ADVANCED HEART FAILURE: STATE OF THE ART MANAGEMENT & THE POWER OF COLLABORATION

Samuel D Plotkin Symposium
June 2nd , 2026

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HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

Disclosures

- Consultant Alnylam, BridgeBio
- Consultant Baim Research Institute

Learning Objectives

At the end of this session, attendees will be able to:

1. Recognize the trajectory of heart failure progression

2. Recognize warning signs for transition to stage D heart failure and the need for referral

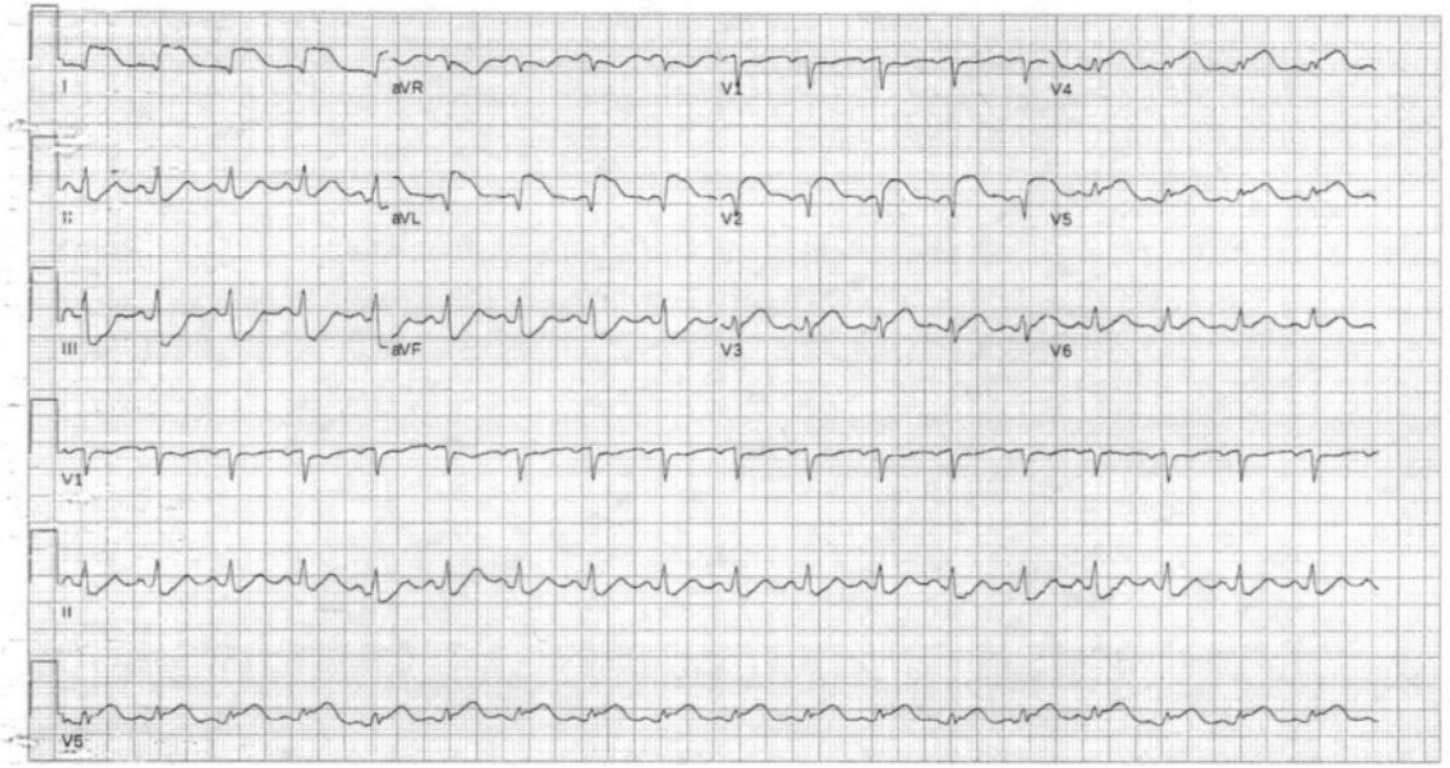
3. Describe options available for advanced heart failure patients

Overview

- Heart Failure Statistics & Disease Trajectory
- Warning Sings of Progression to Advanced Heart Failure
- Advanced Heart Failure Therapies
- New Allocation System and expanding the donor pool
- Power of Collaboration saves lives

Case Presentation

- 34 y/o F, 8 weeks post-partum presented to OSH with acute onset chest pain



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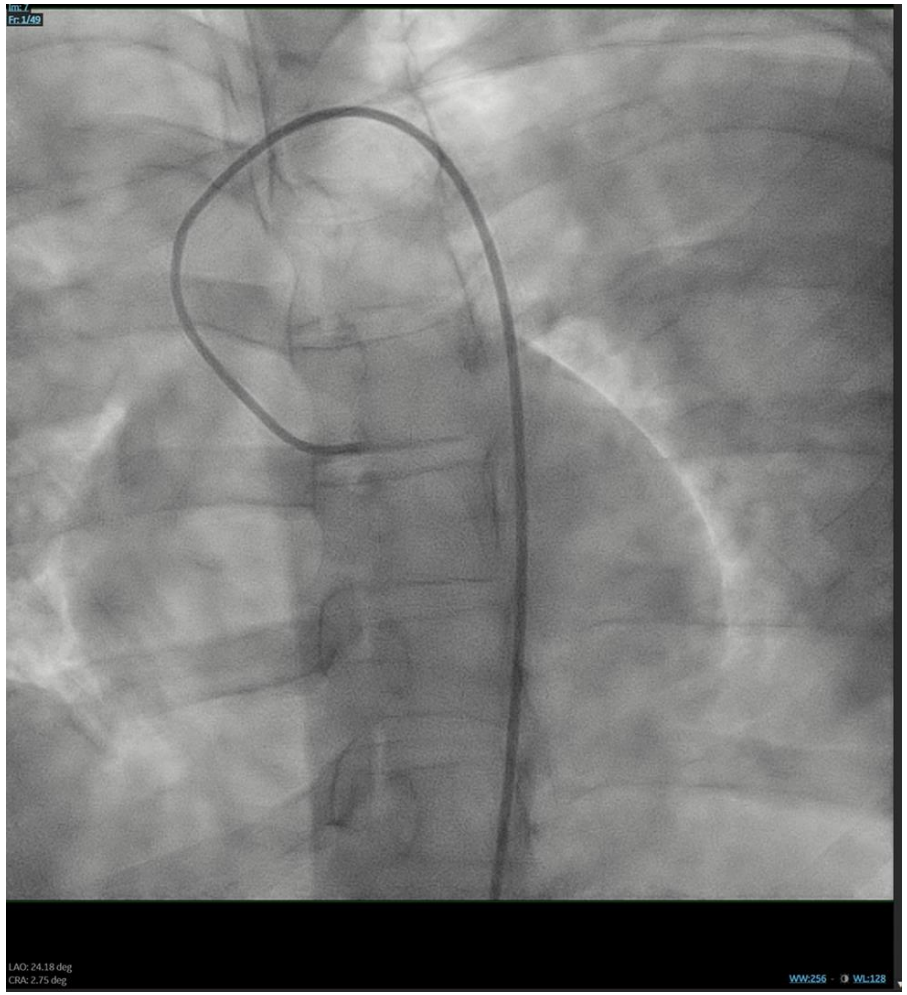
Case Presentation

