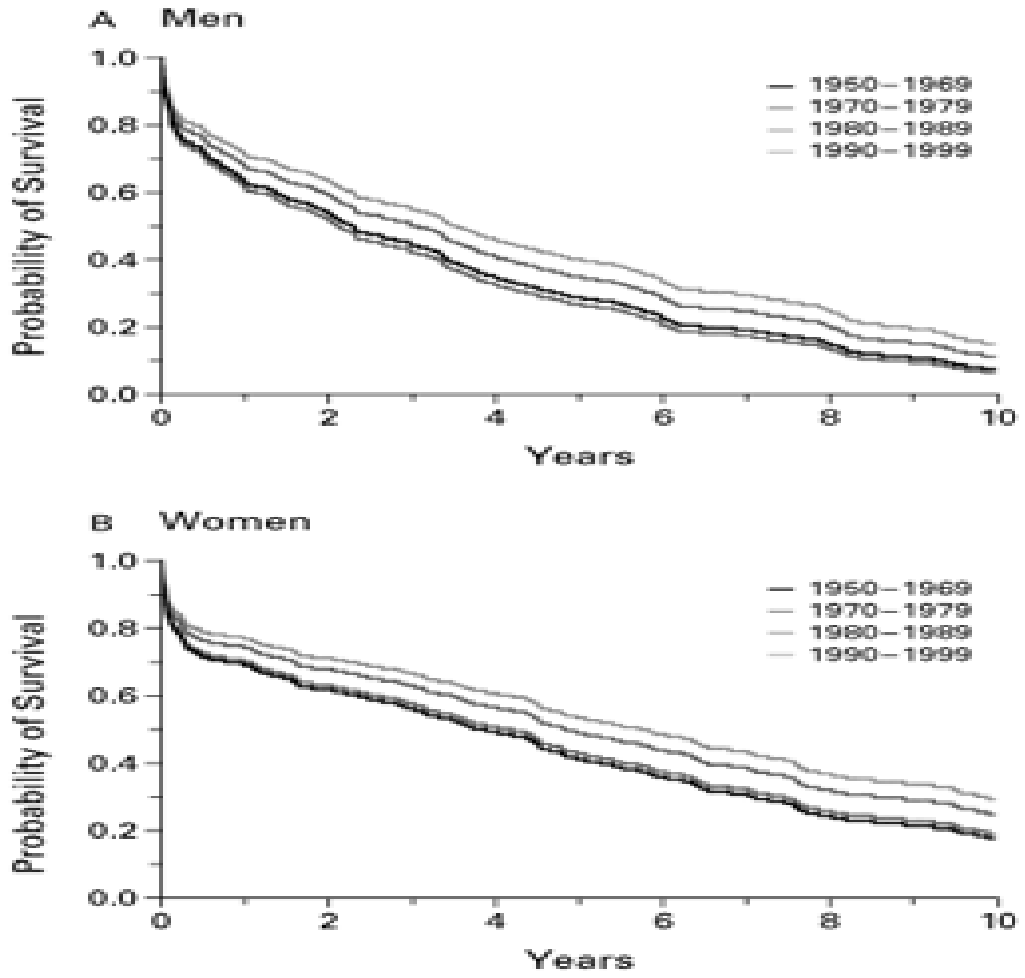
Défibrillateurs dans les Cardiopathies Ischémiques et Dilatées

Simon ABOU JAOUDE
Service de Cardiologie
Hôtel-Dieu, Beyrouth

Survival Trends in Heart Failure

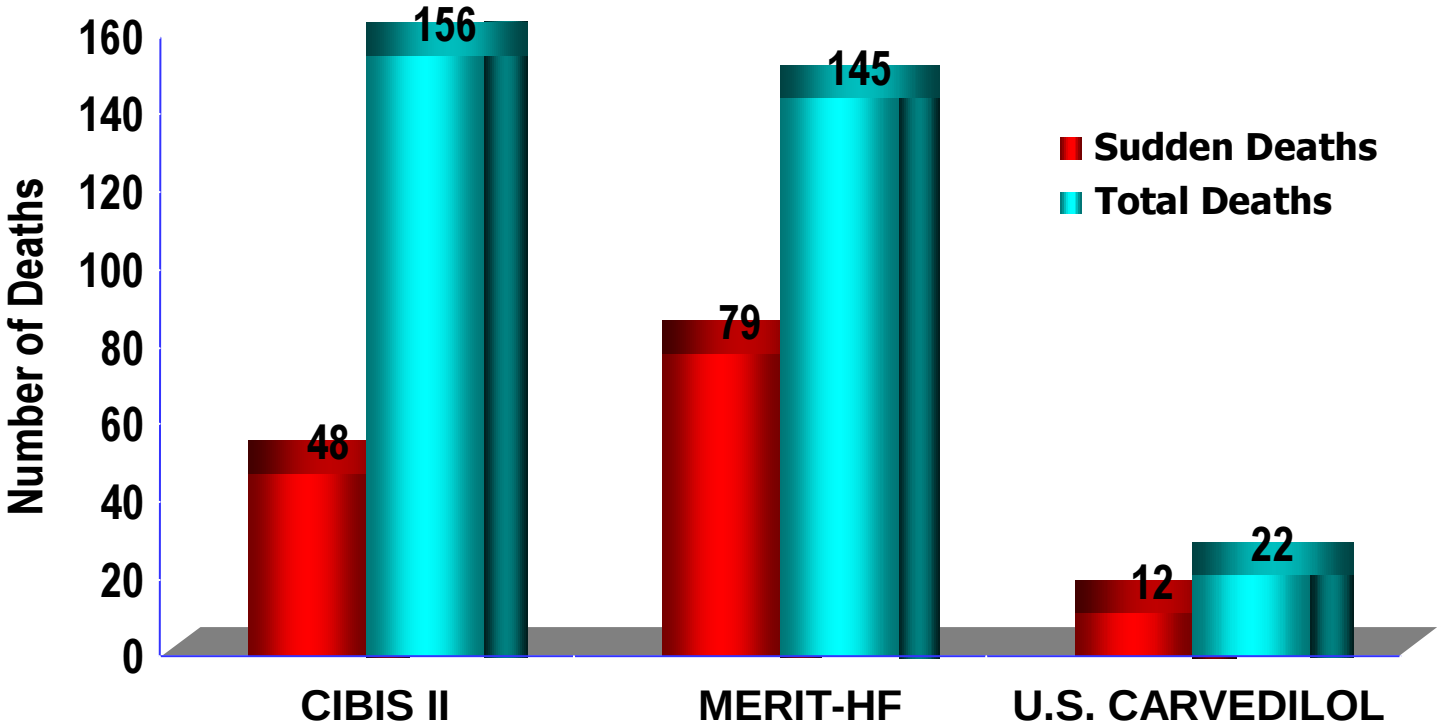


5 years survival : < 50%.

Levy D.

N Engl J Med 2002; 347: 1397-402.

Risk of SCD in Treatment Arms of CHF-Beta Blocker Trials



Sudden Death % of Total Death	31%	54%	54%

Many studies have shown that in selected cardiomyopathy patients, ICD therapy can reduce mortality by reducing the risk of sudden death

The main difficulty is to identify the patient at risk who will benefit from ICD implantation

Survivors of SCD, VF or poorly tolerated VT

Recurrence rate

= 25-30 % at one year

SECONDARY PREVENTION

AVID (Antiarrhythmic Drug Versus Defibrillator)

