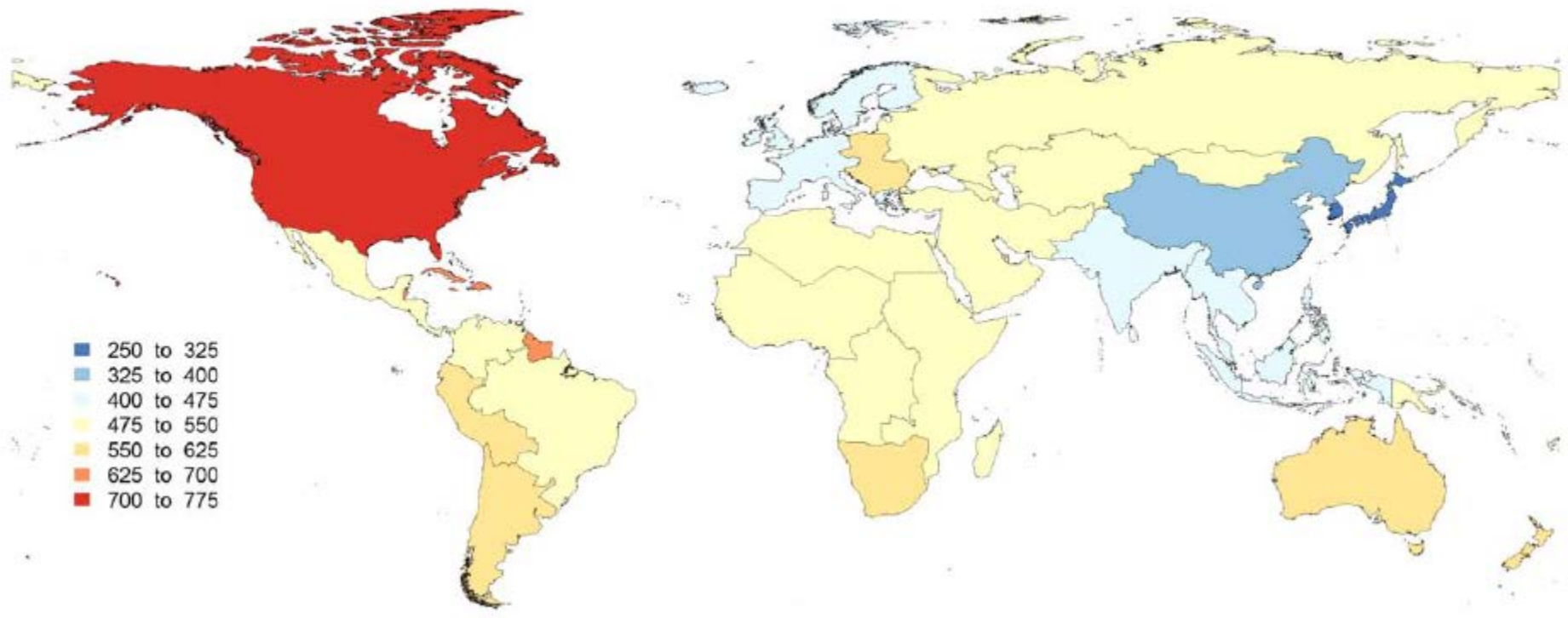
Sumeet S. Chugh, MD; Rasmus Havmoeller, MD, PhD; Kumar Narayanan, MD;
David Singh, MD; Michiel Rienstra, MD, PhD; Emelia J. Benjamin, MD, ScM;
Richard F. Gillum, MD; Young-Hoon Kim, MD; John H. McAnulty, Jr, MD;
Zhi-Jie Zheng, MD, PhD; Mohammad H. Forouzanfar, MD; Mohsen Naghavi, MD;
George A. Mensah, MD; Majid Ezzati, PhD; Christopher J.L. Murray, MD

Circulation 2014;129:837-847

Global Burden of Atrial Fibrillation

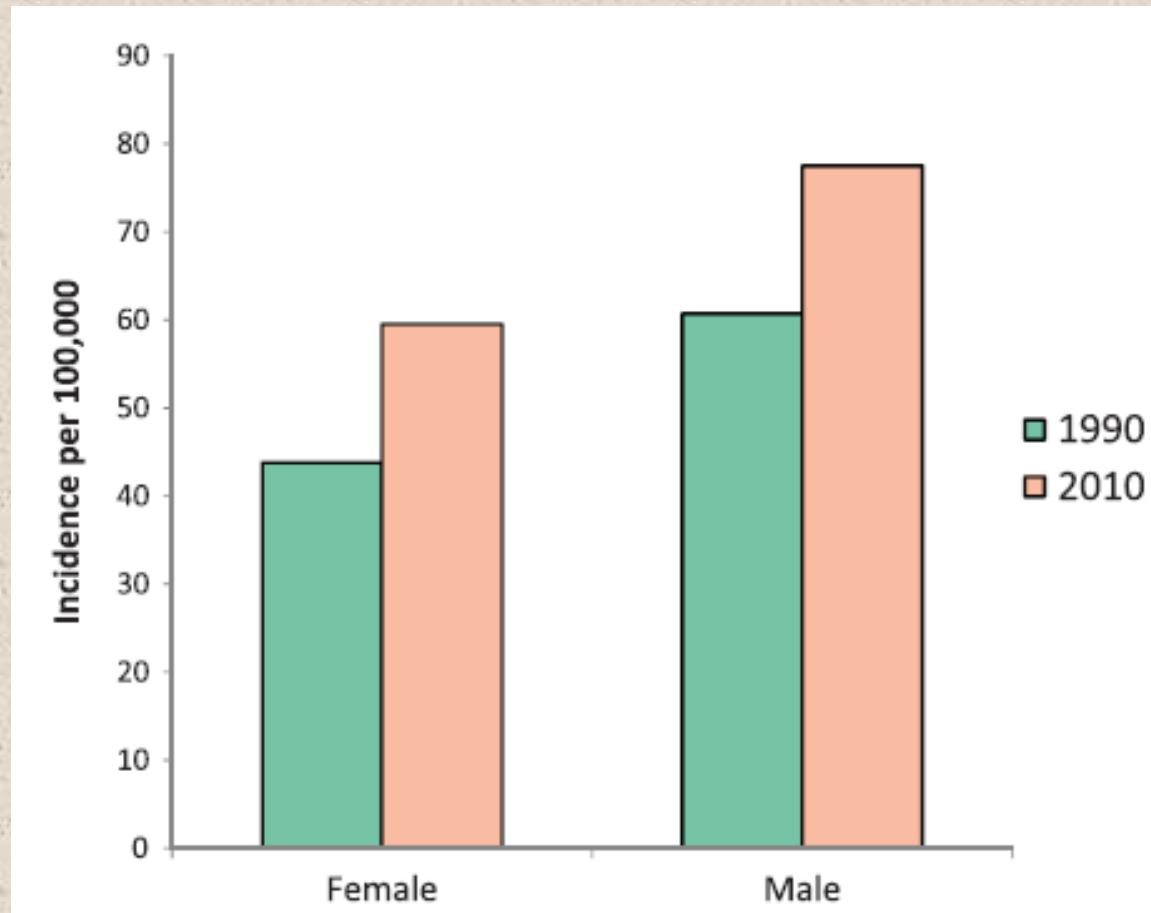
World map showing the age-adjusted prevalence rates (per 100 000 population) of AF in the 21 Global Burden of Disease regions, 2010

