PREVENTION OF SUDDEN CARDIAC DEATH

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Disclosure

No disclosures

SUDDEN CARDIAC DEATH

- The overall incidence of SCD in the US is estimated to be 0.1-0.2% per year or 1-2/1000 people.
- This number includes both those victims whose SCD occurred as a first event as well as those whose death could be predicted with greater accuracy because they were included in higher risk subgroups.
- The major determinants of risk of SCD are related more to the type and severity of associated cardiac disease and less to the frequency or classification of ventricular arrhythmia.

Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS guideline for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *Circulation*. 2018;138(13). doi:10.1161/cir.0000000000000549

SUDDEN CARDIAC DEATH

- Sudden cardiac death (SCD) is defined by the AHA, ACC and HRS as sudden death due to any cardiac disease that occurs out of the hospital, in an emergency department or in any individual reported dead on arrival at a hospital. Death must also have occurred within 1 hour after the onset of symptoms and the proportion of all natural deaths due to SCD is 13% when a definition of 1 hour from onset of symptoms is used.
- SCD may be due to ventricular tachycardia/fibrillation, asystole or nonarrhythmic causes.

Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS guideline for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *Circulation*. 2018;138(13). doi:10.1161/cir.0000000000000549

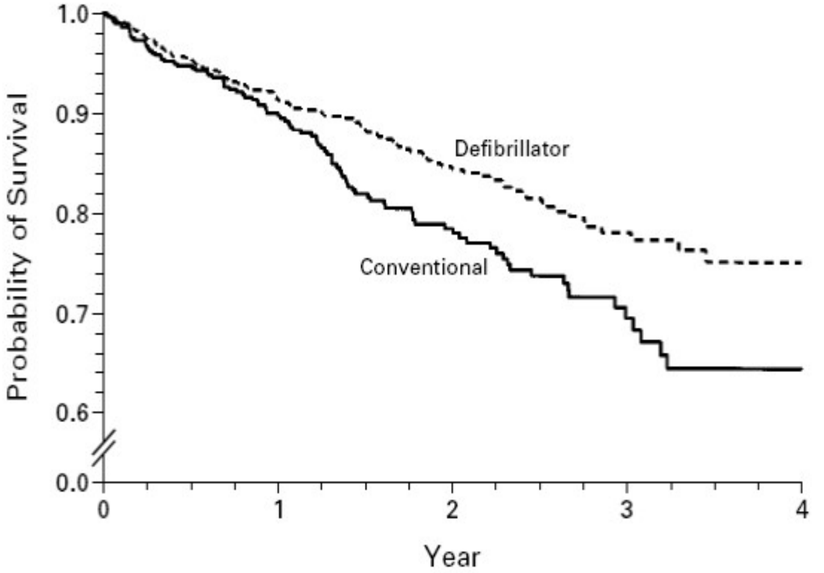
The New England
Journal of Medicine

VOLUME 346 MARCH 21, 2002 NUMBER 12

PROPHYLACTIC IMPLANTATION OF A DEFIBRILLATOR IN PATIENTS WITH MYOCARDIAL INFARCTION AND REDUCED EJECTION FRACTION

ARTHUR J. MOSS, M.D., WOJCIECH ZAREBA, M.D., PH.D., W. JACKSON HALL, PH.D., HELMUT KLEIN, M.D., DAVID J. WILBER, M.D., DAVID S. CANNOM, M.D., JAMES P. DAUBERT, M.D., STEVEN L. HIGGINS, M.D., MARY W. BROWN, M.S., AND MARK L. ANDREWS, B.B.S., FOR THE MULTICENTER AUTOMATIC DEFIBRILLATOR IMPLANTATION TRIAL II INVESTIGATORS*

- Patients who were more than 21 years who had had an MI one month or more prior to enrollment.
- Patients also had to have an EF of 30 % or less within three months prior to entry, as assessed by angiography, radionuclide scanning or echocardiography.



No. at Risk					
Defibrillator	742	503 (0.91)	274 (0.84)	110 (0.78)	9
Conventional	490	329 (0.90)	170 (0.78)	65 (0.69)	3

Figure 2. Kaplan–Meier Estimates of the Probability of Survival in the Group Assigned to Receive an Implantable Defibrillator and the Group Assigned to Receive Conventional Medical Therapy.

