Managing the Patient with an ICD Shock

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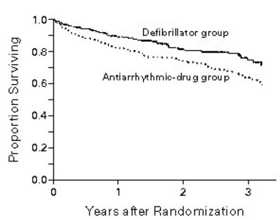
First ICD Implanted February 4, 1980

TERMINATION OF MALIGNANT VENTRICULAR ARRHYTHMIAS WITH AN IMPLANTED AUTOMATIC DEFIBRILLATOR IN HUMAN BEINGS

M. Mirowski, M.D., Philip R. Reid, M.D., Morton M. Mower, M.D., Levi Watkins, M.D., Vincent L. Gott, M.D., James F. Schauble, M.D., Alois Langer, Ph.D., M. S. Heilman, M.D., Steve A. Kolenik, M.S., Robert E. Fischell, M.S., and Myron L. Weisfeldt, M.D.

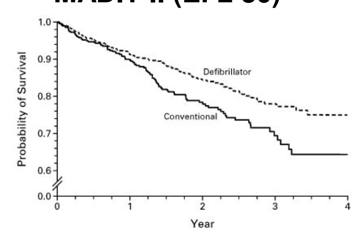
AVID: Survival Benefit of 2º ICD



	0	1	2	3
Patients at risk	1016	644	333	104
Percent surviving				
Defibrillator group		89.3	81.6	75.4
Antiarrhythmic-drug group		82.3	74.7	64.1

AVID Study: N Engl J Med 1997;337:1576-1584

Primary Prevention ICD Survival Benefit MADIT II (EF≤ 30)



No. at Risk	0	1	2	3	4
Defibrillator	742	503 (0.91)	274 (0.84)	110 (0.78)	9
Conventional	490	329 (0.90)	170 (0.78)	65 (0.69)	3

How many ICD's implanted in US? (National ICD Registry 2006)

1) 20,831
2) 50,381
3) 108,341
4) 550,034

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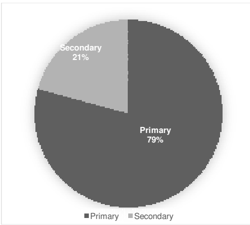
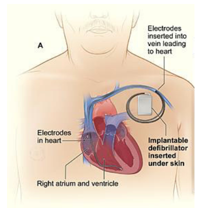
National ICD Registry 2006
108,341 ICD Implants

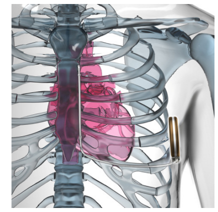


23.4% Single chamber ICD
38.8% Dual chamber ICD
37.5% CRT-D

ICD Options



Transvenous ICD



S ICD

https://www.nhlbi.nih.gov/health-topics/implantable-cardioverter-defibrillators

Managing ICD Shock
Stabilize the Patient

BLS/ACLS

Don’t place AED pads over ICD

Chest compressions

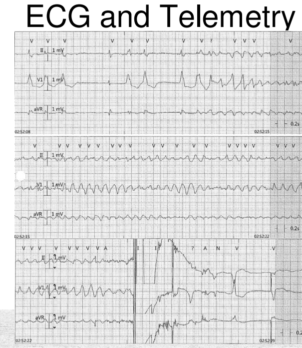
Managing ICD Shock
Initial workup

History and Exam
Device interrogation
ECG
LABS CBC, lytes, TSH, drug levels (digoxin)
CXR

Be Mindful of 4 General Reasons for an ICD Shock

Ventricular arrhythmias
Supraventricular arrhythmias
Device malfunction
EMI (electromagnetic interference)

ECG and Telemetry



Was this ICD Therapy Appropriate?
1) Yes 2)No

Device Interrogation
Classify the Therapy Delivered

1. Appropriate
2. Inappropriate
3. Avoidable
4. Phantom

Classify the Therapy Delivered
1. Appropriate

Sustained VT/VF or hemodynamically unstable tachy (syncope, >200 bpm, Unstable SVT*)

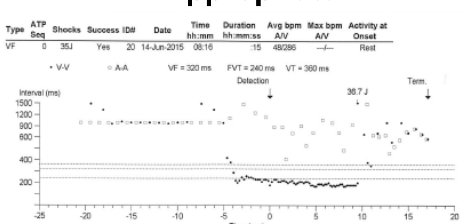
Treat the culprit: ablation, AAD

Treat the substrate: ischemia, CHF

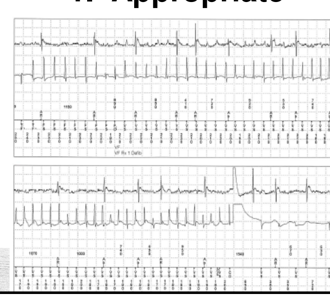
Classify the Therapy Delivered
1. Appropriate

20-35% of heart failure patients who receive primary prevention ICD will have an appropriate shock within 1-3 years of implant

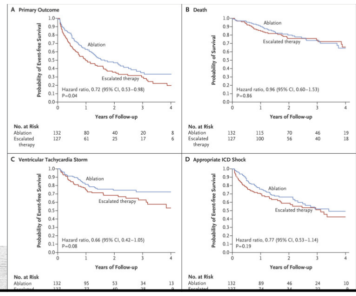
Classify the Therapy Delivered
1. Appropriate



Classify the Therapy Delivered
1. Appropriate

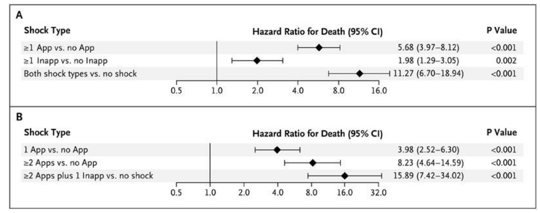


VT Ablation Benefit after an ICD Shock



Primary outcome
death, VT storm, ICD shock
N Engl J Med 2016;375:111-121.

