

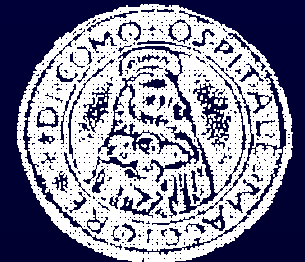
SUDDEN DEATH MANAGEMENT IN HYPERTROPHIC CARDIOMYOPATHY

Guidelines for ICD: It Is Time For an Update ?

Gianluca Botto, MD, FESC

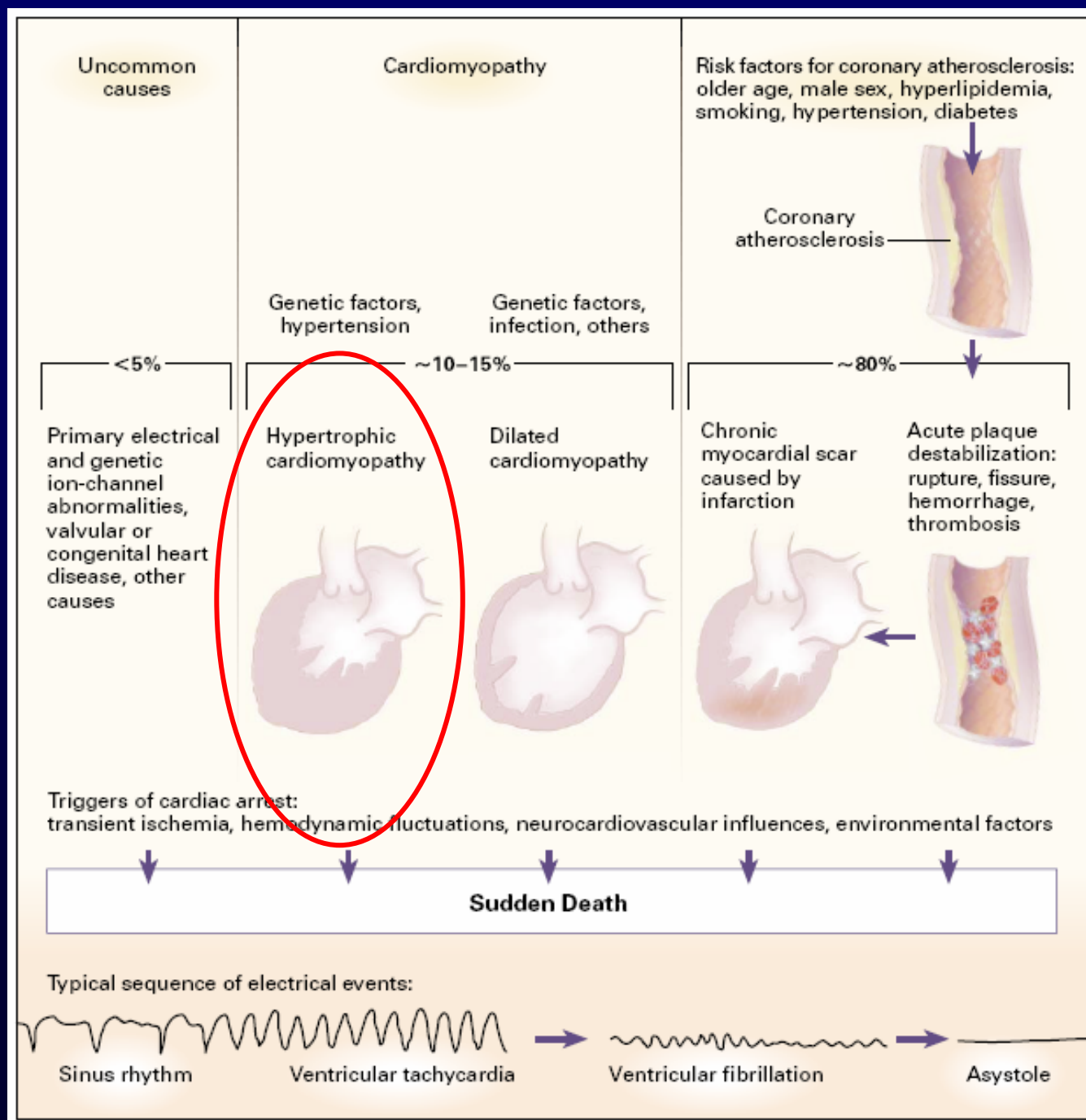
Division of Cardiology

Sant' Anna Hospital, Como, Italy



Sudden Death From Cardiac Cause

Pathphysiology & Epidemiology



Huikuri HV. NEJM
2001; 345: 1473-1482

Class I Indications for ICD Therapy

AVID
CASH
CIDS

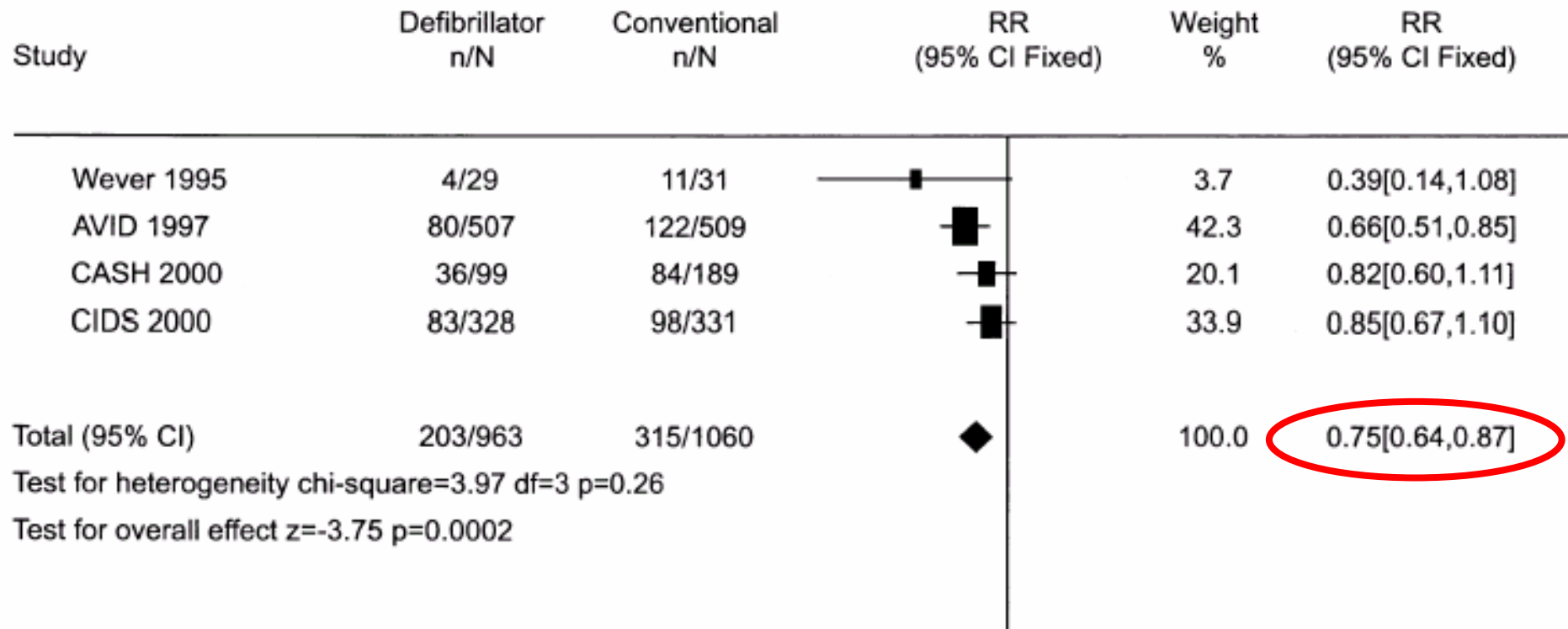
- ✓ Cardiac arrest due to VF or VT not due to a transient or reversible cause (Level of Evidence: A)
- ✓ Spontaneous sustained VT in association with structural heart disease (Level of Evidence: B)

CIDS
AVID
Registry
AVID
Substudy

- ✓ Syncope of undetermined origin with clinically relevant, hemodynamically significant sustained VT or VF induced at EP study when drug therapy is ineffective, not tolerated, or not preferred (Level of Evidence: B)