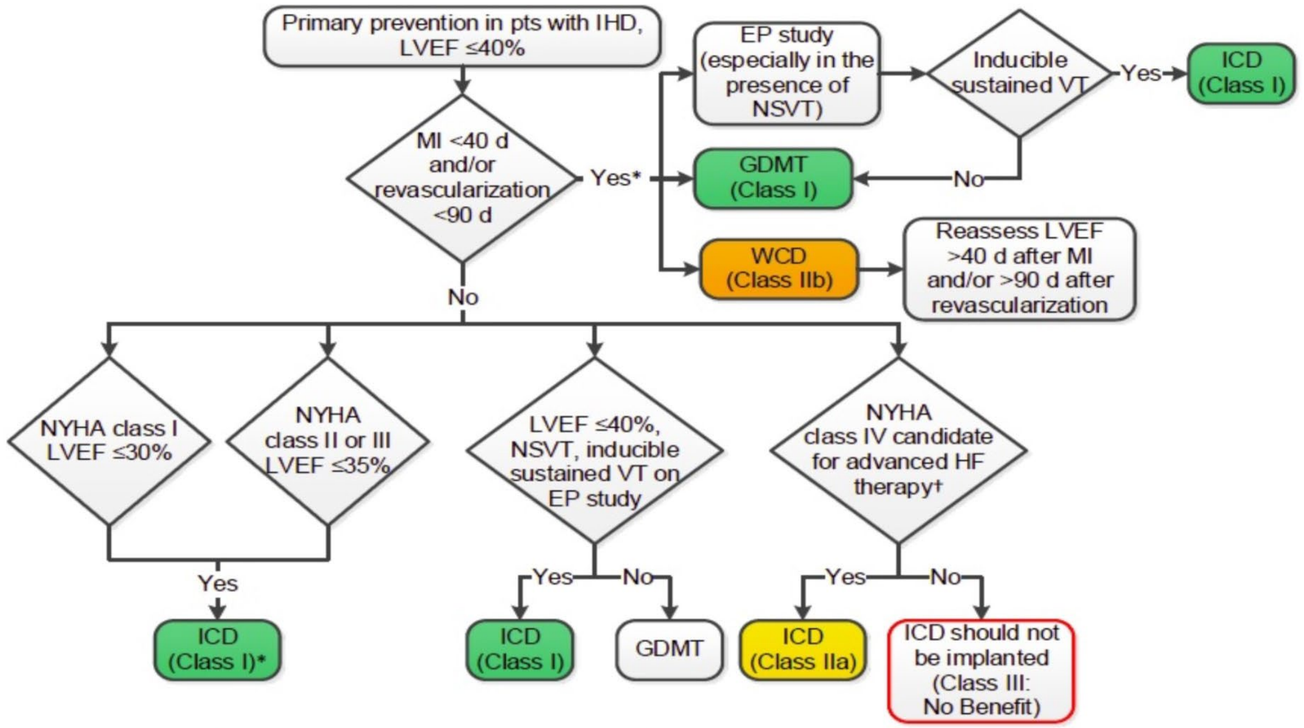
The difference in survival between the two groups was significant (nominal P=0.007, by the log-rank test).

Moss AJ, Zareba W, Hall WJ, et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. *N Engl J Med*. 2002;346(12):877-883. doi:10.1056/NEJMoa013474

Al-Khatib SM, et al.

2017 VA/SCD Guideline

Figure 4. Primary Prevention of SCD in Patients With Ischemic Heart Disease



Colors correspond to Class of Recommendation in Table 1.
See Section 7.1.2 for discussion.
*Scenarios exist for early ICD placement in select circumstances such as patients with a pacing indication or syncope
†Advanced HF therapy includes CRT, cardiac transplant, and LVAD.
thought due to VT. These are detailed elsewhere in an HRS/ACC/AHA expert consensus statement (24).
CRT indicates cardiac resynchronization therapy; EP, electrophysiological; GDMT, guideline-directed management and therapy; HF, heart failure; ICD, implantable cardioverter-defibrillator; IHD, ischemic heart disease; LVEF, left ventricular ejection fraction; MI, myocardial infarction; NSVT, nonsustained ventricular tachycardia; NYHA, New York Heart Association; pts, patients; SCD, sudden cardiac death; VT, ventricular tachycardia; and WCD, wearable cardioverter-defibrillator.