- Due to anticipated delay in transfer to nearest cath lab, she received lytics
- Transferred to Baystate – ongoing chest pain
- In the cath lab she had VT & VF, 3 shocks but no compressions

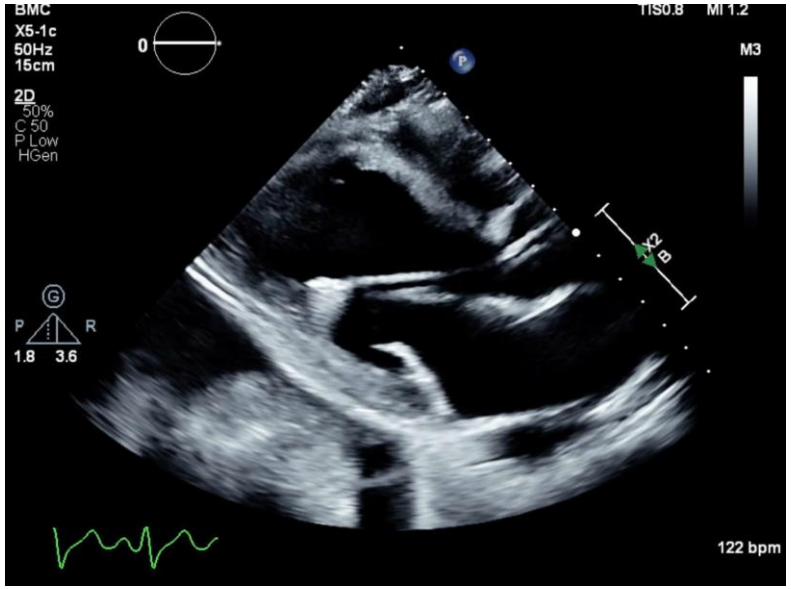
Cath Lab Findings



- Cath showed completely occluded LM due to dissection with a normal RCA
- Cardiac surgery was called emergently but no adequate targets for bypass so plan was to proceed with Impella supported PCI, RHC was also done
- Impella CP placed via right femoral artery
- They then attempted to stent the LM-LAD

Case Presentation

- Patient went to CCU but with worsening hemodynamics overnight, she was taken urgently for Impella 5.5 placement
- Complicated placement – Right axillary dissection
- Following placement hemodynamics improved and patient was transferred to BIDMC for transplant evaluation.



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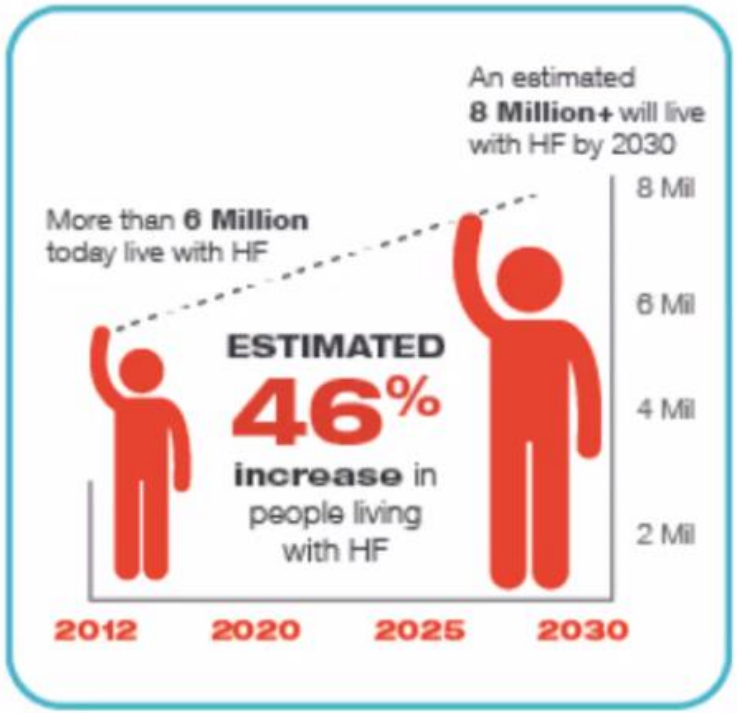
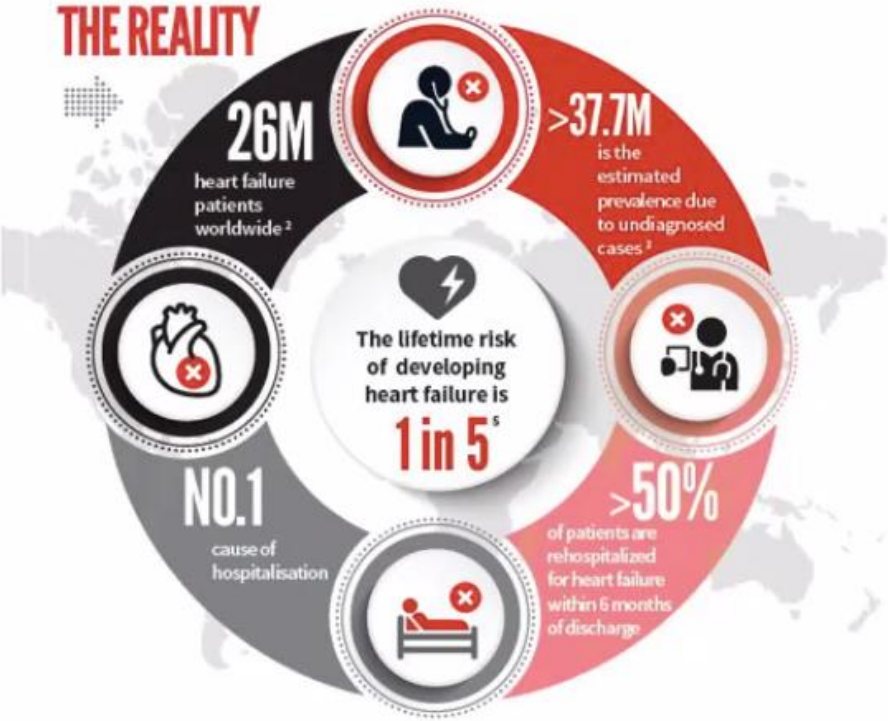
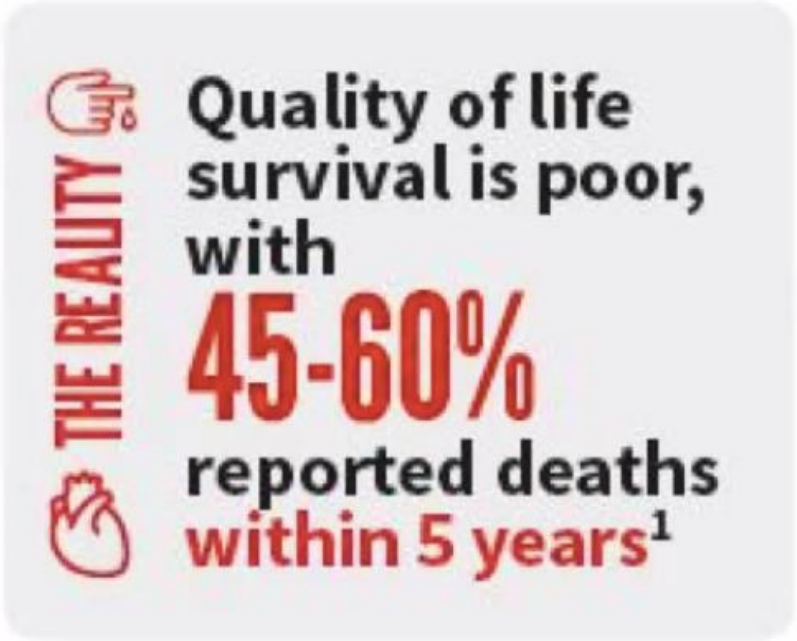
Heart Failure by the Numbers