Effectiveness of ICDs in Preventing SD

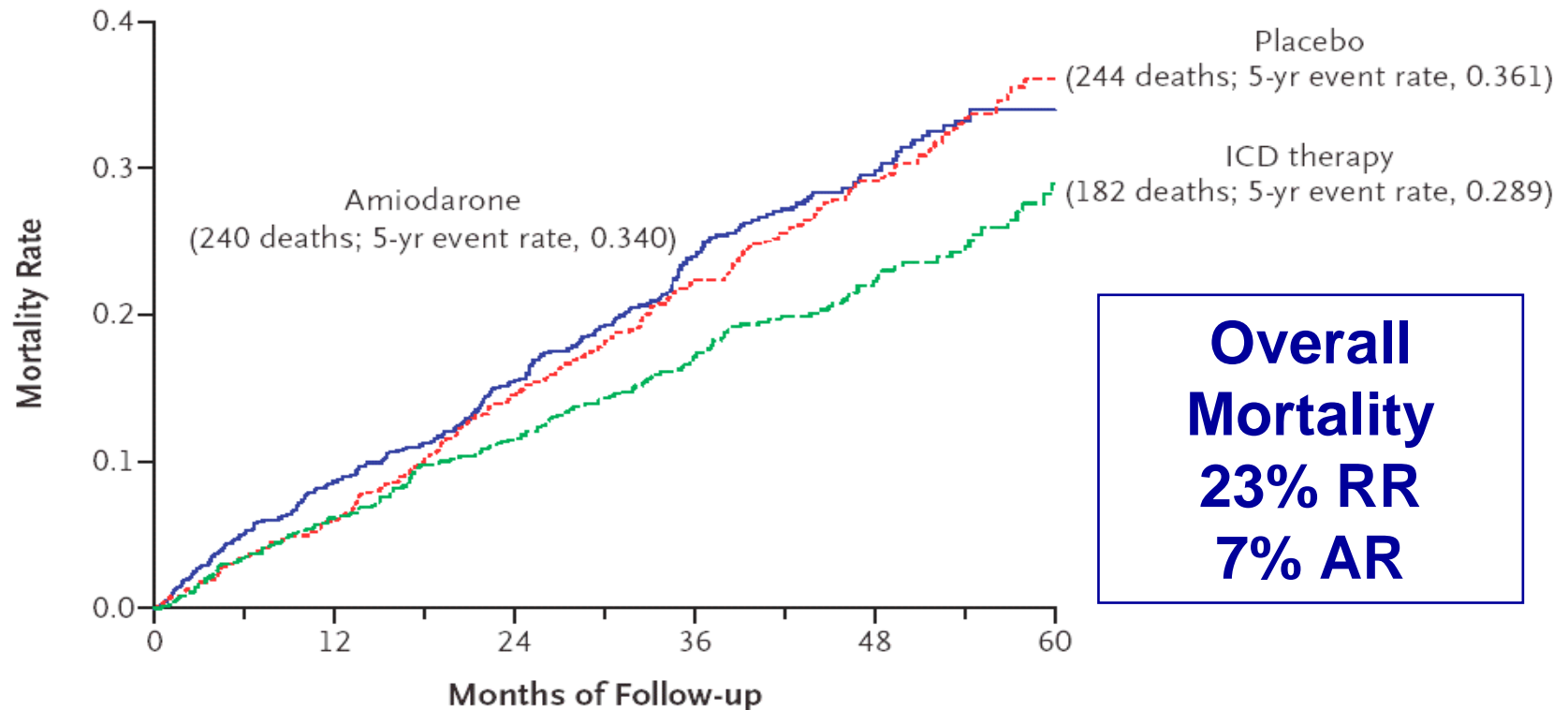
A Meta Analysis



Absolute Reduction = 7%
Number Need to Treat = 15

Kaplan-Meier Estimates of Death from Any Cause

	Hazard Ratio (97.5% CI)	P Value
Amiodarone vs. placebo	1.06 (0.86–1.30)	0.53
ICD therapy vs. placebo	0.77 (0.62–0.96)	0.007



**Overall
 Mortality
 23% RR
 7% AR**

No. at Risk

Amiodarone	845	772	715	484	280	97
Placebo	847	797	724	505	304	89
ICD therapy	829	778	733	501	304	103

Bardy G.
 New Engl J Med
 2005: 352: 3



ICDs in Primary Prevention of SCD

A Meta Analysis

Comparison: 01 ICD vs. Control (Overall)
 Outcome: 01 All-cause Mortality

Study or sub-category	Treatment n/N	Control n/N	RR (random) 95% CI	Weight %	RR (random) 95% CI
AMIOVIRT	6/51	7/52		2.76	0.87 [0.32, 2.42]
CABG Patch	101/446	95/454		12.79	1.08 [0.84, 1.39]
CAT	13/50	17/54		5.93	0.83 [0.45, 1.52]
COMPANION	105/595	131/617		13.19	0.83 [0.66, 1.05]
DEFINITE	28/229	40/229		8.46	0.70 [0.45, 1.09]
DINAMIT	62/332	58/342		11.00	1.10 [0.80, 1.52]
MADIT 1	15/95	39/101		7.12	0.41 [0.24, 0.69]
MADIT 2	105/742	97/490		12.71	0.71 [0.56, 0.92]
MUSTT	35/161	255/537		11.42	0.46 [0.34, 0.62]
SCD HeFT	182/829	244/847		14.62	0.76 [0.65, 0.90]
Total (95% CI)	3530	3723		100.00	0.75 [0.63, 0.91]

Total events: 652 (Treatment), 983 (Control)
 Test for heterogeneity: $\text{Chi}^2=29.67$, $\text{df} = 9$ ($P=0.0005$), $I^2 = 69.7\%$
 Test for overall effect: $Z = 3.00$ ($P=0.003$)

0.1 0.2 0.5 1 2 5 10
 Favours treatment Favours control

Absolute Reduction = 8%
Number Need to Treat = 12

Nanthakumar K. J Am Coll Cardiol 2004; 44: 2166-72

Sudden Death Management in Uncommon Disease

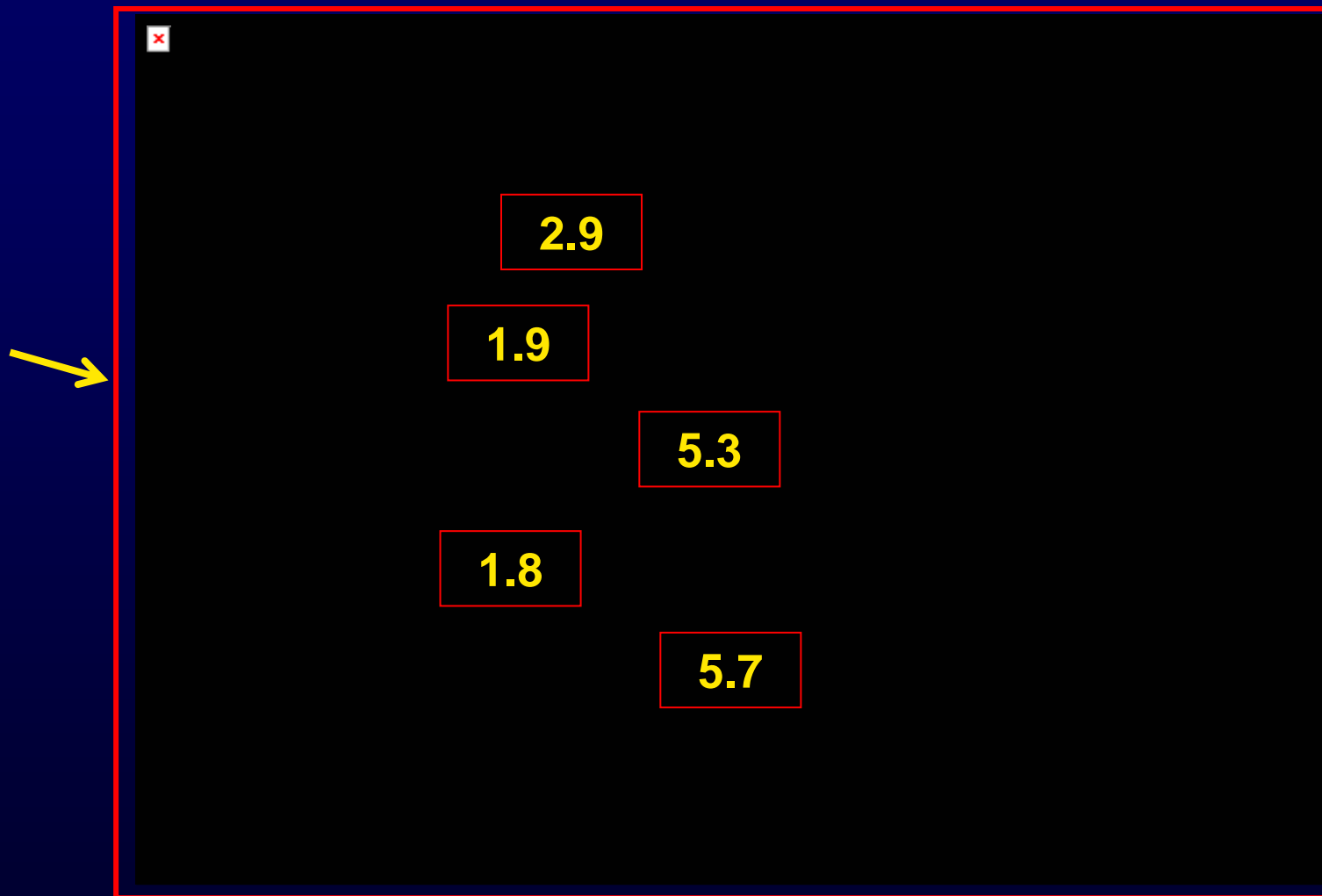
- Large RCT may not be feasible
 - if the disease is relatively uncommon
 - if reasonably useful risk stratifiers for arrhythmic death are not available
- RCT unrealistic in disease detected at early age where the meaningful clinical end-point is lifetime prevention of SD
- The annual risk of SD is generally low and most pts do well for many years or lifetime

