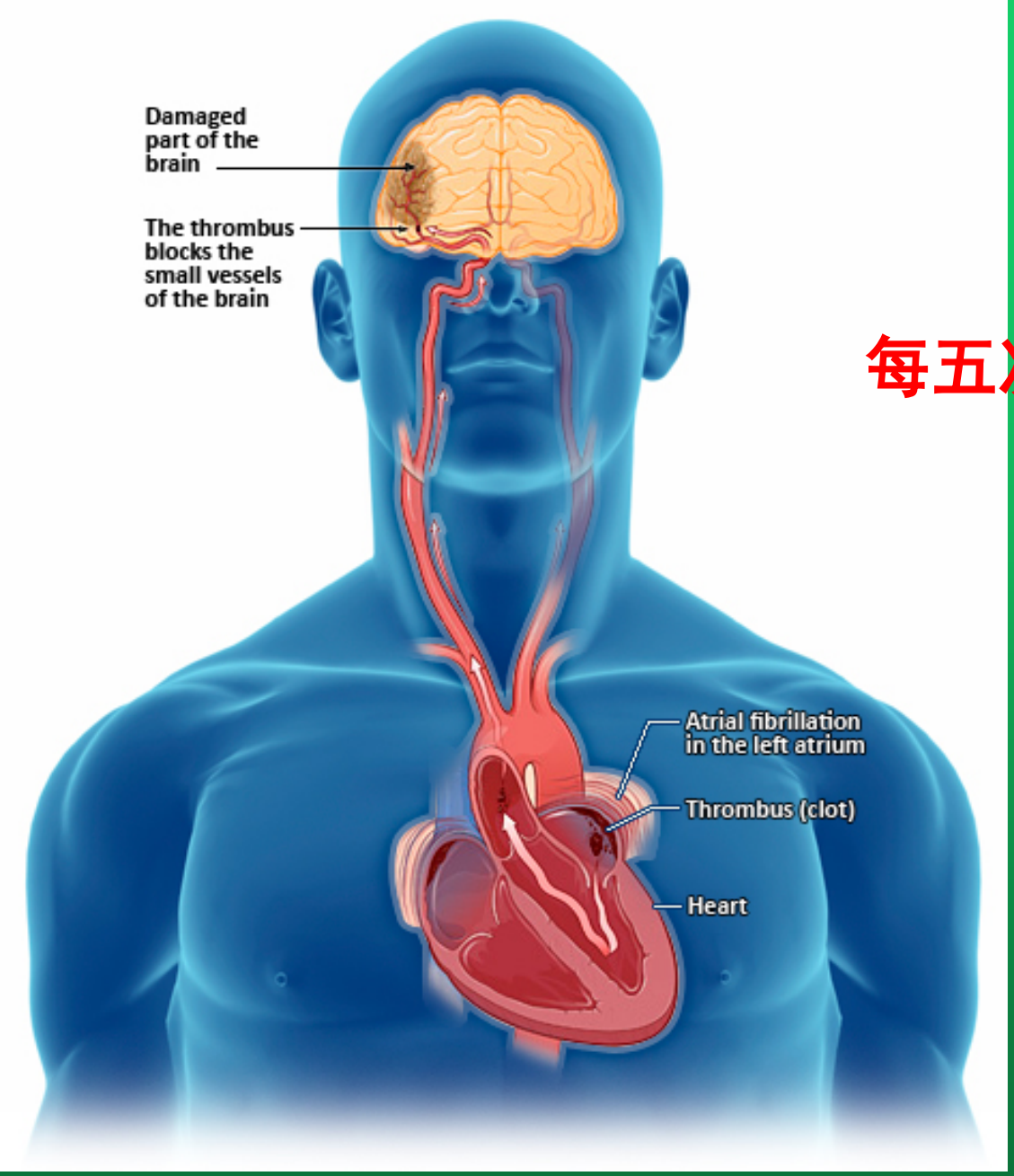
现代起搏器对房性心律失常的诊断、治疗及预防

起搏器对AT/AF的诊断和预防

- 起搏器植入患者AT/AF发生率
- 起搏器记录AT/AF事件是否可靠
- 起搏器记录的AT/AF对临床的意义
- 如何减少起搏器植入患者AT/AF的发生



每五次中风事件就有一次

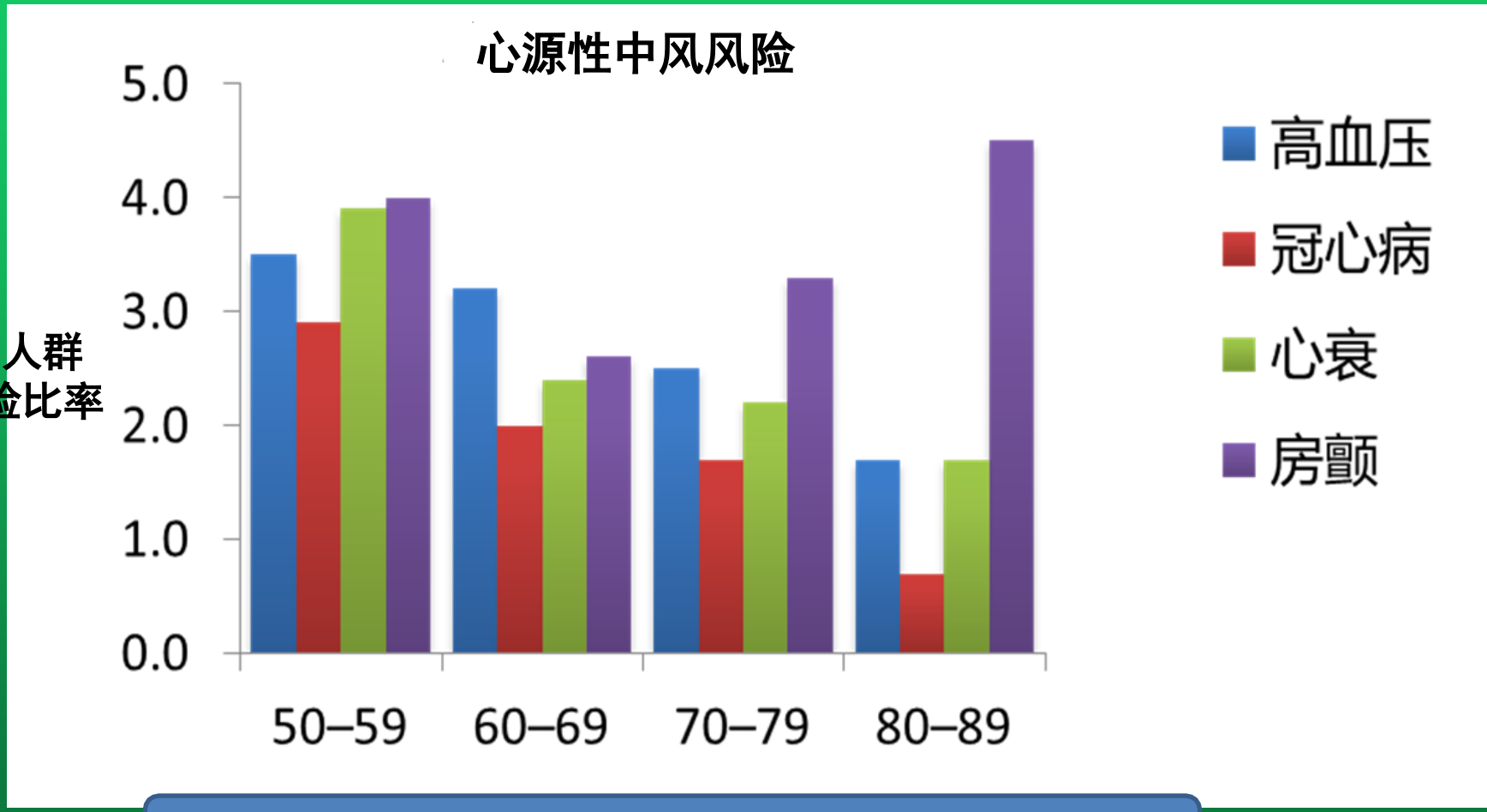
与AF相关

SOS-AF
Stroke Prevention Strategies