Prevalence of atrial fibrillation and flutter (per 100,000) by region, 2010



Global Burden of Atrial Fibrillation

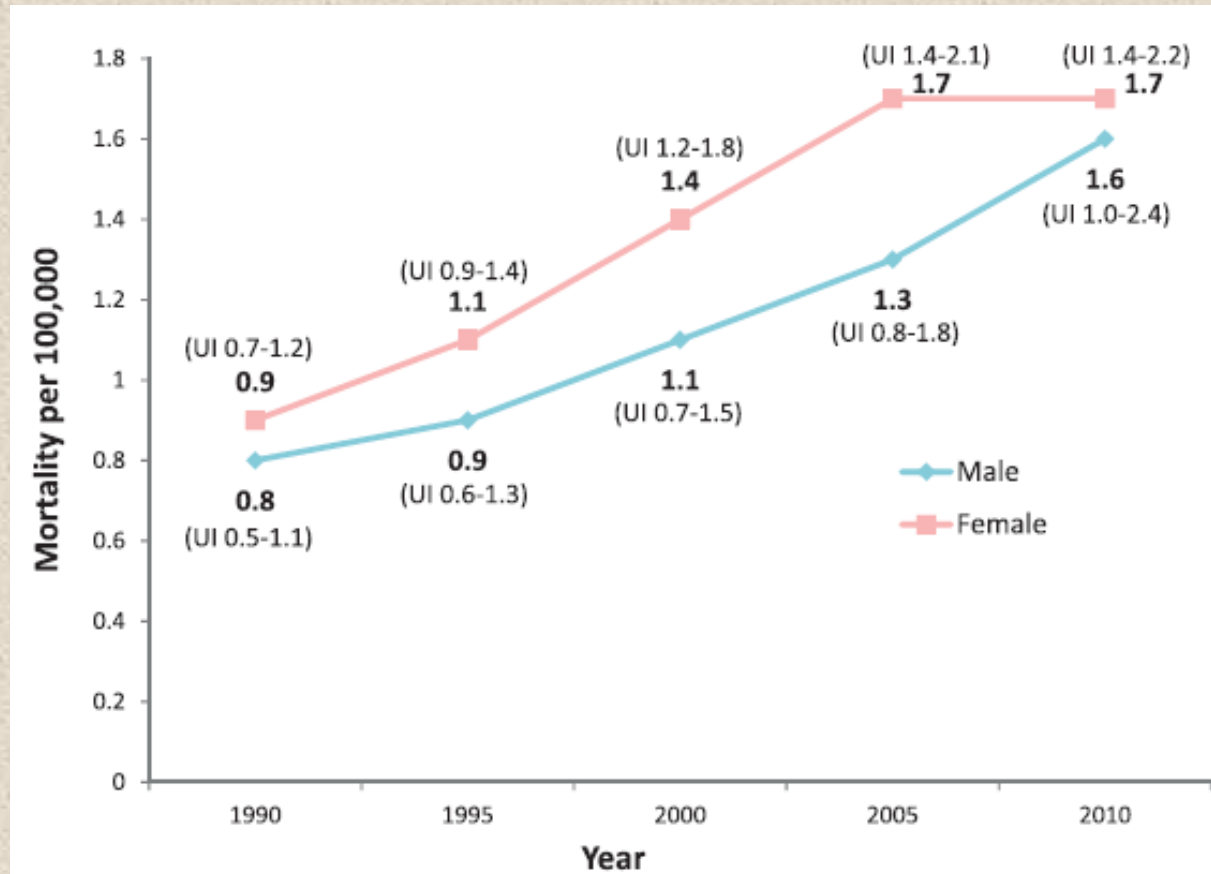
Incidence of AF: 1990 and 2010. Estimated age-adjusted global incidence (per 100 000 person-years) for men and women for 1990 and 2010.



Global Burden of Atrial Fibrillation

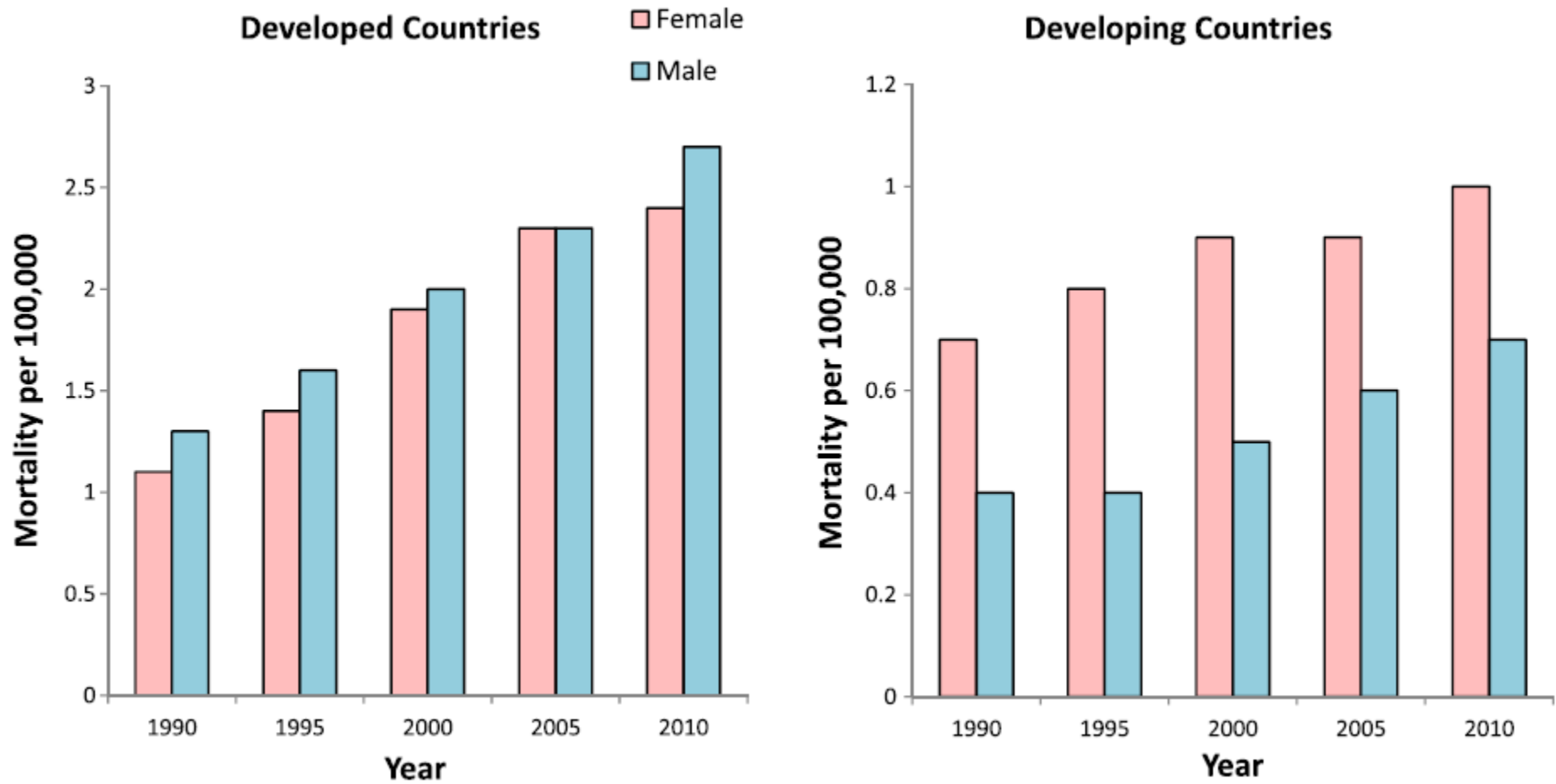
Mortality associated with AF: 1990 to 2010.