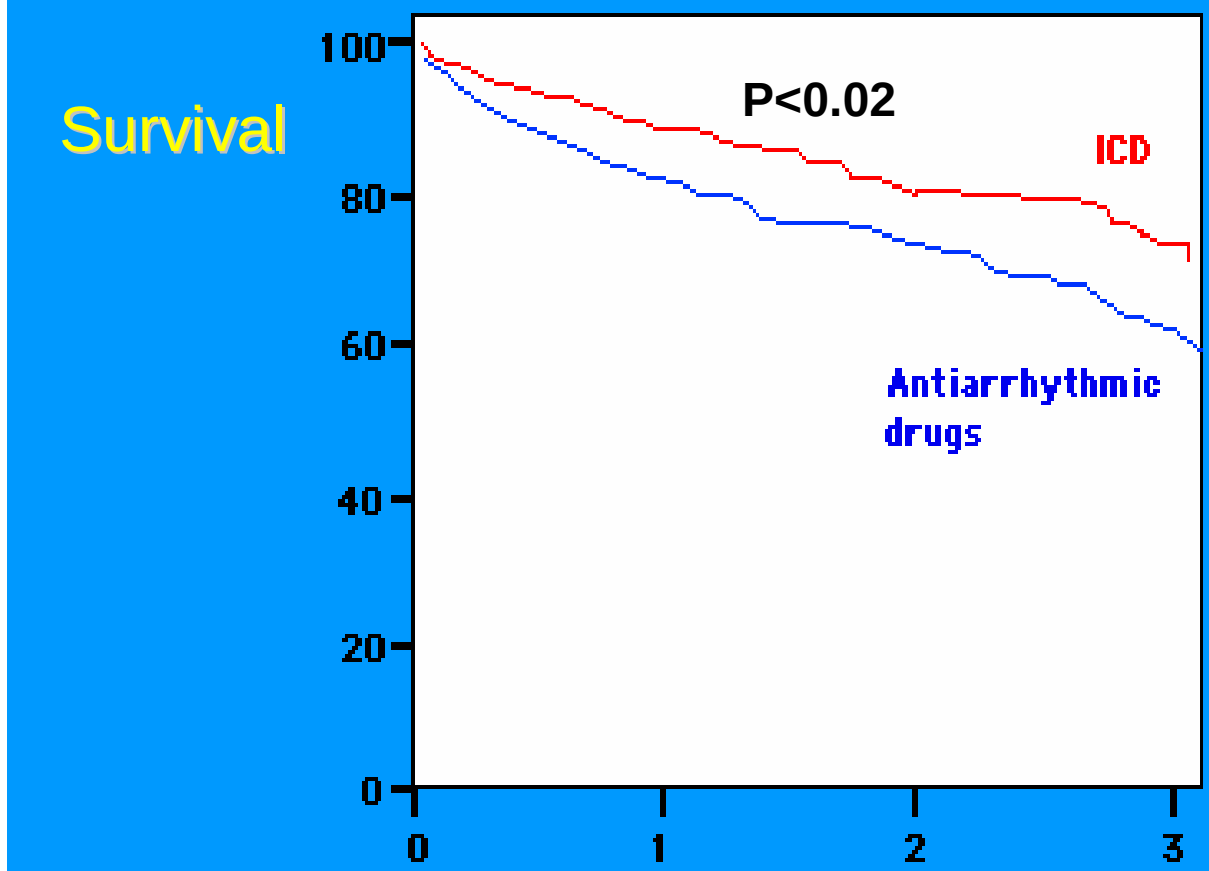
Resuscitated SCD, Syncopal VT

ICD	vs	Amiodarone or Sotalol
507 pts		509 pts

NEJM
1997; 337:1576

SECONDARY PREVENTION

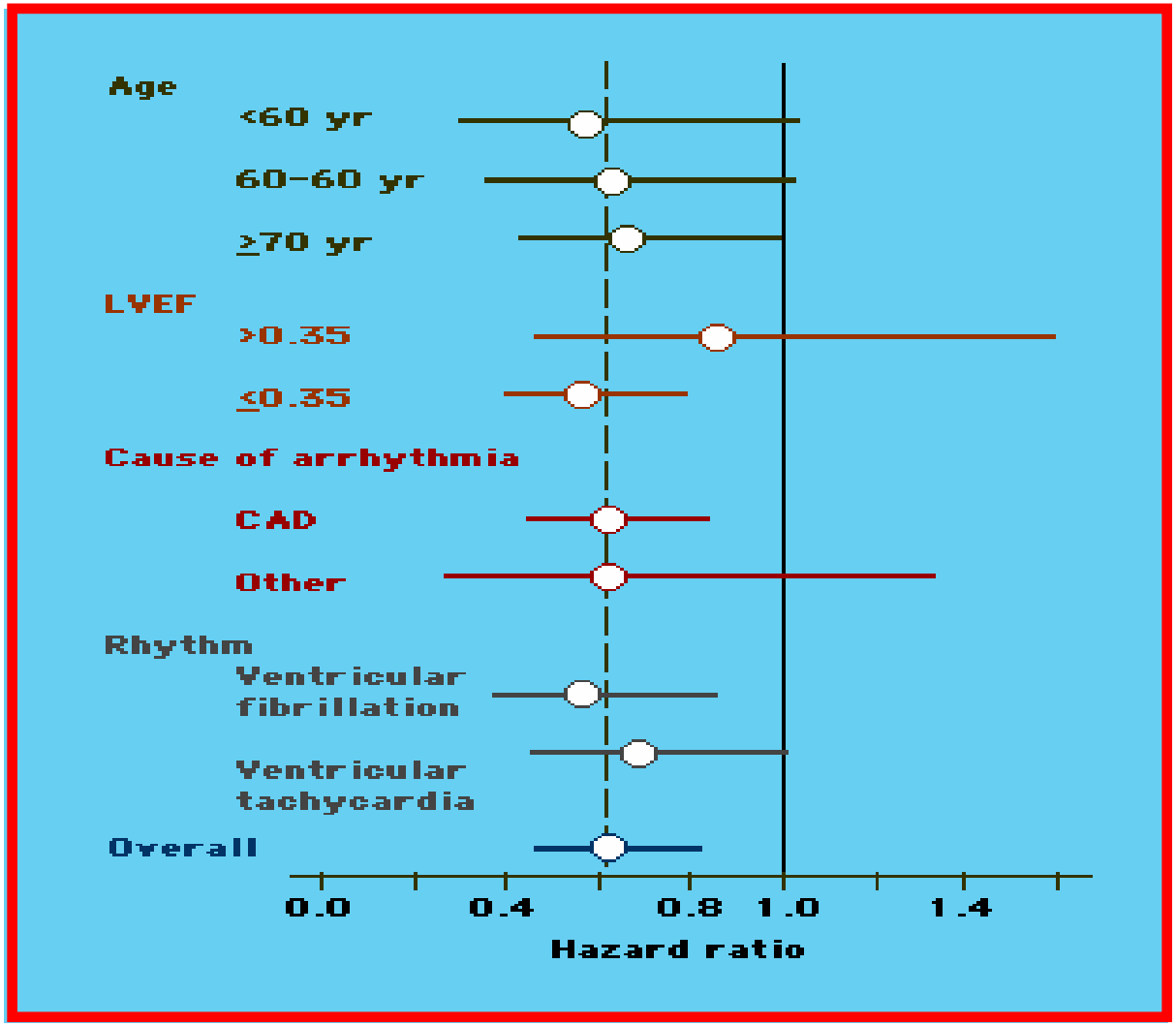
AVID (Antiarrhythmic Drug Versus Defibrillator)



NEJM
1997; 337:1576

SECONDARY PREVENTION

AVID (Antiarrhythmic Drug Versus Defibrillator)

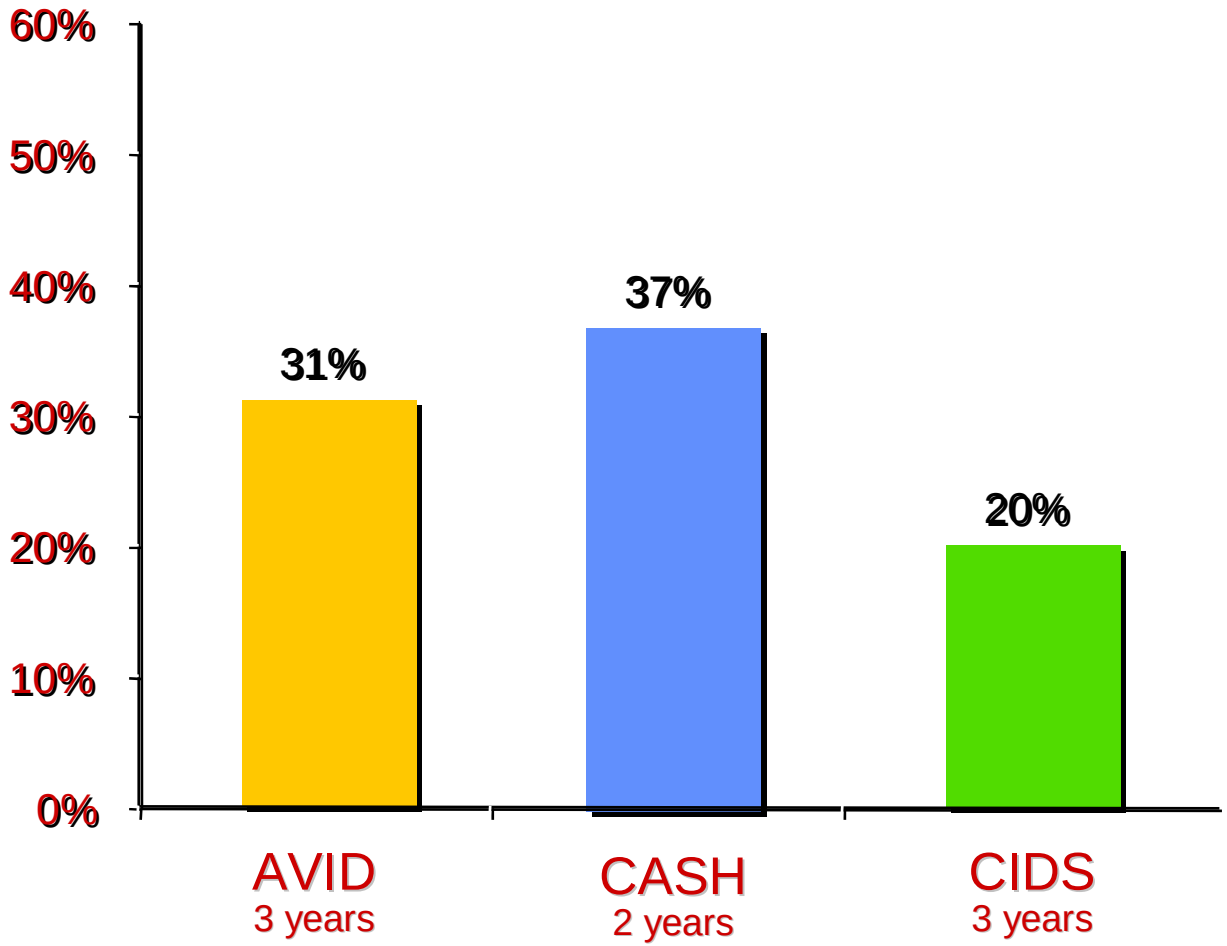


NEJM
1997; 337:1576

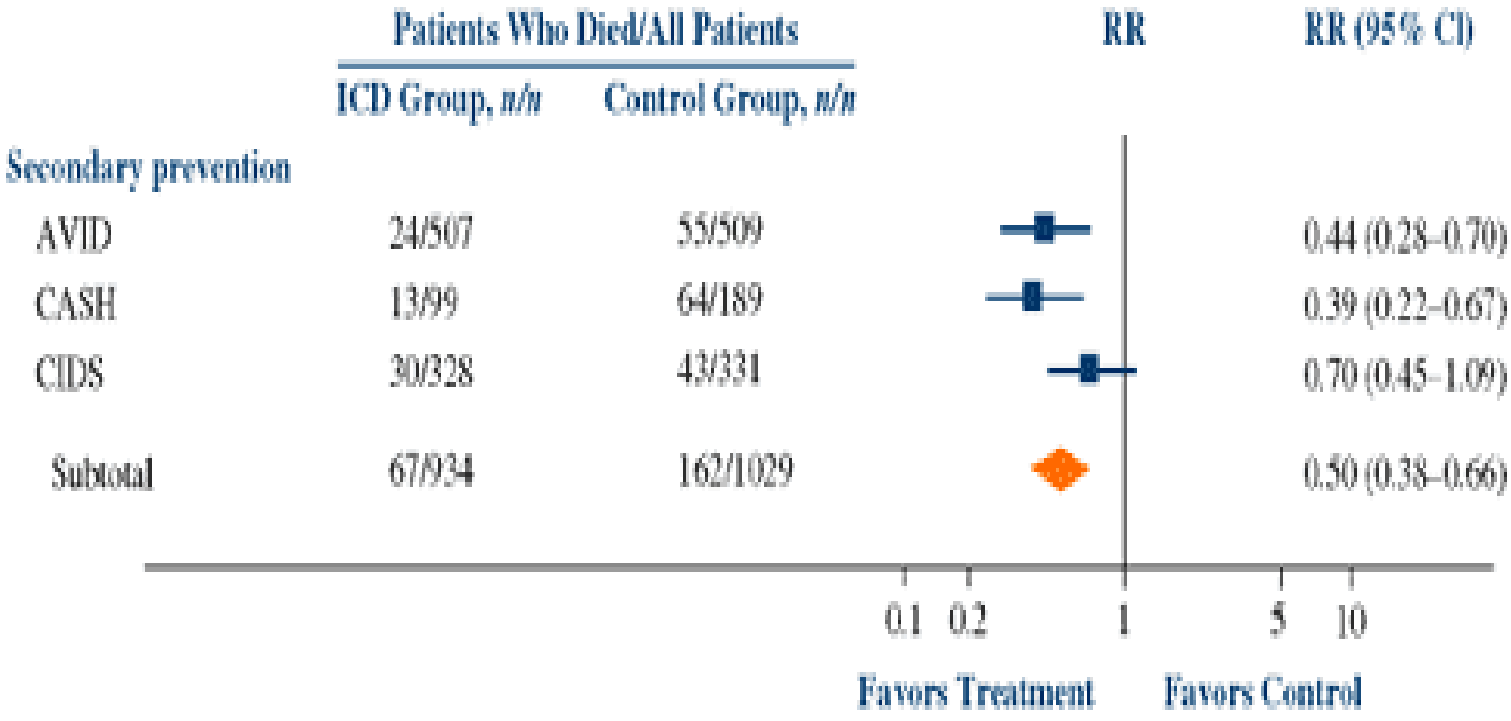
SECONDARY PREVENTION TRIALS

% Mortality Reduction

ICD vs AA drugs



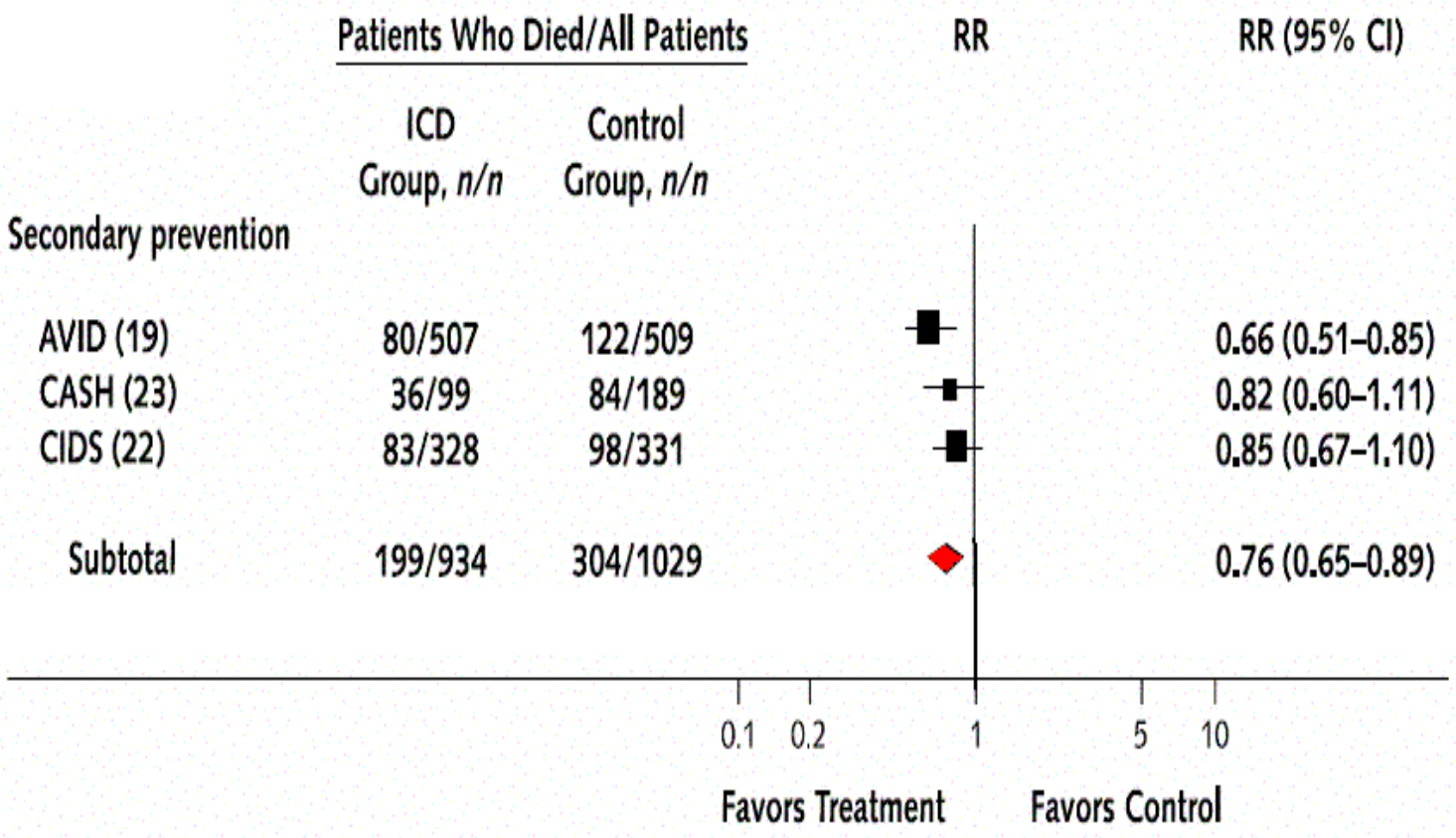
Meta-analysis of secondary prevention trials



