



# Dying with a Left Ventricular Assist Device as Destination Therapy

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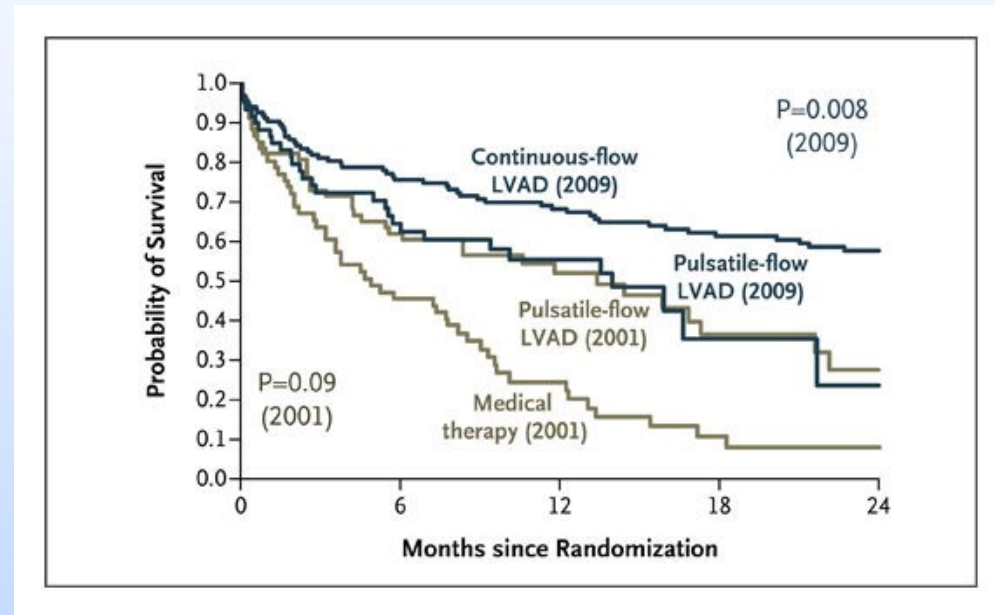
Mayo Clinic, Rochester, MN

# Disclosures

- Research funding NIH/ NHLBI and PCORI

# DT-LVAD is an Efficacious Therapy

- LVAD as Destination Therapy (DT-LVAD) increasingly utilized in patients with advanced heart failure
- On average, patients
  - Live longer compared with medical therapy
  - Have improved QOL
  - Individual benefit varies
- However, eventually everybody dies



# Study Aim

- The goal of this study was to systematically examine the deaths in patients treated with DT-LVAD at a single academic center
- Inclusion/ exclusion
  - Patients DT-LVAD implanted Jan 2007- Sept 2014
  - Deaths through July 1, 2015
  - Died with LVAD *in situ*
  - Cause of death from autopsy reports, death certificates, clinical notes