Estimated age-adjusted mortality (per 100 000 population) associated with AF from 1990 to 2010. UI indicates uncertainty interval.



Global Burden of Atrial Fibrillation

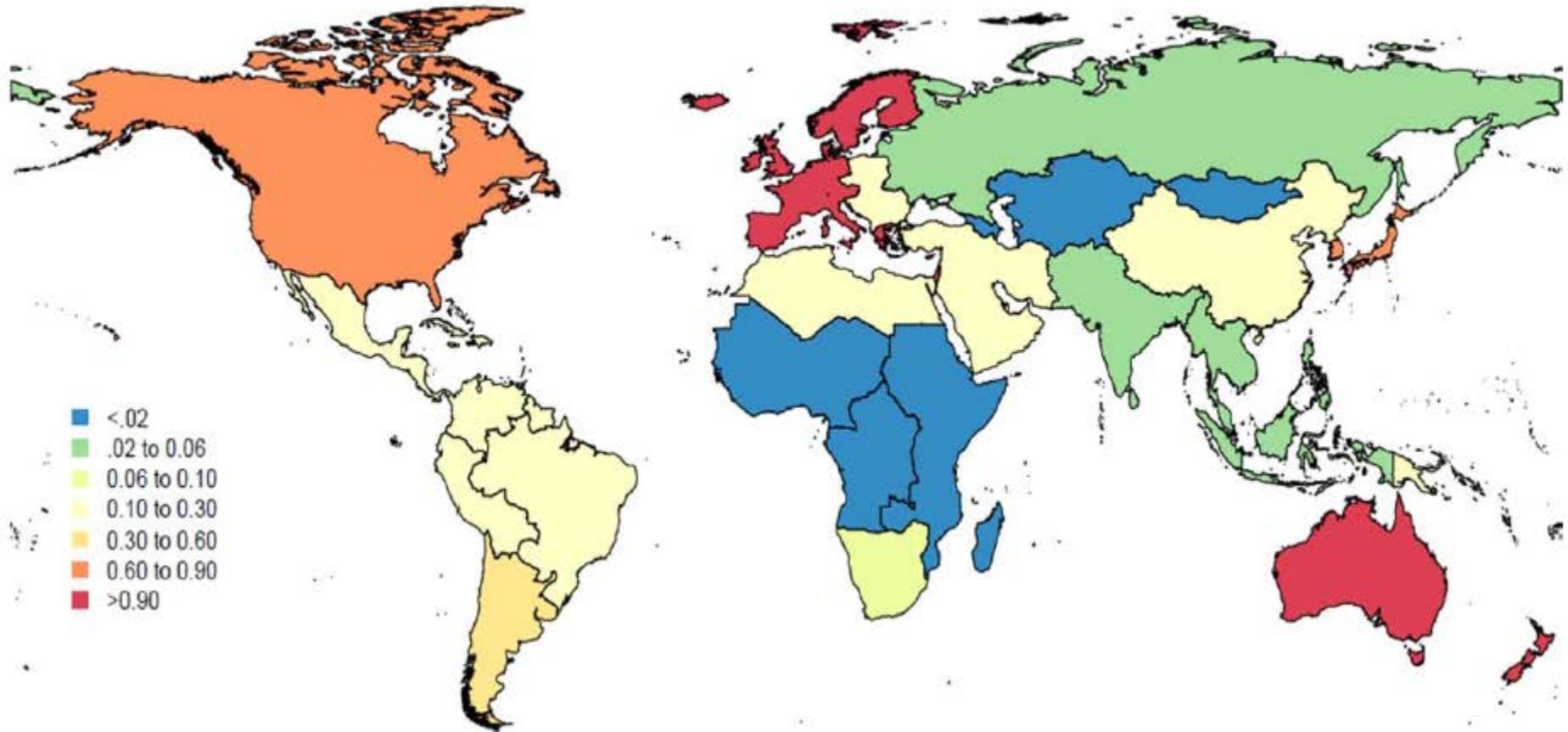
Mortality associated with AF stratified by sex and type of region (developed vs developing)



Global Burden of Atrial Fibrillation

Proportion of global deaths associated with AF in 2010.

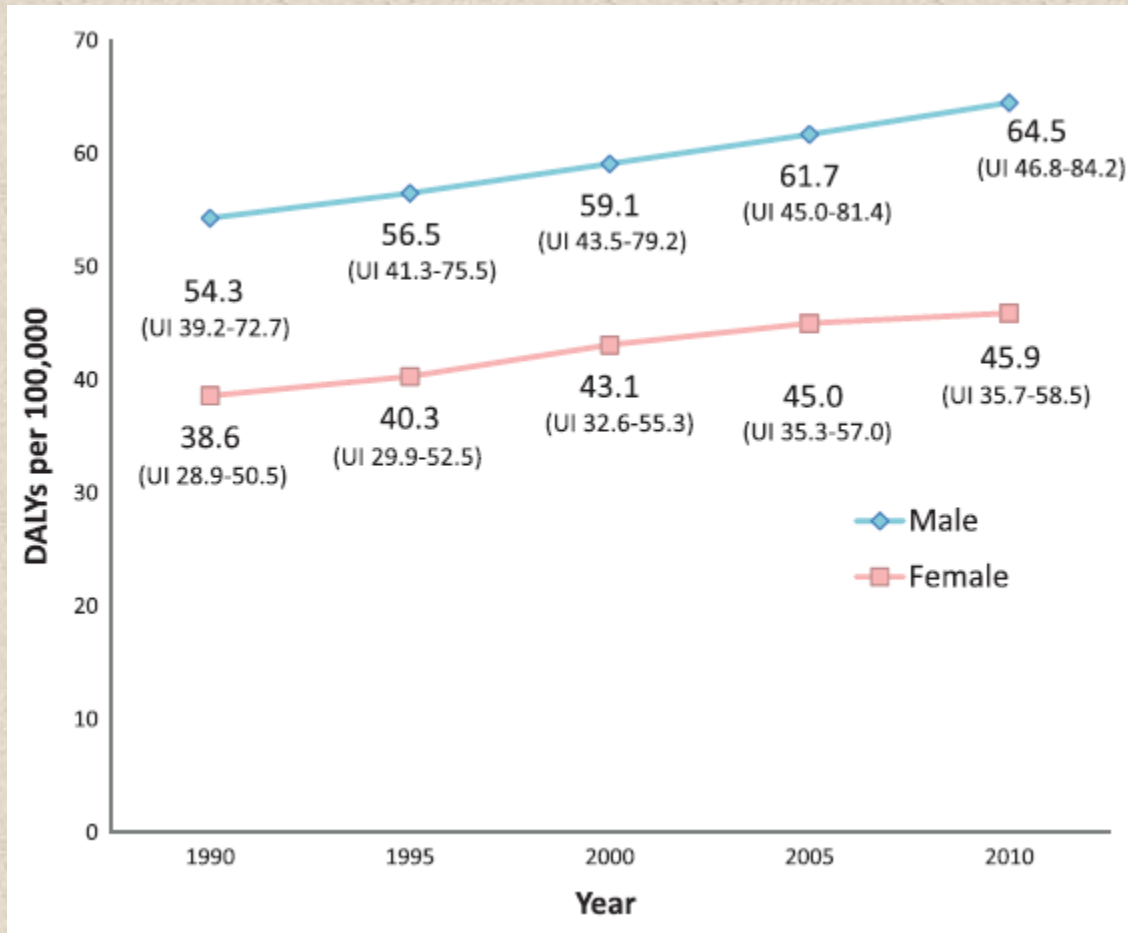
Percent deaths attributable to atrial fibrillation and flutter by region, 2010



