Cardiovascular Implantable Electronic Device Leads & Arteriovenous Hemodialysis Access

Theodore F. Saad, MD
Nephrology Associates, PA
Christiana Care Health System
Newark, Delaware

Cardiovascular Implantable Electronic Device (CIED)

- CIED
  - Permanent Pacemaker (PPM)
  - Implantable Cardioverter-Defibrillator (ICD)
  - Cardiac Resynchronization Therapy (CRT)

CIED Leads & AV Access

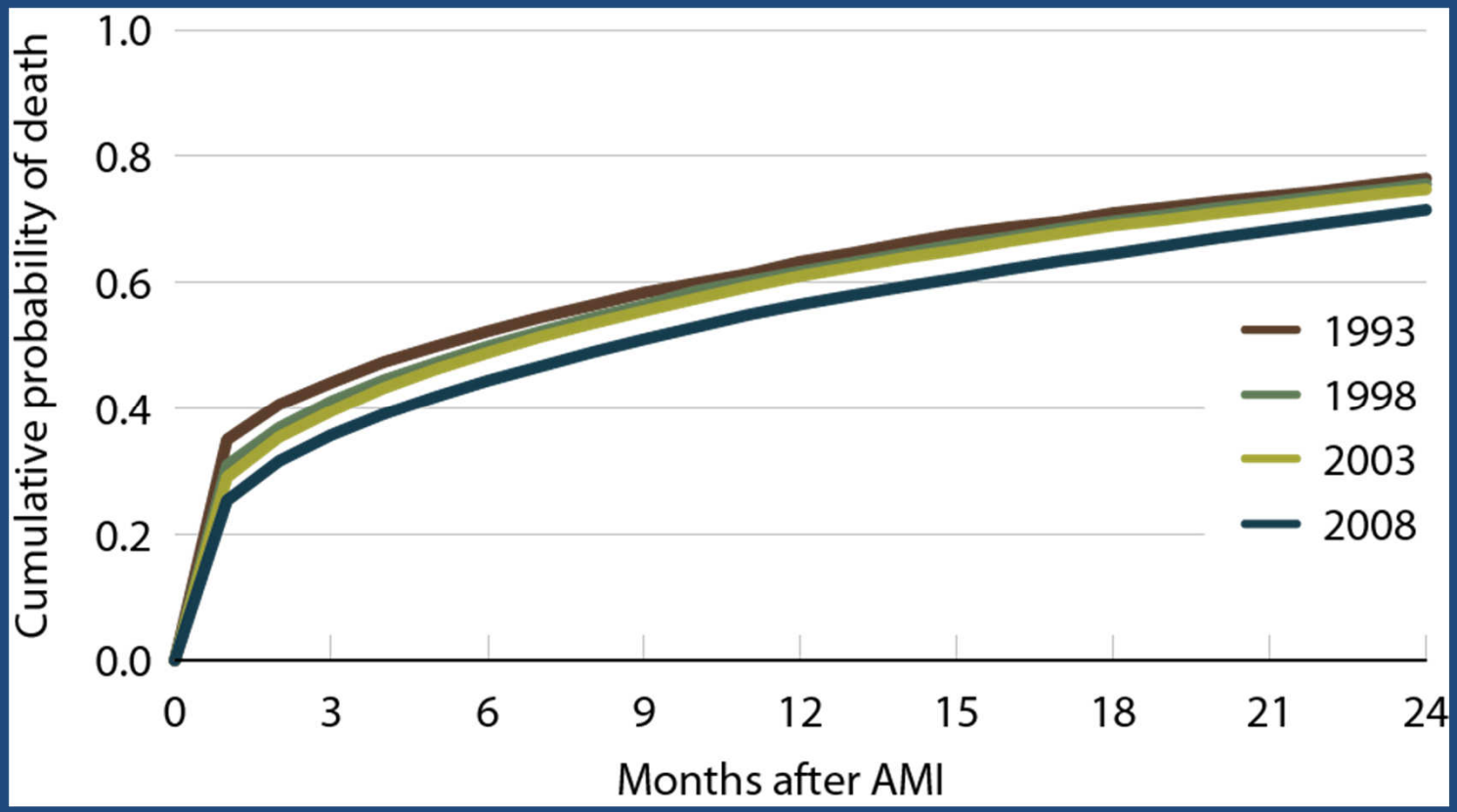
1. Are transvenous CIED leads really that bad?
   - Central vein stenosis or occlusion
   - Infection
2. Are epicardial leads really the answer?
   - Evidence
   - Alternatives