Table 4 from page 71 of Guidelines

2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society
Sana M. Al-Khatib, William G. Stevenson, Michael J. Ackerman, William J. Bryant, David J. Callans, Anne B. Curtis, Barbara J. Deal, Timm Dickfeld, Michael E. Field, Gregg C. Fonarow, Anne M. Gillis, Mark A. Hlatky, Christopher B. Granger, Stephen C. Hammill, José A. Joglar, G. Neal Kay, Daniel D. Matlock, Robert J. Myerburg and Richard L. Page
Circulation. 2017;CIR.0000000000000549, originally published October 30, 2017

2006 ACC/AHA/ESC GUIDELINES FOR MANAGEMENT OF PATIENTS WITH VENTRICULAR ARRHYTHMIAS AND THE PREVENTION OF SUDDEN CARDIAC DEATH

- ICD therapy is recommended for primary prevention to reduce total mortality by a reduction in SCD in patients with LV dysfunction due to prior MI who are at least 40 days post-MI, have an LVEF ≤30%–40%, are NYHA Class II or III receiving chronic optimal medical therapy, and have a reasonable expectation of survival with a good functional status for more than 1 year.

Zipes DP, Camm AJ, Borggrefe M, Buxton AE, Chaitman B, Fromer M, Gregoratos G, Klein G, Moss AJ, Myerburg RJ, Priori SG, Quinones MA, Roden DM, Silka MJ, & Tracy C. ACC/AHA/ESC 2006 Guidelines for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *Circulation.* 2006:*114*(10). https://doi.org/10.1161/circulationaha.106.178233

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JANUARY 20, 2005 VOL. 352 NO. 3

Amiodarone or an Implantable Cardioverter–Defibrillator for Congestive Heart Failure

Gust H. Bardy, M.D., Kerry L. Lee, Ph.D., Daniel B. Mark, M.D., Jeanne E. Poole, M.D., Douglas L. Packer, M.D., Robin Boineau, M.D., Michael Domanski, M.D., Charles Troutman, R.N., Jill Anderson, R.N., George Johnson, B.S.E.E., Steven E. McNulty, M.S., Nancy Clapp-Channing, R.N., M.P.H., Linda D. Davidson-Ray, M.A., Elizabeth S. Fraulo, R.N., Daniel P. Fishbein, M.D., Richard M. Luceri, M.D., and John H. Ip, M.D., for the Sudden Cardiac Death in Heart Failure Trial (SCD-HeFT) Investigators*

- Patients had to have NYHA class II or III chronic, stable CHF due to ischemic or nonischemic causes and an LVEF less then or equal to 35%.
- All patients were required, if clinically reasonable, to receive treatment with a BB, an ACE-I, aldosterone, ASA and statins when appropriate.