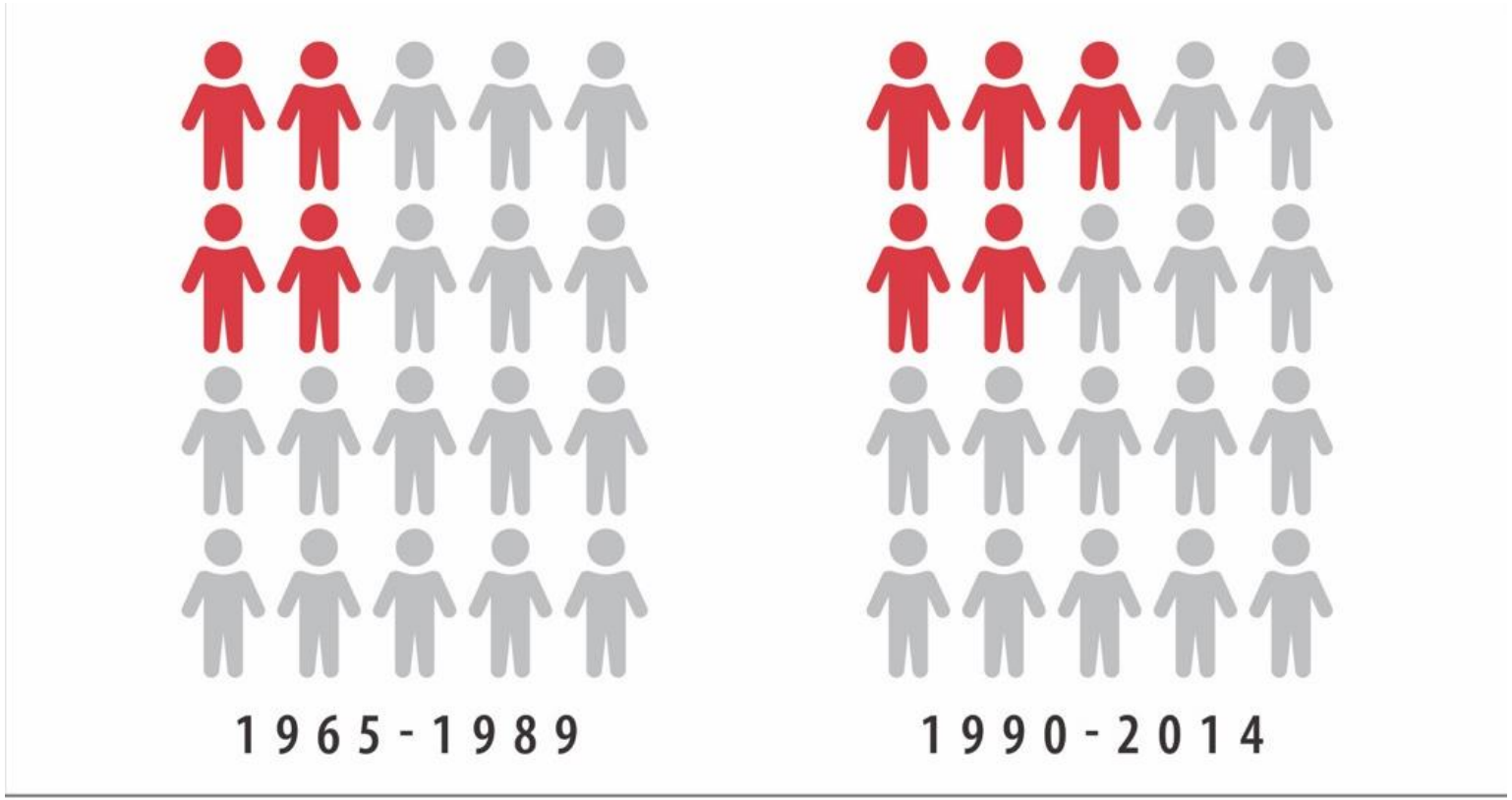






At least 50,000 patients are believed to be in need of cardiac transplant

Lifetime Risk of Heart Failure



Lifetime risk of heart failure (HF) has increased from 1 in 5 to 1 in 4 people.

1. Vasan RS, Enserro DM, Beiser AS, Xanthakis V. Lifetime Risk of Heart Failure Among Participants in the Framingham Study. *J Am Coll Cardiol.* 2022 Jan 25;79(3):250-63.