Sudden cardiac death

Ezekowitz. Ann Intern Med. 2003;138:445

Meta-analysis of secondary prevention trials



All-cause mortality

Ezekowitz. Ann Intern Med. 2003;138:445

SECONDARY PREVENTION

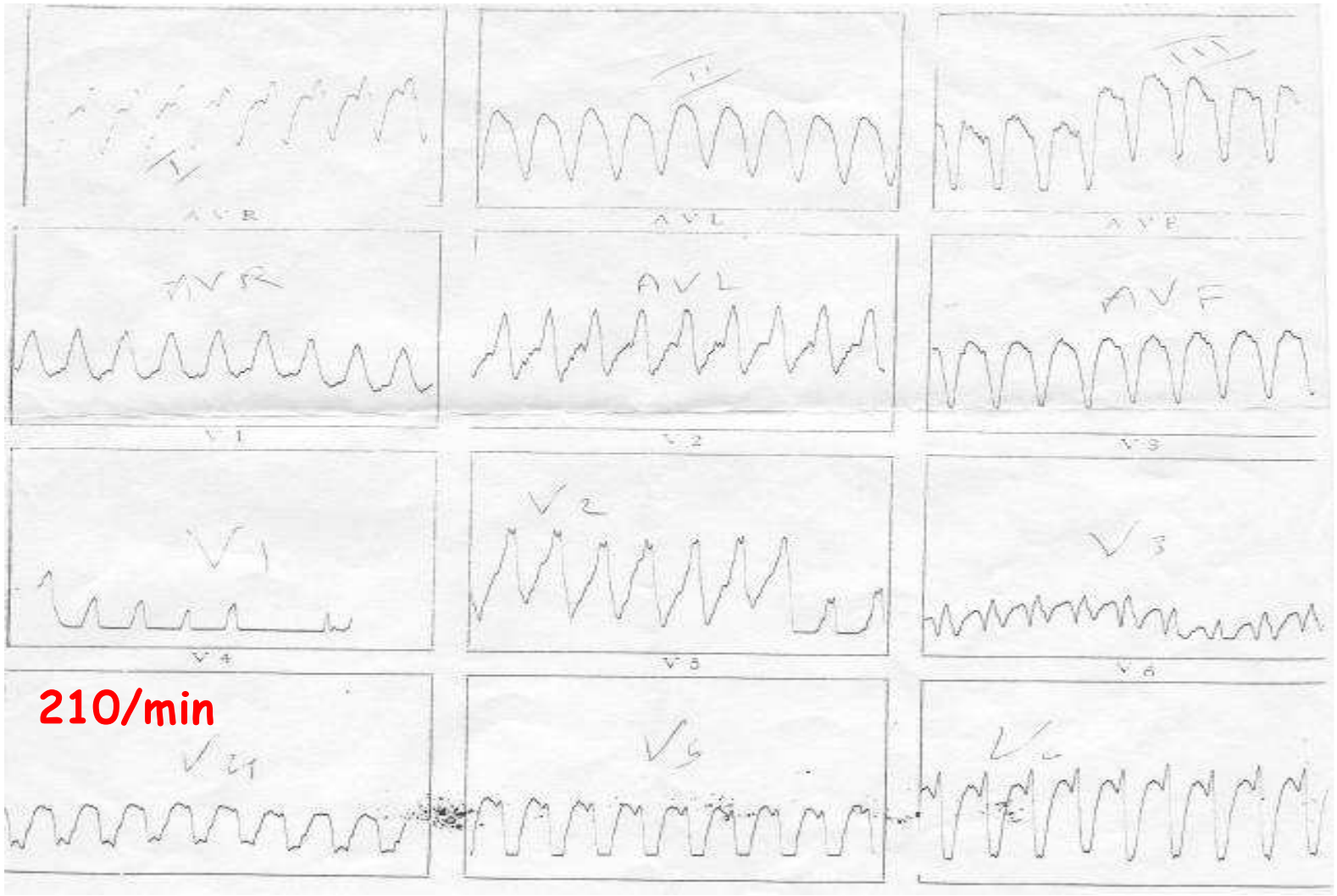
ACC/AHA/NASPE 2002 Guidelines

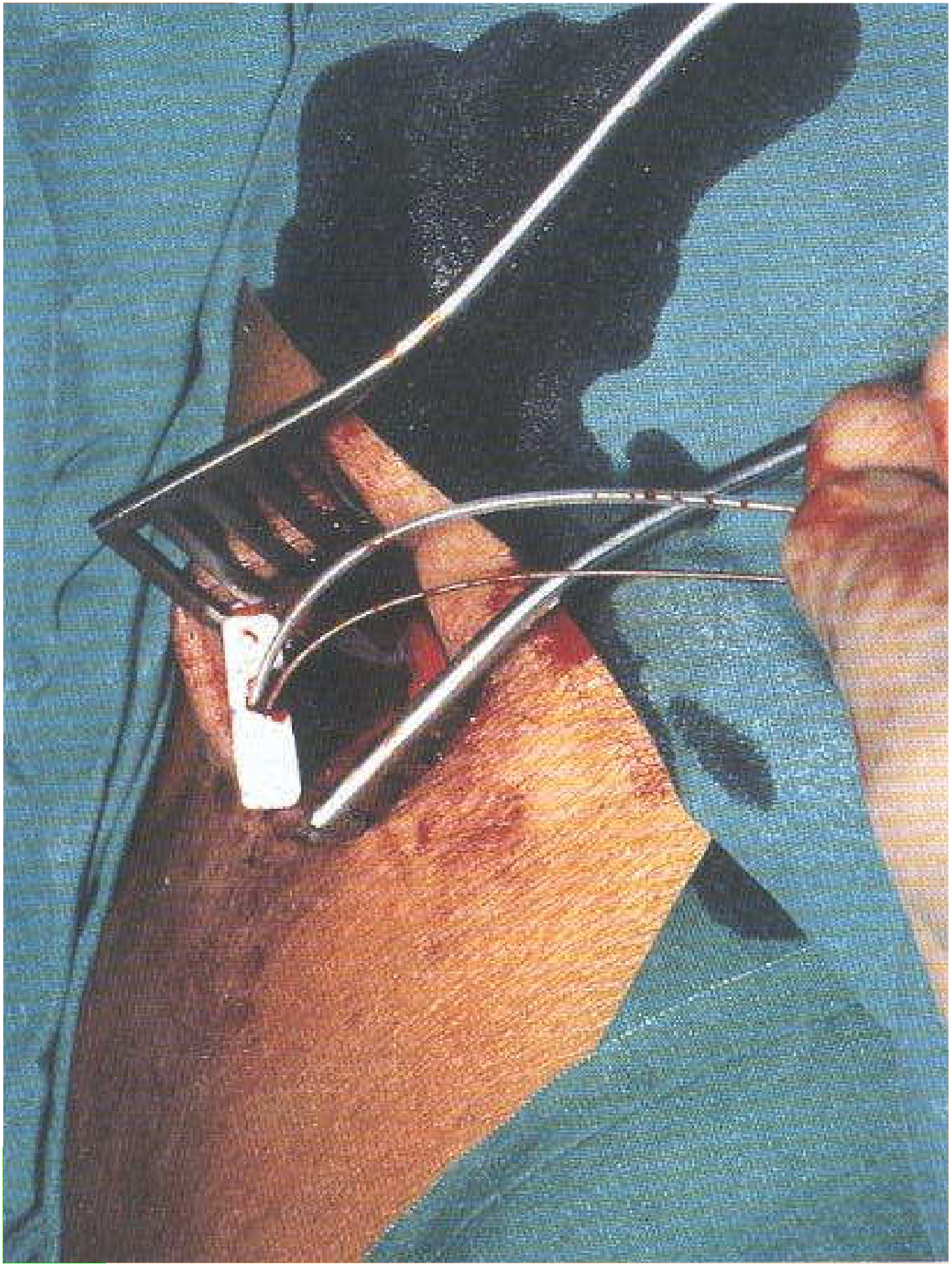
ICD indications in CAD and DCM pts

- Cardiac arrest due to VF or VT not due to a transient or reversible cause.

- Spontaneous sustained VT.

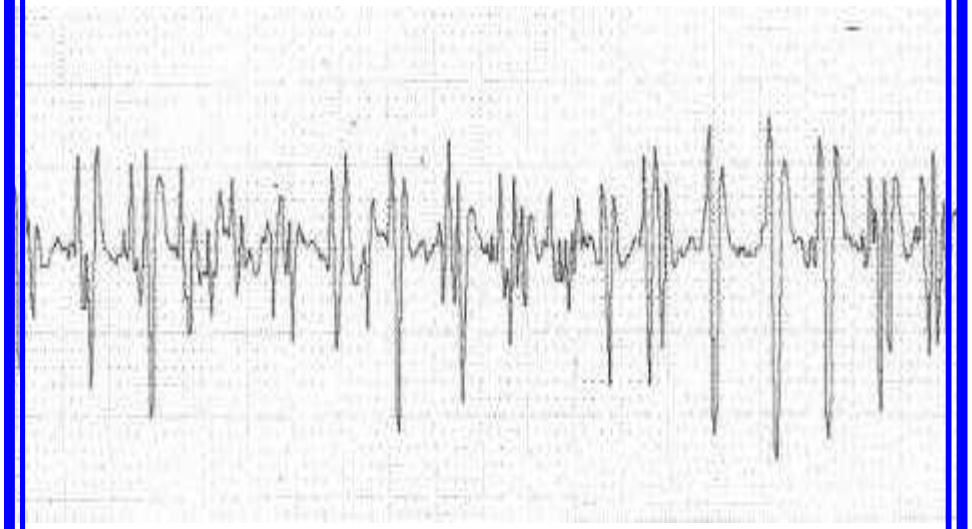
M 68y, DCM since 1996, EF = 20%
1999 : Syncope => Fast VT