Chugh et al. Circulation 2014;129:837-847

Global Burden of Atrial Fibrillation

Disability-adjusted life-years (DALYs) related to AF



The interplay between AF and SCD

Patients With Supraventricular Tachycardia Presenting With Aborted Sudden Death: Incidence, Mechanism and Long-Term Follow-Up

YINSHI WANG, MD, MELVIN M. SCHEINMAN, MD, FACC, WALTER W. CHIEN, MD, TODD J. COHEN, MD, MICHAEL D. LESH, MD, FACC, JERRY C. GRIFFIN, MD, FACC

J Am Coll Cardiol 1991; 18:1711-9

Editorial Comment

Supraventricular Tachyarrhythmias: Not Always So Benign*

JEFFREY L. ANDERSON, MD, FACC

J Am Coll Cardiol 1991; 18:1720-1

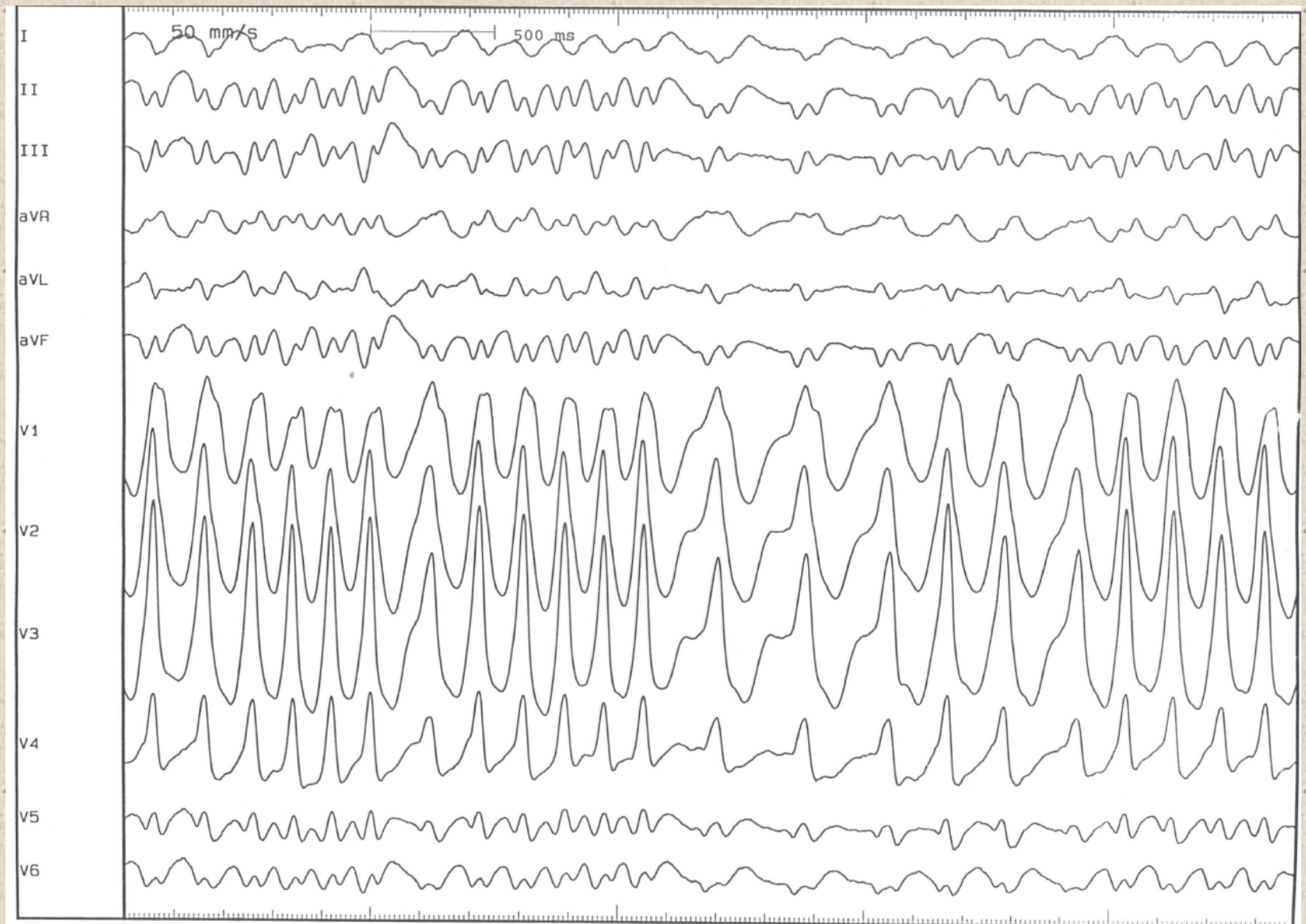
The interplay between AF and SCD

SVT and sudden death

13/290 pts with aborted SD

SVT $\Rightarrow$ VF

➤ WPW syndrome	n = 6	}	4.5%
➤ AVN RT	n = 3		
➤ AF + EANC	n = 4		



The interplay between AF and SCD

Wolff-Parkinson-White Syndrome in the Era of Catheter Ablation