**Most individuals with HCMP
are symptomatic and the first
manifestation may be SCD**

Identification of high-risk patients and effort at prevention of sudden death represent important clinical challenges in HCMP

Hypertrophic Cardiomyopathy

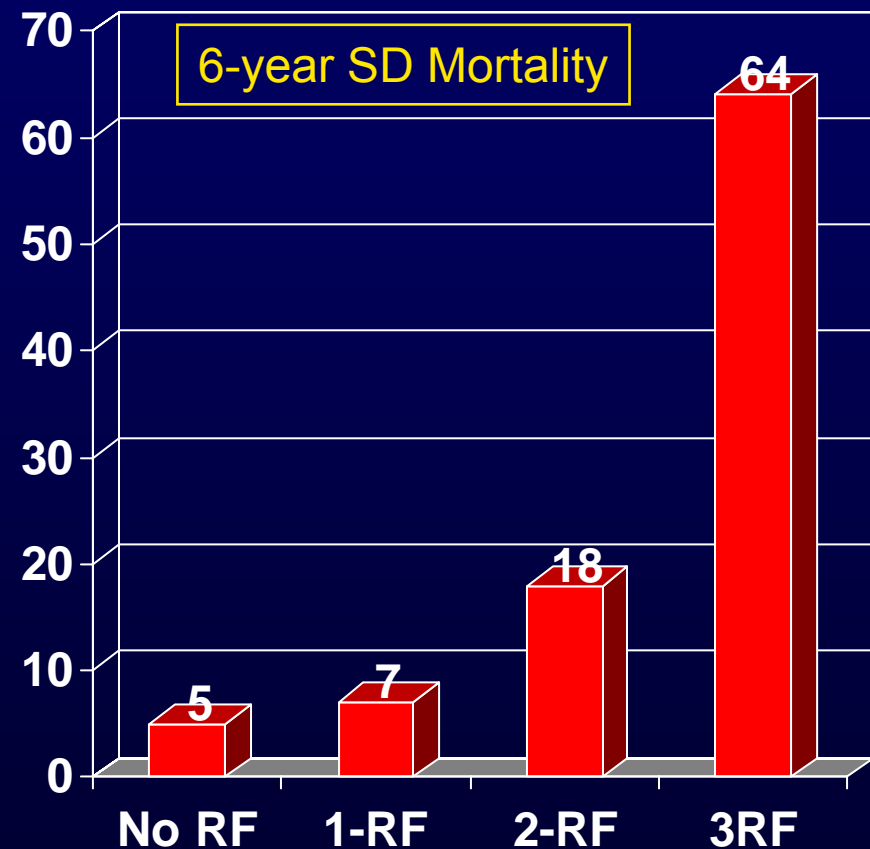
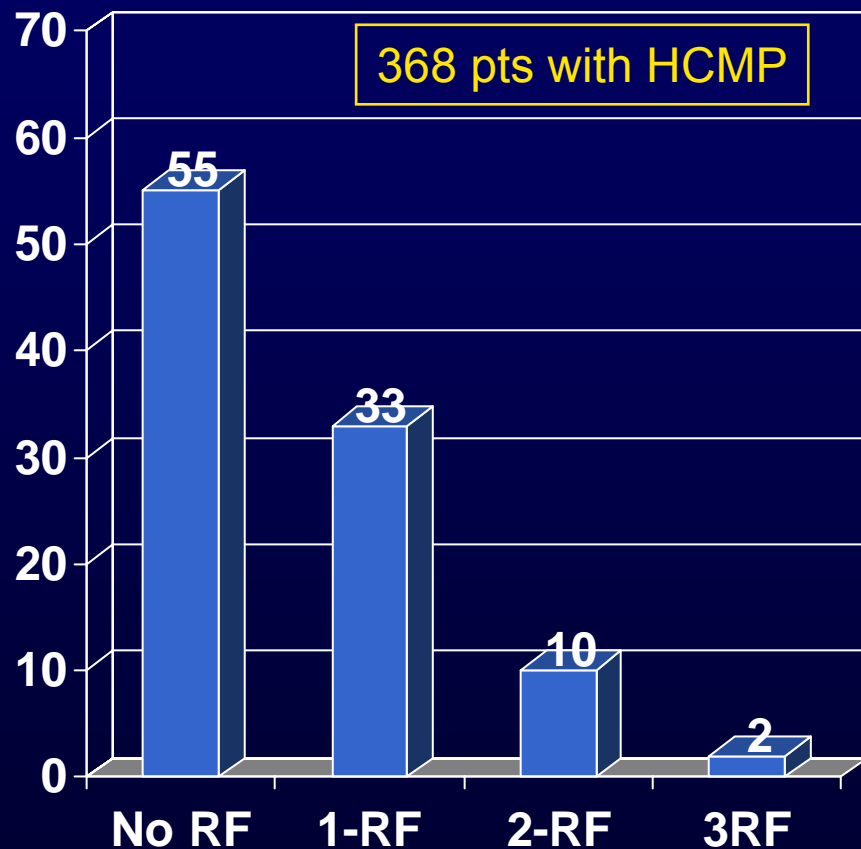
Identification of Pts at Risk for Sudden Death



Elliot PM , WJ McKenna J Am Coll Cardiol 2000; 36: 2212-8

Hypertrophic Cardiomyopathy

Identification of Pts at Risk for Sudden Death



ACC/ESC EXPERT CONSENSUS DOCUMENT

American College of Cardiology/
European Society of Cardiology Clinical Expert
Consensus Document on Hypertrophic Cardiomyopathy

Major Risk Factors for SD in HCMP

- Cardiac arrest
- Spontaneous s-VT
- Family history of premature SD
- Unexplained syncope
- LV thickness \geq 30 mm
- Abnormal exercise blood pressure
- Spontaneous ns-VT

ACC/ESC EXPERT CONSENSUS DOCUMENT

American College of Cardiology/
European Society of Cardiology Clinical Expert
Consensus Document on Hypertrophic Cardiomyopathy

Possible Risk Factors for SD in HCMF in Individual Patients

- Atrial fibrillation
- Myocardial ischemia
- LV outflow obstruction
- High-risk mutation
- Intensive competitive physical exertion

Hypertrophic Cardiomyopathy (HCM)