Lifetime risk of HF has increased to 24%

Approximately **1 in 4** people will develop HF in their lifetime

HFSTATS℠ EPIDEMIOLOGY AND OUTCOMES

Bozkurt B, *et al. J Card Fail* 2023 .07.006

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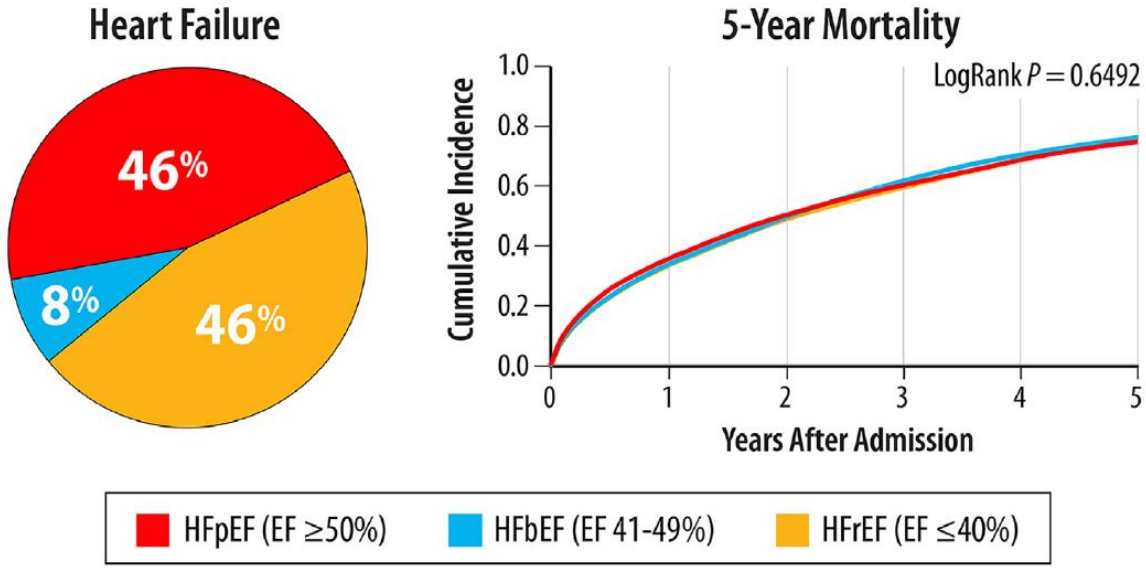
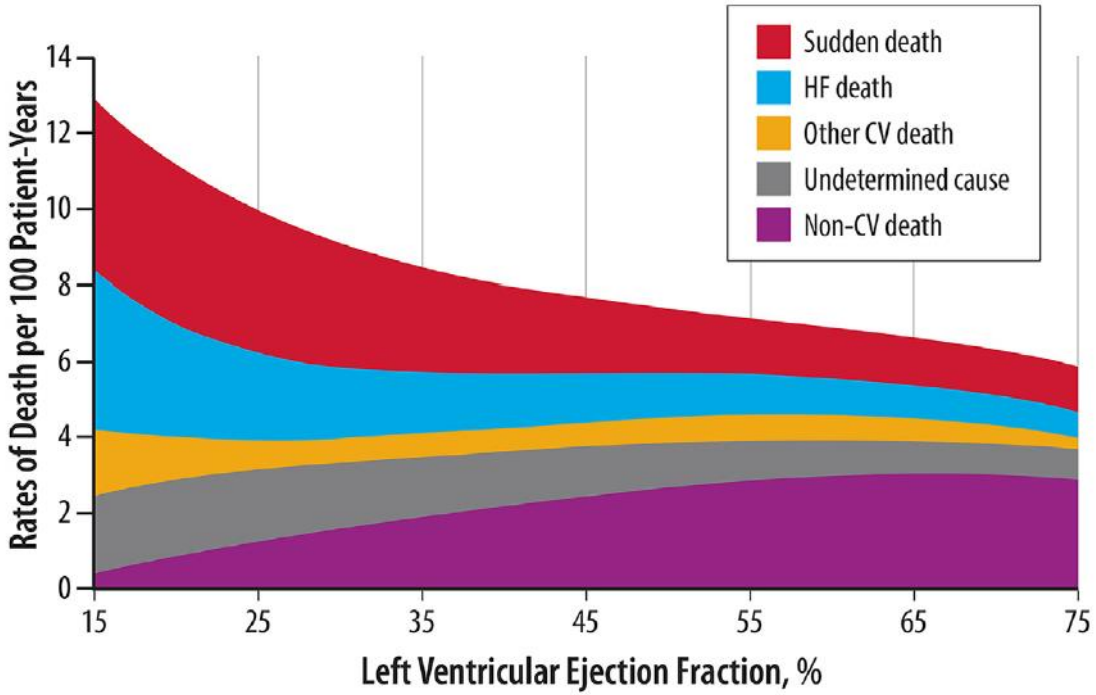
5 – Year Outcomes in Patients Hospitalized with HF



Outcomes: 5-Year Event Rates (%)

	Mortality	Readmission	CV Readmission	HF Readmission	Mortality/Readmission
HFrEF	75.3	82.2	63.9	48.5	96.4
HFbEF	75.7	85.7	63.3	45.2	97.2
HFpEF	75.7	84.0	58.9	40.5	97.3



JCFBozkurt et al DOI:10.1016/j.cardfail.2023.07.006

Shah KS et al. JACC 2017 Nov 14;70(20):2476-86

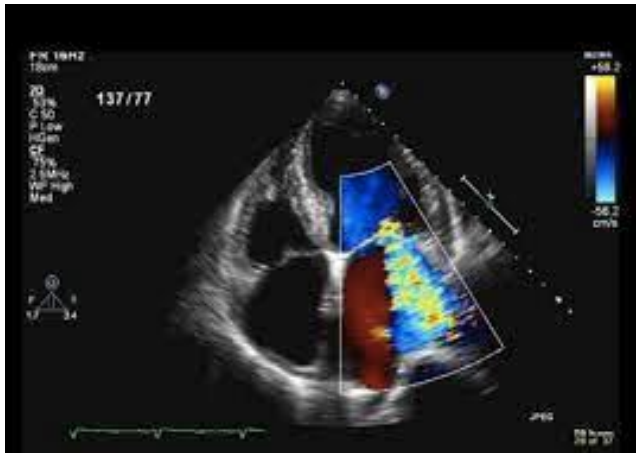
Salim S. Virani. Circulation. Heart Disease and Stroke Statistics—2020 Update: A Report From the American Heart Association, Volume: 141, Issue: 9, Pages: e139-e596

Desai AS et al. JAMA Cardiol 2022 Dec 1;7(12):1227-1234

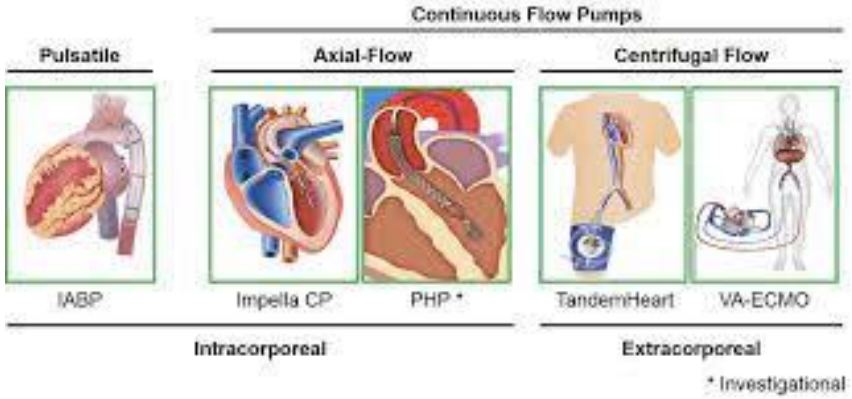
Improvements in Heart Failure Care

GDMT

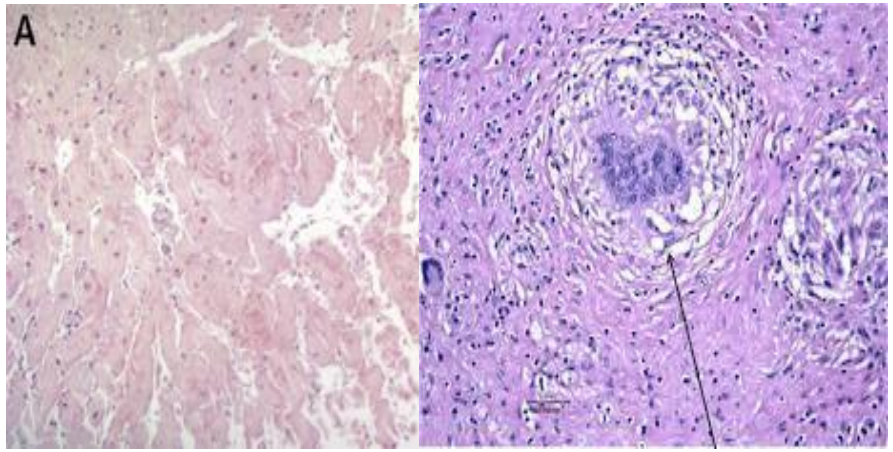
Structural Intervention



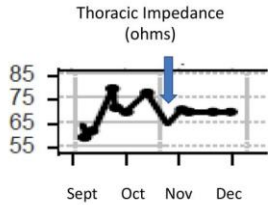
MCS (short and long-term)