CIED Leads & AV Access

- Hemodialysis as “Palliative” Therapy for ESRD in Patients with Cardiovascular Disease
  - Myocardial Infarction
  - CHF
  - ICD

Two-year cumulative probability of death in dialysis patients following an AMI

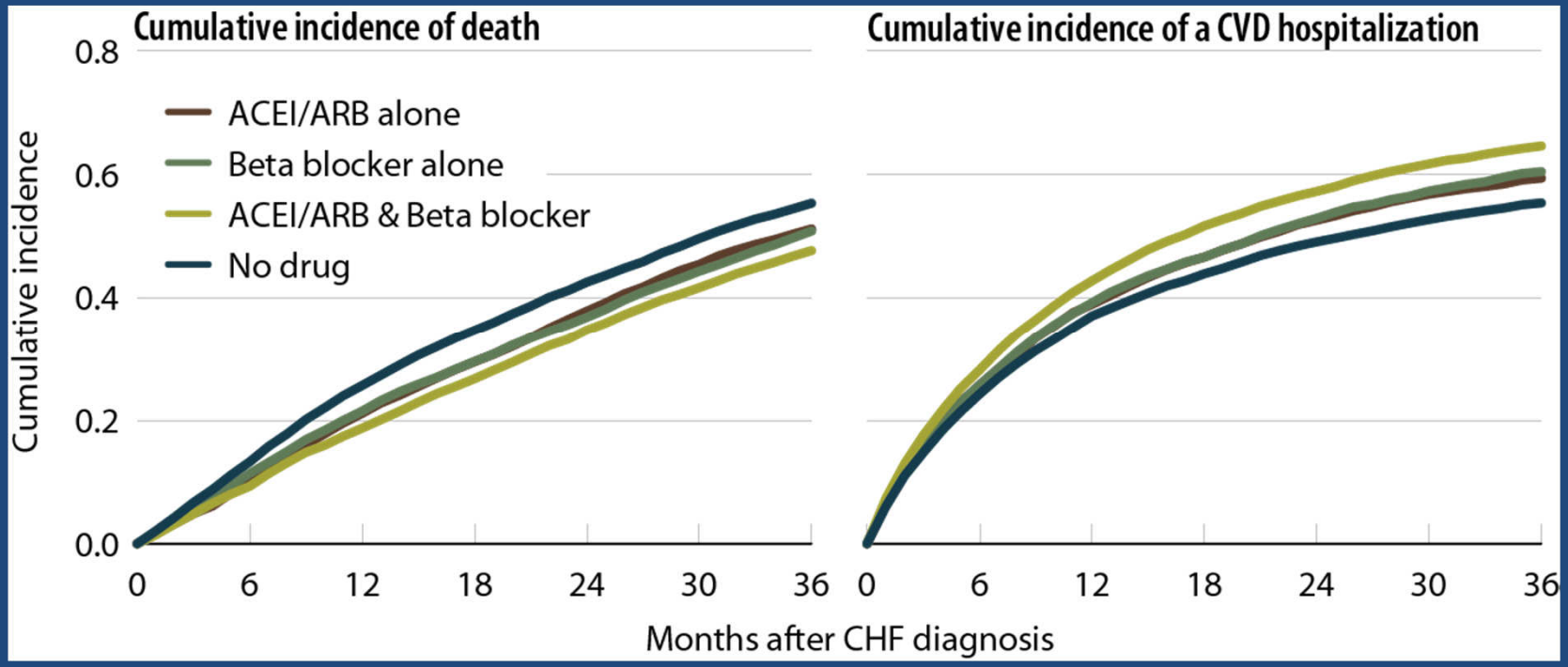
Figure 4.19 (Volume 2)



Period prevalent dialysis patients with first AMI in the year, unadjusted.

Cumulative incidence of death or CVD hospitalization in ESRD patients following diagnosis of CHF, 2007–2010

Figure 4.29 (Volume 2)