2000 : Syncope and choc

Endocavitary tracing

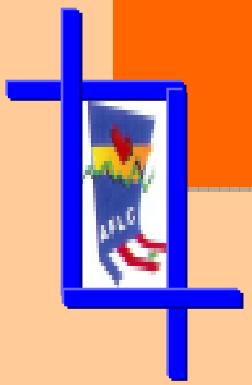


ICD interrogation

Endocavitary tracing

PLACE OF ICDs IN PRIMARY PREVENTION

Primary Prevention Trials

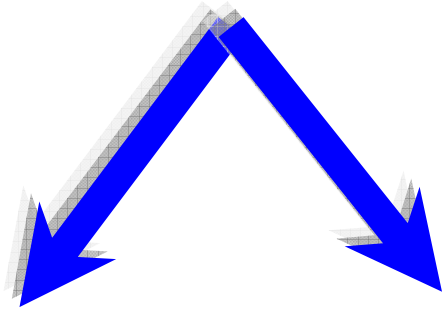


isch CM	dilated CM
CABG PATCH	CAT
MADIT	AMIOVERT
MUSTT	
MADIT II	DEFINITE
SCD-HeFT	

MADIT II

Post-MI patients
EF ≤ 30%

1232 pts



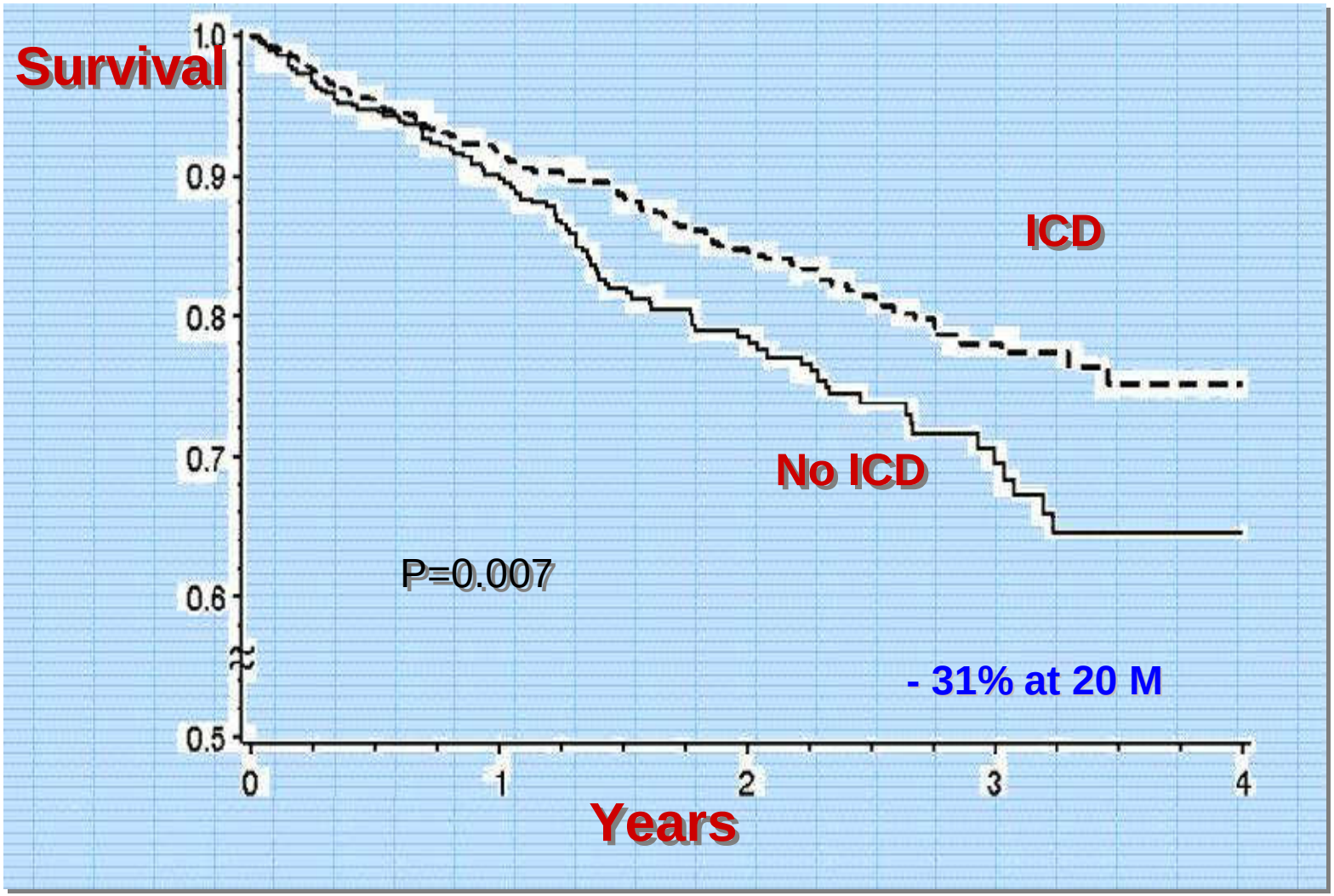
ICD

vs

conventional medical therapy

N Engl J Med 2002; 346:877

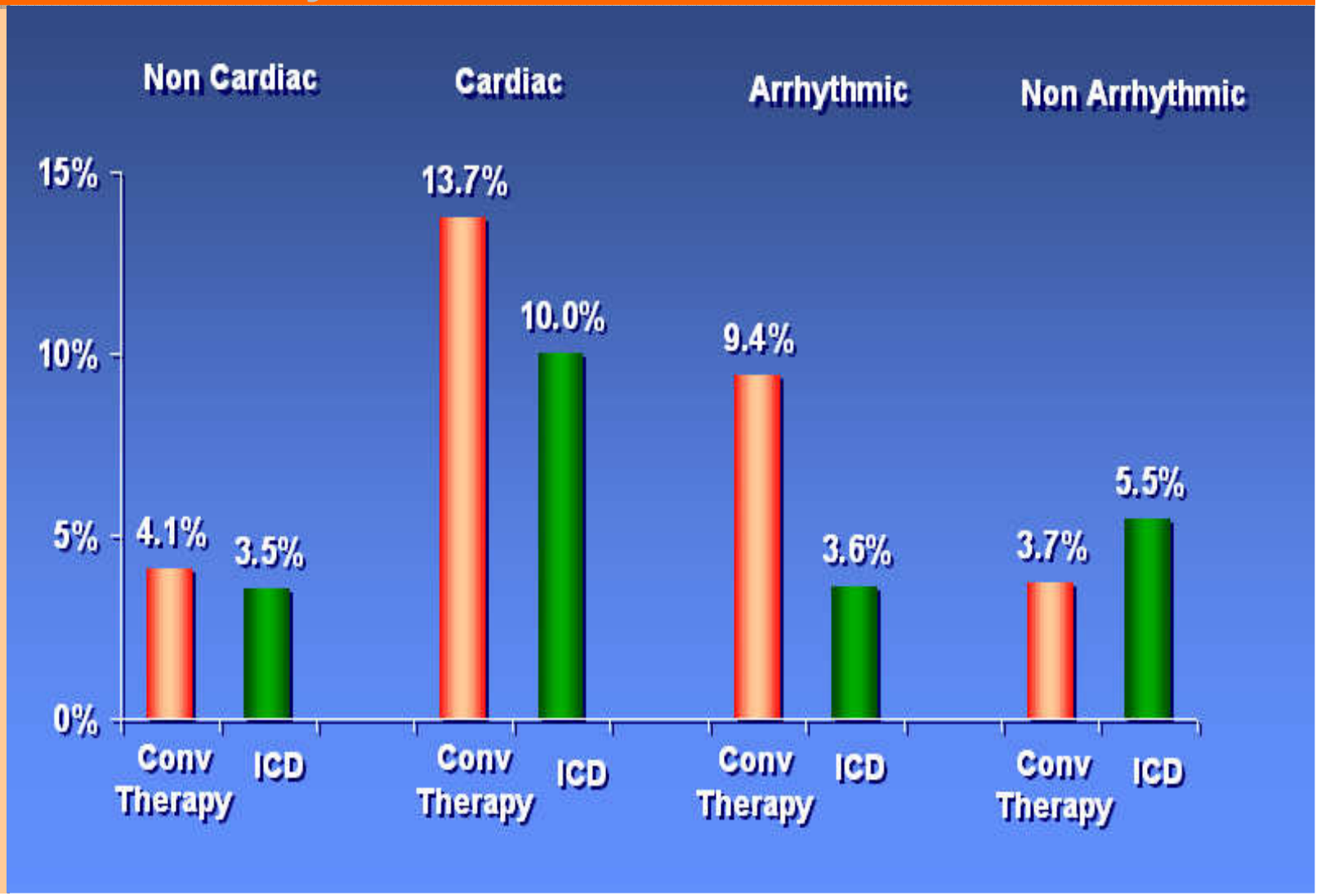
MADIT II



N Engl J Med
2002; 346:877

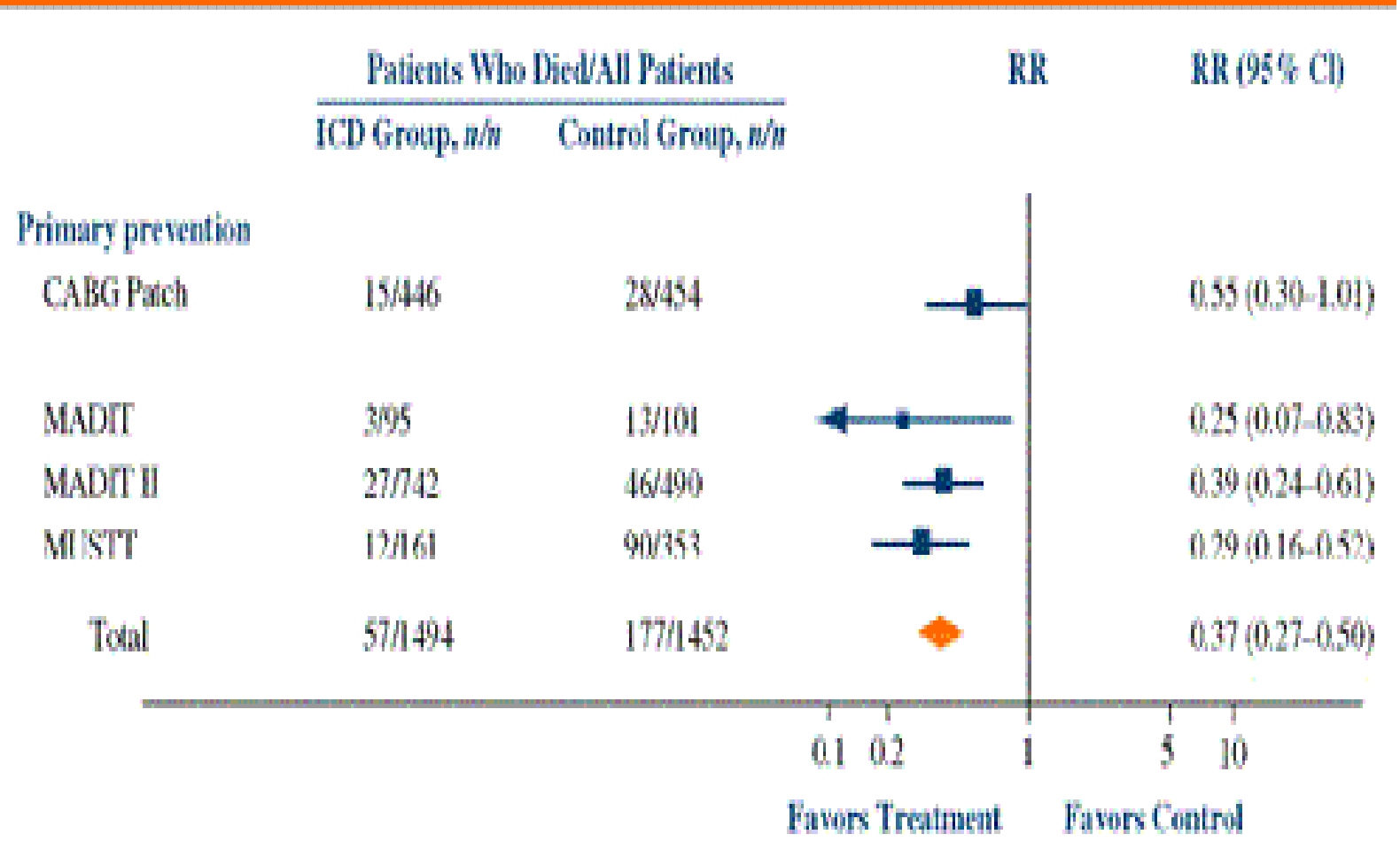
MADIT II

Mortality Events



N Engl J Med
2002; 346:877

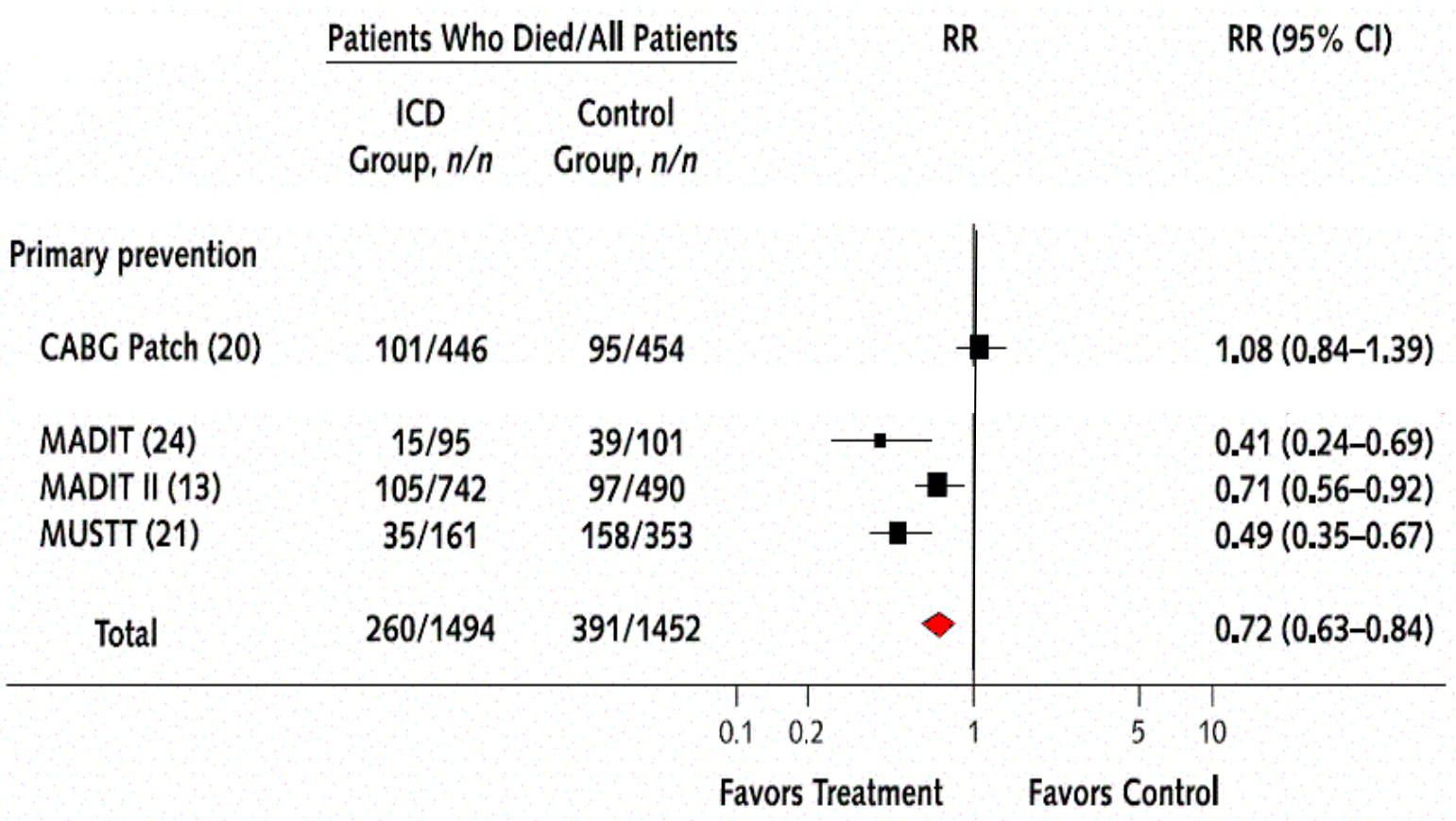
Meta-analysis of primary prevention trials in CAD pts



Sudden cardiac death

Ezekowitz. Ann Intern Med. 2003;138:445

Meta-analysis of primary prevention trials in CAD pts



