Why is the Transvenous ICD still optimal to prevent Sudden Cardiac Arrest?

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What is optimal ICD to Prevent SCA?

Subcutaneous ICD (S-ICD)? or transvenous ICD (TV-ICD)?

S-ICD: Patient Selection

Optimal S-ICD candidate[8]

STRONG INDICATION

Young age*

Primary prevention

Poor vascular access

Previous infection

Infection risk (mechanical valves, diabetes, renal dysfunction)

Difficult venous access

Young patients facing a lifetime of device therapy

Patients with a particular risk of infection

RELATIVE CONTRAINDICATION

Need for ATP (difficult to define clinically)**

CONTRAINDICATED**

Pacing indication (bradycardia or CRT)

Failed screening (potentially high inappropriate shock risk)

2017 ACC/AHA/HRS Guidelines

COR	LOE	Recommendations
I	B-NR	In patients who meet criteria for an ICD who have inadequate vascular access or are at high risk for infection, and in whom pacing for bradycardia or VT termination or as part of CRT is neither needed nor anticipated, a subcutaneous implantable cardioverter-defibrillator is recommened.
II	B-NR	In patients who meet indication for an ICD, implantation of a subcutaneous implantable cardioverter-defibrillator is reasonable if pacing for bradycardia or VT termination or as part of CRT is neither needed nor anticipated.
III	B-NR	In patients with an indication for bradycardia pacing or CRT, or for whom antitachycardia pacing for VT termination is required, a subcutaneaus implantable cardioverter-defibrillator should not be implanted.

2017 ACC/AHA/HRS Guidelines

- **The risk of infection appears to be lower** with subcutaneous implantable cardioverter-defibrillators than with transvenous ICDs.
- Therefore, a subcutaneous implantable cardioverter-defibrillator may be preferred in patients who are at **high risk of infection**, such as those with a prior device infection, ESRD, diabetes mellitus, or who are chronically immunosuppressed.

2015 ESC Guidelines

COR	Recommendations
IIa	S-ICD is recommended for all ICD-indicated patients without pacing requirement.
IIb	to provide additional guidance to the stratification process of patients who could benefit most from the S-ICD: supported by expert opinion.

Pacing and ATP Requirement

Patient requiring	At implant	Post implant	Explantation for[4]
Pacing[1]	6 %	2 % / Year[2]	1%
ATP[3]	1.8 %	1.8 % / Year	5%

1. *AHA 2014 Abstract 20158*
2. *Circulation 2007;115:2474-80*
3. *Circulation 2010;122:2359-67*
4. *Circulation 2013;944-53*

Pacing and ATP Requirement

- Greater than 80% of the detectable episodes in typical ICD populations are monomorphic VT and ~50% of these are pace terminable[1,2]
- 10-15% of ICD patients develop bradycardia within 5 years[3,4]

1. *PREPARE Trial, HRS 2008*
2. *ADVANCE III Study. AHA 2012*
3. *Heart 2013;99:1018-23*
4. *SCD-HeFT HRS 2014*

ATP Programming Recommendations

Tachycardia therapy programming recommendations	Class of recommend
It is recommended in all patients with structural heart disease and ATP-capable ICD therapy devices that ATP therapy be active for all ventricular tachyarrhythmia detection zones to include arrhythmias up to 230 bpm, to reduce total shocks except when ATP is documented to be ineffective or proarrhythmic.	I
It is recommended in all patients with structural heart disease and ATP-capable ICD therapy devices that ATP therapy be programmed to deliver at least 1 ATP attempt with a minimum of 8 stimuli and a cycle length of 84–88% of the tachycardia cycle length for ventricular tachyarrhythmias to reduce total shocks, except when ATP is documented to be ineffective or proarrhythmic.	I
It is indicated to programme burst ATP therapy in preference to ramp ATP therapy, to improve the termination rate of treated ventricular tachyarrhythmias.	I
It is reasonable to activate shock therapy to be available in all* ventricular tachyarrhythmia therapy zones, to improve the termination rate of ventricular tachyarrhythmias. **Rarely, to limit patient discomfort and anxiety, haemodynamically stable slow VT can be treated without programming a backup shock.*	IIa
It is reasonable to programme the initial shock energy to the maximum available energy in the highest rate detection zone to improve the first shock termination of ventricular arrhythmias unless specific defibrillation testing (DT) demonstrates efficacy at lower energies.	IIa