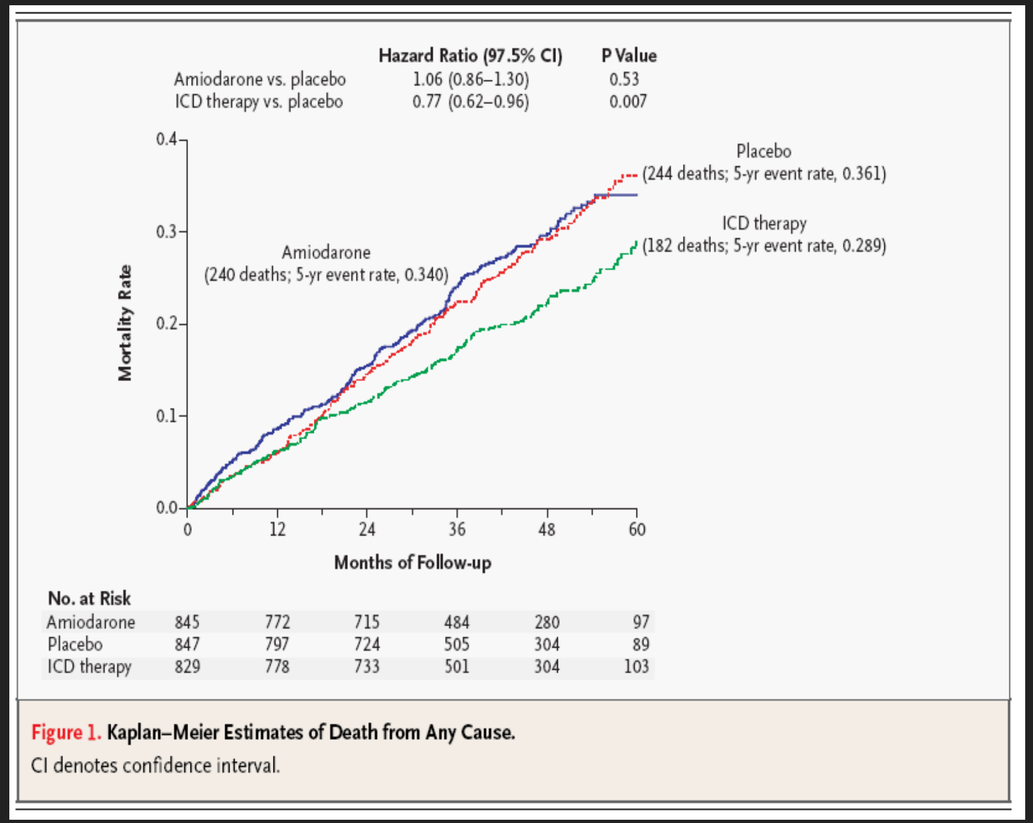


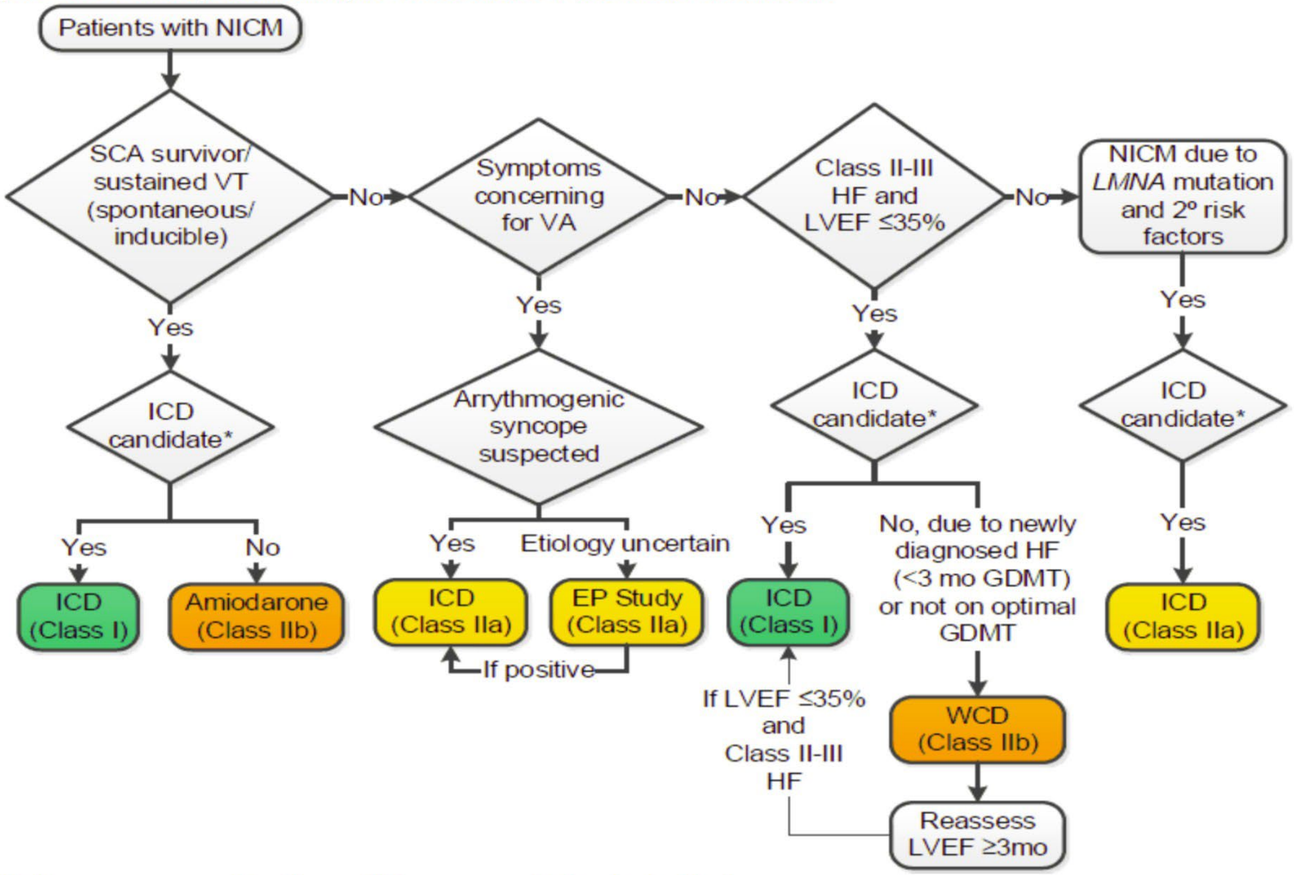
Figure 1. Kaplan–Meier Estimates of Death from Any Cause.
CI denotes confidence interval.