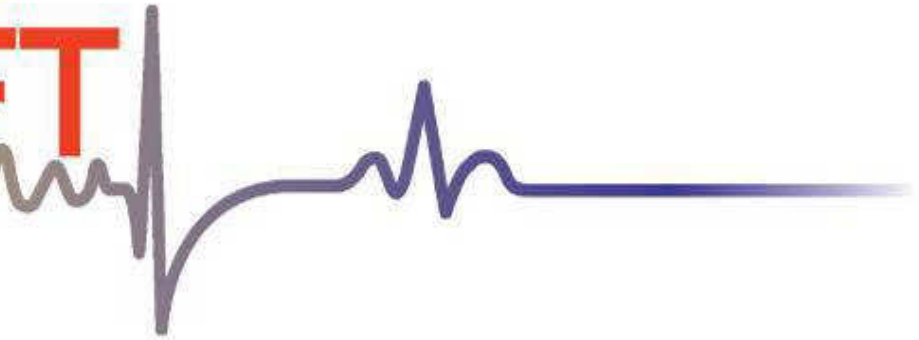
All-cause mortality

Ezekowitz. Ann Intern Med. 2003;138:445

Sudden Cardiac Death

SCDHeFT

in Heart Failure Trial



NEJM
Janv 2005

SCD-HeFT

Will Amiodarone and/or an ICD improve survival compared to placebo in patients with:

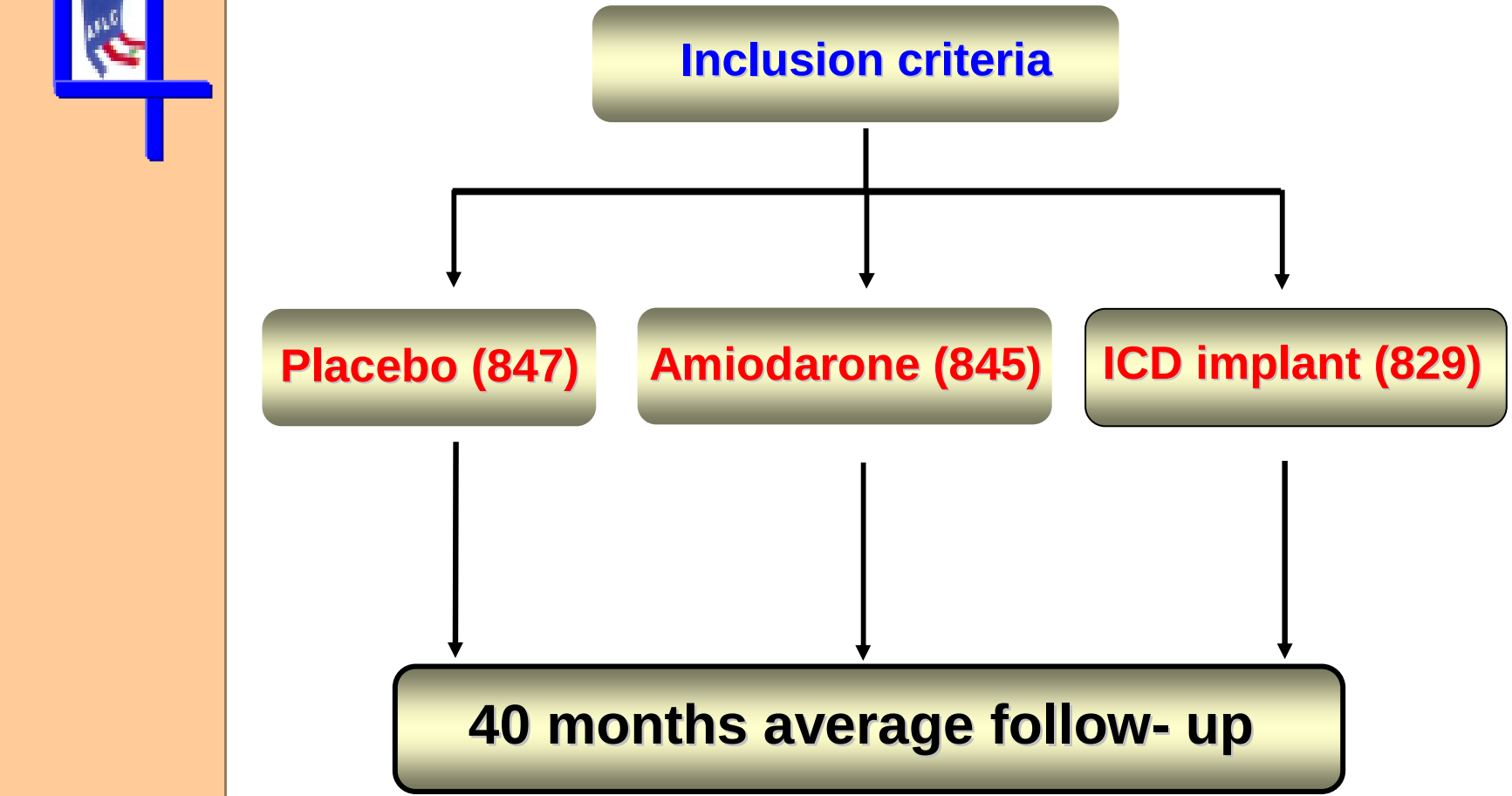
CHF (NYHA Class II and III) due to ischemic or nonischemic dilated cardiomyopathy

and

EF≤ 35%

NEJM
Janv 2005

SCD-HeFT protocol



NEJM
Janv 2005

SCD-HeFT Endpoints

- Primary
  - To compare **all cause mortality** after 2.5 years of follow-up (Power: 90% to detect 25% benefit)
- Secondary
  - Mortality – Ischemic, Non-Ischemic
  - …

NEJM
Janv 2005

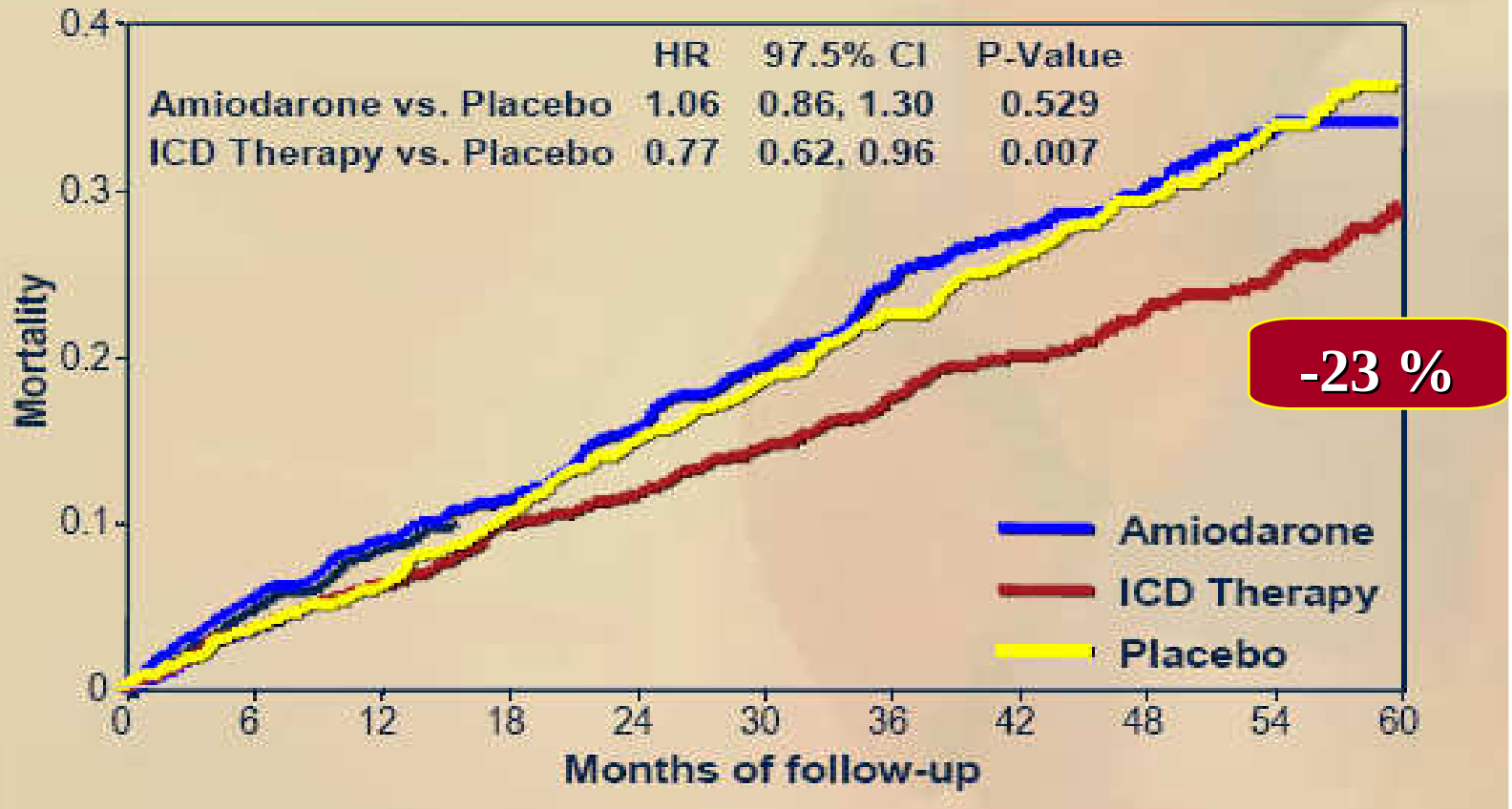
SCD-HeFT
Patients characteristics

- **NYHA II 70%, NYHA III 30%**
- **Ischemic 52%, non-ischemic 48%**
- **ACE Inhibitor or ARB 87%**
- **Beta-blocker 78%**