# Study Population

166 patients  
DT-LVAD  
1/2007-9/2014

- 11 heart transplant
- 2 explanted
- 64 alive 7/1/2015

89 patients died with DT-LVAD and  
included in analysis

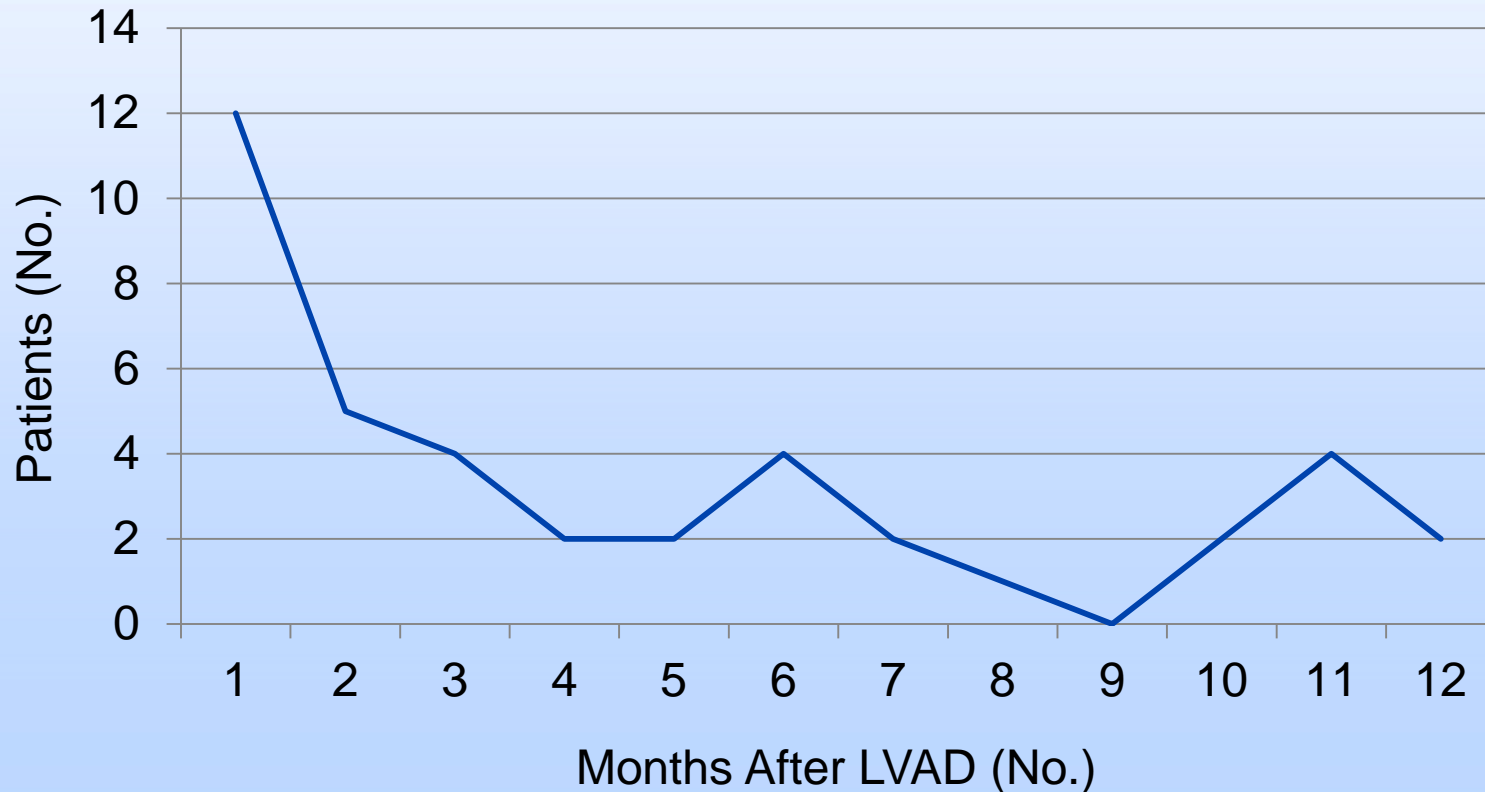
- 84 HMII, 3 HW HVAD, 2 HM XVE

# Pre-LVAD Characteristics of 89 Patients

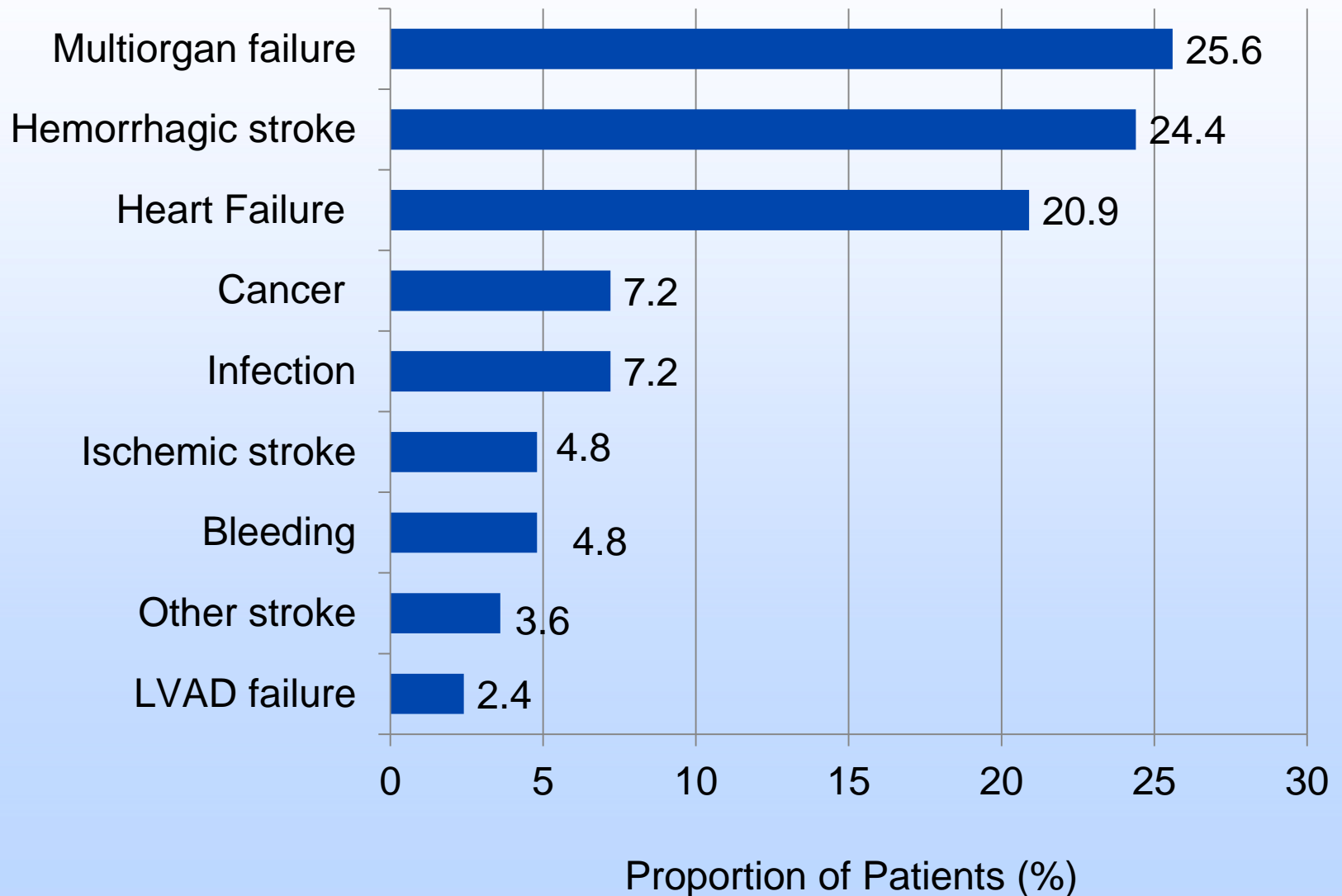
Age, years	64.5 (10.7)
Male, %	80.7%
Ischemic etiology of HF, %	58.4%
Prior sternotomy, %	60.7%
Comorbidities, %	
Hypertension	59.6%
Diabetes	46.1%
Peripheral vascular disease	28.1%
COPD	16.9%
Cerebrovascular disease	36.0%
Obese (BMI $\geq$ 30 kg/m <sup>2</sup> )	44.3%
Laboratory Data, median (IQR)	
Total bilirubin, mg/dL	1.0 (0.8, 1.7)
Creatinine, mg/dL	1.4 (1.1, 1.8)
INR	1.3 (1.1, 1.4)
>Moderate RV dysfunction, %	26.4%

# Experiences Around the Time of Death

<b>Age at death, years, mean (SD)</b>	66.1 (10.7)
<b>Time LVAD implant to death, years, mean (SD)</b>	1.7 (1.7)



# Cause of Death





# Where Did Patients Die?

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In hospital death, %	77.6%
Time hospital admission to death, days, median (IQR)	6 (2, 24)
ICU care during terminal hospitalization, %	91.7%
Died in an ICU, %	87.7%
Resuscitation during terminal hospitalization, %	20.6%
Mechanical ventilation during terminal hospitalization, %	73.3%
Hemodialysis in 48 hours prior to death, %	28.9%
Transition to comfort care prior to death, %	88.9%