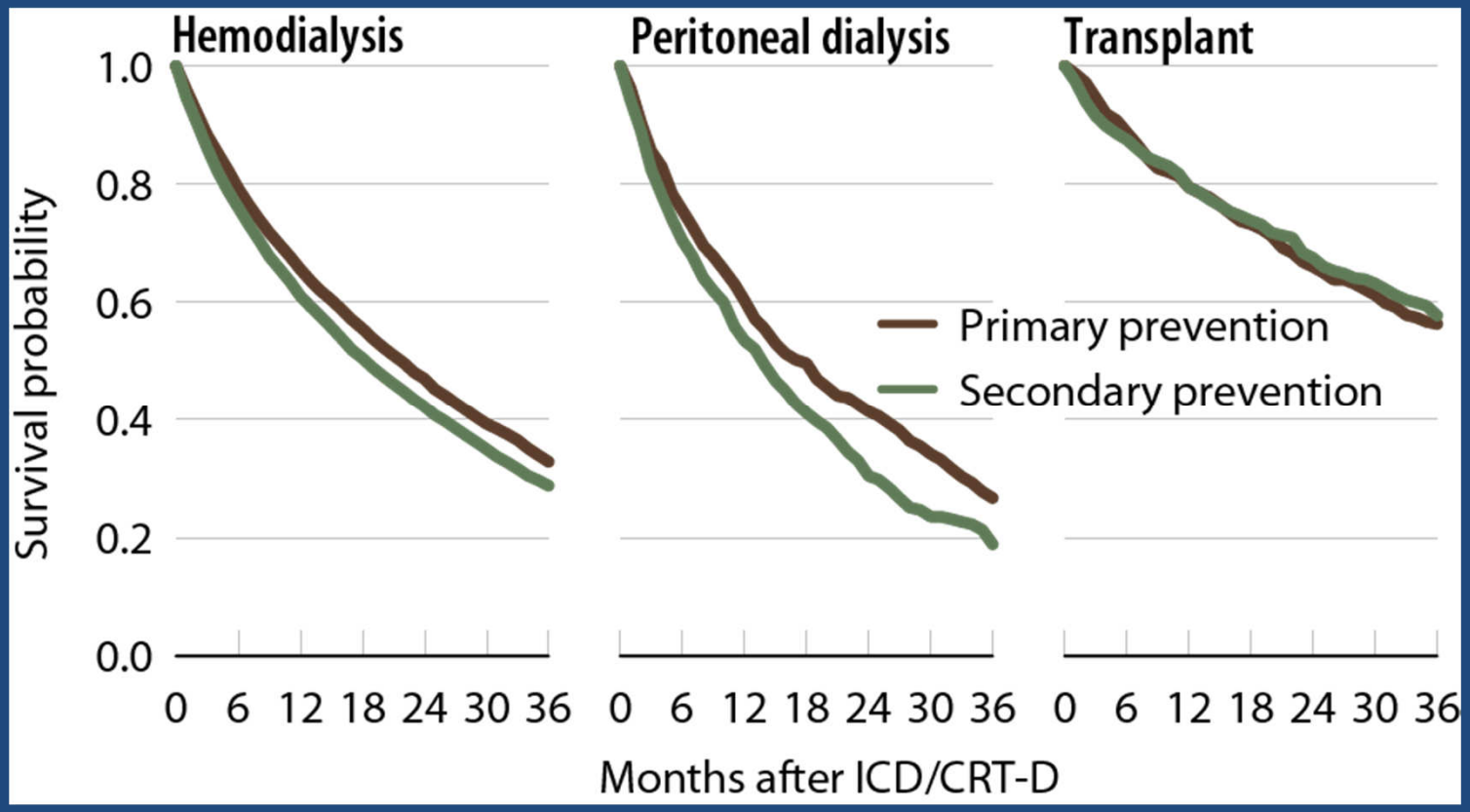


January 1 point prevalent ESRD patients with Medicare Parts A, B, & D enrollment, with a first diagnosis of CHF in 2007.

USRDS 2012 ADR

All-cause survival following implantation of first ICD/CRT-D, by modality, 1999–2010

Figure 4.16 (Volume 2)



Dialysis & transplant patients receiving their first ICDs/CRT-Ds in 1999–2010.