NEJM
Janv 2005

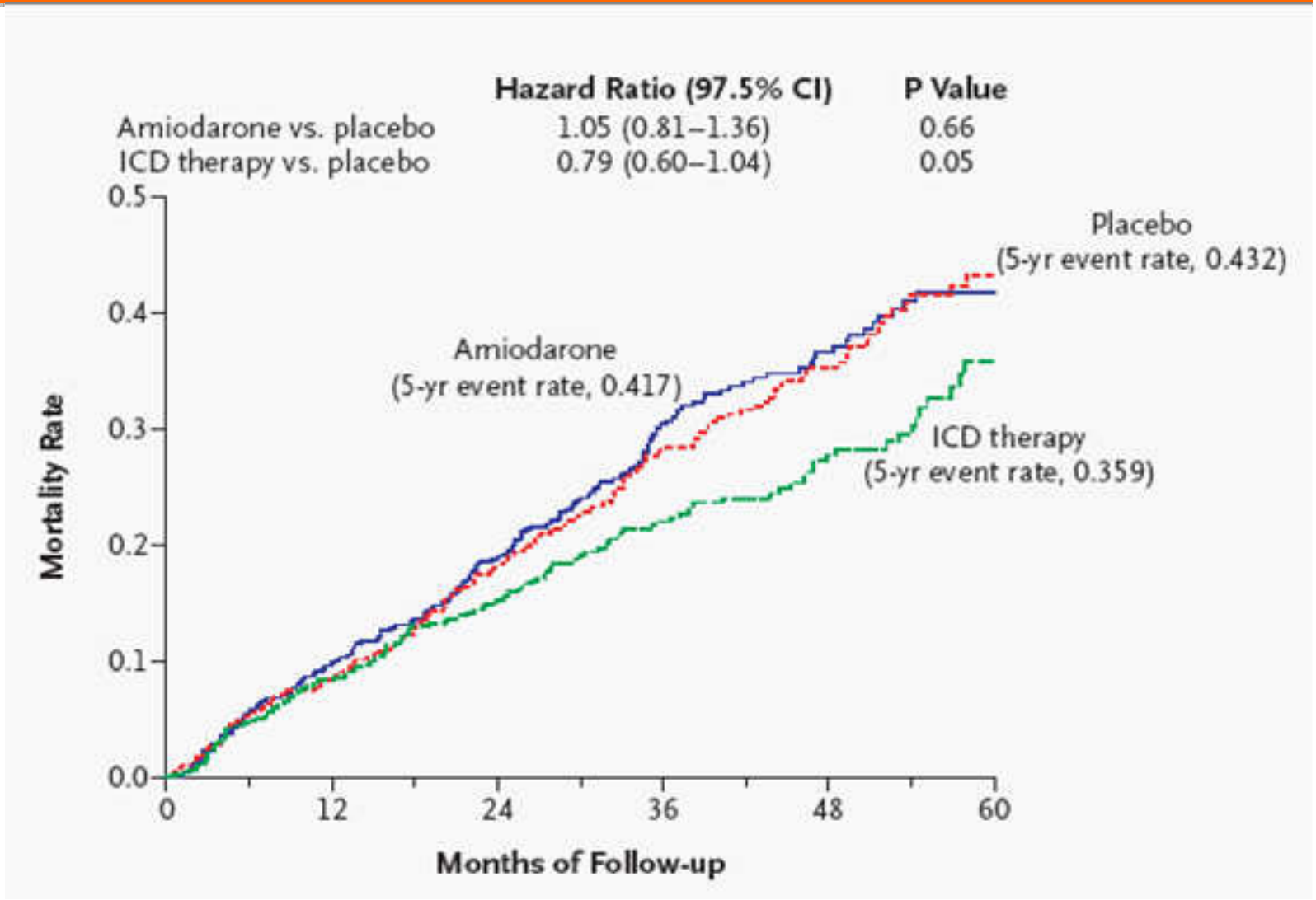
SCD-HeFT Results

Mortality by Intention-to-treat



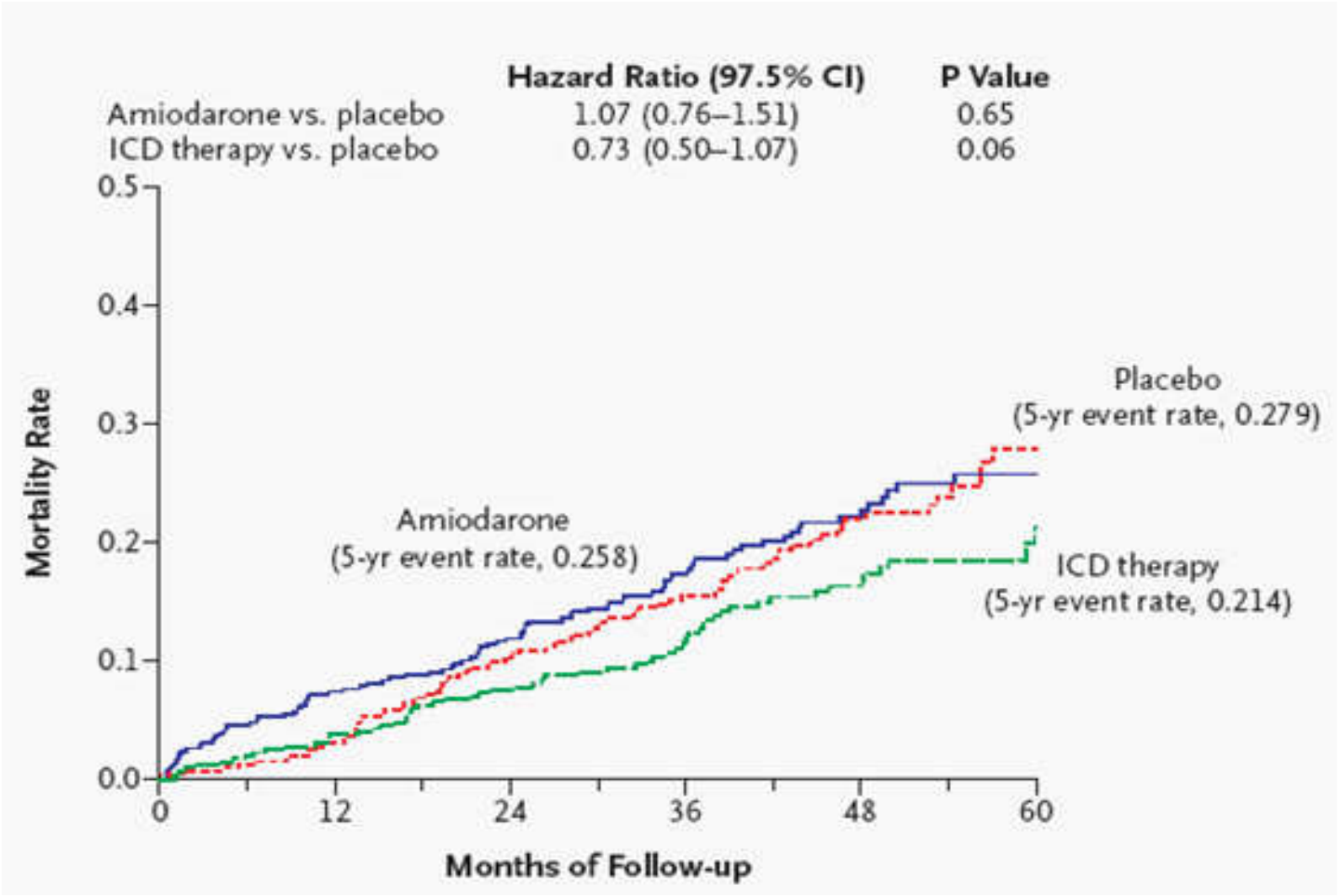
NEJM
Janv 2005

SCD-HeFT – Results
CAD patients



NEJM
Janv 2005

SCD-HeFT – Results
DCM patients



NEJM
Janv 2005

Meta-analysis of Randomized Controlled Trials:

ICD for the Prevention of Mortality in Nonischemic Cardiomyopathy

All-Cause Mortality

Study	Years of Enrollment	No. of Patients	Risk Ratio (95% CI)
CAT[16]	1991-1997	104	0.83 (0.45-1.82)
AMIOVIRT[17]	1996-2000	103	0.87 (0.31-2.42)
DEFINITE[15]	1998-2002	458	0.65 (0.40-1.06)
SCD-HeFT[14]	1997-2001	792	0.73 (0.50-1.04)
COMPANION[21]	2000-2002	397	0.50 (0.29-0.88)
Combined		1854	0.69 (0.55-0.87)

Akshay
JAMA
Dec 2004

Without COMPANION : RR 0.74; 95% CI, 0.58-0.96; *P*=0.02

ESC Guidelines (update 2005)

ICD implantation is reasonable for primary prevention in patients

- with LVEF < 30–35%
- on optimal background therapy including ACEi, beta-blocker, and an aldosterone antagonist.

(Class of recommendation I, level of evidence A)

European Heart Journal (2005) 26, 1115–1140

ACC/AHA 2005 Guideline Update

ICD therapy is recommended for primary prevention in patients with:

- **ischemic and non ischemic heart disease**
- **who have an LVEF less than or equal to 30%,**
- **with NYHA functional class II or III symptoms**
- **while undergoing chronic optimal medical therapy,**
- **and have reasonable expectation of survival with a good functional status for more than 1 year.**

(Class I recommendation)

www.acc.org and www.americanheart.org

Limitations of ICD Therapy

Complications of ICD Therapy

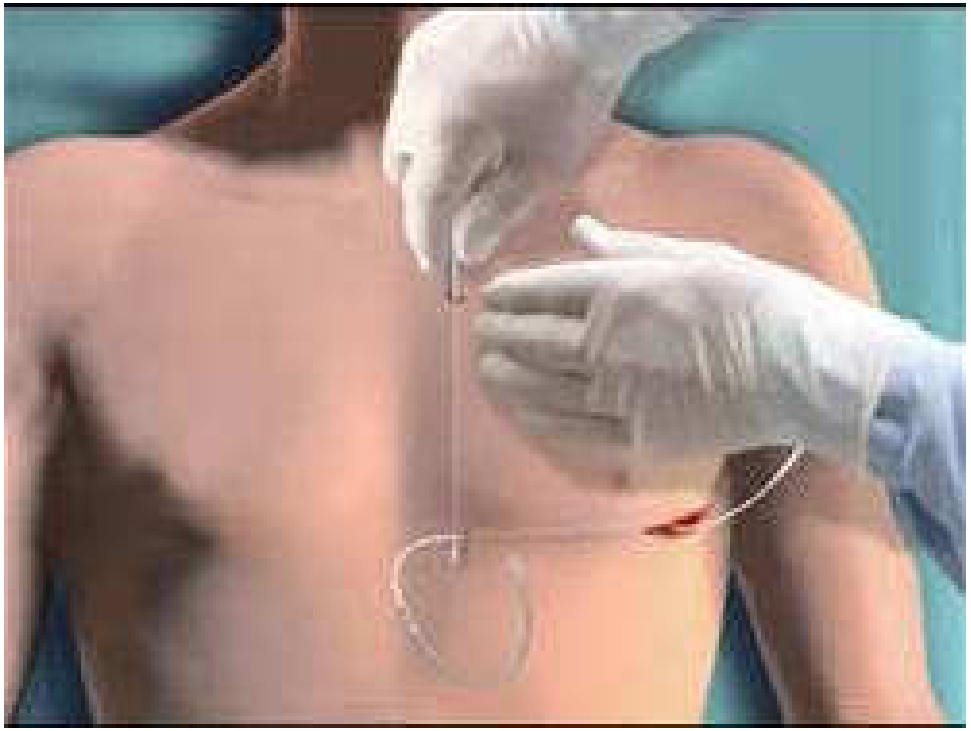
Device-related

- Infection or erosion
- Hematoma
- Pneumothorax
- Lead dislodgment
- Inadequate defibrillation threshold
- Connection problems
- Lead malfunctions or fractures
- Electromagnetic interference

Therapy-related

- Frequent shocks, appropriate or inappropriate
- Acceleration of ventricular tachycardia
- Psychological reactions
- Longer or additional hospitalization (possibly for right ventricular pacing)

Subcutaneous ICD System



Cameron Health
Effortless Rhythm Management

Limitations of ICD Therapy

ICD therapy is associated with an increased risk of HF hospitalization

(new or worsened heart failure)

= Deleterious effect of ventricular pacing (ventricular desynchronization)

Limitations of ICD Therapy

Patient Selection

EF < 30% is the single most powerful independent predictor for SCD

Present indications of prophylactic ICD therapy in CAD and DCM patients is based mainly on ejection fraction