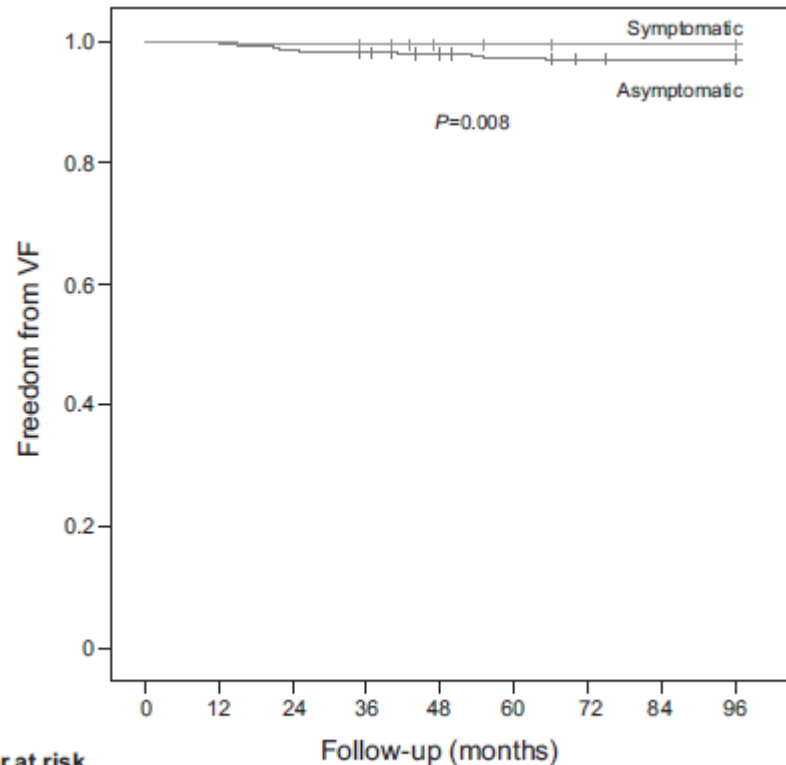
Insights From a Registry Study of 2169 Patients

Carlo Pappone, MD, PhD; Gabriele Vicedomini, MD; Francesco Manguso, MD, PhD;
Massimo Saviano, MD; Mario Baldi, MD; Alessia Pappone, MD; Cristiano Ciaccio, MD;
Luigi Giannelli, MD; Bogdan Ionescu, MD; Andrea Petretta, MD; Raffaele Vitale, MD;
Amarild Cuko, MD; Zarko Calovic, MD; Angelica Fundaliotis, MD; Mario Moscatiello, MD;
Luigi Tavazzi, MD; Vincenzo Santinelli, MD

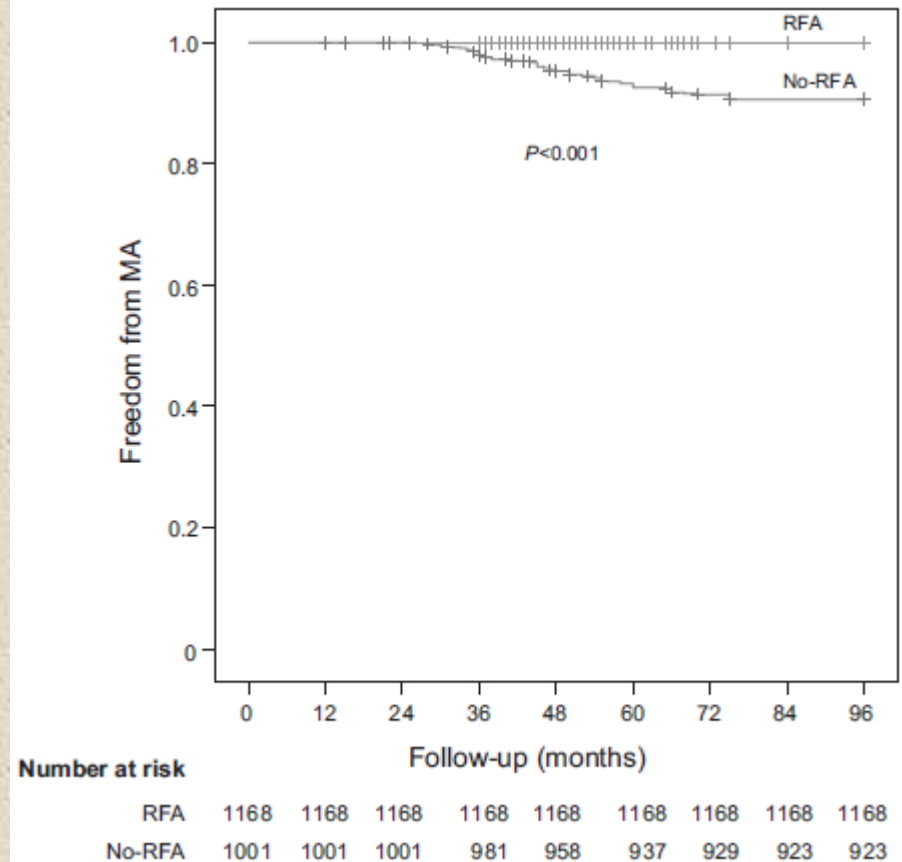
Circulation 2014;130:811-819

The interplay between AF and SCD

Symptoms after the exclusion of malignant arrhythmias



Malignant arrhythmias (MAs) in untreated patients (noradiofrequency catheter ablation (RFA)) and patients treated with RFA.



The interplay between AF and SCD

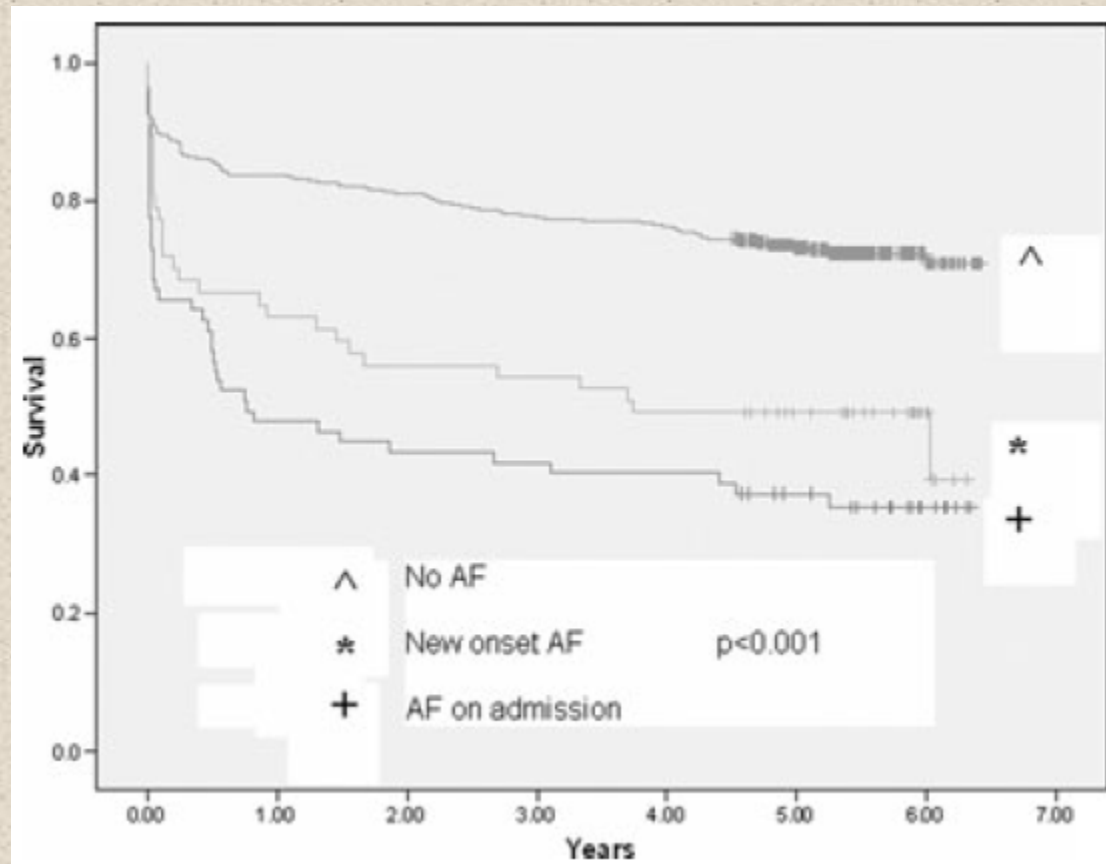
Does Atrial Fibrillation Beget Ventricular Fibrillation in Patients with Acute Myocardial Infarction?