Comprehensive Therapy for Infiltrative CMP



Remote Monitoring



Comprehensive EP Management

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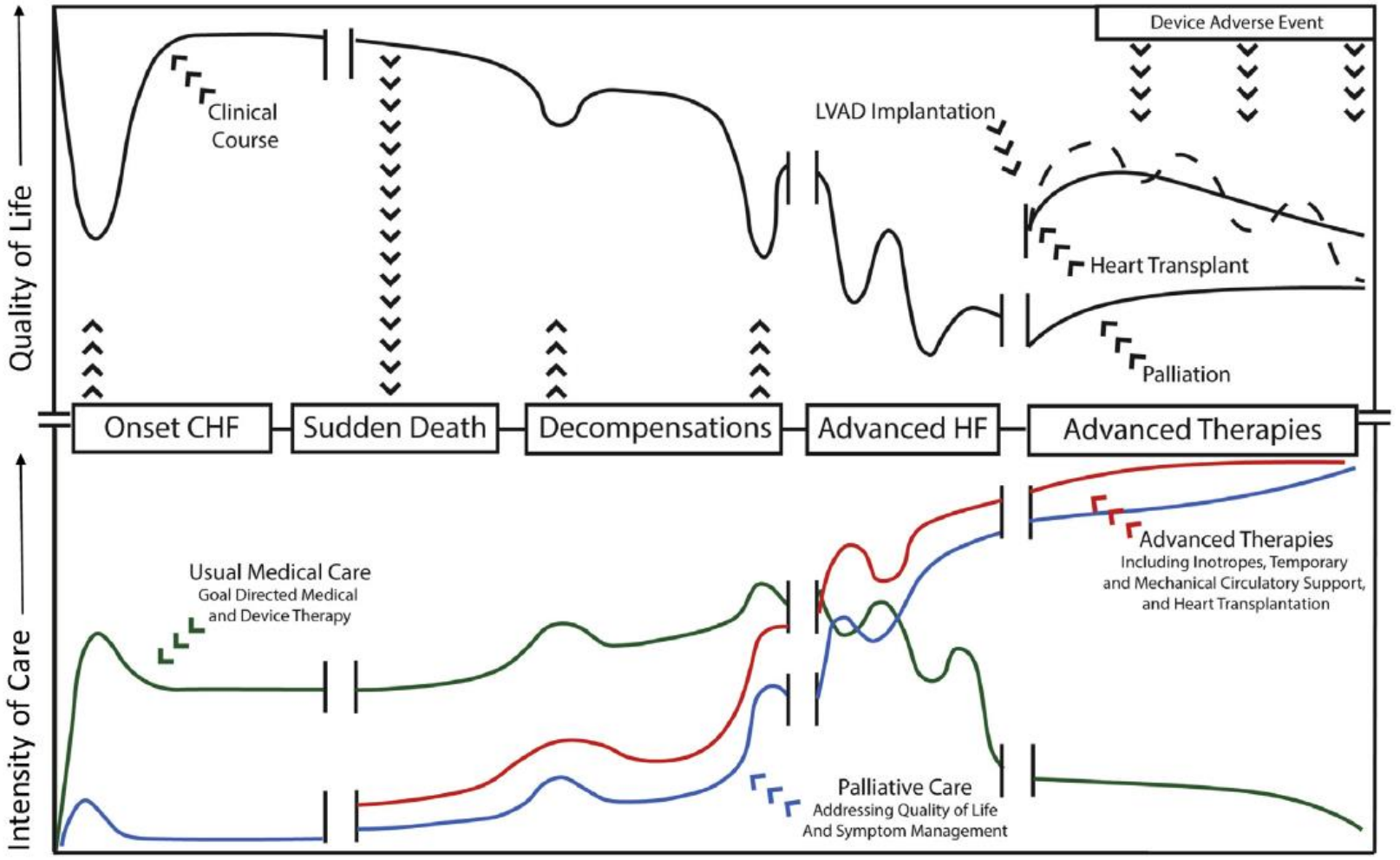
Heart Failure Disease Progression



Truby, LK. Et al. JACC HF 2020;8(7):523-36

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Recognizing the Advanced Heart Failure Patient

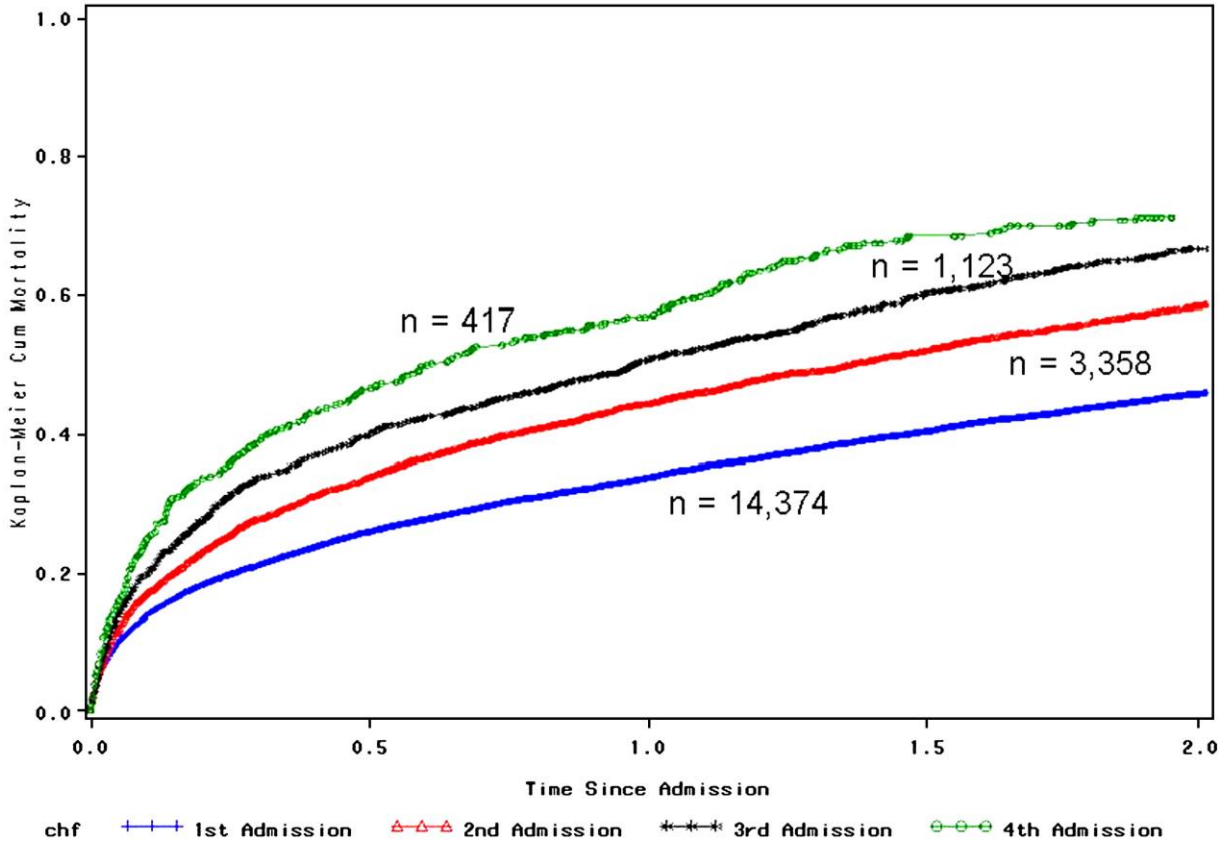
2022 AHA/ACC/HFSA Heart Failure Guideline