based on AF information from implanted devices

Camm AJ, et al. *Eur Heart J*. 2012;**33**:2719-2747

Framingham 研究指出AF与中风之间具有明确关联

患有AF的患者较正常人群发生心源性中风风险高出4-5倍



是否植入性器械可以在减少中风风险上有所行为?

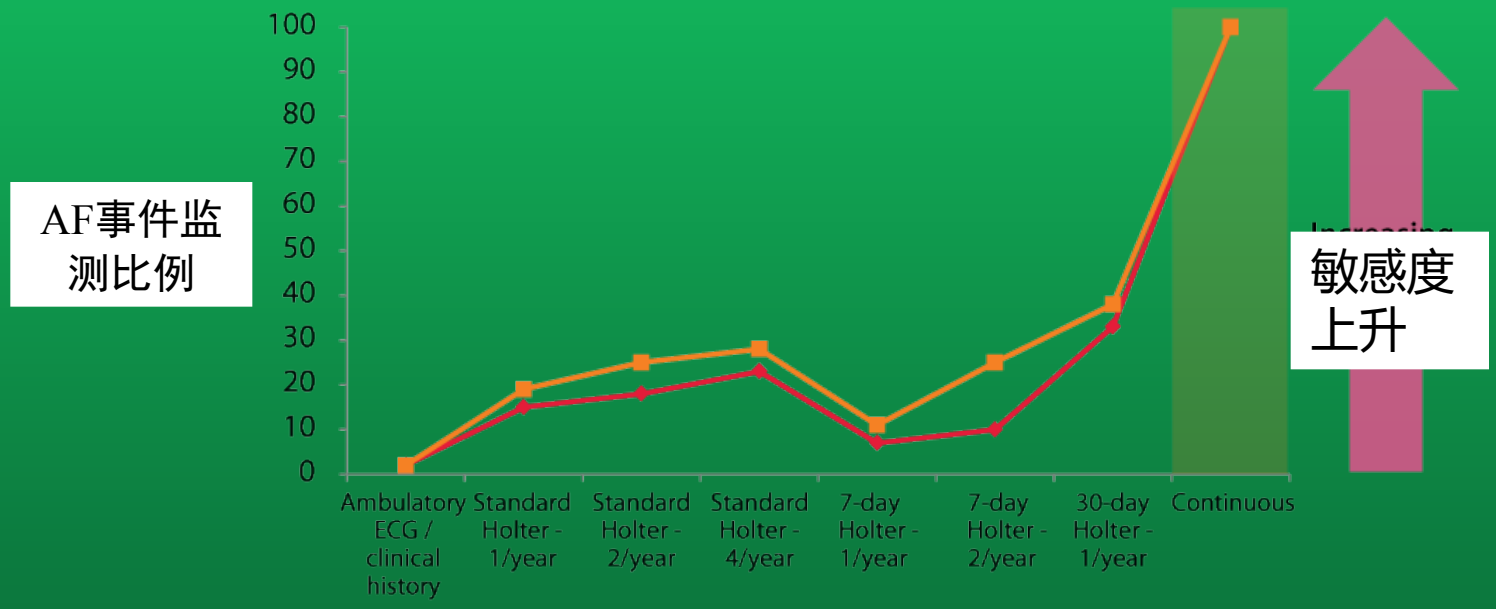
Wolf et al. Stroke (AHA). 1991;22:983-988