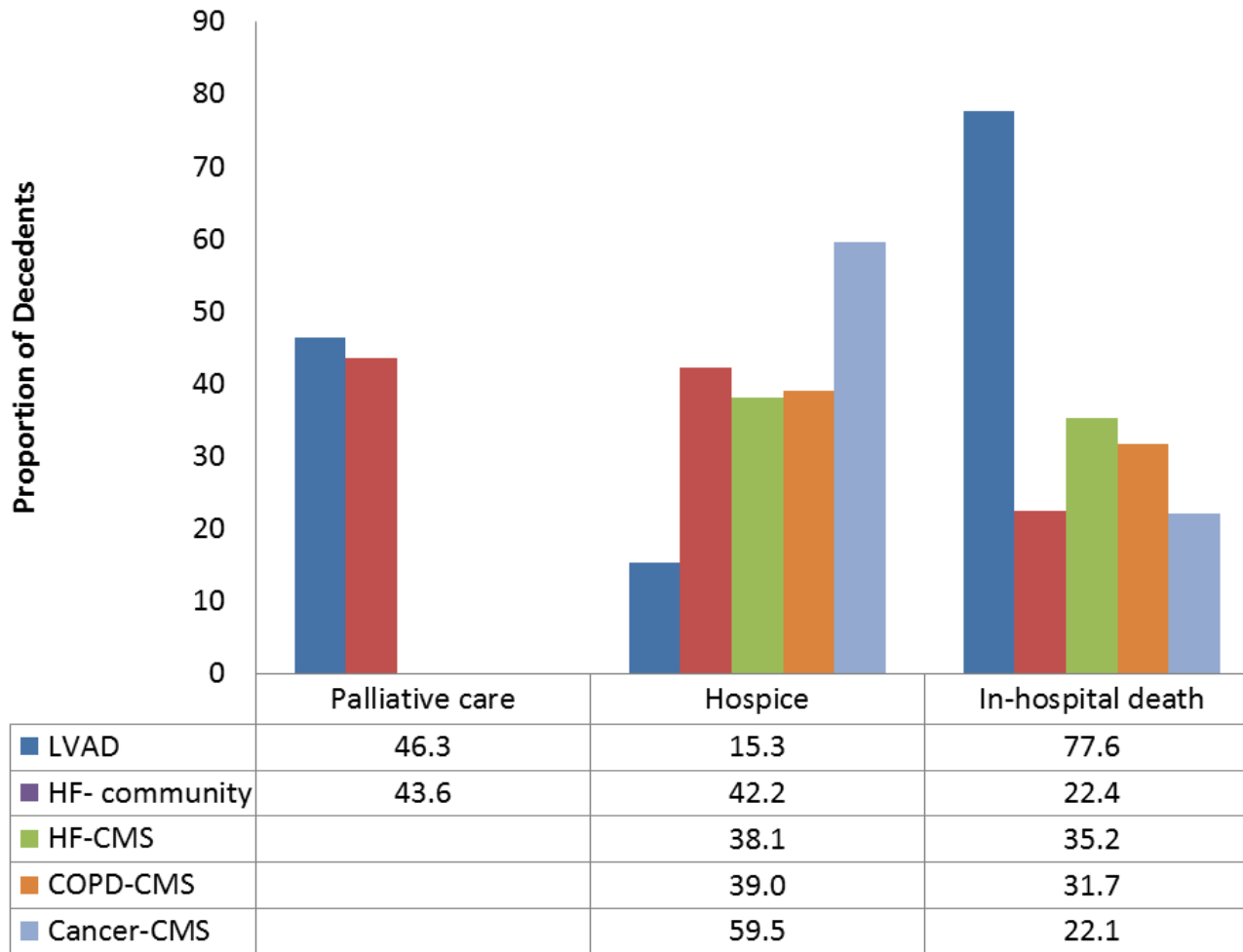
# LVAD Deactivations

- Defined as deactivation prior to clinical death
- Information available on 81/89 patients
- 49 (60.5%) had LVAD deactivated prior to death
  - 3 at home, remainder in hospital
  - Final decision by family/ clinical team 85.7%
  - Most patients died within minutes of deactivation, all within 26 hours

# Hospice and Palliative Care

- 46.3% (37/80) of patients saw palliative care in last month
  - Standard for all to see palliative care prior to LVAD
- 15.5% (13/84) enrolled in hospice
  - Time hospice to death median 10.5 days (range 1-315)
  - Cause of death → 5 multiorgan failure, 4 cancer, 2 stroke, 2 heart failure
  - 12/13 patients enrolled in hospice died at home or in hospice facility

# DT-LVAD Deaths Compared with Heart Failure, COPD, Cancer



Dunlay SM Circ Heart Fail 2015; 8:489  
 Unroe KT Arch Intern Med 2011; 171:196  
 Teno JM JAMA 2013; 309:470

# Limitations

- Single center study
- Some details were not available in patients that died in other hospitals

# Summary

- Most patients dying with a DT-LVAD
  - Died in the hospital, most in an ICU
  - Most common causes of death were multiorgan failure, heart failure, hemorrhagic stroke
  - Over half had LVAD deactivated, final decision by family/ hospital team
  - Half saw palliative care
  - Very few enrolled in hospice

Patients with a DT-LVAD die differently than other patients with heart failure

# Why do DT-LVAD patients die differently?

- Patient preferences may differ
- Acute deaths less predictable
- Clinicians may not be engaging patients in goals of care discussions
  - Involving palliative care too late
- Challenging to find skilled nursing and hospice facilities to accept patients with LVAD

# Next Steps

- Examine if findings differ at other centers
  - Explore variability
- Are decisions aligned with patient preferences?
  - Are clinicians discussing preferences with patients and family?
  - What are the barriers to hospice enrollment?
  - Should palliative care have a longitudinal role?



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