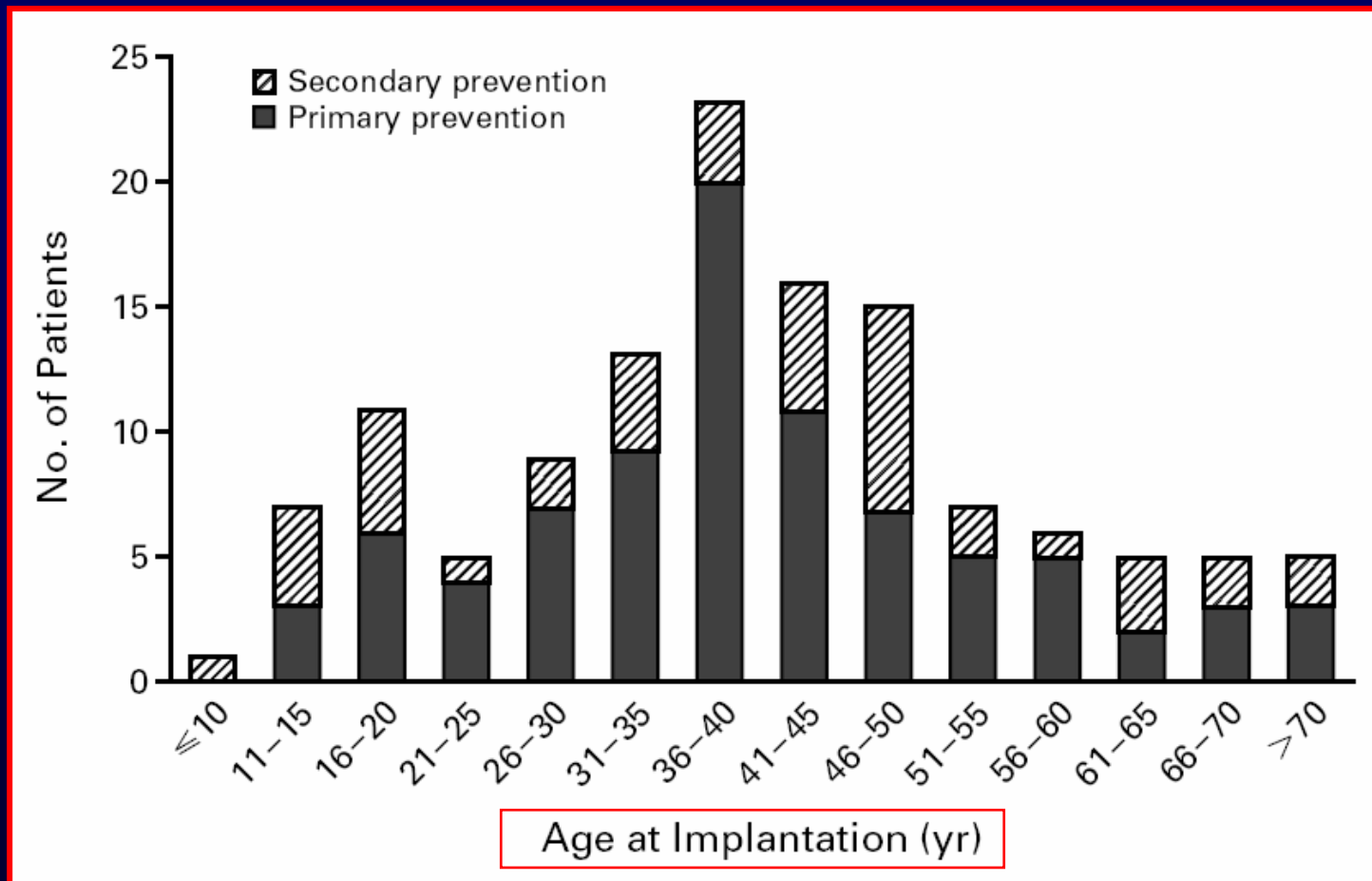
Class	I	Ila	Ilb
Risk Stratification	<ul style="list-style-type: none">•VTs•VF	<ul style="list-style-type: none">•Fam. Hist. SCD•Syncope•LVH >3cm•VTns•Hypot. EST	<ul style="list-style-type: none">•High risk mutation

VF = ventricular fibrillation; VTs= sustained ventricular tachycardia;
Fam Hist SCD = familial history of sudden cardiac death; LVH = left ventricular hypertrophy;
VTns = non sustained ventricular tachycardia; Hypot. EST = hypotensive response during exercise stress test.

Hypertrophic Cardiomyopathy

Implantable Defibrillators for Prevention of SD

Age @ the Implantation



Maron BJ et al. N Engl J Med 2000; 342: 365-73

Hypertrophic Cardiomyopathy Implantable Defibrillators for Prevention of SD 128 pts Who Received ICD

Maron BJ et al.

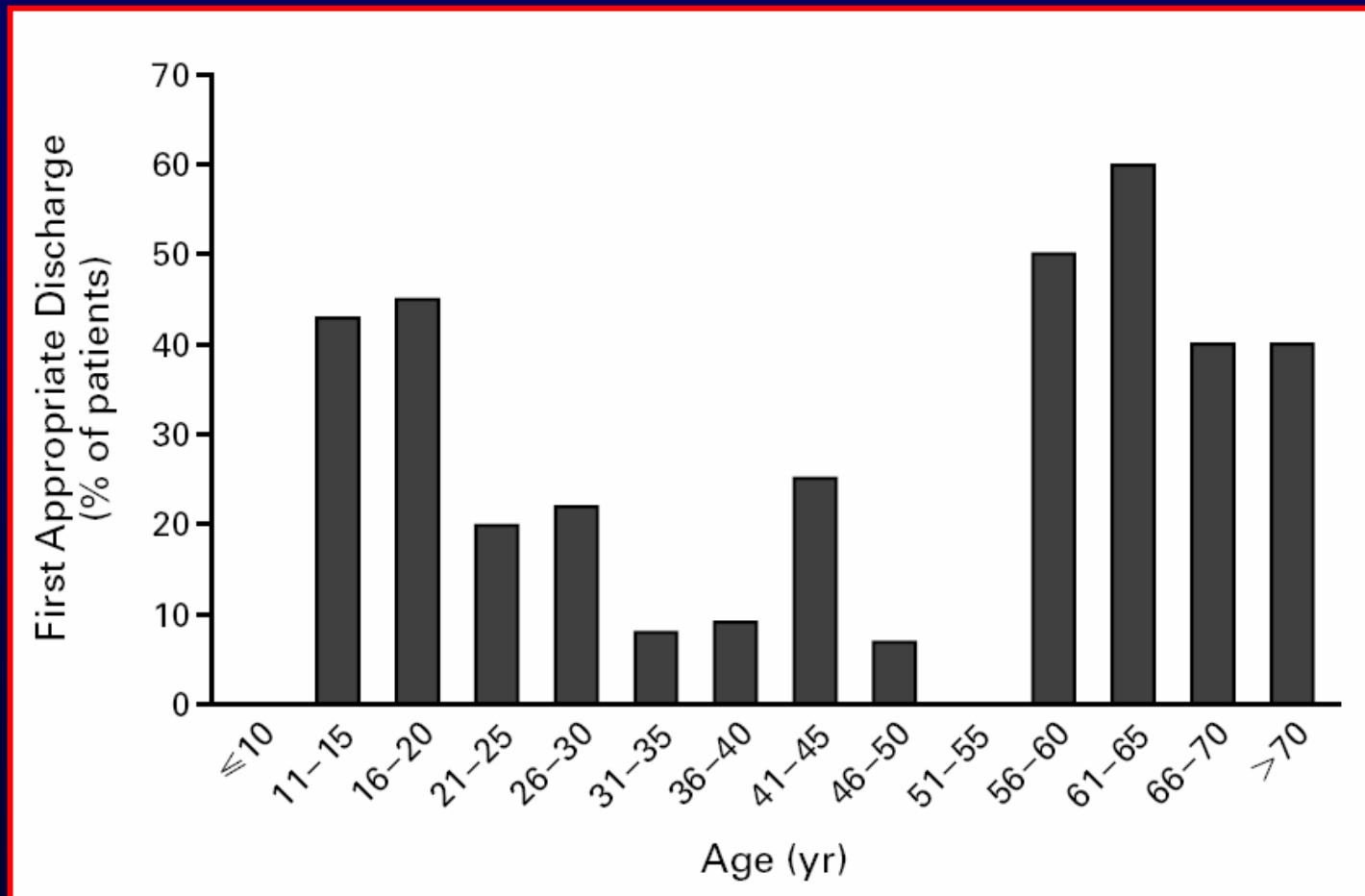
N Engl J Med

2000; 342: 365-73

CHARACTERISTIC	VALUE
Mean age — yr	40±16
Male sex — no. (%)	88 (69)
NYHA class — no. (%)	
I	83 (65)
II	27 (21)
III or IV	18 (14)
Antiarrhythmic drugs — no.	
Amiodarone	
Before implantation	33
After implantation	22
Sotalol	
Before implantation	13
After implantation	11
Disopyramide	
Before implantation	7
After implantation	8
Maximal LV-wall thickness — mm	
Mean	23±7
Range	14–60
LV end-diastolic cavity dimension — mm	
Mean	44±8
Range	23–61
Left atrial dimension — mm	
Mean	44±6
Range	26–62
LV outflow gradient — no. (%)	
≥30 mm Hg	23 (18)
<30 mm Hg	105 (82)
Electrophysiologic testing to induce VT or VF — no.	
Not inducible	12
Inducible	79

Hypertrophic Cardiomyopathy

Implantable Defibrillators for Prevention of SD Age @ First Appropriate Discharge