90% 的AF是无症状的，这会导致临床上诊断延迟

Page RL et al. *Circulation* 1994; 89:224-227
Israel CW et al. *J Am Coll Cardiol* 2004;43:47-52
Arya A et al. *PACE* 2007;30:458-462

通过30天的Holter, 也只有40%的AF事件可以被监测出

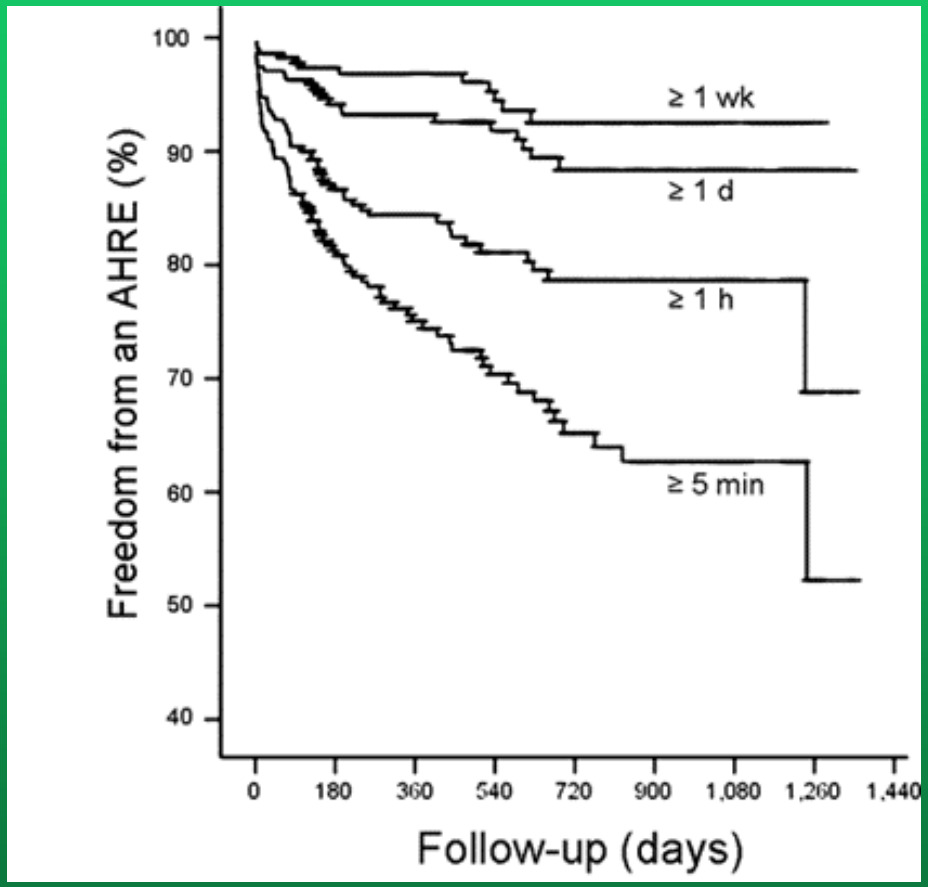
通过持续性监测*对比间歇性监测方法诊断出AF的时间 (* 通过美敦力机器监测)



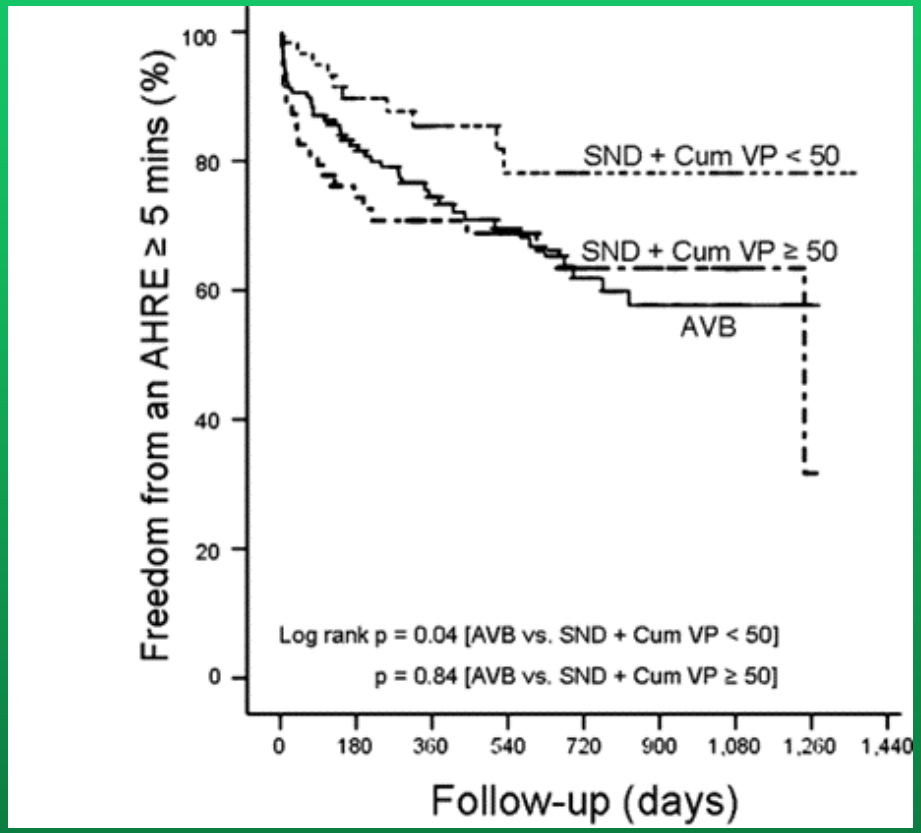
上下两条线代表敏感度最大和最低百分比

Botto et al. J Cardio Electro. 2009;20:241-248

起搏器植入患者AT/AF发病率



Freedom from an atrial high-rate event.