Witch is not the ideal risk-stratification method

Limitations of ICD Therapy

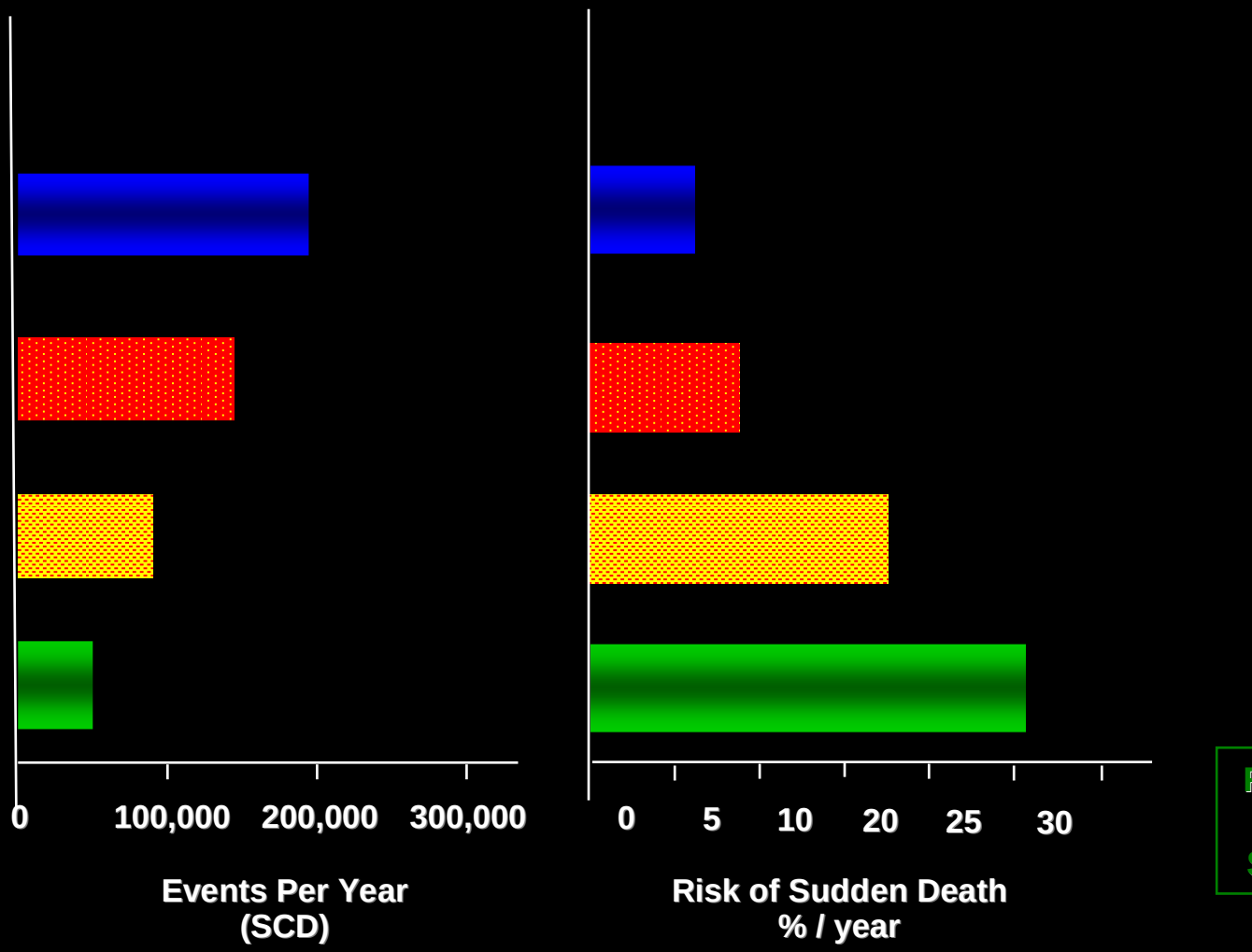
ICD indications based only on EF will prevent a limited number of all sudden deaths in CAD pts and DCM pts

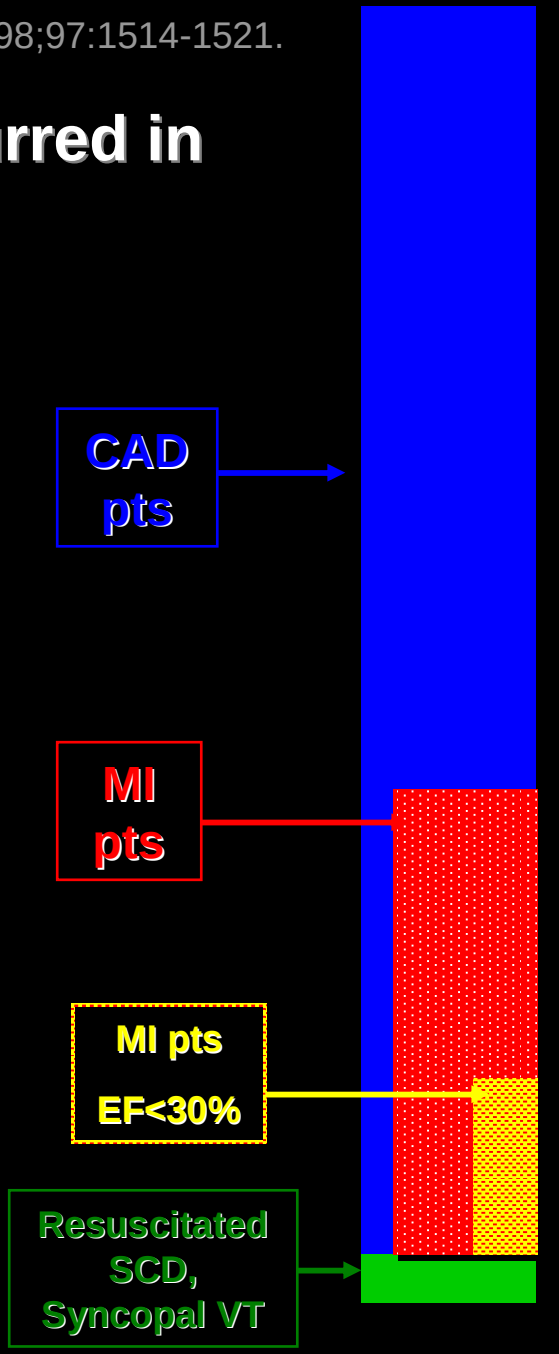
Gorgels Eur Heart J. 2003;24: 1204

Myerburg RJ. ***Circulation***.1998;97:1514-1521.

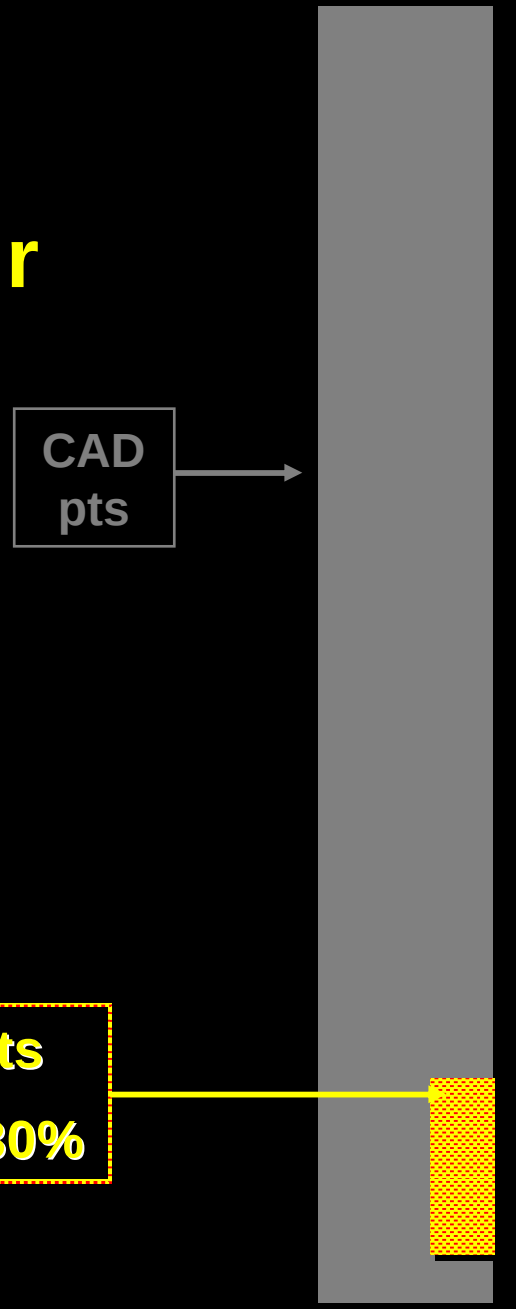
> 50% of the deaths in CAD patients occurred in patients whose EF was > 30%

and 20% occurred in patients with an EF >50%.





Many ICD pts will never use their devices:

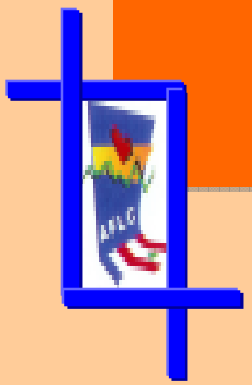


in primary prevention:

- Appropriate ICD therapy at 1 year: 21%
- Appropriate ICD therapy at 3 year: 32%
- Annual rate: 10%

Theuns Eur J Heart Failure 2005; 7: 1027

CONCLUSIONS



>> **Multiple studies completed within the past decade have demonstrated that ICDs can improve survival in selected patients with CAD and DCM.**

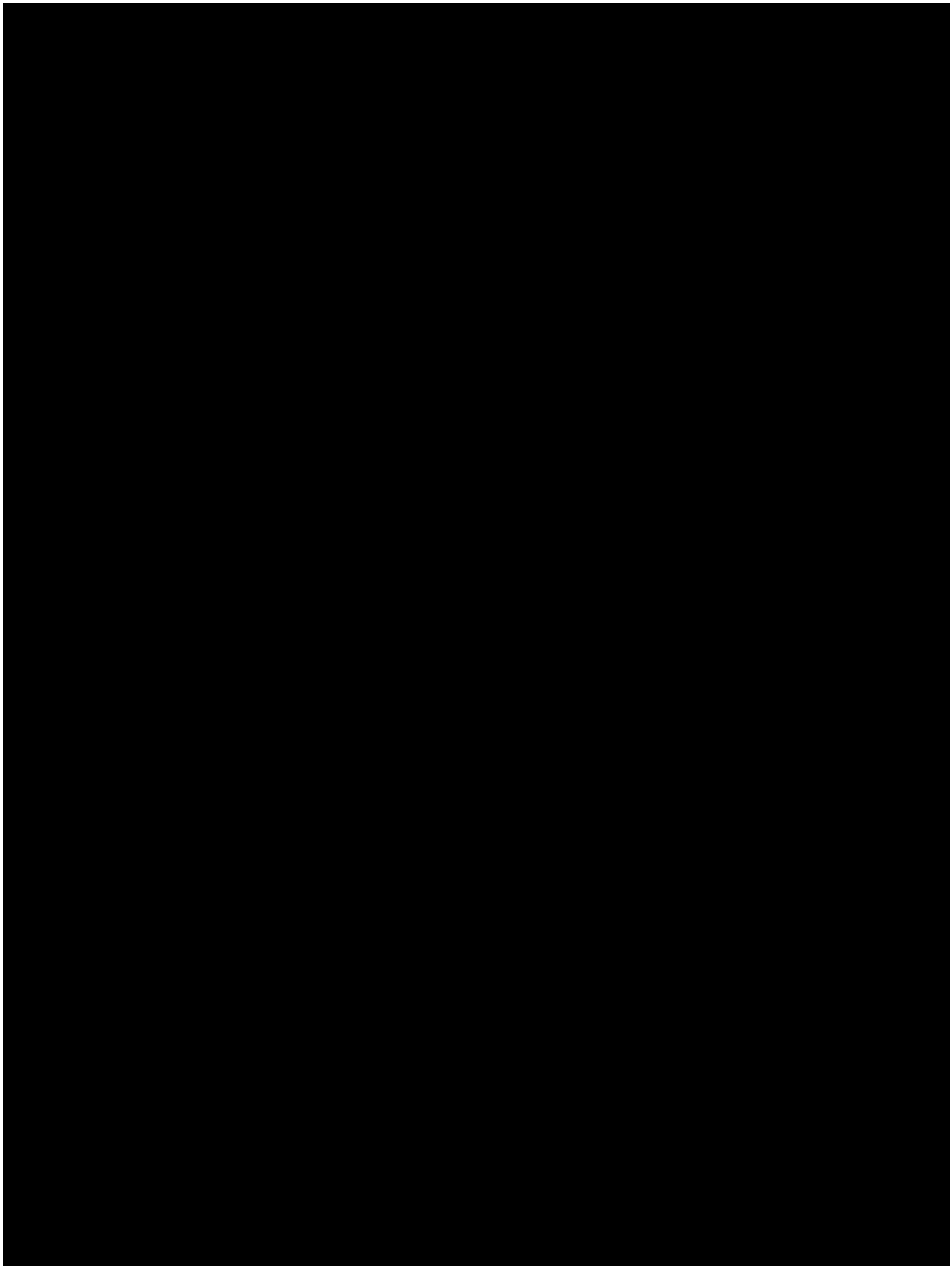
>> **Ejection fraction < 30 – 35% is the main selection filter for implanting ICDs in CAD pts and DCM pts…**