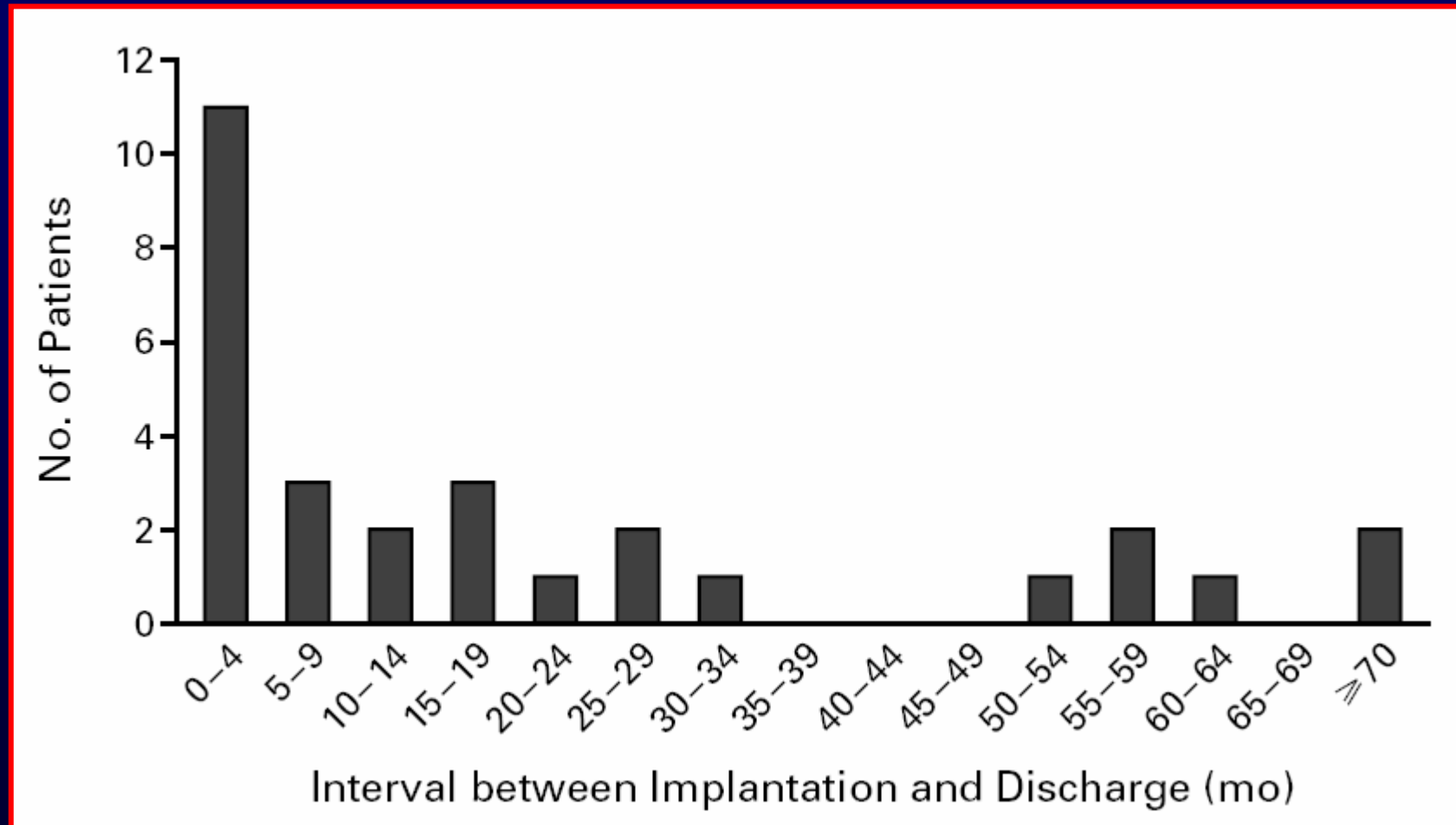


Maron BJ et al. N Engl J Med 2000; 342: 365-73

Hypertrophic Cardiomyopathy

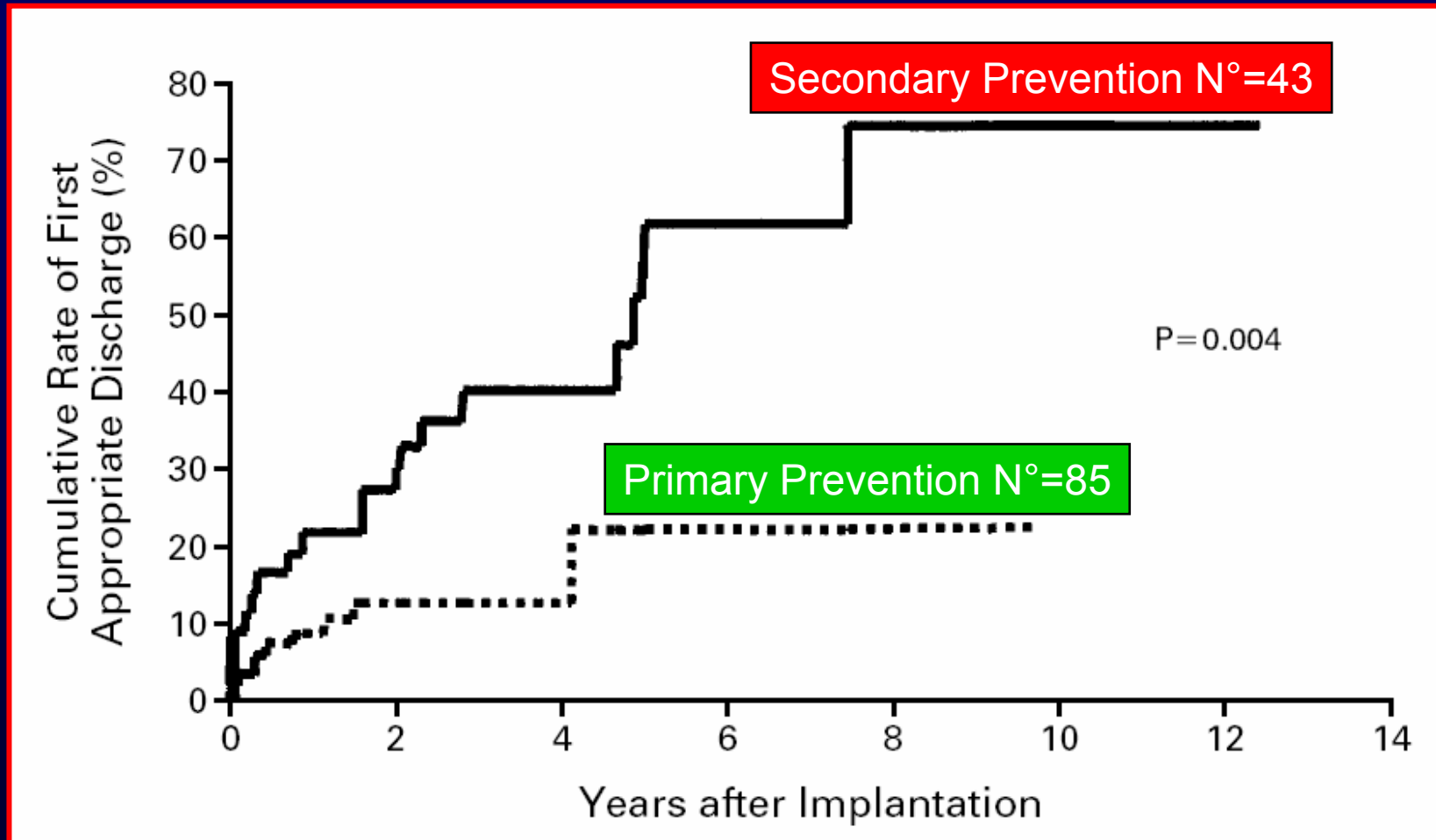
Implantable Defibrillators for Prevention of SD

Interval Between Implantation and First appropriate Discharge



Hypertrophic Cardiomyopathy

Implantable Defibrillators for Prevention of SCD Cumulative Risk of First Appropriate Discharge



Maron BJ et al. N Engl J Med 2000; 342: 365-73




REVIEW

**Efficacy of Implantable Cardioverter Defibrillator
Therapy for Primary and Secondary Prevention of
Sudden Cardiac Death in Hypertrophic Cardiomyopathy**