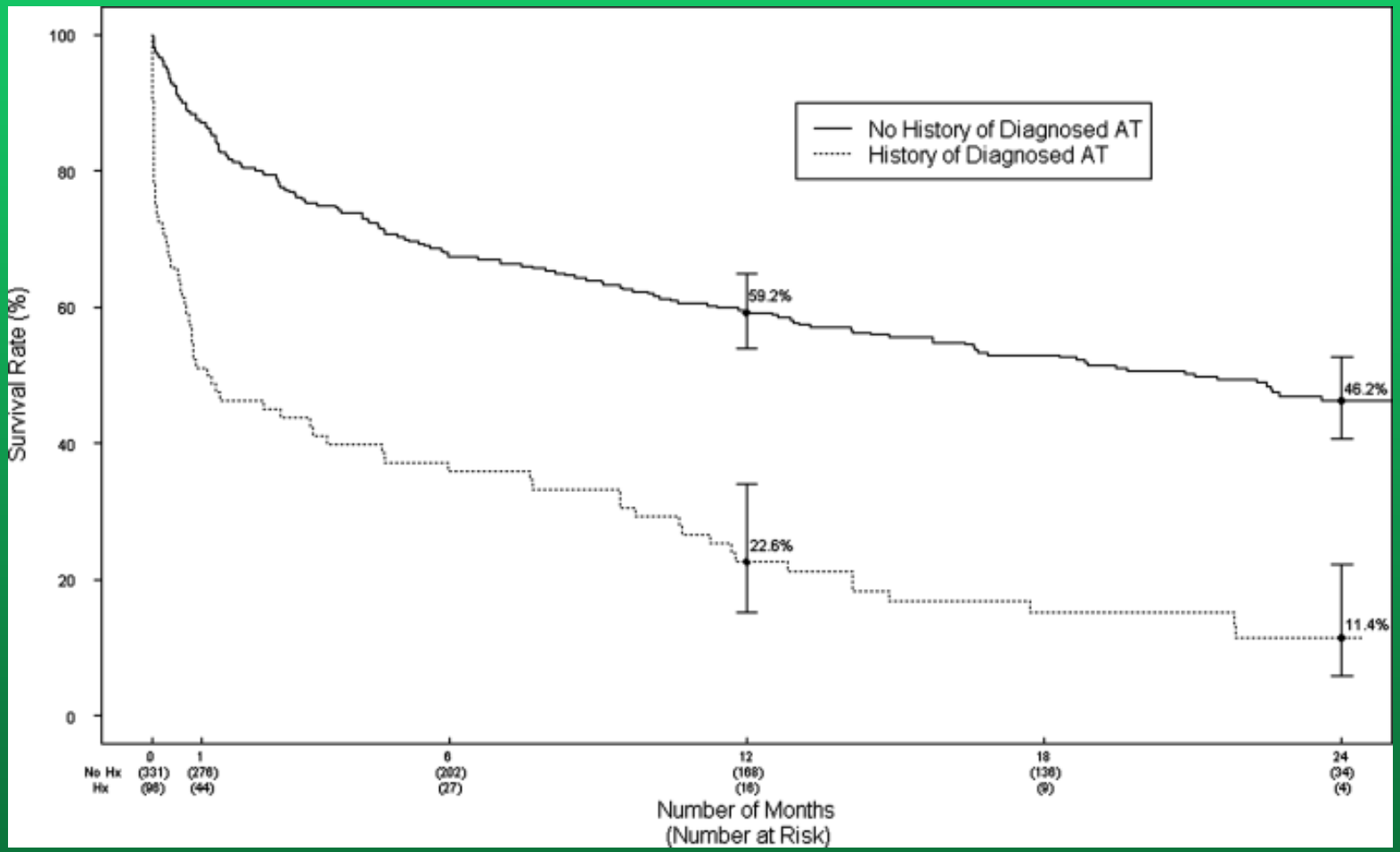


Freedom from an atrial high-rate episode lasting ≥5 minutes in patients stratified by pacing indication.

Cheung, J et al., Newly detected atrial fibrillation following dual chamber pacemaker implantation, *J. Cardiovasc. Electrophysiol.*,**2006**,17(12),1323

起搏器植入患者AT/AF发病率

A-HIRATE临床研究



Orlov MV, et al.; Asymptomatic atrial fibrillation in pacemaker recipients: incidence, progression, and determinants based on the atrial high rate trial, *Pacing Clin. Electrophysiol.*, **2007**, 30(3):404-11

起搏器植入患者AT/AF发病率

临床	历史记录/新监测	平均随访时间	AT/AF发生百分比
ASSERT[1]	Newly Detected	3 Months	10.1%
TRENDS[2]	Newly Detected	1.1 ± 0.7 Years	30%
Canadian Single Center[3]	Both	51.5 ± 39.7 Months	有AF病史： 65.8% 没有临床病史：51.87%

对于植入前未发现AT/AF的患者，通过器械随访三个月内监测出AF比例为10%，在4年后检出率增长到大于50%

对于植入过起搏器或者ICD的患者，
4年内发生AT/AF的几率超过**50%**

[1] Healey JS, Connolly SJ, Gold MR, et al. Subclinical atrial fibrillation and the risk of stroke. *N Engl J Med*. January 12, 2012;366(2):120-129.

[2] Ziegler PD, Glotzer TV, Daoud EG, et al. Detection of previously undiagnosed atrial fibrillation in patients with stroke risk factors and usefulness of continuous monitoring in primary stroke prevention. *Am J Cardiol*. November 1, 2012;110(9):1309-1314.

[3] Healey JS, Martin JL, Duncan A, et al. Pacemaker-detected atrial fibrillation in patients with pacemakers: prevalence, predictors, and current use of oral anticoagulation. *Can J Cardiol*. February 2013;29(2):224-228.