RAJIV SANKARANARAYANAN, M.B.B.S, M.R.C.P.,* MICHAEL A. JAMES, M.D., F.R.C.P.+
BOGDAN NUTA, M.R.C.P.,‡ MANDIE TOWNSEND M.B.B.Ch., M.R.C.P.,§ SUJATA KESAVAN,
M.B.B.S., M.R.C.P.,¶ STEPHANIE BURTCHAELL, B.Sc., R.N.,** RUSSELL HOLLOWAY,++
and PAUL EWINGS, B.Sc., M.Sc., Ph.D., C.Stat., F.R.S.S., Hon.M.F.P.H.M.‡‡

PACE 2008; 31:1612-1619

The interplay between AF and SCD

Survival n = 500 pts with AMI



The interplay between AF and SCD

Outcomes of the Various Subsets of Patients in the Study Population with Respect to Mortality and Ventricular Arrhythmias

	AF on Admission, n = 67	New-onset AF, n = 57	All Patients with AF, n = 124	Patients without AF, n = 376
Mortality				
In-pt.	23 (34%) P < 0.001	13 (23%) P = 0.005	36 (29%) P < 0.001	38 (10%)
1 year	35 (52%) P < 0.001	21 (37%) P = 0.0001	56 (45%) P < 0.001	61 (16%)
5.5 year	43 (64%) P < 0.001	30 (53%) P < 0.001	73 (59%) P < 0.001	103 (27%)
Ventricular tachycardia	13 (19%) P = 0.73	12 (21%) P = 0.46	25 (20%) P = 0.50	65 (17%)
Ventricular fibrillation	11 (16%) P = 0.01	5 (9%) P = 0.57	16 (13%) P = 0.03	24 (6%)

The interplay between AF and SCD

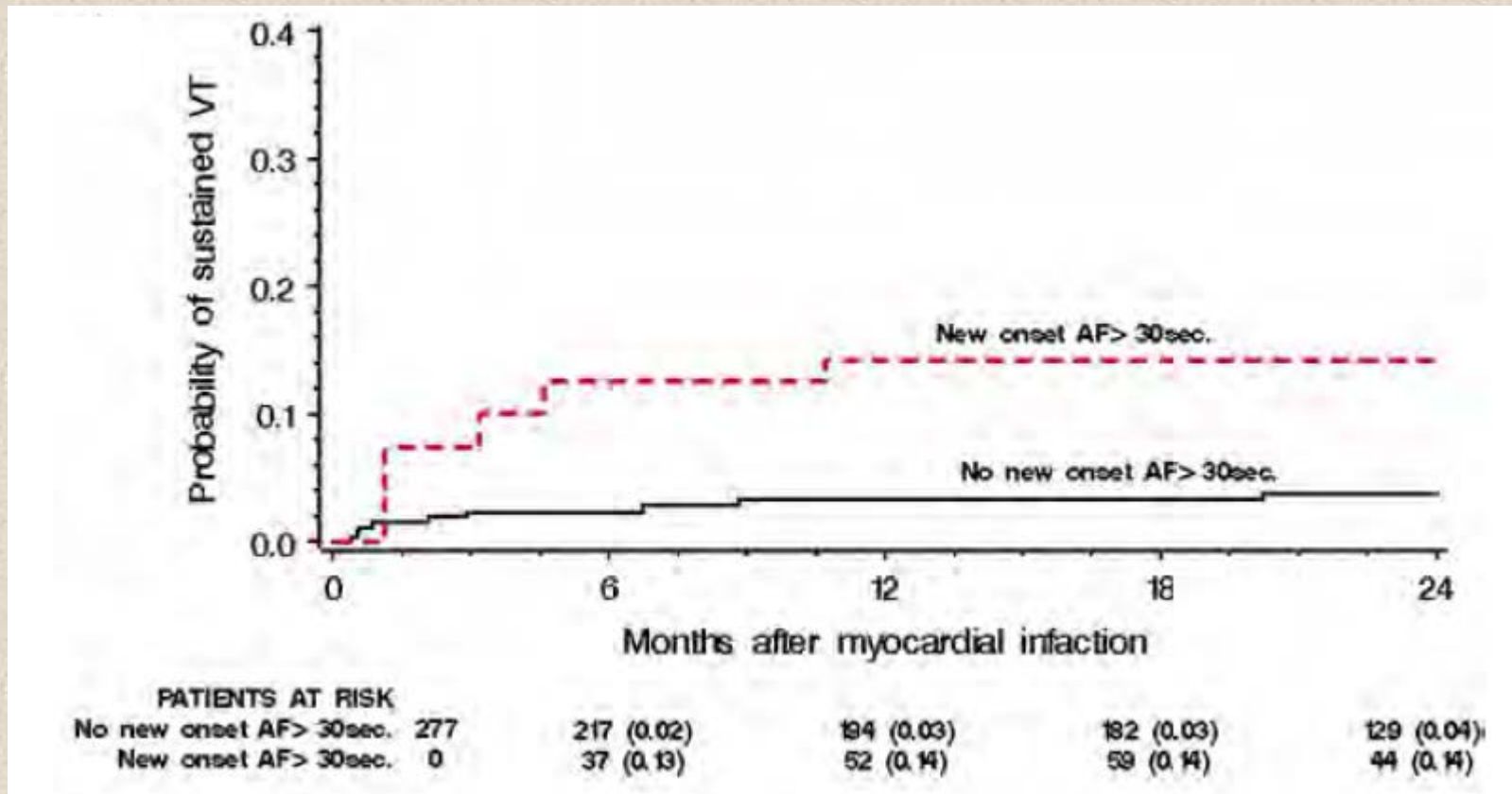
New-onset atrial fibrillation predicts malignant arrhythmias in post-myocardial infarction patients— A Cardiac Arrhythmias and Risk Stratification after acute Myocardial infarction (CARISMA) substudy

Anne-Christine Huth Ruwald, MD, ^{a,b} Poul Erik Bloch Thomsen, MD, PhD, ^c Uffe Gang, MD, PhD, ^a Rikke Mørch Jørgensen, MD, PhD, ^d Heikki V. Huikuri, MD, PhD, ^c and Christian Jons, MD, PhD, ^a

Am Heart J 2013; 166:855-863.e3

The interplay between AF and SCD

Risk of ventricular tachycardia and AF



Ruwald et al. Am Heart J 2013; 166:855-863.e3

The interplay between AF and SCD

The association between new-onset AF and specific subtypes of ventricular tachyarrhythmic events