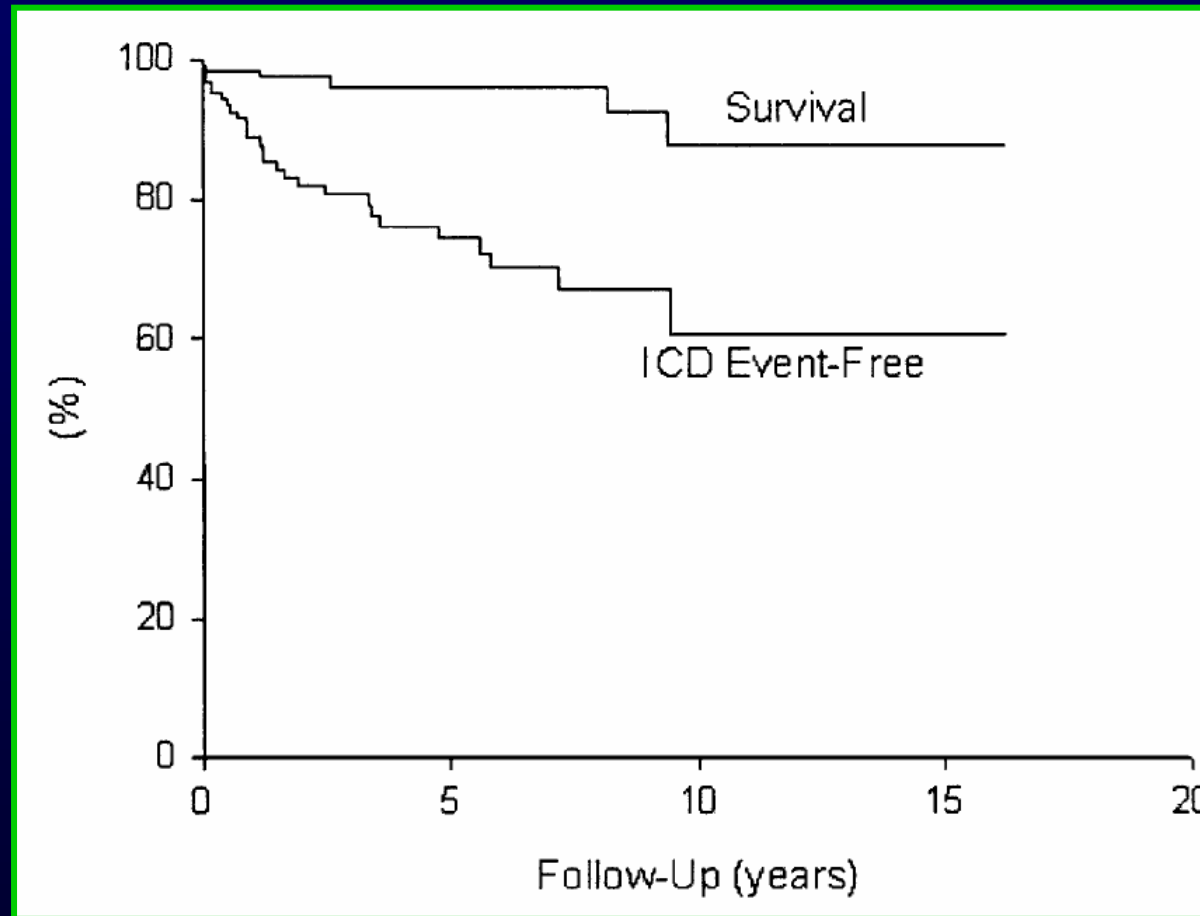
DAVID A. BEGLEY, SAIDI A. MOHIDDIN, DOROTHY TRIPODI, JUDITH B. WINKLER,
and LAMEH FANANAPAZIR

From the Cardiovascular Branch, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda,
Maryland



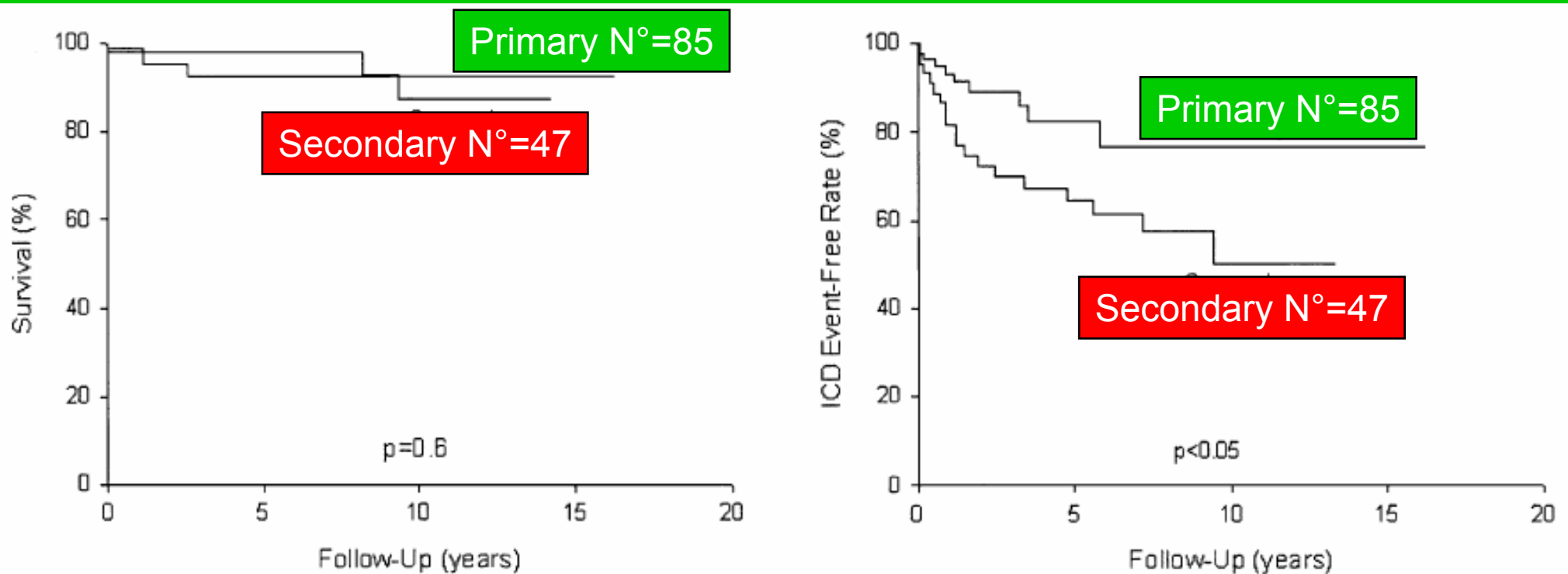
Hypertrophic Cardiomyopathy

Implantable Defibrillators for Prevention of SD Survival Rates & Therapeutic ICD Interventions



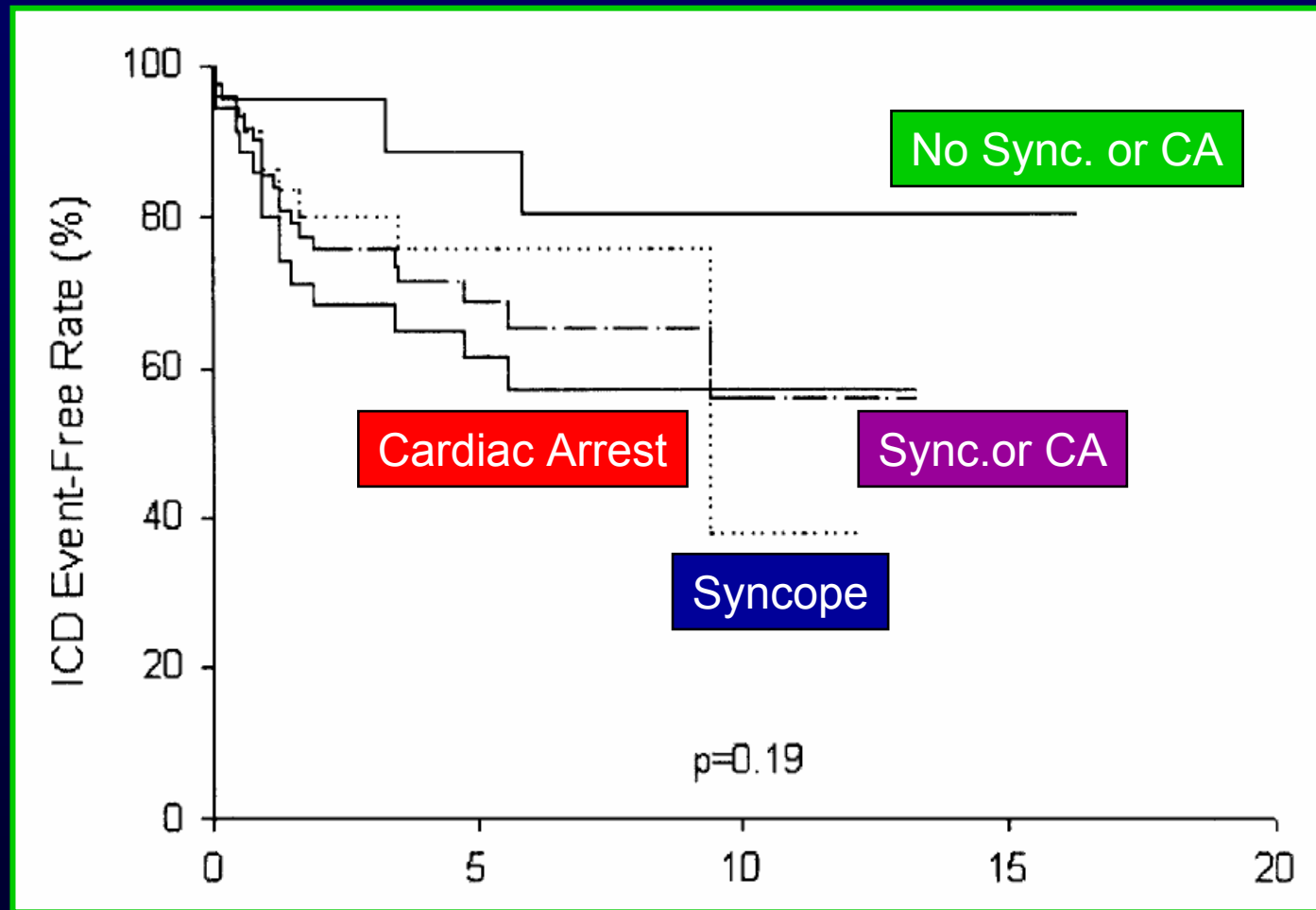
Hypertrophic Cardiomyopathy

Implantable Defibrillators for Prevention of SCD Survival Rates & Therapeutic ICD Interventions