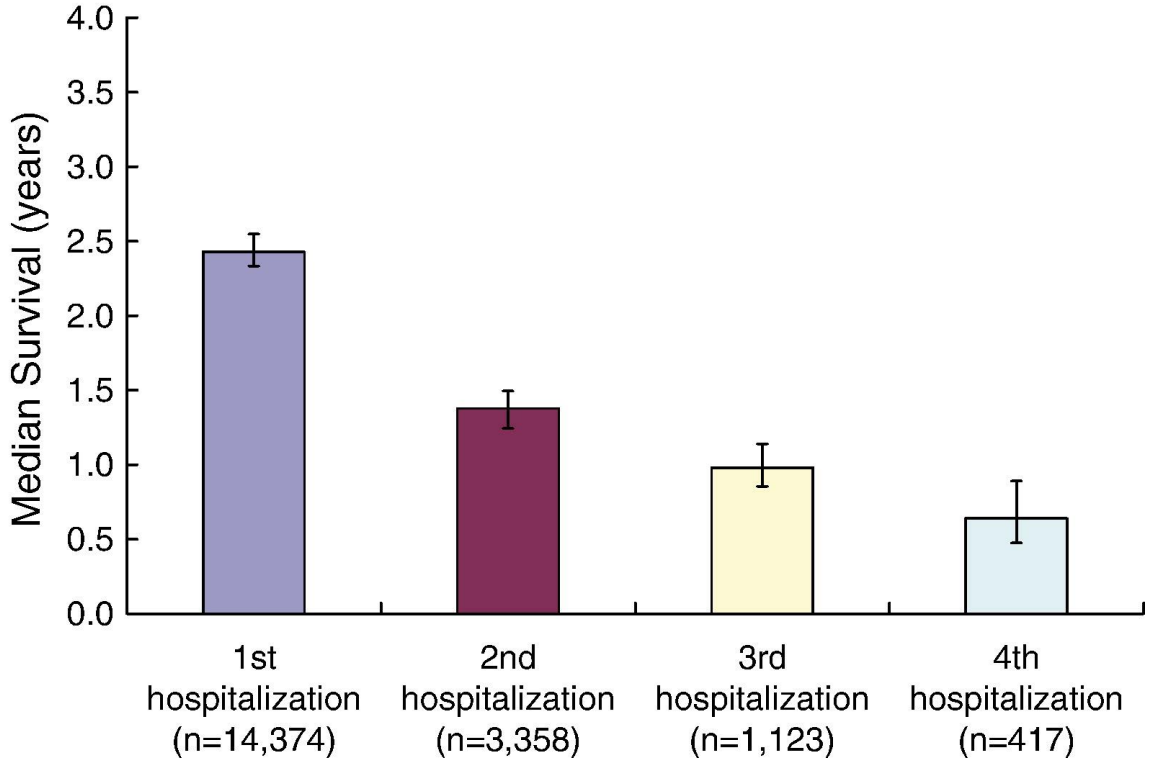
Clinical Impact of Each "I Need Help" Criteria

"I Need Help" criterion	All-cause death or HF hospitalization				All-cause death			
	Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis	
	HR (95% CI)	*P* value	HR (95% CI)	*P* value	HR (95% CI)	*P* value	HR (95% CI)	*P* value
Inotropes	1.71 (1.41–2.07)	<0.001	1.64 (1.33–2.02)	<0.001	2.53 (1.98–3.24)	<0.001	2.37 (1.81–3.12)	<0.001
NYHA class/natriuretic peptides	1.40 (1.16–1.69)	<0.001	1.37 (1.12–1.66)	0.002	1.62 (1.24–2.11)	<0.001	1.58 (1.20–2.09)	0.001
End-organ dysfunction	1.58 (1.32–1.90)	<0.001	1.44 (1.19–1.73)	<0.001	2.03 (1.59–2.58)	<0.001	1.84 (1.44–2.37)	<0.001
Ejection fraction <20%	1.20 (0.95–1.52)	0.12	0.96 (0.75–1.24)	0.77	1.27 (0.92–1.73)	0.14	0.83 (0.59–1.17)	0.29
Defibrillator shocks	1.39 (0.92–2.09)	0.12	1.20 (0.78–1.85)	0.41	1.55 (0.91–2.66)	0.11	1.30 (0.74–2.29)	0.37
>1 HF hospitalization in the last year	1.55 (1.28–1.87)	<0.001	1.29 (1.06–1.57)	0.012	1.45 (1.12–1.88)	0.005	1.10 (0.84–1.44)	0.51
Edema or escalating diuretics	1.39 (1.16–1.68)	<0.001	1.55 (1.28–1.88)	<0.001	1.37 (1.07–1.77)	0.014	1.59 (1.23–2.07)	0.001
Low blood pressure	1.60 (1.31–1.94)	<0.001	1.47 (1.16–1.86)	0.001	1.91 (1.48–2.46)	<0.001	1.57 (1.15–2.13)	0.004
Prognostic medications	1.24 (1.03–1.49)	0.024	1.00 (0.80–1.26)	0.98	1.41 (1.10–1.81)	0.006	1.00 (0.75–1.35)	0.98