*CIEDs = Cardiac Implantable Electronic Devices

- **起搏器的AF诊断功能**在房颤管理中具有

越来越重要的地位

起搏器AT/AF诊断功能是否可靠？

Medtronic ICDs

(eg. Viva/Evera, Protecta, Consulta/Secura)

Swerdlow et al. *Circulation* 2000

- 间期+计数检测方式 对AT/AF敏感度 = **100%**
- 间期+计数检测方式 对非AT/AF特异性 = **99.99%**
- 恰当的 AF 检测 = **98%** (依据事件发生率)

TABLE 3. Appropriately-Detected AT/AF: Total Duration per Holter Recording

Holter Recording†	No. of Episodes AT	No. of Episodes AF	Median PP Interval, ms	Duration per Holter, min
55004b	1		340	14
55004c		1*	230	1435
55015c		1	180	31
55107a		1*	200	1218
5505a		3	220–230	6
5505a		3	190–230	209
5508b		1	230	173
5521b		1	160	322
5521d		1	170	120
5523a		1*	200	1435
5523b		1*	210	479
5526a		1*	140	1440
5526b	119		200–240	67
5526b		11	220–230	6
Total	120	26		6955 (115.9 hr)

*Continuous AF throughout Holter.

†Recordings from the same patient have the same number. Multiple recordings in the same patient are designated by differing letters.

vals). All 120 AT and 26 AF episodes that satisfied the programmed atrial rate criterion were detected continuously, for a total of 116 hours. Three episodes of AT lasting a total of 3 minutes were not detected because the AT cycle length exceeded the programmed detection interval. Holter-recorded

Medtronic Brady Pacemakers

(e.g. Adapta, Versa, Sensia, Relia)

Passman et al. *J Cardiovasc Electrophysiol* 2004

- 模式转换敏感度 = **98.1%** (AT/AF)
- 模式转换特异性 = **100%** (AT/AF)

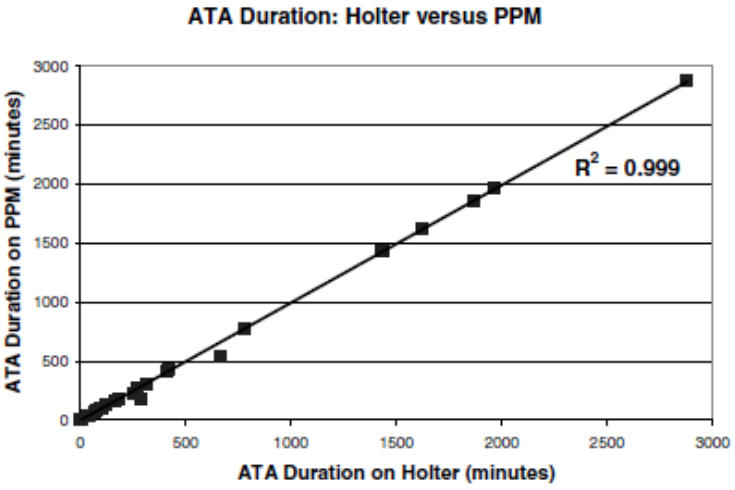


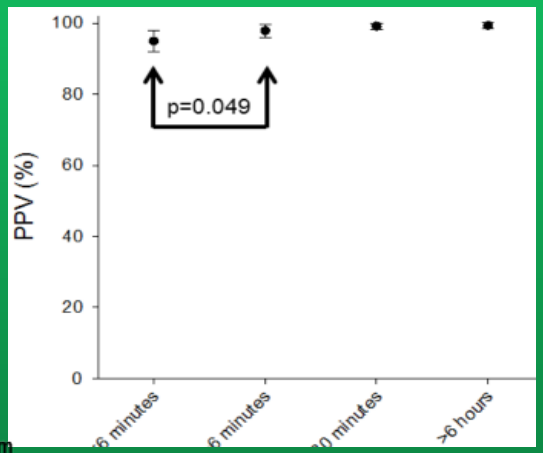
Figure 2. *Correlation of atrial tachyarrhythmia duration as recorded by Holter versus pacemaker.*

Medtronic Tachy Pacemakers
(eg. Advisa/Ensura MRI, Consulta/Syncra CRT-P)

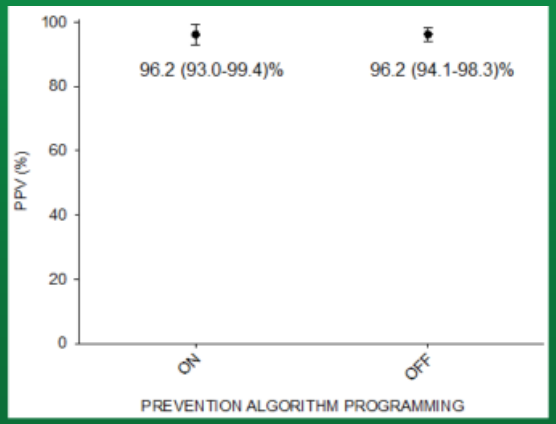
Ziegler et al. *Heart Rhythm* 2013

- 整体阳性预测值= **96.2%**
- 阳性预测值(<6 分钟) = **94.9%**
- 阳性预测值(>6 分钟) = **97.8%**

Impact of Episode Duration



Impact of Prevention Pacing Algorithm



St. Jude PM & ICDs

Kaufman et al. *Heart Rhythm* 2012

- 整体阳性预测值= **59.7%**
- 阳性预测值(<6 分钟) = **48.0%**
- 阳性预测值(>6 分钟) = **82.7%**

Kaufman et al Predictive Value of AHREs

Table 1 Positive predictive value of AHREs at different rates and durations

AHRE type	Appropriate (n)	Inappropriate (n)	Positive predictive value (%)
<6 min, >190 beats/min	5450	5905	48
>6 min, >190 beats/min	4769	1000	82.7