Hypertrophic Cardiomyopathy

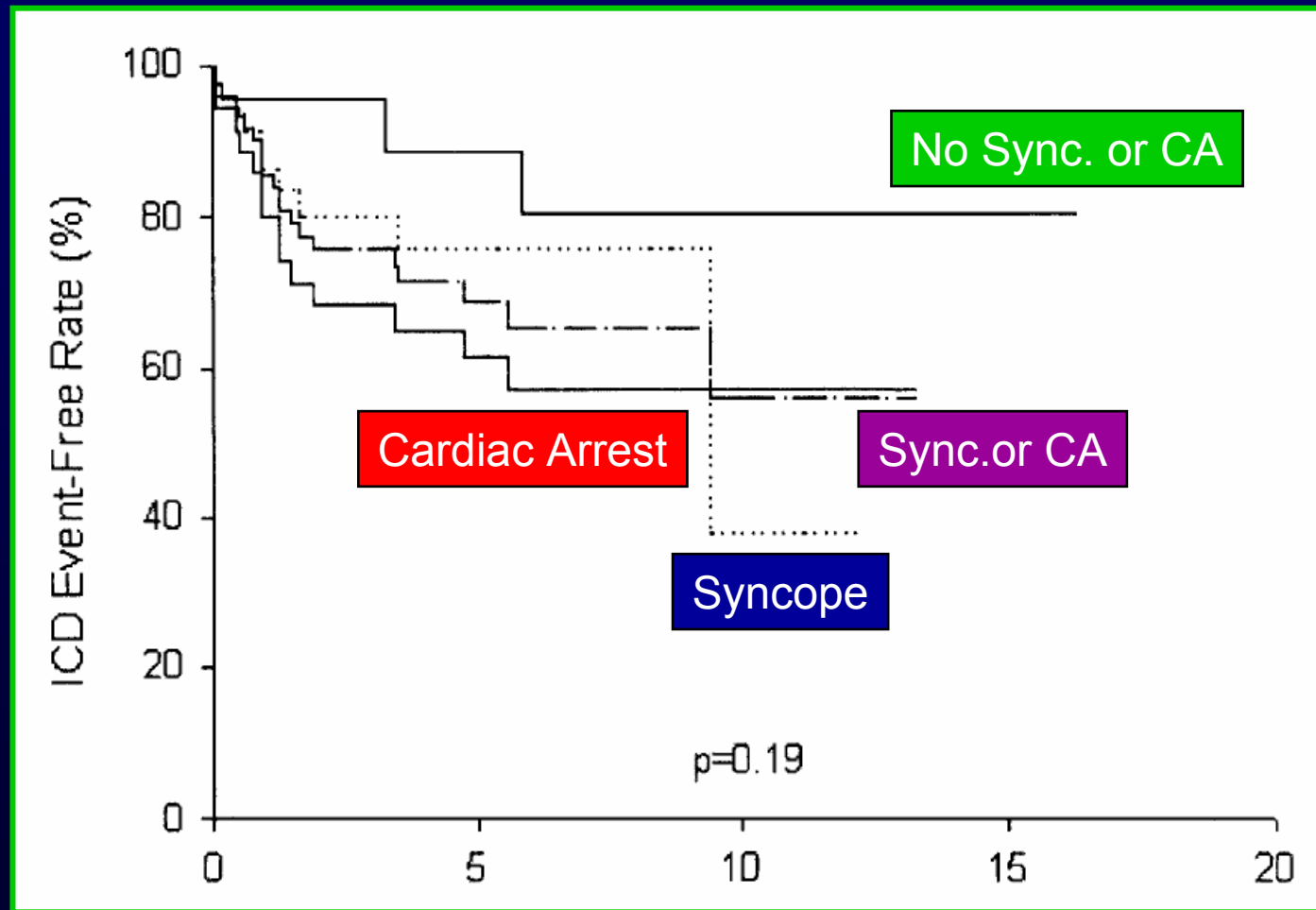
Implantable Defibrillators for Prevention of SD Therapeutic ICD Interventions Regarding Presentation



Hypertrophic Cardiomyopathy

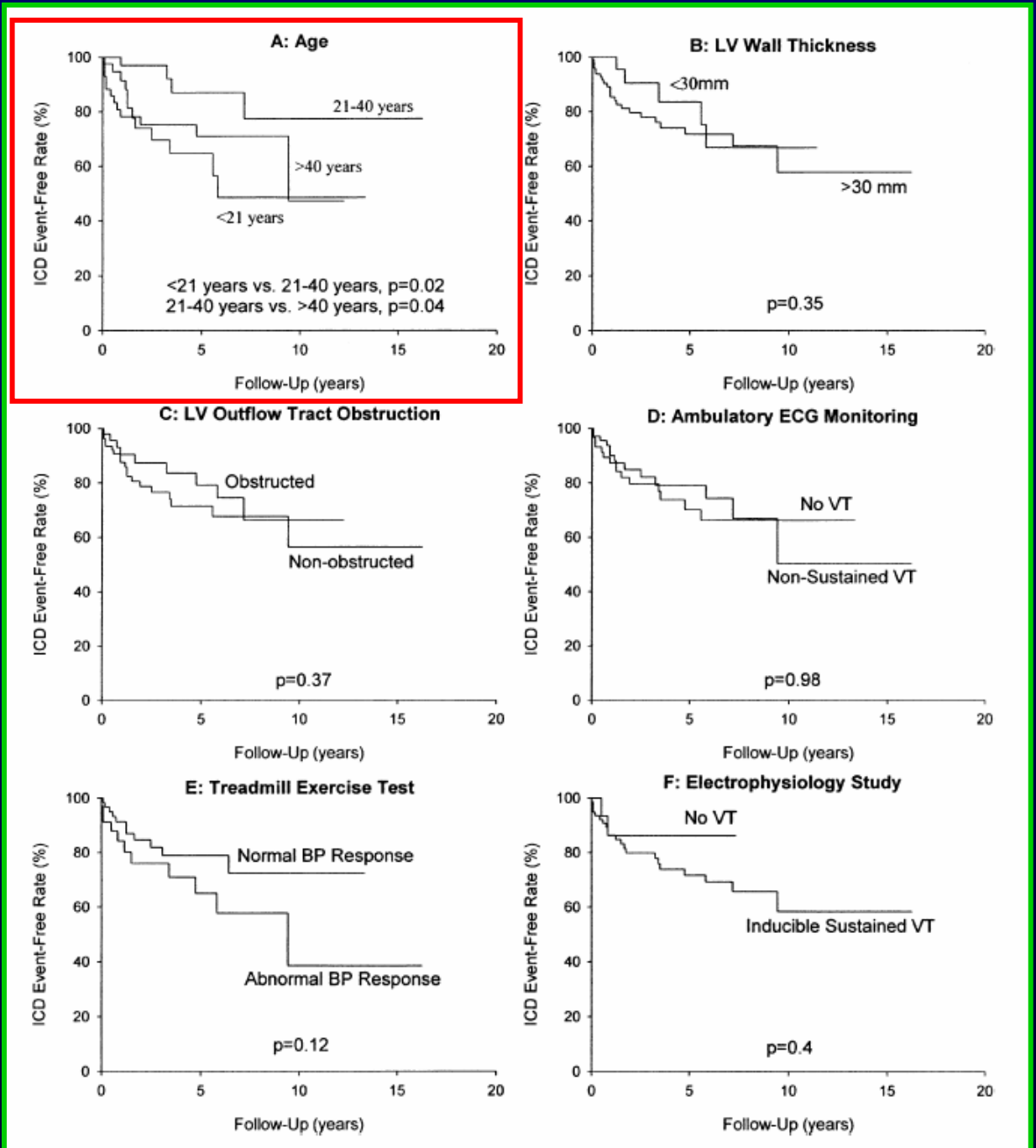
Implantable Defibrillators for Prevention of SD

Therapeutic ICD Interventions Regarding Presentation



Hypertrophic Cardiomyopathy Implantable Defibrillators for Prevention of SD Relation Between Therapeutic Intervention and Risk Factors