Pagnesi M, et al. Circ Heart Fail 2023 Dec;16 (12):e011003

Recurrent Hospitalizations





Setoguchi S, Stevenson L, S Schneeweiss AM Heart J 2007 ug;154 (2):260-6

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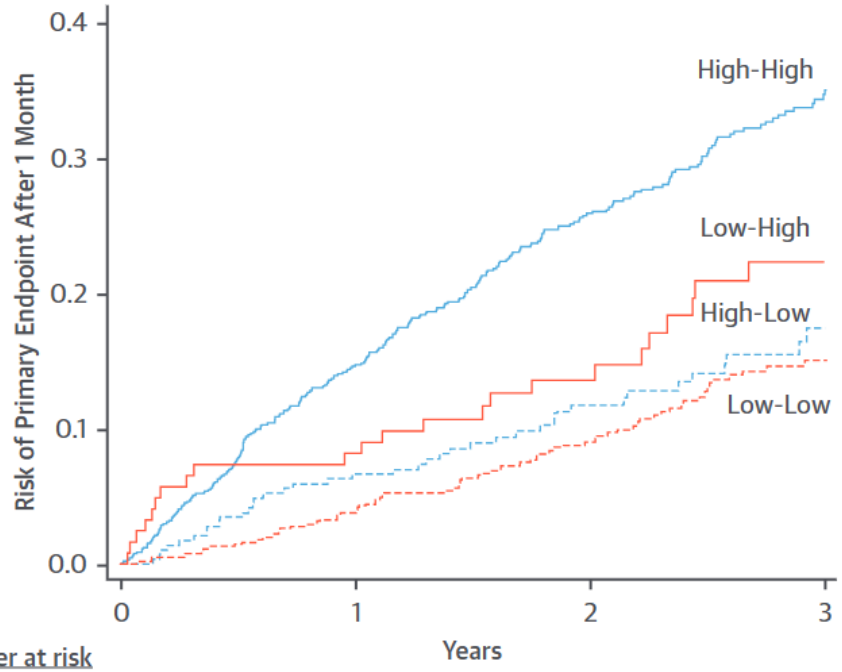
Biomarkers – BNP & NT-proBNP

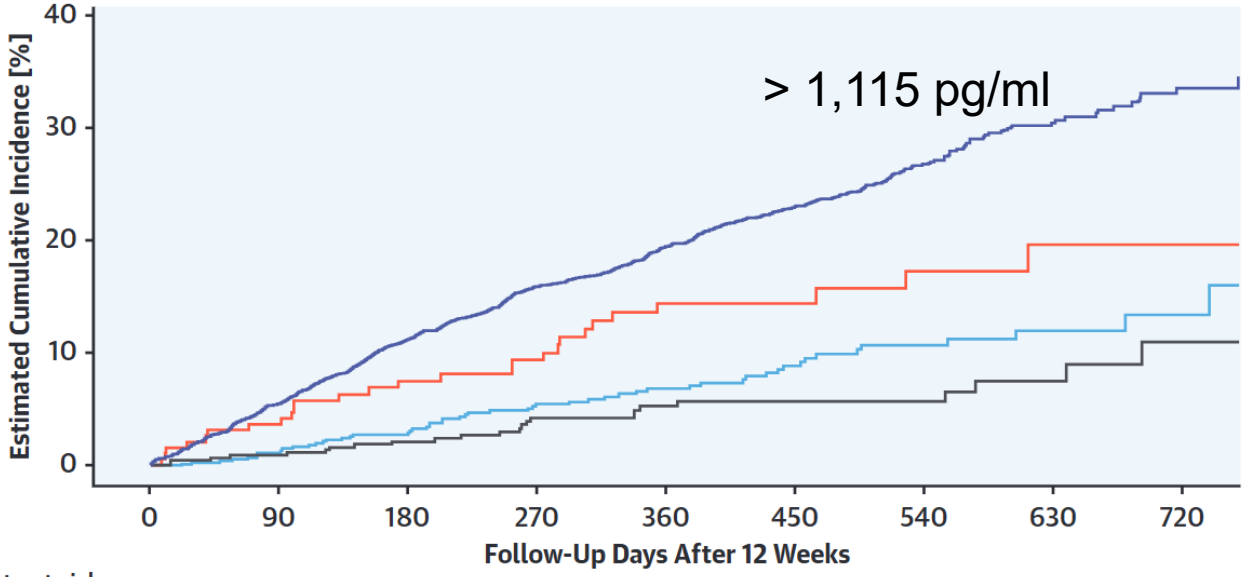
PARADIGM

A



Number at risk				
High-High	903	746	476	191
High-Low	287	263	174	74
Low-High	122	111	78	36
Low-Low	611	581	390	182

EMPEROR- Reduced



Patients at risk Baseline/12 Weeks									
Low/Low	664	654	570	471	388	263	175	93	42
Low/High	190	183	155	142	103	69	50	27	15
High/Low	442	434	367	305	241	178	123	67	33
High/High	1,937	1,813	1,514	1,246	963	716	460	257	121

Zile M et al. J Am Coll Cardiol 2016;68:2425-36
Januzzi J et al. J Am Coll Cardiol 2021;78:1321-1332

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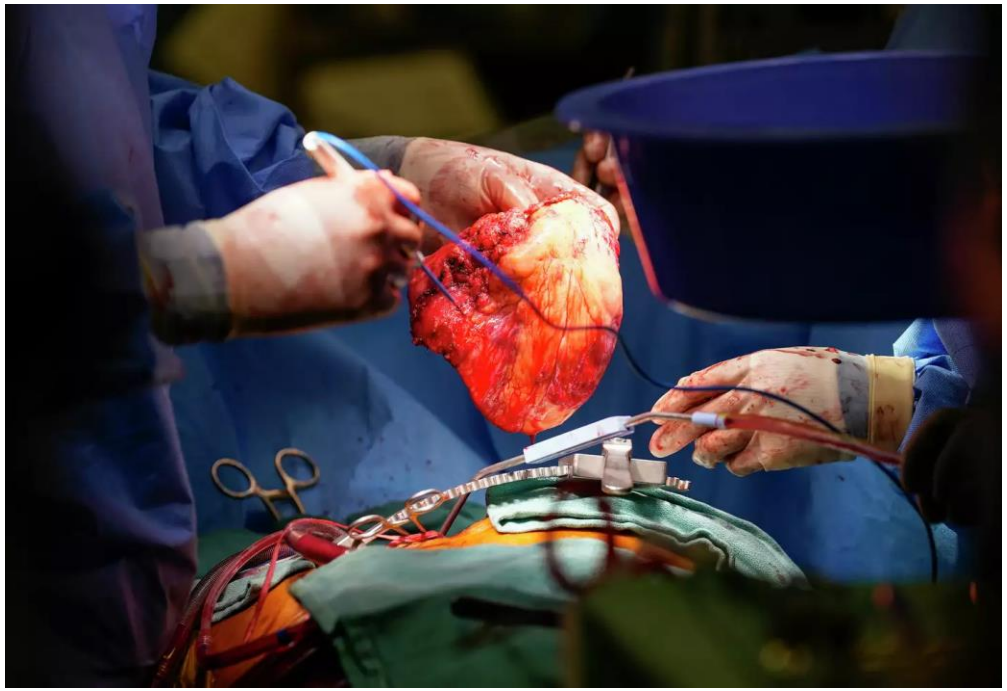
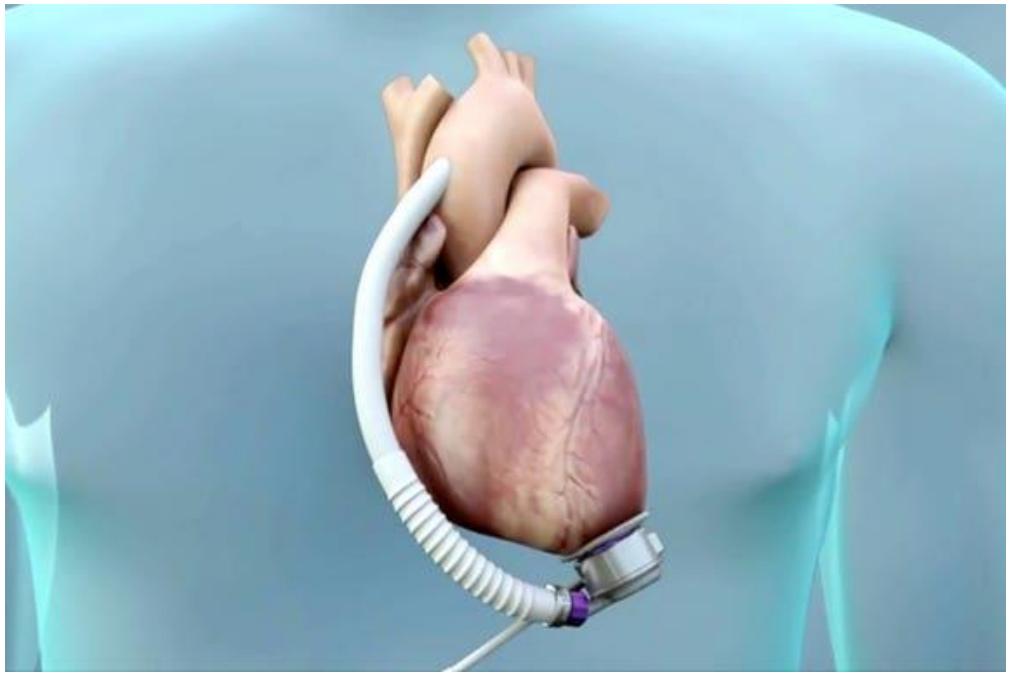
Advanced Therapies for Heart Failure