End point	Events	All AF			AF >30 s		
		HR	95% CI	P	HR	95% CI	P
Non-sustained ventricular tachycardia*	38	3.83	1.91-7.70	<.001	3.48	1.69-7.16	<.001
Sustained ventricular tachycardia *	13	6.71	1.83-24.62	.004	4.16	1.10-15.66	.035
VF [†]	10	1.34	0.31-5.77	.697	1.14	0.22-5.78	.877

Ruwald et al. Am Heart J 2013; 166:855-863.e3

The interplay between AF and SCD

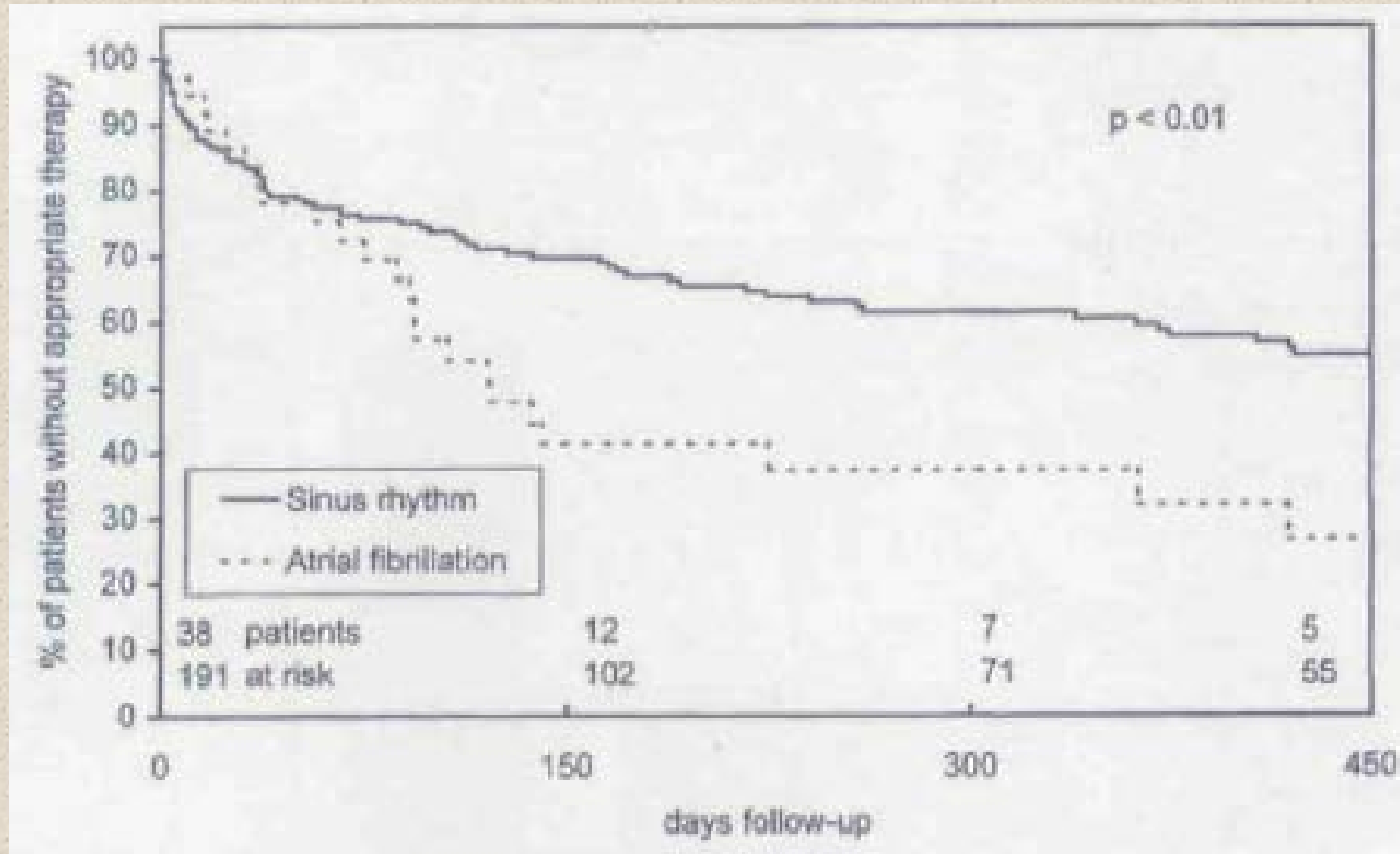
Association Between Atrial Fibrillation and Appropriate Implantable Cardioverter Defibrillator Therapy: Results from a Prospective Study

GERIAN C. GRÖNEFELD, M.D., OLIVER MAUSS, M.SC., YI-GANG LI, M.D.,
THOMAS KLINGENHEBEN, M.D., and STEFAN H. HOHNLOSER, M.D., FACC