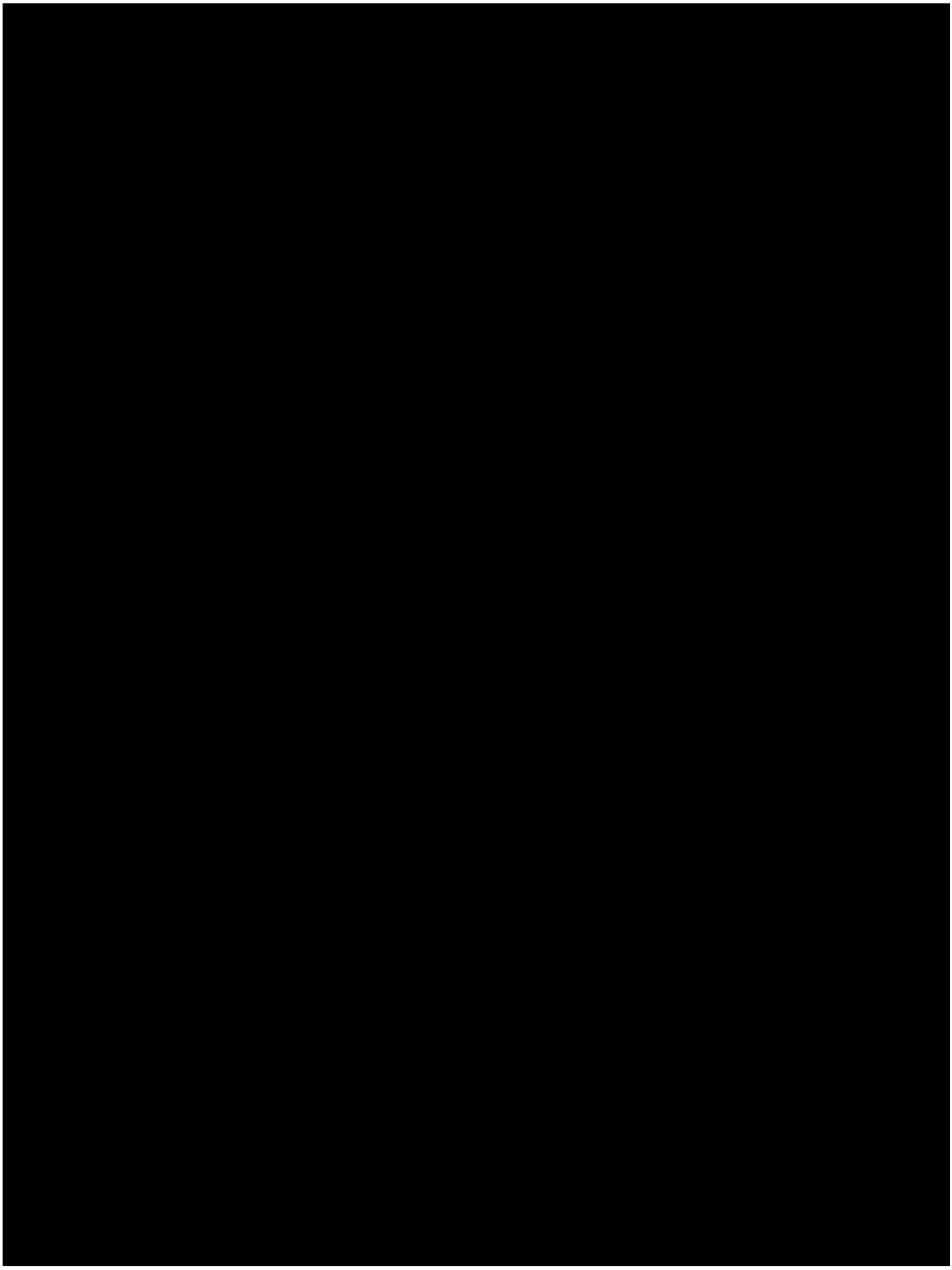
but is far from an ideal risk-stratification test on which to base prophylactic ICD therapy.

CONCLUSIONS

Future Challenge

Develop a better screening method based on multiple parameters to identify the true indications of prophylactic ICD therapy





	CIDS	AVID	CASH
Study Treatment Period	1990-1997	1995-1997	1987-1998
Randomization	ICD vs. amiodarone	ICD vs. empirical therapy with amiodarone or sotalol	ICD vs. amiodarone, metoprolol, propafenone
Primary Endpoint	All-cause mortality	All-cause mortality	All-cause mortality
Size and Scope	659 patients; 1:1 randomization	1,016 patients; 1:1 randomization	518 patients; 1:1:1:1 randomization
Inclusion Criteria	Documented VF " Cardiac arrest " VT with hemodynamic compromise"	Primary VF " VT with syncope " VT with symptoms and LVEF<40% " VT with syncope with symptoms and LVEF<40% " VT with BP <80 and LVEF<40%"	Cardiac arrest survivor with documented VT "
Mean Follow-Up	36 months	31 months	57 months
Study End	Jan-97	Apr-97	Mar-98
Results	20% risk reduction in mortality with ICD (non-significant) " p=0.14 "	Mortality reduction Year 1: 39% " Year 2: 27% " Year 3: 31% " p<0.02 "	23% risk reduction in mortality with ICD (non-significant) compared to amiodarone/ metoprolol " p=0.08 "

Secondary prevention

	CIDS	AVID	CASH
Study Treatment Period	1990-1997	1995-1997	1987-1998
Randomization	ICD vs. amiodarone	ICD vs. empirical therapy with amiodarone or sotalol	ICD vs. amiodarone, metoprolol, propafenone
Primary Endpoint	All-cause mortality	All-cause mortality	All-cause mortality
Size and Scope	659 patients; 1:1 randomization	1,016 patients; 1:1 randomization	518 patients; 1:1:1:1 randomization
Inclusion Criteria	• Documented VF • Cardiac arrest • VT with hemodynamic compromise	• Primary VF • VT with syncope • VT with symptoms and LVEF≤40% • VT with syncope with symptoms and LVEF≤40% • VT with BP <80 and LVEF≤40%	• Cardiac arrest survivor with documented VT
Mean Follow-Up	36 months	31 months	57 months
Study End	January 1997	April 1997	March 1998
Results	• 20% risk reduction in mortality with ICD (non-significant) • p=0.14	Mortality reduction • Year 1: 39% • Year 2: 27% • Year 3: 31% • p<0.02	• 23% risk reduction in mortality with ICD (non-significant) compared to amiodarone/ metoprolol • p=0.08

primary prevention (1)

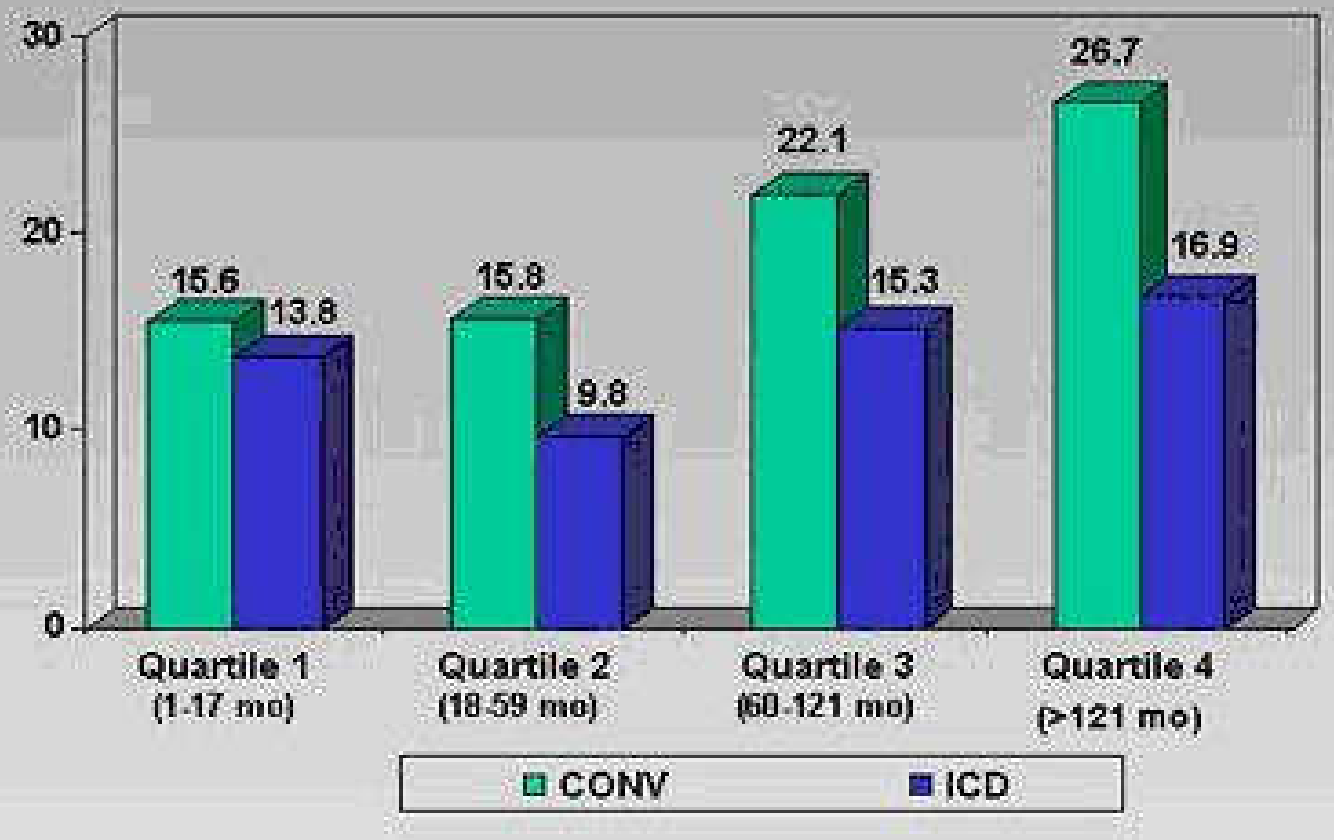
	CABG PATCH	MADIT	MUSTT	MADIT II
Study Treatment Period	1988-1995	1991-1996	1993-1999	1997-2001
Principle Investigator	J. Thomas Bigger, Jr., MD	Arthur J. Moss, M.D.	Alfred E. Buxton, M.D.	Arthur J. Moss, M.D.
Randomization	ICD + CABG vs. CABG	ICD vs. OPT	EP guided therapy for prevention of SCD and spontaneous VT vs. no antiarrhythmic therapy	ICD + OPT vs. OPT
Primary Endpoint	All-cause mortality	All-cause mortality	Arrhythmic death or cardiac arrest	All cause mortality
Size and Scope	900 patients; 37 centers; 1:1 randomization	196 patients; 32 centers (30 in the U.S.; 2 in Europe); 1:1 randomization	767 patients; 85 centers in US and Canada	1232 patients; 76 centers in US and Europe; 3:2 randomization
Risk Identifier	• Abnormal SAECG	• Inducible/non suppressible VT • Asymptomatic VT (3-30 beats)	• Asymptomatic VT (3-30 beats) less than 6 months before	• N/A

primary prevention (2)

	CABG PATCH	MADIT	MUSTT	MADIT II
Coronary Disease	• Recent CABG	• Prior MI	• MI, CABG or PTCA ≥ 96 hours	• Prior MI
EP Study	N/A	Yes	Yes	No
Ejection Fraction	LVEF<36%	LVEF ≤ 35%	LVEF ≤ 40%	LVEF ≤ 30%
Mean follow-up	32 months	27 months	39 months (median)	20 months
Termination Date	1995	March 1996	1999	November 2001
Results	• No reduction in all-cause mortality with ICD • p=0.63	• 54% reduction in all-cause mortality at 4 years • p=0.009	• Substudy: at 5 yrs, 55% mortality risk reduction (ICD subarm vs. non antiarrhythmic treatment arm) • p=0.04	• 31% risk reduction in mortality at 20 months • p=0.016

time-dependence of mortality risk and ICD benefit in MADIT II patient population

MADIT II substudy: mortality by time from last MI in both arms.



T Wave Alternans Identifies Low-Risk Patients Who May Not Benefit From ICD Therapy

TWA exercise testing

An automatic (ie, computer-generated) system that computes beat-to-beat fluctuations was used to interpret TWA tests. A positive TWA was defined as the presence of sustained TWA >/= 1.9 microvolts for at least 1 minute with an onset heart rate </= 110 bpm. TWA was negative if it did not meet criteria for positive and if the maximum negative heart rate was >/= 105/min.