2015 ESC Guidelines

Indications for S-ICD Replacement or Explantation

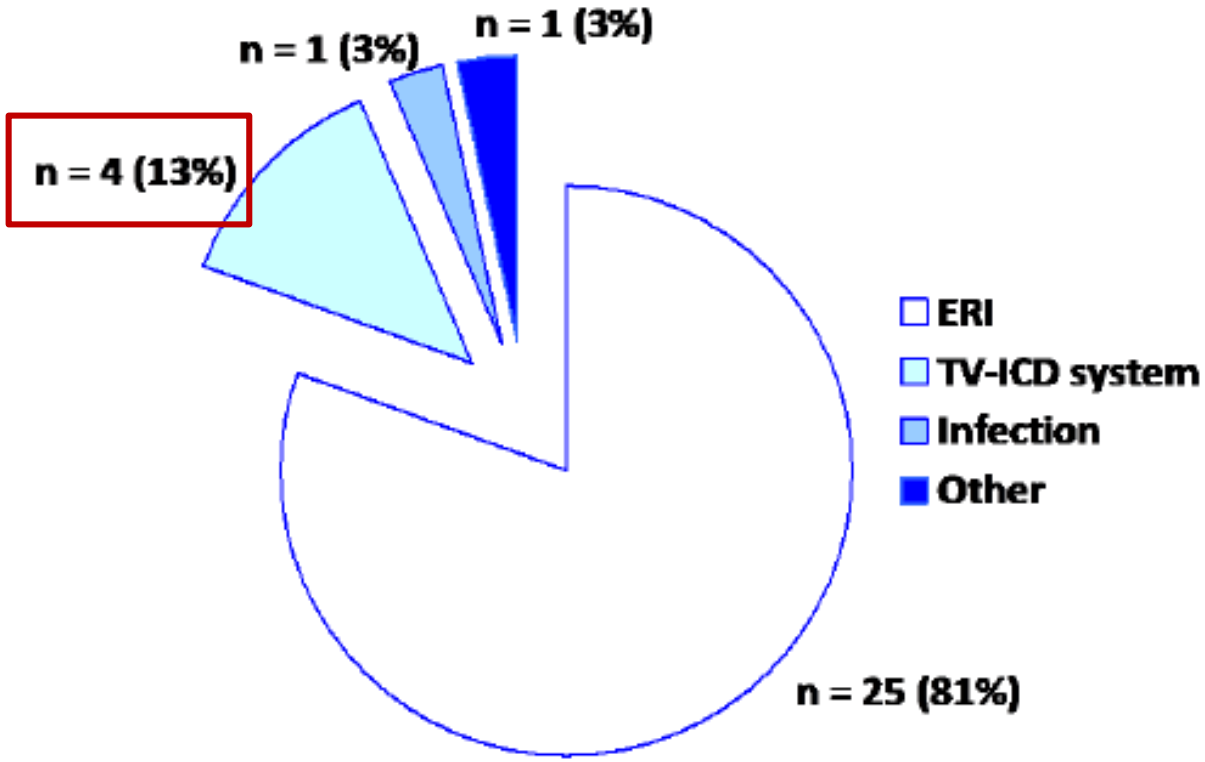

Figure 1. Proportions of the indications for device replacement and explantation. ERI indicates elective replacement indication; and TV-ICD system, transvenous ICD system.