Bardy GH, Lee KL, Mark DB, et al. Amiodarone or an implantable cardioverter-defibrillator for congestive heart failure [published correction appears in N Engl J Med. 2005 May 19;352(20):2146]. *N Engl J Med*. 2005;352(3):225-237. doi:10.1056/NEJMoa043399

Al-Khatib SM, et al.

2017 VA/SCD Guideline

Figure 6. Secondary and Primary Prevention of SCD in Patients With NICM



Colors correspond to Class of Recommendation in Table 1.
See Section 7.2 for discussion.
*ICD candidacy as determined by functional status, life expectancy or patient preference.
2° indicates secondary; EP, electrophysiological; GDMT, guideline-directed management and therapy; HF, heart failure; ICD, implantable cardioverter-defibrillator; LVEF, left ventricular ejection fraction; NICM, nonischemic cardiomyopathy; SCA, sudden cardiac arrest; SCD, sudden cardiac death; VA, ventricular arrhythmia; and WCD, wearable cardiac-defibrillator.

Figure 6. from page 83 of Guidelines

2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society

Sana M. Al-Khatib, William G. Stevenson, Michael J. Ackerman, William J. Bryant, David J. Callans, Anne B. Curtis, Barbara J. Deal, Timm Dickfeld, Michael E. Field, Gregg C. Fonarow, Anne M. Gillis, Mark A. Hlatky, Christopher B. Granger, Stephen C. Hammill, José A. Joglar, G. Neal Kay, Daniel D. Matlock, Robert J. Myerburg and Richard L. Page

Circulation. 2017;CIR.0000000000000549, originally published October 30, 2017

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Zipes DP, Camm AJ, Borggrefe M, Buxton AE, Chaitman B, Fromer M, Gregoratos G, Klein G, Moss AJ, Myerburg RJ, Priori SG, Quinones MA, Roden DM, Silka MJ, & Tracy C. ACC/AHA/ESC 2006 Guidelines for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *Circulation.* 2006:*114*(10). https://doi.org/10.1161/circulationaha.106.178233

Al-Khatib SM, et al.
2017 VA/SCD Guideline

5.2. Preventing SCD With HF Medications

Recommendation for Pharmacological Prevention of SCD References that support the recommendation are summarized in Online Data Supplement 10.		
COR	**LOE**	**Recommendation**
I	A	1. In patients with HF*r*EF (LVEF ≤40%), treatment with a beta blocker, a mineralocorticoid receptor antagonist and either an angiotensin-converting enzyme inhibitor, an angiotensin-receptor blocker, or an angiotensin receptor-neprilysin inhibitor is recommended to reduce SCD and all-cause mortality (1-8).

Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS guideline for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *Circulation*. 2018;138(13). doi:10.1161/cir.0000000000000549

Published online May 1995

Carvedilol improves left ventricular function and symptoms in chronic heart failure: A double-blind randomized study FREE

isten to the Editors Audio Summary

Download File

Stephanie L. Olsen, MD; Edward M. Gilbert, MD, FACC; Dale G. Renlund, MD, FACC; David O. Taylor, MD, FACC; Frank D. Yanowitz, MD, FACC; Michael R. Bristow, MD, PhD, FACC

[+] Author Affiliations

J Am Coll Cardiol. May 1995,25(6):1225-1231 doi:10.1016/0735-

- Carvedilol therapy resulted in a significant reduction in heart rate and mean pulmonary artery and pulmonary capillary wedge pressures and a significant increase in stroke volume and left ventricular stroke work.
- Left ventricular ejection fraction increased 52% in the carvedilol group.
- Carvediolol-treated patients also reported a significant lessening of heart failure symptoms

Olsen SL, Gilbert EM, Renlund DG, Taylor DO, Yanowitz FD, Bristow MR. Carvedilol improves left ventricular function and symptoms in chronic heart failure: a double-blind randomized study. *J Am Coll Cardiol*. 1995;25(6):1225-1231. doi:10.1016/0735-1097(95)00012-S

- The first 6-12 months after an MI constitute a period during which there is a particularly high risk of death from arrhythmia, and pharmacologic therapies, other than beta-blockers, have not been shown to be effective in counteracting this risk.

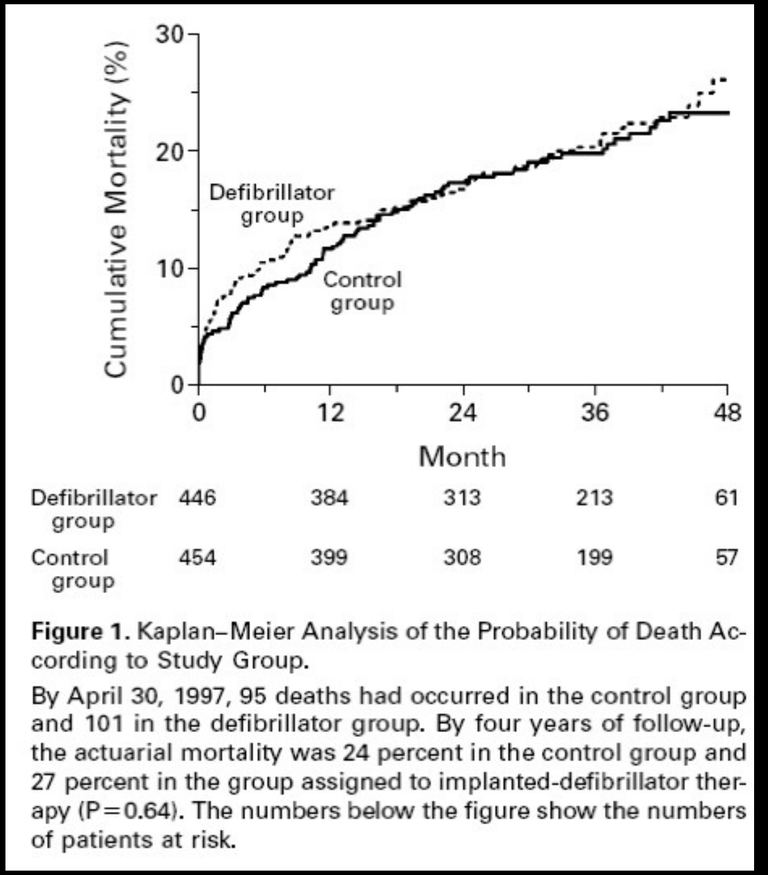
- Why not implant an ICD right away???

The New England
Journal of Medicine

VOLUME 337 NOVEMBER 27, 1997 NUMBER 22

PROPHYLACTIC USE OF IMPLANTED CARDIAC DEFIBRILLATORS IN PATIENTS AT HIGH RISK FOR VENTRICULAR ARRHYTHMIAS AFTER CORONARY-ARTERY BYPASS GRAFT SURGERY

J. THOMAS BIGGER, JR., M.D., FOR THE CORONARY ARTERY BYPASS GRAFT (CABG) PATCH TRIAL INVESTIGATORS*



Defibrillator group	446	384	313	213	61
Control group	454	399	308	199	57

Figure 1. Kaplan–Meier Analysis of the Probability of Death According to Study Group.