Risk Death after ICD Shocks in SCD-HeFT

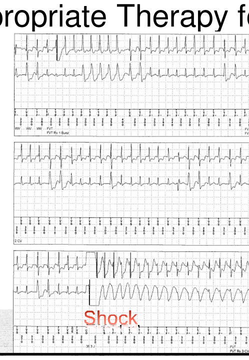


Poole JE et al. N Engl J Med 2008;359:1009-1017.

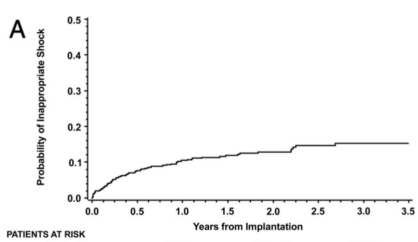
Classify the Therapy Delivered
2. Inappropriate

Sinus tachycardia, AF, AFL, PSVT
Inaccurate sensing: oversensing of A, V, T
Environmental: EMI
Frequent PVCs and NSVT
Extracardiac physiologic signals (myopotential)
Hardware (set screw, lead failure)
Other implantable devices: LVAD, nerve stimulators

Inappropriate Therapy for AFL



Inappropriate Shocks in MADIT II



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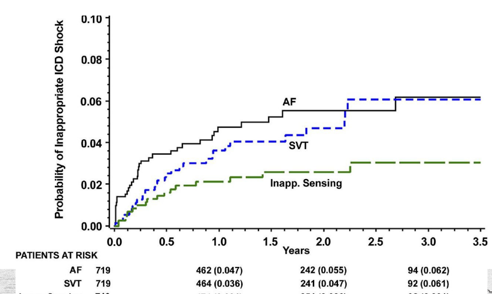
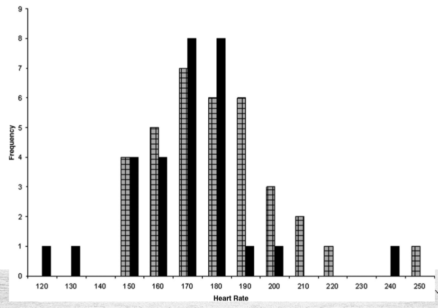


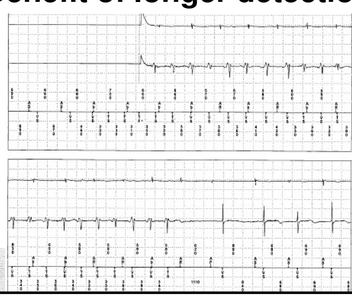
Inappropriate Shocks in MADIT II



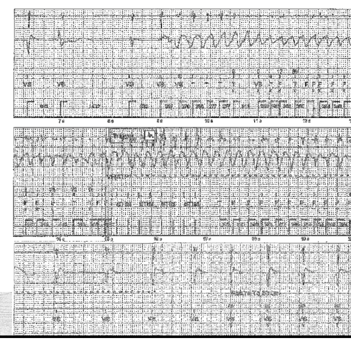
Classify the Therapy Delivered
3. Avoidable

1. **Self-terminating arrhythmias.**
2. **ATP responsive ventricular tachyarrhythmias.**
3. **Overdrive suppression responsive rhythms.**
4. **Many appropriate and most inappropriate therapies are also potentially avoidable.**

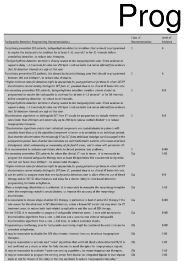
Self-terminating arrhythmias
Benefit of longer detection



ATP



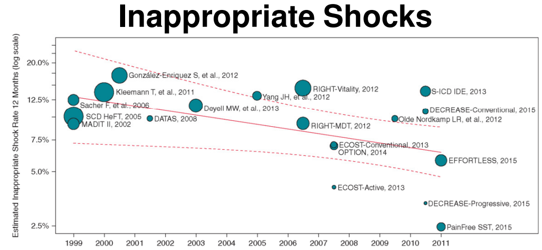
Consensus Statement on Optimal ICD Programming & Testing



<u>**Key points**</u>

Duration 6-12 sec or 30 intervals
Slowest tachy zone 185-200 bpm
(secondary prev at least 10 bpm < clinical VT)
Use SVT discriminators
Use lead failure alerts
Enable ATP

Optimal Programming Reduces Inappropriate Shocks



Inappropriate shocks in single-chamber and subcutaneous implantable cardioverter-defibrillators: a systematic review and meta-analysis. Europace. 2017;19(12):1973-1980.

ICD Shock Action Plan

EVENT	SYMPTOMS	ACTION
Single ICD Shock	Feels fine immediately	Call heart doctor to discuss event and arrange appropriate FU
Single ICD Shock	Chest pain/pressure, shortness of breath, rapid heart action, dizzy confused or not well	Seek medical attention immediately
Two or more Shocks within 24 hours	Feels fine or ill	Seek medical attention immediately

Circulation. 2005;111:e380-e382

Summary

Device interrogation
Optimize programming
Treat the culprit
--- Ablation beneficial for inappropriate (AF/AFL/SVT) and appropriate (VT)
--- Antiarrhythmia drug therapy
--- Optimize therapy for ischemia and CHF
Empower patients with an action plan