Colon Cancer 5-year Survival by Stage at Diagnosis*: 2002-2008

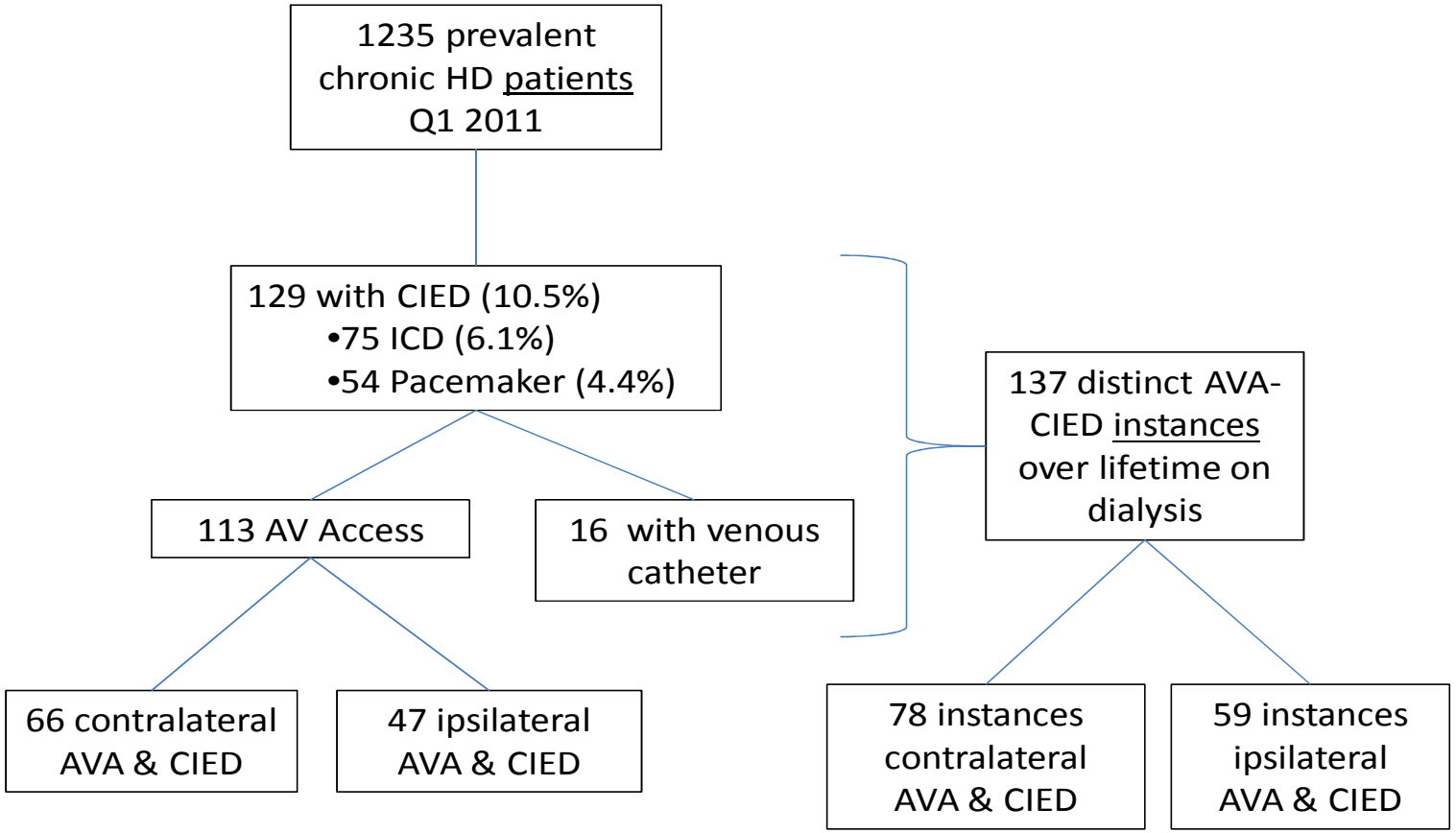
Stage at Diagnosis	5-year Survival (%)
Stage 0-I-II Localized	89.9
Stage III Regional	69.6
Stage IV Metastatic	11.9

*National Cancer Institute: http://seer.cancer.gov/statfacts/html/colorect.html

Nephrology Associates Hemodialysis Patient Access & CIED Study

- Survey of CIED in prevalent HD patients
  - 1235 patients receiving HD Q1 (Jan-Mar) 2011
  - CIED present in 129 patients (10.5%)
    - 54 Pacemakers (4.4%)
    - 75 ICD (6.1%)
      - Primary Prevention 42
      - Secondary Prevention 14
      - Undetermined 19
  - All Subclavian or cephalic
    - No jugular, femoral, epicardial
- Patients
  - Mean age 70.3
  - 80 Male, 49 Female
- Access Type
  - AV Fistula 76 (59%)
  - AV Graft 37 (29%)
  - Venous catheter 16 (12%)

Nephrology Associates Hemodialysis Patient Access & CIED Study



	CIED and AV Access		
	All	Contralateral	Ipsilateral
Instances	137	78	59
CIED left-sided	101 (74%)	45 (58%)	56 (95%)
CIED right-sided	36 (26%)	33 (42%)	3 (5%)
CIED prior to AV Access	82 (60%)	34 (44%)	48 (81%)
AV Access prior to CIED	54 (39%)	44 (56%)	10 (18%)
Unknown	1		1
Total Access Circuit Interventions (Rate per AY)	506 (1.48)	261 (1.44†)	245 (1.53)
Central Venous Interventions (Rate per AY)	145 (0.43)	50 (0.28*)	95 (0.59)
Interventions for superior vena cava stenosis	0	0	0