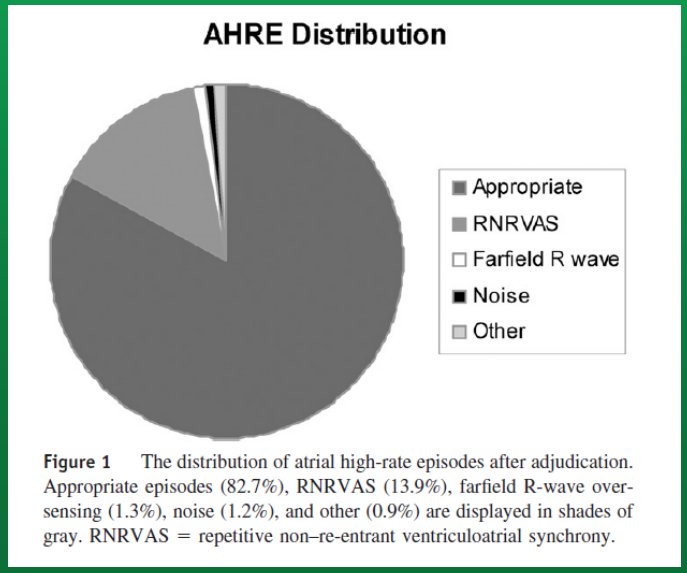
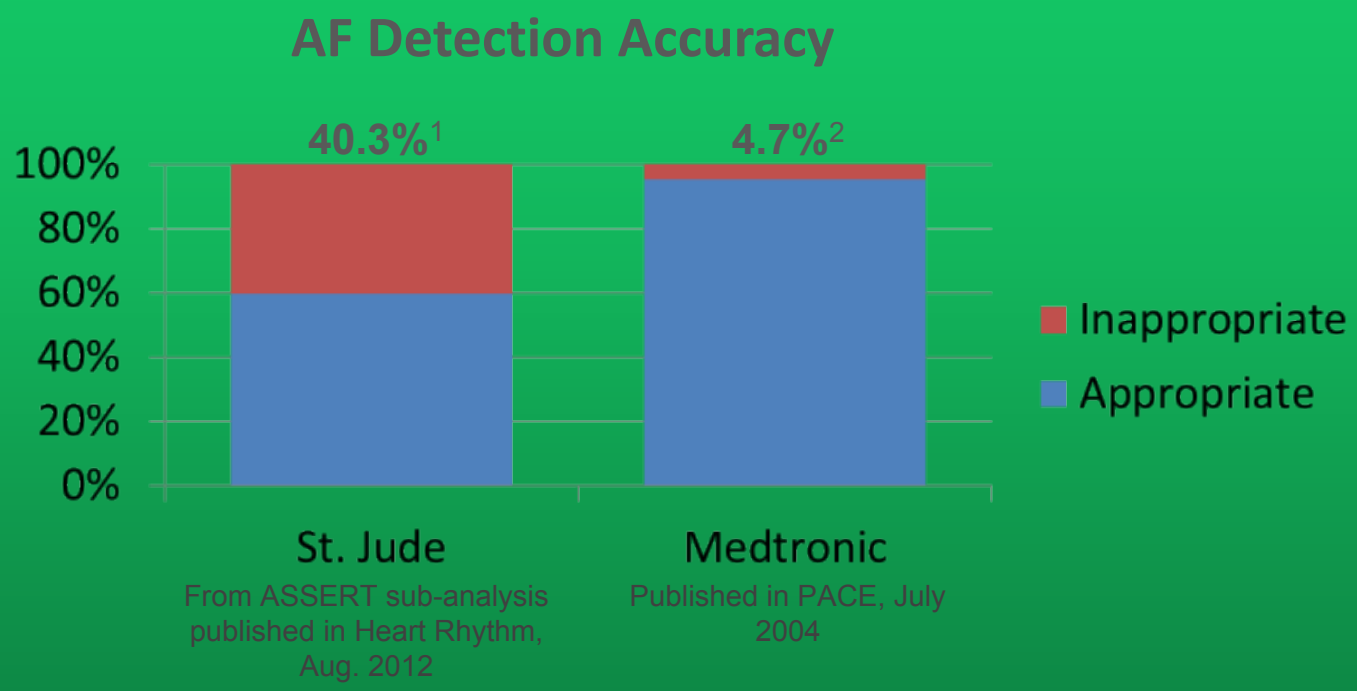


Figure 1 The distribution of atrial high-rate episodes after adjudication. Appropriate episodes (82.7%), RNRVAS (13.9%), farfield R-wave oversensing (1.3%), noise (1.2%), and other (0.9%) are displayed in shades of gray. RNRVAS = repetitive non–re-entrant ventriculoatrial synchrony.

Leverage AF Detection Accuracy to Combat St. Jude's Wireless



Proven Accuracy

ST. JUDE MEDICAL
MORE CONTROL. LESS RISK.