By April 30, 1997, 95 deaths had occurred in the control group and 101 in the defibrillator group. By four years of follow-up, the actuarial mortality was 24 percent in the control group and 27 percent in the group assigned to implanted-defibrillator therapy (P=0.64). The numbers below the figure show the numbers of patients at risk.

- There were 44 deaths in the first 30 days after randomization 24 in the ICD group and 20 in the control group.
- Survival was not improved by prophylactic implantation of ICD at the time of elective CABG in patients at high risk for death from ventricular arrhythmia.

Bigger JT. Prophylactic use of implanted cardiac defibrillators in patients at high risk for ventricular arrhythmias after coronary-artery bypass graft surgery. *New England Journal of Medicine.* 1997:*337*(22), 1569–1575. https://doi.org/10.1056/nejm199711273372201

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 9, 2004 VOL. 351 NO. 24

Prophylactic Use of an Implantable Cardioverter–Defibrillator after Acute Myocardial Infarction

Stefan H. Hohnloser, M.D., Karl Heinz Kuck, M.D., Paul Dorian, M.D., Robin S. Roberts, M.Tech., John R. Hampton, M.D., Robert Hatala, M.D., Eric Fain, M.D., Michael Gent, D.Sc., and Stuart J. Connolly, M.D., on behalf of the DINAMIT Investigators*

- This study was designed to test whether prophylactic implantation of an ICD would reduce mortality in survivors of a recent MI who are at high risk for ventricular arrhythmias.

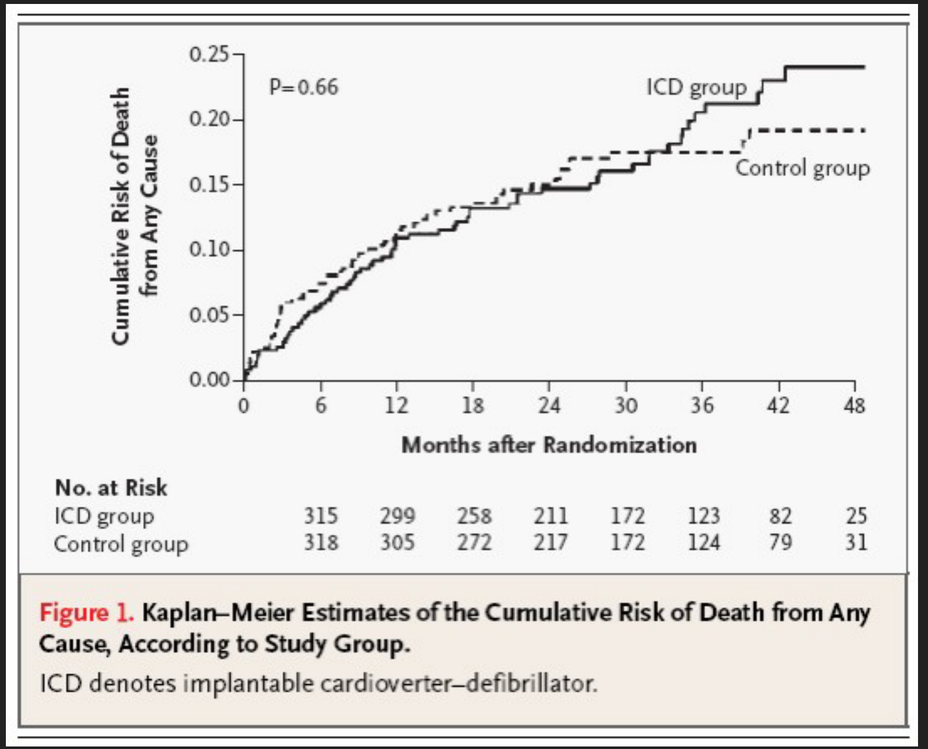


Figure 1. Kaplan–Meier Estimates of the Cumulative Risk of Death from Any Cause, According to Study Group.

ICD denotes implantable cardioverter–defibrillator.

- In the ICD group, there were 12 deaths due to arrhythmia, as compared with 29 in the control group.
- There were 50 deaths due to non-arrhythmic causes in the ICD group as compared with 29 in the control group.