†P=0.26 versus Ipsilateral Access Circuit Interventions

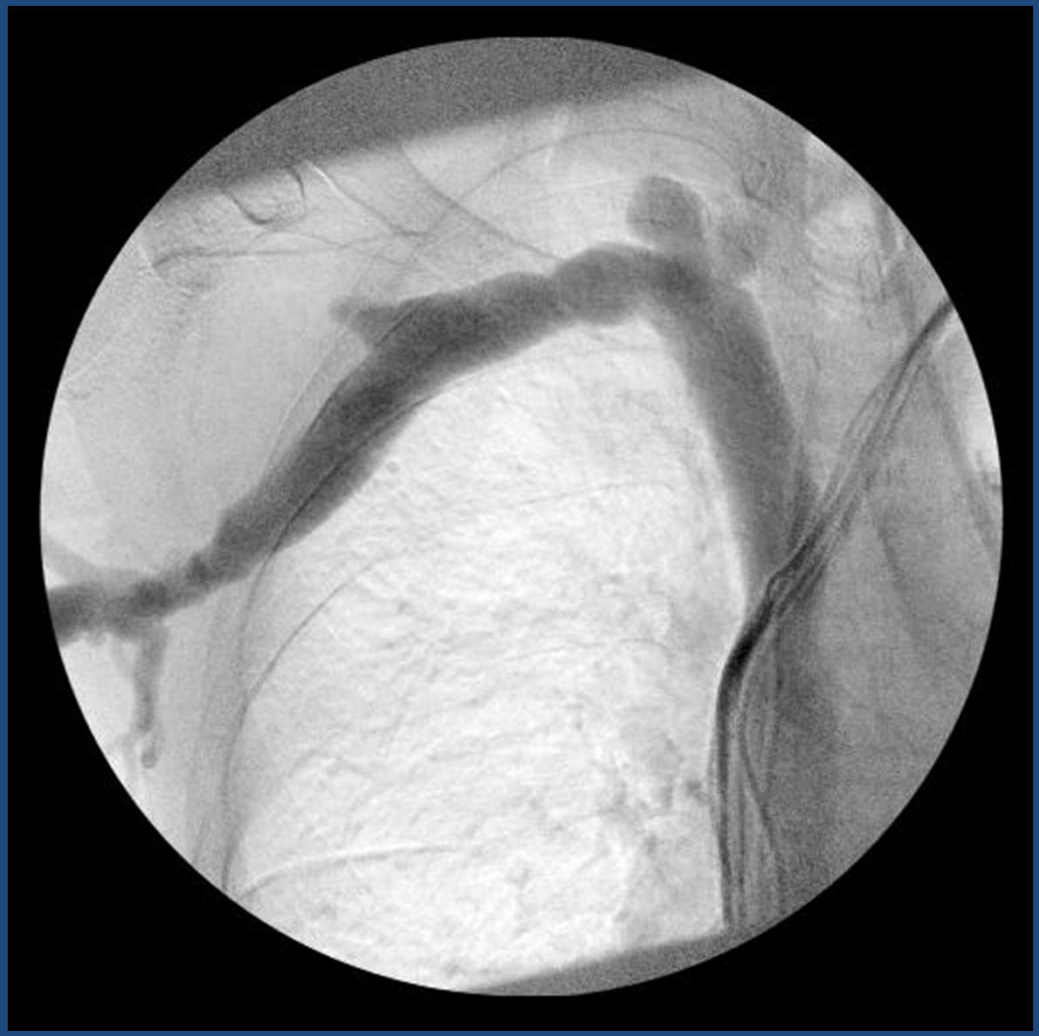
*P<0.0001 versus Ipsilateral Central Venous Interventions


NEPHROLOGY ASSOCIATES
08/08/2008
9:50:28 AM
19
85
68 kVp
7.72 mA
27
OEC

Ipsilateral CIED-AVA

- 59 instances
  - 34 (58%) with NO clinically evident venous hypertension and NO central venous interventions
  - 20 required <2 interventions per access-year
  - 5 required >2 interventions per access-year
- 6 resulted in loss of AV access due to intractable venous hypertension
  - Ligation of ipsilateral AVA
  - Creation of contralateral AVA