Circ Arrhythm Electrophysiol 2015;8:1159-63

S-ICD Battery Longevity

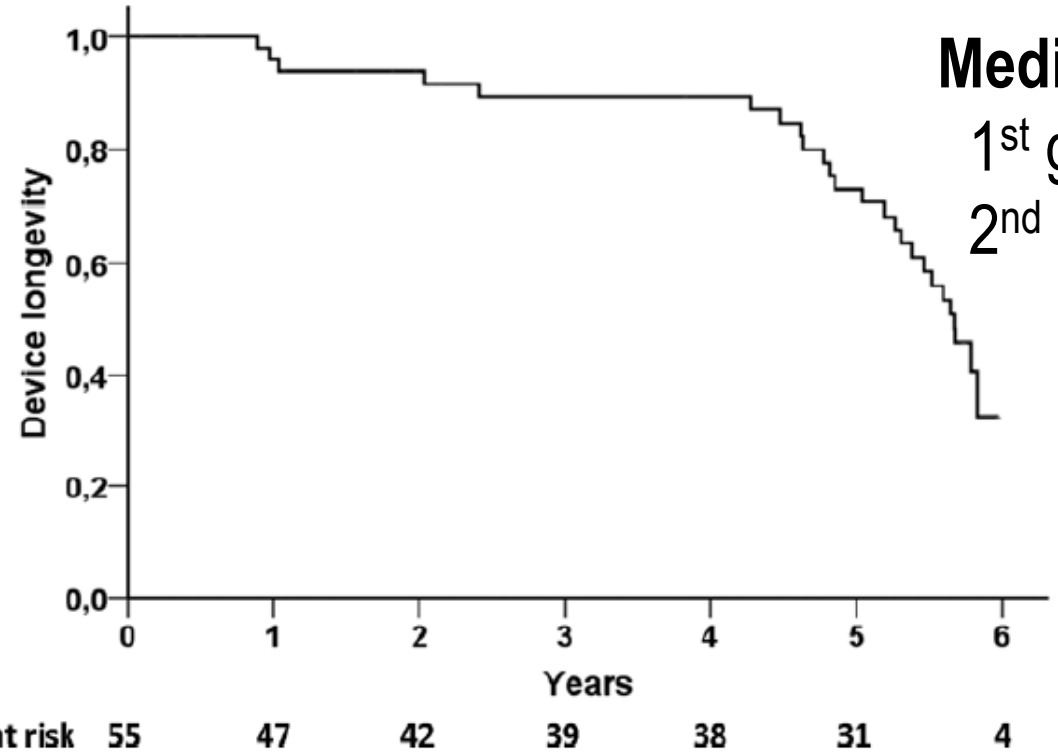

Figure 2. Event-free rates for device replacement because of normal and premature battery depletion. Regarding the curves, devices were censored in case of explantation for reasons other than battery depletion.

Median battery longevity:

1st generation S-ICD: 5 years

2nd generation S-ICD: 7 years

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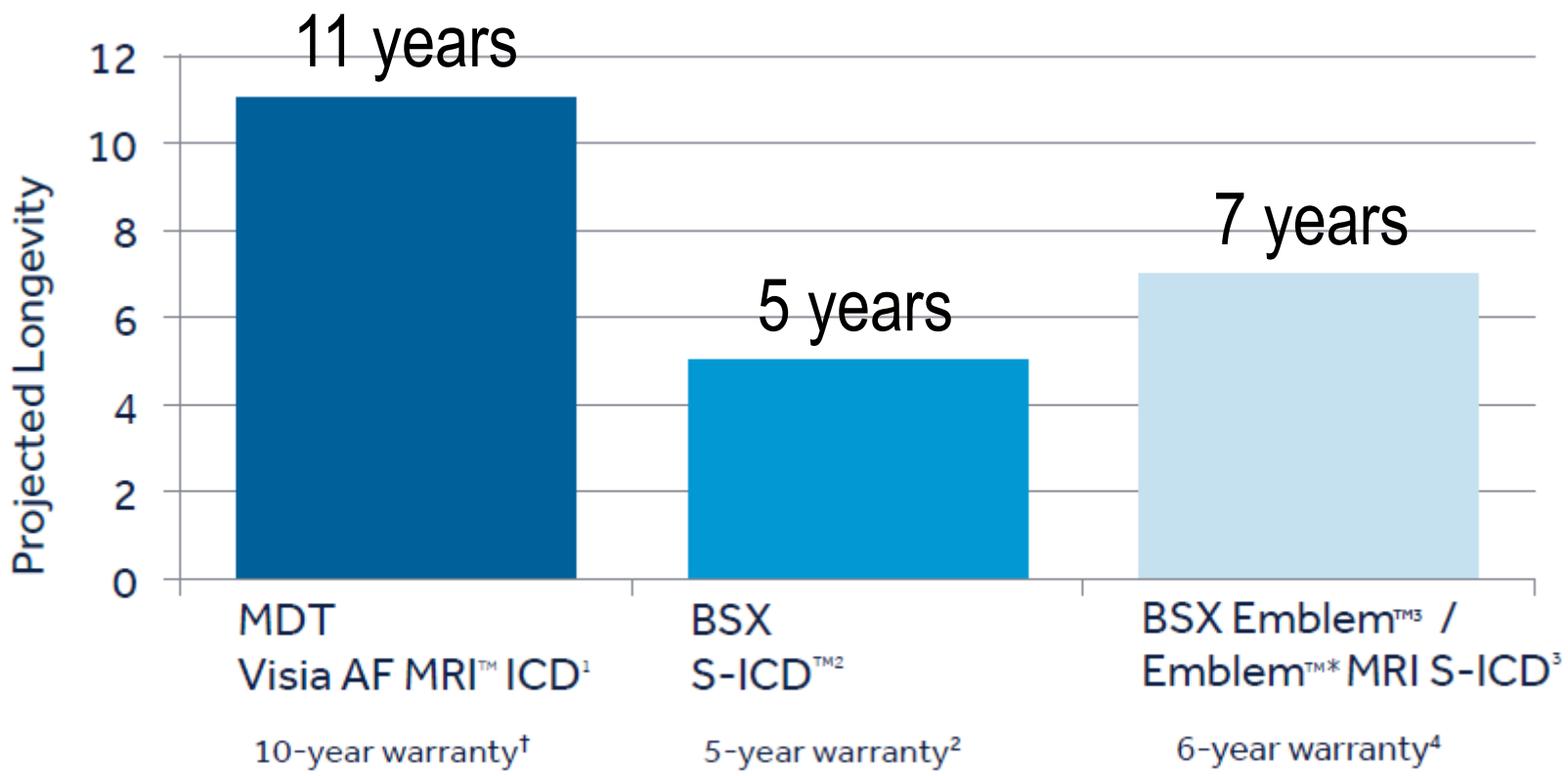
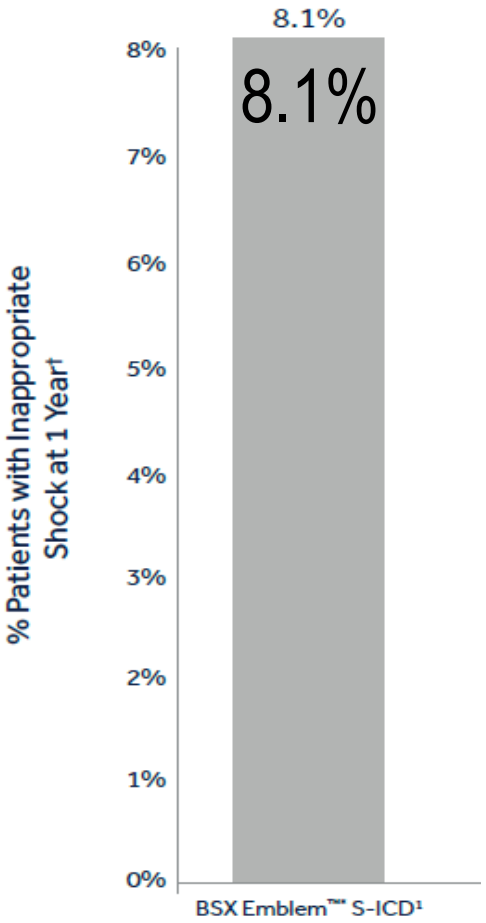
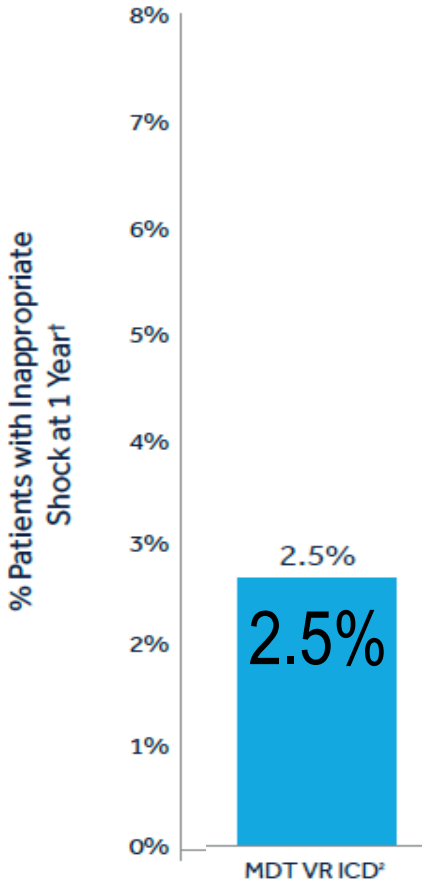
Battery Longevity



Inappropriate ICD Shocks





EFFORTLESS Study. HRS 2016
Heart Rhythm 2015;12:926-36

Data Storage Capacity

	Medtronic ICD	S-ICD
Treated episodes	100	25
Untreated episodes	100	20
AF episodes	50	7
Max ECG length	5 min	128 sec
Captured reports	50	15

Summary

- **S-ICD still has a big gap**
  - No pacing therapy
  - No SVT discriminator
  - Shorter battery longevity than TV-ICD
  - Bigger than TV-ICD
  - Only 1.5T-MRI-compatible