Wireless transmission of AF episodes is only beneficial if **AF detection is accurate**

See Notes for References

AT/AF诊断准确率

	Medtronic	St. Jude Medical	Boston Scientific	BIOTRONIK	SORIN GROUP
整体阳性率	95%	60%	62%	无相关数据	无相关数据
敏感度	98%	无相关数据	无相关数据	无相关数据	无相关数据

起搏器记录AT/AF的临床意义

ASSERT临床研究

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

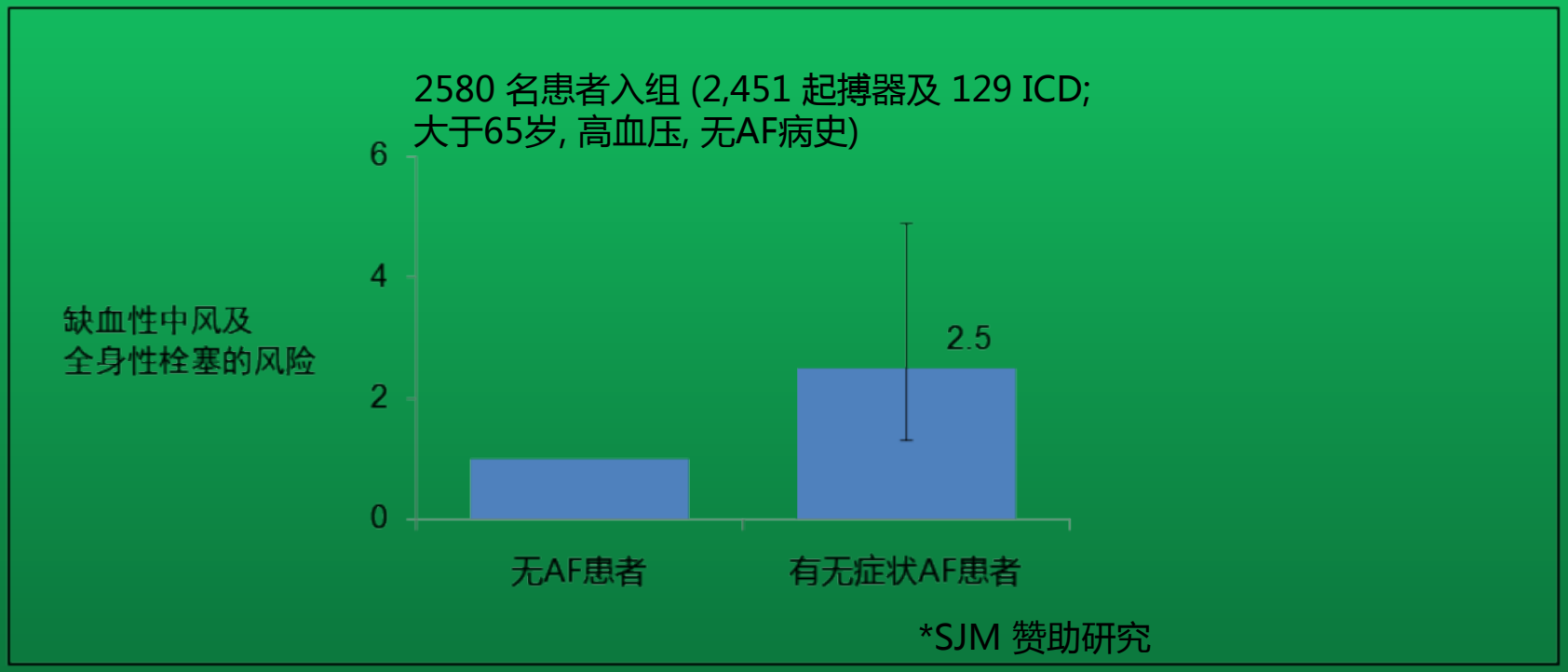
Subclinical Atrial Fibrillation and the Risk of Stroke

Jeff S. Healey, M.D., Stuart J. Connolly, M.D., Michael R. Gold, M.D., Carsten W. Israel, M.D., Isabelle C. Van Gelder, M.D., Alessandro Capucci, M.D., C.P. Lau, M.D., Eric Fain, M.D., Sean Yang, M.Sc., Christophe Bailleul, M.D., Carlos A. Morillo, M.D., Mark Carlson, M.D., Ellison Themeles, M.Sc., Elizabeth S. Kaufman, M.D., and Stefan H. Hohnloser, M.D., for the ASSERT Investigators*

Healey J. S. et al.; Subclinical atrial fibrillation and the risk of stroke, *N. Engl. J. Med.*, **2012**, 12;366(2):120-9.

起搏器记录AT/AF的临床意义

- ASSERT结果：**无症状的AF的患者**在最初植入的**3个月**内较没有AF的患者发生缺血性中风及全身性栓塞的风险高出**2.5倍**



Healey J. S. et al.; Subclinical atrial fibrillation and the risk of stroke, *N. Engl. J. Med.*, **2012**, 12;366(2):120-9.

通过CIEDs定义中风风险的临床研究

Selected Studies Evaluating the Correlation of AF Burden and Stroke or Systemic Embolism

Author (Year)	Patients (n)	研究类型及标准	检测方法及持续时间	结论
Glotzer et al. (2003)[14]	312	Ancillary analysis of multicenter RCT (MOST)	Dual-chamber PPM for a median of 27 months	• 10 patients (3.2%) developed stroke • Atrial arrhythmia ≥5 minutes: HR 2.8, P = 0.0011 for death or nonfatal stroke
Capucci et al. (200	725	Prospective, registry study	Dual-chamber PPM	• 14 patients (1.9%) had an arterial thromboembolic event
Glotz (20				ual
				e of
				• 30-day cumulative AT/AF burden <10.8 hours: no difference in rate of thromboembolism compared to no AT/AF group (P = 0.96) • 30-day cumulative AT/AF burden ≥10.8 hours: trend toward
Heale (20				pared e or
				systemic embolism 4.9%
Shanmugam et al. (2012)[13]	560	Ancillary analysis from two prospective multicenter observational studies of CHF patients with CRT	CRT device for a mean of 1 year	• 11 patients (2%) had a thromboembolic events • Atrial tacharrhythmia ≥3.8 hours a day: HR 9.4; P = 0.006 for stroke or systemic embolism compared to patients with no arrhythmia • No significant increase risk of thromboembolic events in patients with ≥3.8 hours a day versus <3.8 hours a day: HR 2.4; P = 0.23

AHRE = atrial high rate episode; AF = atrial fibrillation; AT = atrial tachycardia; CHF = congestive heart failure; CRT = cardiac resynchronization therapy; HR_{adj} = adjusted hazard ratio; ICD = implantable cardioverter defibrillator; PPM = permanent pacemaker; RCT = randomized control trial.