SCV Stenosis: Non-Problem



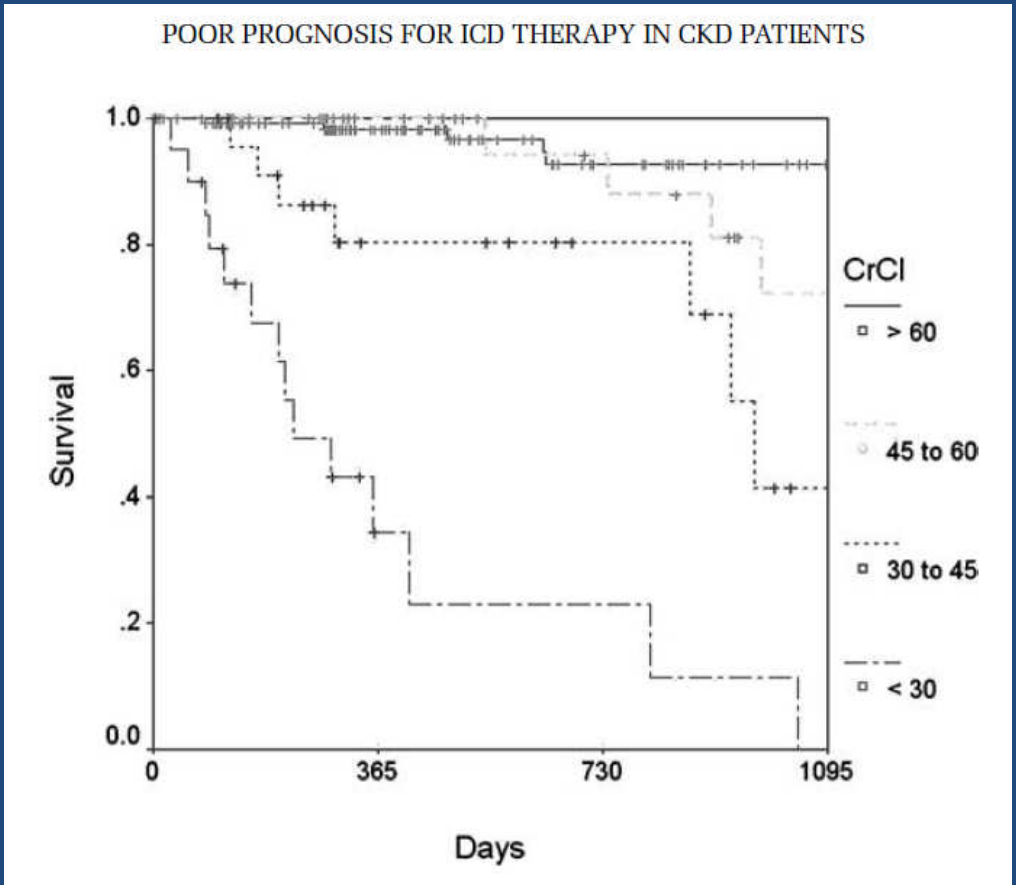
CIED Leads & AV Access

- Are transvenous CIED leads really that bad?
- NO

Nephrology Associates HD Patient CIED Study: Indications for ICD

- ESRD Patients with ICD: 75/1235 (6.1%)
  - Primary Prevention: 42 (56%)
  - Secondary Prevention: 14 (19%)
  - Unable to Determine: 19 (25%)