Hohnloser S, Kuck K, Dorian P, Roberts, R, Hampton J, Hatala R, Fain, E., Gent M, & Connolly S. Prophylactic use of an implantable cardioverter–defibrillator after acute myocardial infarction. *New England Journal of Medicine*. 2004:*351*(24), 2481–2488. https://doi.org/10.1056/nejmoa041489

The IRIS study was based on the hypothesis that early implantation of an ICD, as compared with optimal medical therapy, would improve survival among patients with acute MI and predefined markers of elevated risk (elevated heart rate, decreased LVEF and the occurrence of rapid, NSVT.

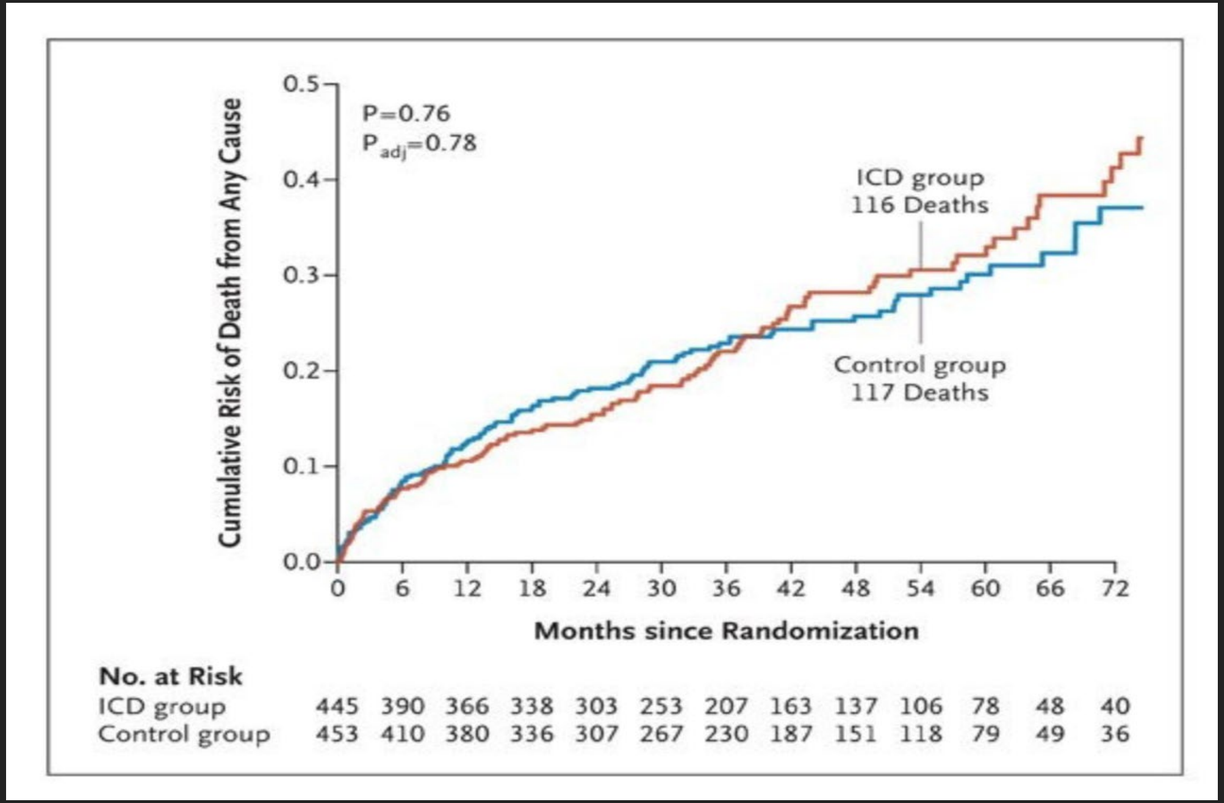


Figure 1. Cumulative Risk of Death from Any Cause According to Study Group.

At the close of the study, definitive information about vital status was available for 897 patients. One patient was lost to follow-up. For patients who withdrew their consent, data were censored at the time of withdrawal. ICD denotes implantable cardioverter–defibrillator.

Steinbeck G, Andresen D, Seidl K, et al. Defibrillator implantation early after myocardial infarction. *N Engl J Med*. 2009;361(15):1427-1436. doi:10.1056/NEJMoa0901889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