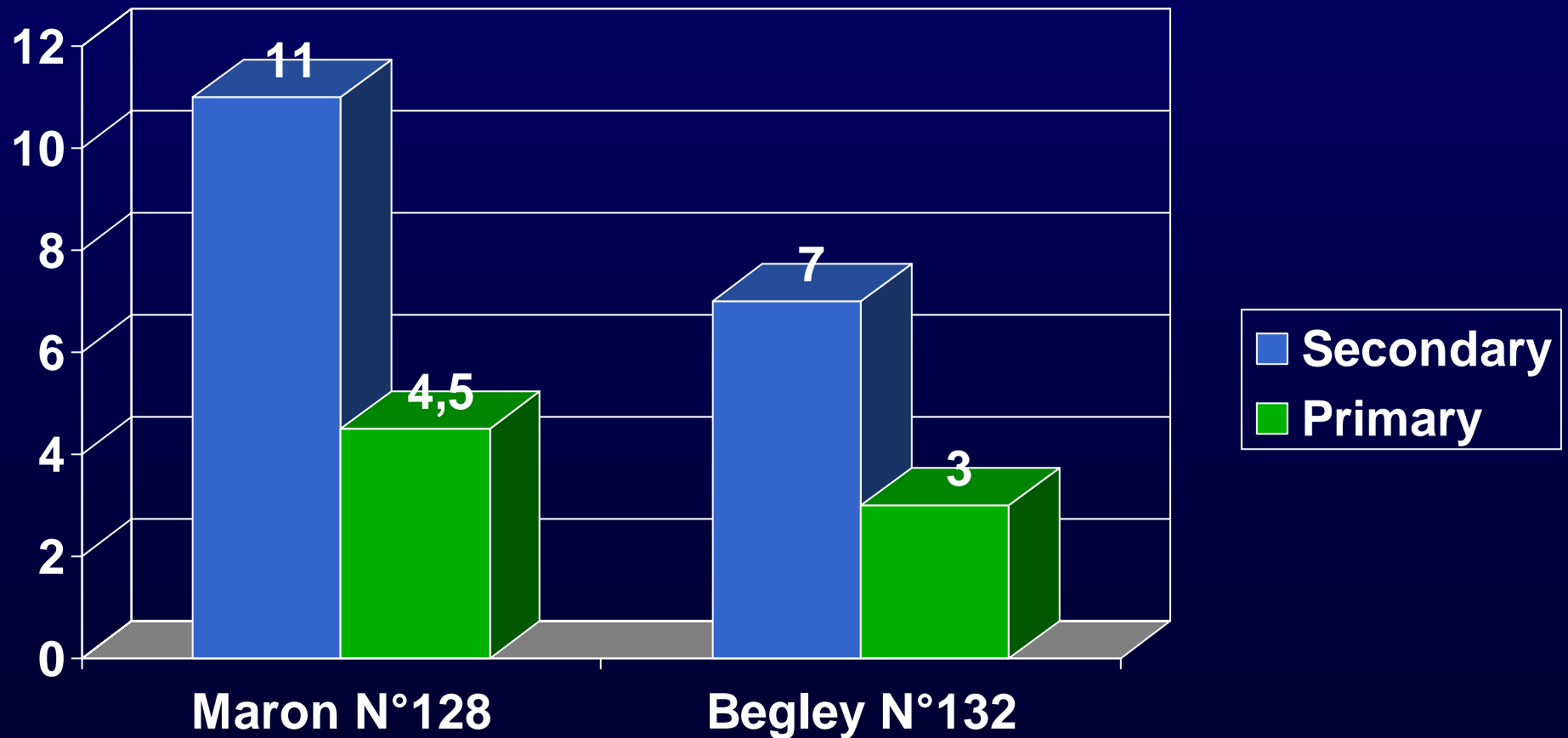
Begley DA.
PACE 2003;
26: 1887-1896



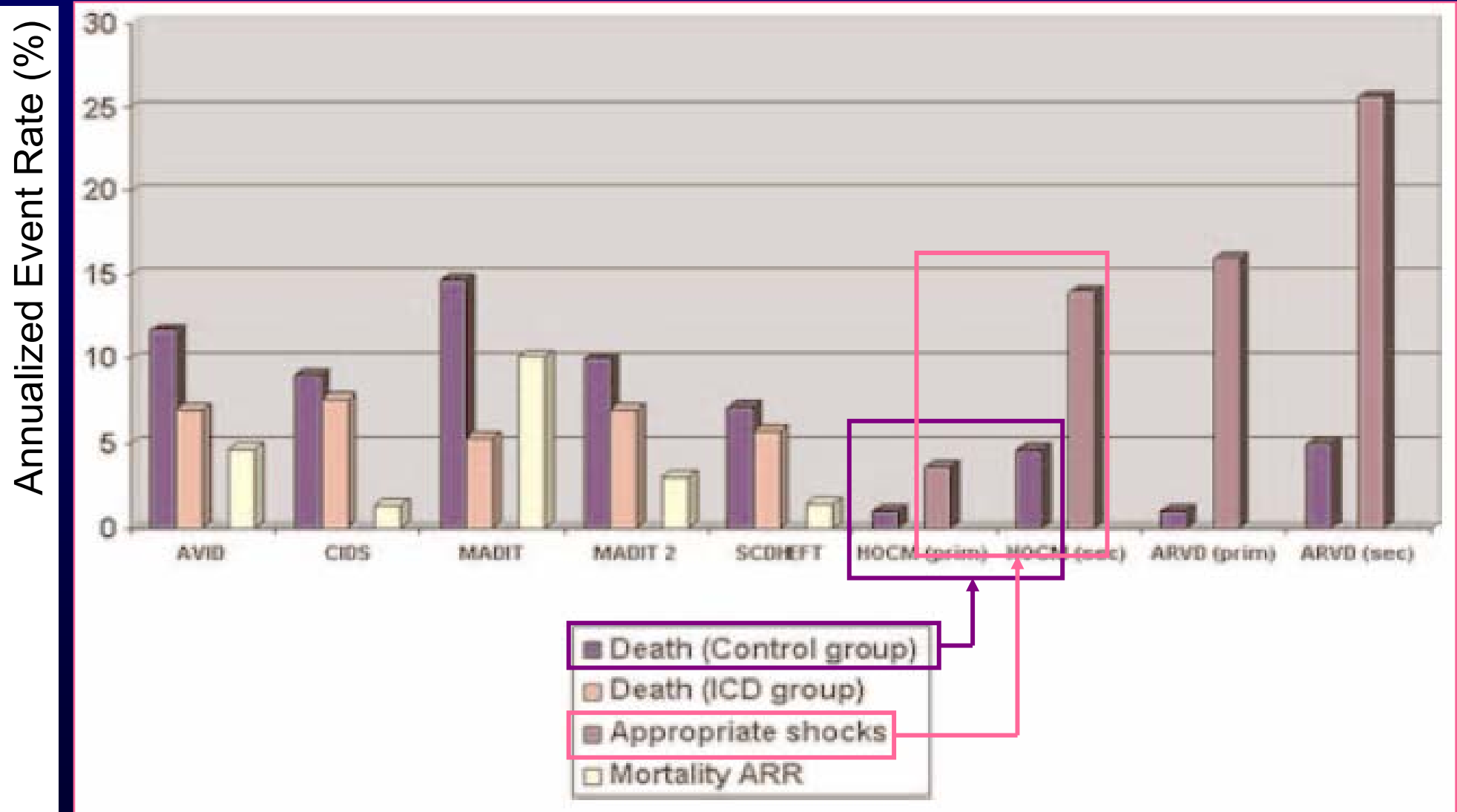
Hypertrophic Cardiomyopathy

Implantable Defibrillators for Prevention of SD

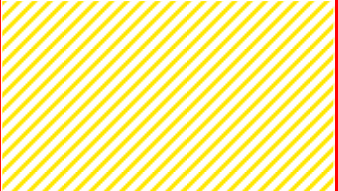


Average Annual Event Rate



Average Annual Event Rate Over 3 Years



Hypertrophic Cardiomyopathy (HCM)

Class	I	IIa	IIb
Primary Prevention		•ICD	•Amiodarone
Secondary Prevention	•ICD		

Class IIb Indications for ICD Therapy

3. Familial or inherited conditions with a high risk for life-threatening ventricular tachyarrhythmias such as long QT syndrome or **hypertrophic cardiomyopathy** (Level of Evidence: B)



AIAC

Italian Association of Arrhythmology

Guidelines for Implantation of ICD in HCM

→ Class I

- Previous CA
- Recurrent VT

→ Class II

- History of SD in ≥ 2 familiar
- High-grade (>30 mm) LV hypertrophy in young people