"短阵AF的发生在临床上的重要性逐步得到重视,同时在临床研究中评价通过器械指导的抗凝药物的应用其可行性,安全性 及有效率正在进行中." *Zimetbaum et al (PACE 2013)*

Lamas 指出精确的识别与中风风险提高相关的AF负荷阈值的重要性 *(N Engl J Med 2012)*

SOS AF 临床试验 – 发表于2013-12-11

European Heart Journal Advance Access published December 11, 2013

European Heart Journal
doi:10.1093/eurheartj/eht491

CLINICAL RESEARCH
Atrial fibrillation

Device-detected atrial fibrillation and risk for stroke: an analysis of >10 000 patients from the SOS AF project (Stroke preventiOn Strategies based on Atrial Fibrillation information from implanted devices)

Giuseppe Boriani[1]*, Taya V. Glotzer[2], Massimo Santini[3], Teena M. West[4], Mirko De Melis[4], Milan Sepsi[5], Maurizio Gasparini[6], Thorsten Lewalter[7], John A. Camm[8], and Daniel E. Singer[9]

- 结合3个大型的前瞻性观察性临床研究进行分析

  (TRENDS, PANORAMA and Italian Clinical Service® Registry)

- 患者群(相对而言未经筛选):
  - 植入可监测 AT/AF的器械
  - 不小于3个月的临床随访
  - 没有永久性AF

SOS AF 临床结果

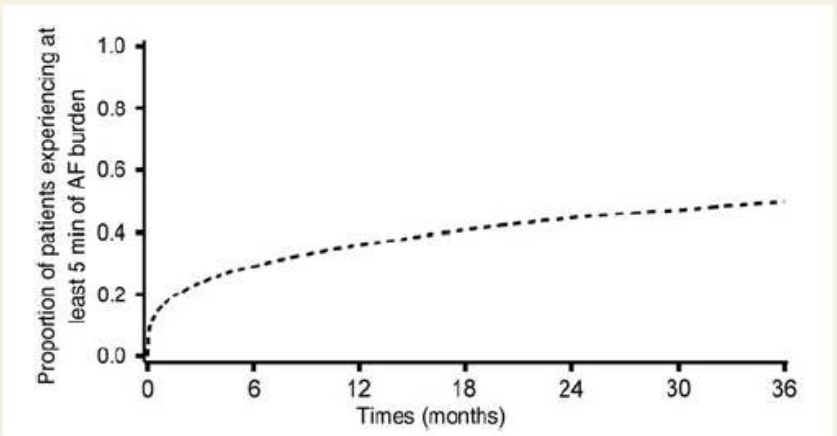
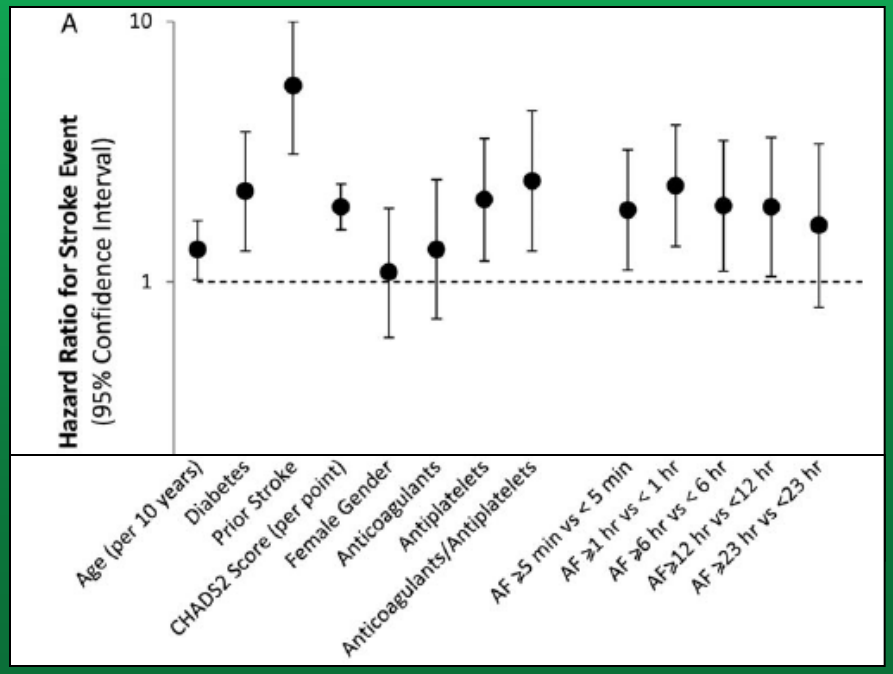


Figure 1 Atrial fibrillation burden along with time during the follow-up. Kaplan–Meier curve of patients experiencing a first day with at least 5 min of atrial fibrillation burden, among all subjects ($n = 10\,016$).



- **AF 负荷**是对缺血性中风发生风险的独立预测因子(HR=1.03 /每小时 at 95% CI: 1.00-1.05, P=0.040)
- **6 个月**是患者达到最大AF负荷的中位数
- **AF负荷 1 小时** 发生缺血性中风的风险最高

最高AF负荷每增加一小时，相对应发生中风险增加

~3%

起搏器诊断AT/AF总结

- **AF 诊断功能总结:**
  - **AF 负荷**是对缺血性中风发生风险的独立预测因子
  - SOS AF临床 指出**AF负荷一小时** 中风风险最高
  - 具有心房导线的起搏器及ICD对AF的监测率准确性非常高
  - 在美敦力产品中可以达到**95%**