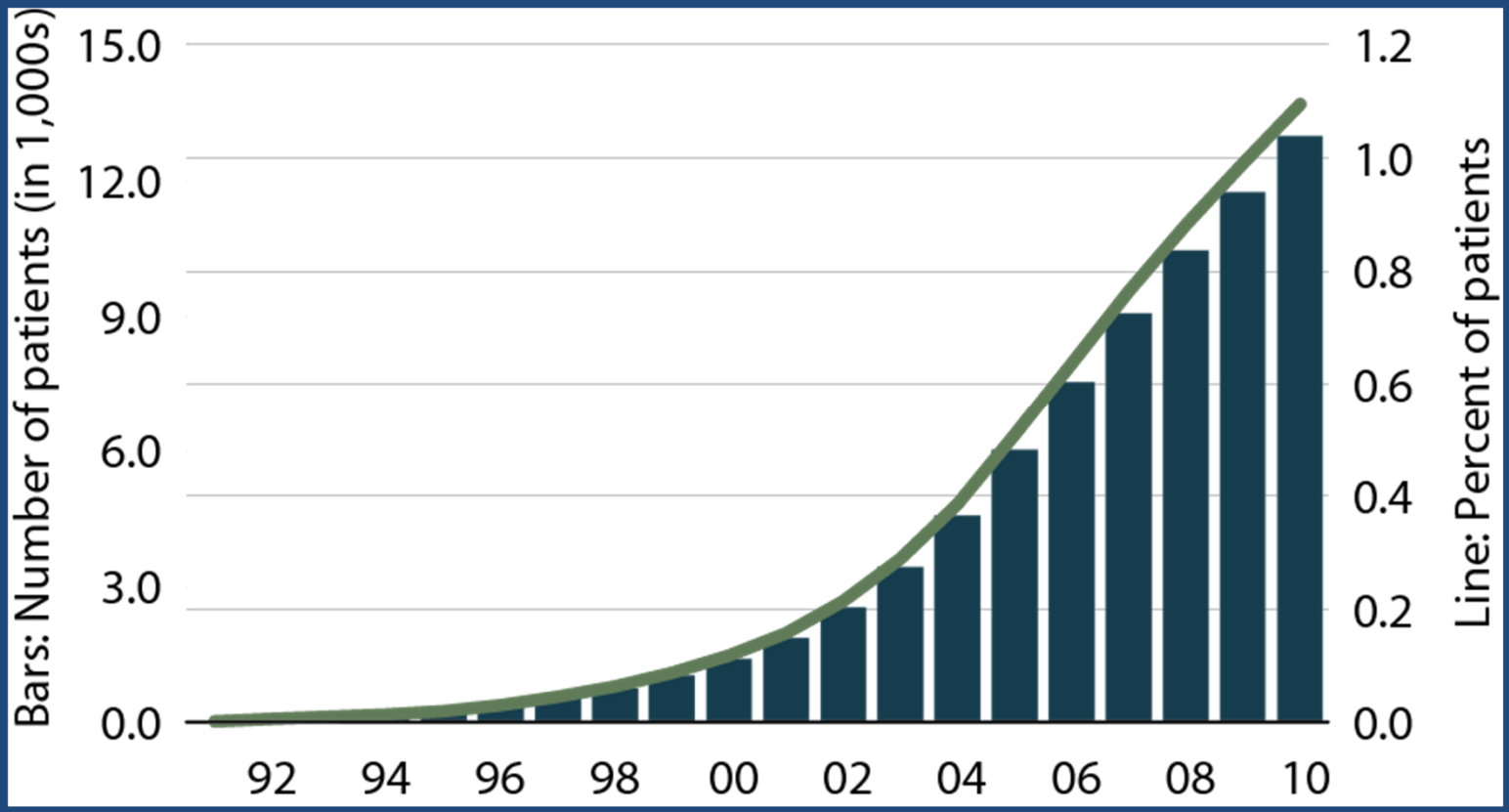
Poor Outcomes in Patients with CKD Treated with ICD for Primary Prevention



Cuculich, et al: Poor Prognosis for Patients with Chronic Kidney Disease Despite ICD Therapy for the Primary Prevention of Sudden Death. PACE 2007