J Cardiovasc Electrophysiol 2000;11: 1208-1214

The interplay between AF and SCD

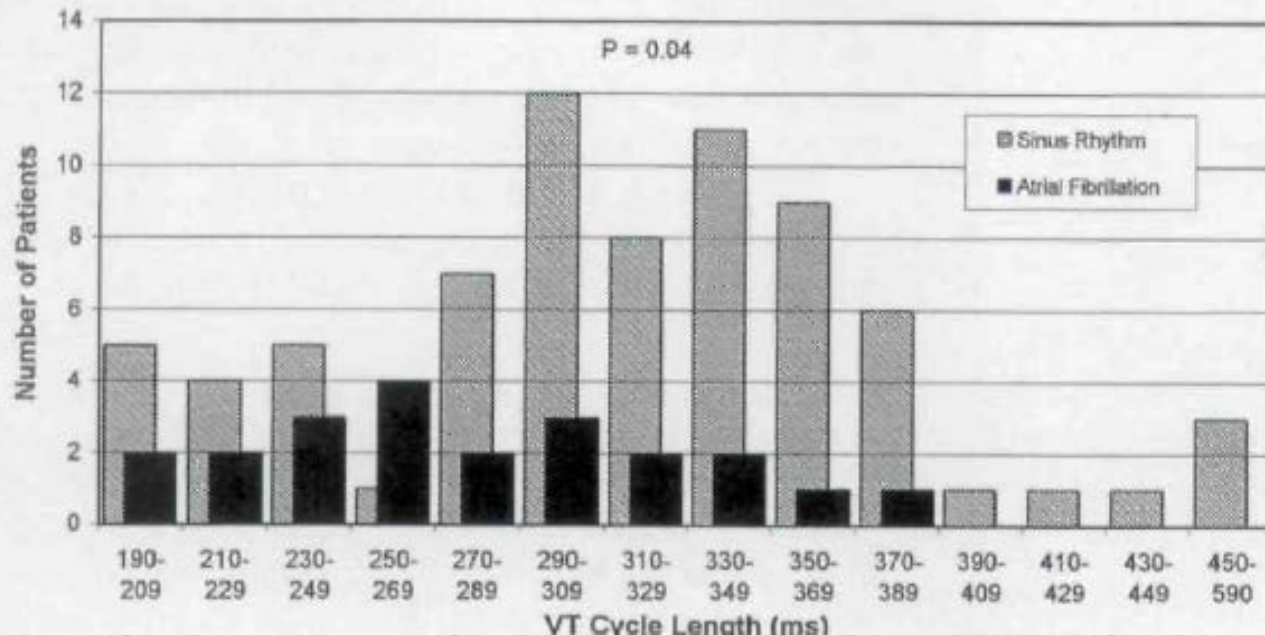
Freedom from appropriate device therapy



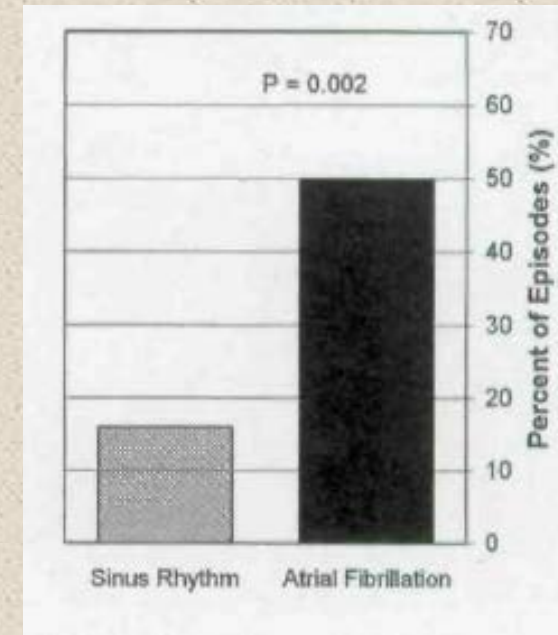
The interplay between AF and SCD

Cycle lengths of the ventricular arrhythmia

Tachycardia Cycle Length (ms) Distribution



Short-Long-Short Intervals



The interplay between AF and SCD

Circulation
Arrhythmia and Electrophysiology



Atrial Fibrillation Is an Independent Risk Factor for Ventricular Fibrillation: A Large-Scale Population-Based Case-Control Study

Abdennasser Bardai, Marieke T. Blom, Daniel A. van Hoeijen, Hanneke W. van Deutekom, Henk J. Brouwer and Hanno L. Tan

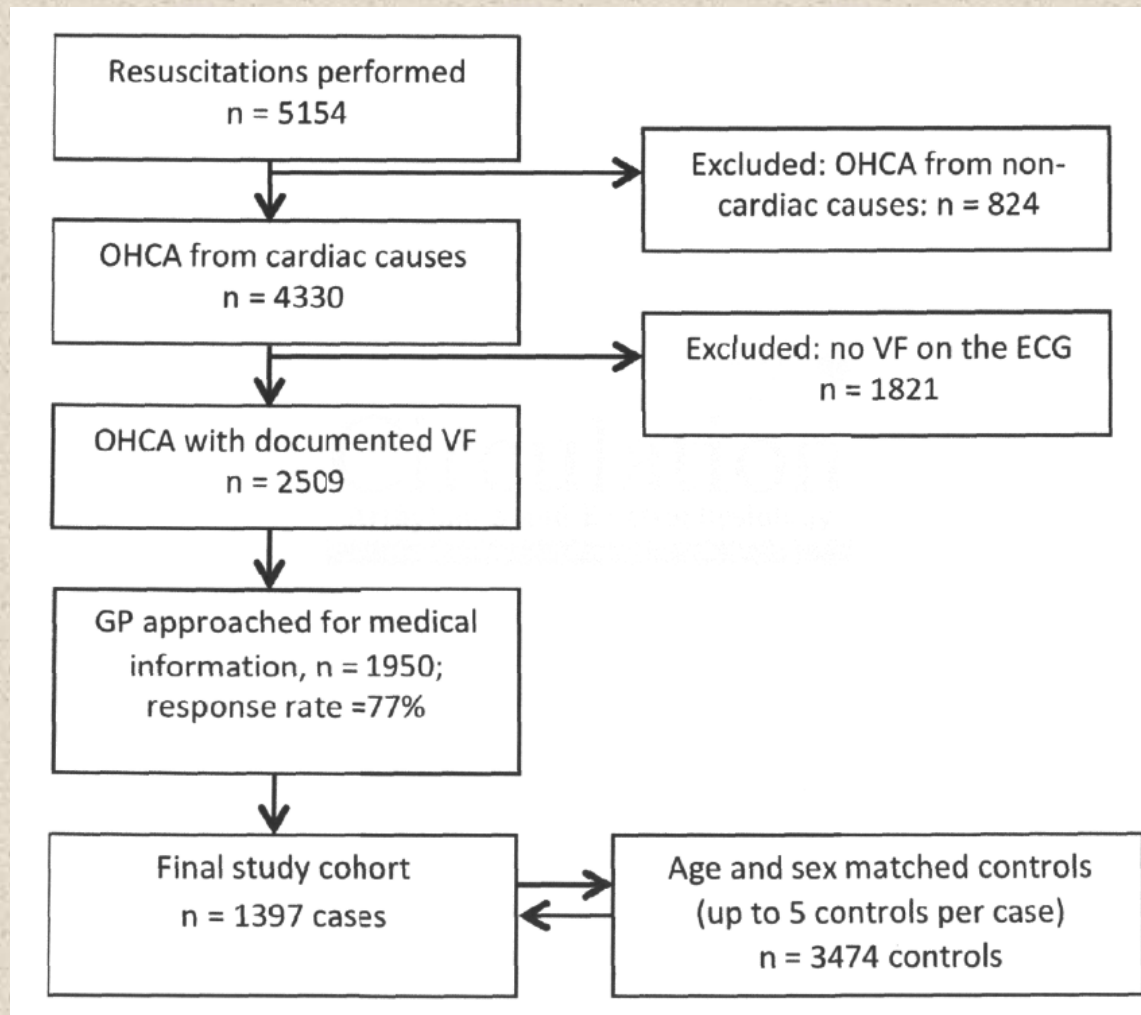
The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://circep.ahajournals.org/content/early/2014/09/18/CIRCEP.114.002094>



The interplay between AF and SCD

Flowchart of case inclusion



Bardai et al. <http://circep.ahajournals.org/content/early/2014/09/18/CIRCEP.114.002094>

The interplay between AF and SCD

AF and sudden death

1397 VF cases **→** AF : 215 pts (15,4%)

3774 controls **→** AF : 90 pts (2.6%)

AF increases risk for VF: OR 3.1

Bardai et al. <http://circep.ahajournals.org/content/early/2014/09/18/CIRCEP.114.002094>

The interplay between AF and SCD

AF and sudden death

Possible mechanisms (I)

- Embolic
- Cerebral bleeding
- AF facilitates VT/VF
- AF = marker of more severe disease
- Antiarrhythmic drugs

AF intrinsically increases VF risk
(genetic mutations for both AF/VF)

AF → coronary perfusion ↓ → ischemia → EMD (VF)

Bardai et al. <http://circep.ahajournals.org/content/early/2014/09/18/CIRCEP.114.002094>

The interplay between AF and SCD

AF and sudden death

Possible mechanisms (II)

- Enhanced AV nodal conduction
(pts with DCM + LSB)
- Rapid heart rate
- Increased sympathetic flow
- Irregularity of HP activation
- Hemodynamic compromise
(LVEDP ↑ → Stretch → VF)

Bardai et al. <http://circep.ahajournals.org/content/early/2014/09/18/CIRCEP.114.002094>