Cumulative number & percent of dialysis patients receiving ICDs/CRT-Ds

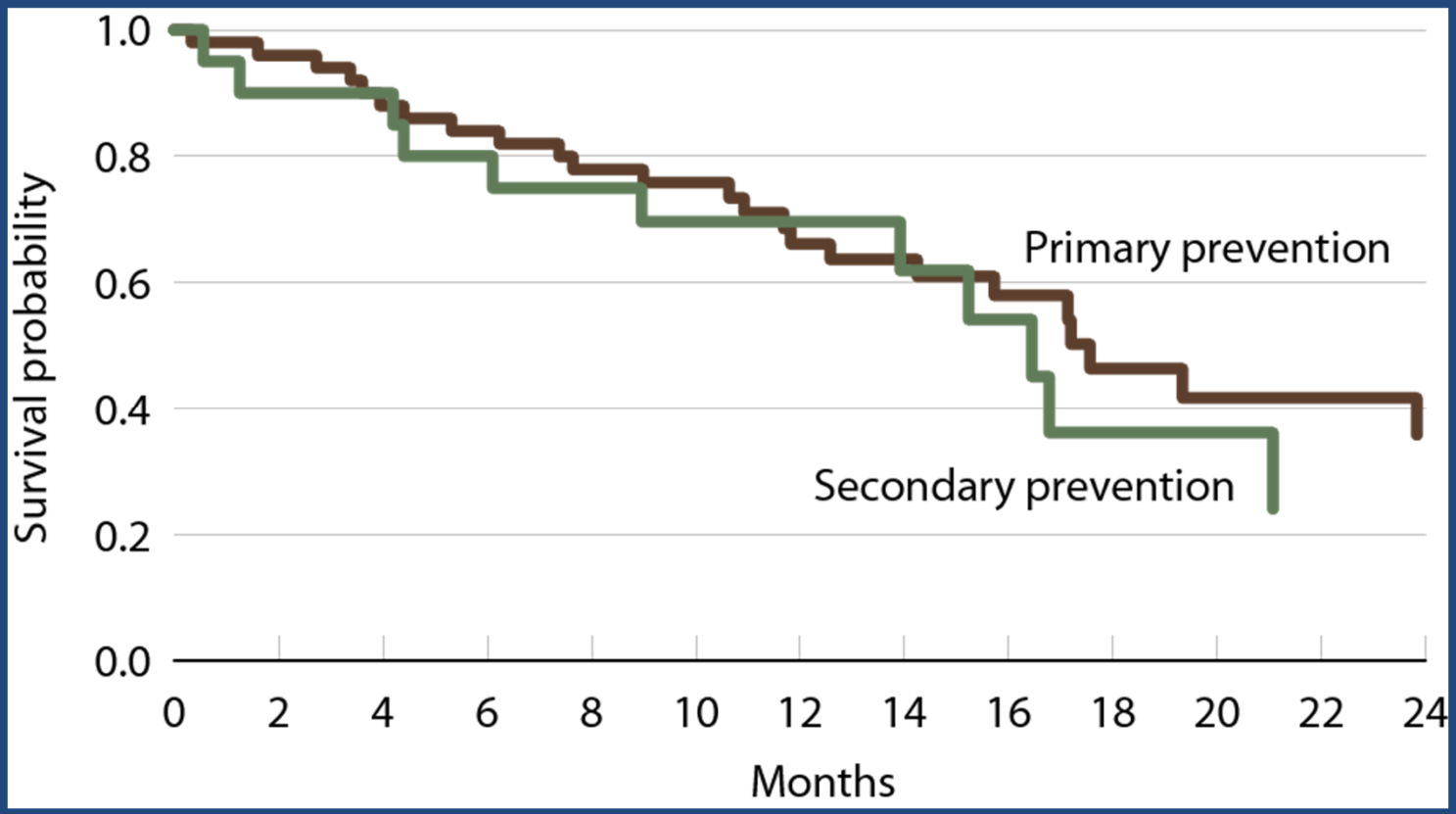
Figure 4.13 (Volume 2)



Period prevalent patients; dialysis patients 1992–2010.

All-cause survival in dialysis patients using first wearable cardioverter defibrillator (WCD), 2005–2010

Figure 4.17 (Volume 2)



Dialysis patients receiving first WCD in 2005–2010.

CIED Leads & AV Access

- Are epicardial leads safe & effective for PPM or ICD therapy in patients with CKD or ESRD?
  - Probably

    All major studies of ICD therapy have excluded patients with advanced CKD or ESRD
  - Very limited case reports & series describing epicardial leads in ESRD patients
    - Asif et al:
      - 9 patients with infected transvenous CIED leads
      - Leads removed by laser extraction & replaced with epicardial leads
      - No complications reported
    - Lacking larger comparative study, outcomes, complications

Asif et al., Epicardial Cardiac Rhythm Devices for Dialysis Patients: Minimizing the Risk of Infection and Preserving Central Veins. Seminars in Dialysis, 2010

Transvenous CIED Leads and Bloodstream Infection

- Hemodialysis patient are at higher risk for bloodstream infection
  - Patients with AV access 10x greater than general population
  - Patients with chronic venous access 7.6x greater than those with AV access
- Venous catheter access and transvenous CIED leads are a toxic combination

Transvenous CIED Leads and Bloodstream Infection

- Avoid CIED & venous catheter whenever possible
  - Use wearable defibrillator
  - Create early-use AV access
  - Delay initiation of hemodialysis
  - Utilize peritoneal dialysis, permanent or as bridge
  - Rethink use of ICD for primary prevention VT/VF
- Epicardial leads indeed may be optimal choice when indication for CIED & is absolute and venous hemodialysis access cannot be avoided

Epicardial Leads: Not the Answer

- Transvenous leads not that bad
  - Patient selection & planning can avoid ipsilateral
  - Even ipsilateral AVA & CIED may be acceptable
- Infections minimized by avoiding venous catheter
- ESRD patient survival with ICD very poor
  - What is accomplished by increasing use of ICDs with unproven benefit?
- Alternatives to ICD
  - Wearable defibrillator: Available NOW
  - Subcutaneous defibrillator: Coming
- Logistical or institutional barriers
  - Are cardiac electrophysiologists persuaded?
  - Is there expert & available CT surgery support?