Heart Transplantation



Durable Left Ventricular Assist Device (LVAD)



www.houstonchronicle.com
www.medpagetoday.com

Evaluation for Cardiac Transplant (and LVAD)

Goal:

1) identify those with markedly limited prognosis from cardiac perspective and

2) identify those with limited life-expectancy from non-cardiac causes or those with conditions that will worsen significantly if transplant occurs

Cardiac Testing:

Cardiac Catheterization (RHC and coronary angiography)
CPET
TTE

Cancer Screening (colonoscopy, mammogram, PSA)

Cross-sectional Imaging and laboratory testing to evaluate other organ systems

PFTs

Consultation:

ID
SW
Psychiatry
Cardiac surgery
Nutrition

ISHLT Guidelines for Recipient Evaluation, 2016.

Cardiac Transplantation

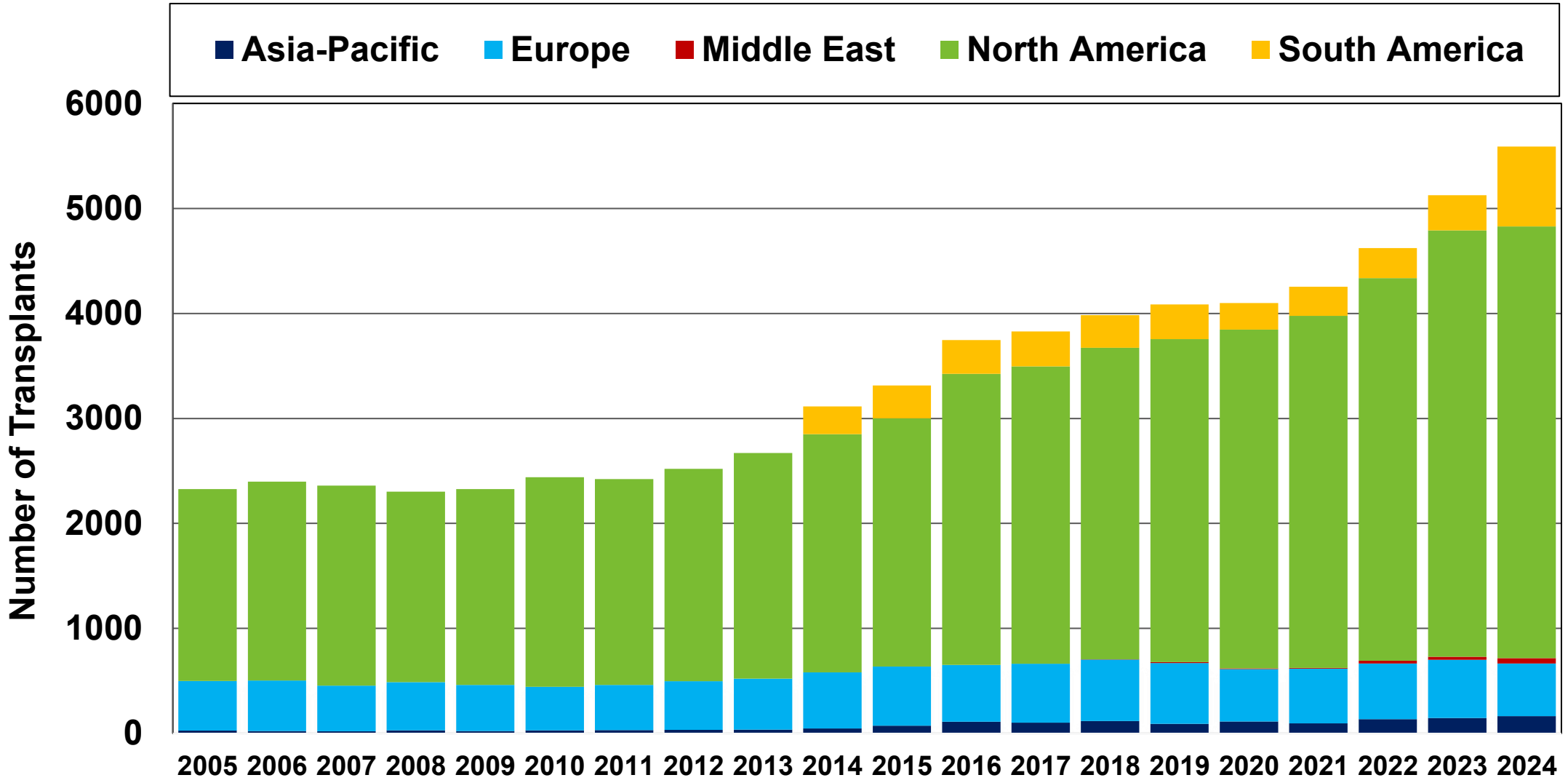
Courtesy M. Kiernan MD

Indications for Cardiac Transplant

- Markedly impaired cardiac performance
  - Cardiogenic shock requiring inotropic support, short-term, or long-term mechanical circulatory support
  - Assessed by cardiopulmonary exercise testing (peak VO_2 < 12ml/kg/min on β–blockers, < 14ml/kg/min off β–blockers, or < 50% age predicted)
- Coronary artery disease with refractory symptoms despite OMT without revascularization option
- Ventricular arrhythmia refractory to medical therapy/catheter ablation

Adult Heart Transplants, 2005-2024

Number of Transplants by Year and Location

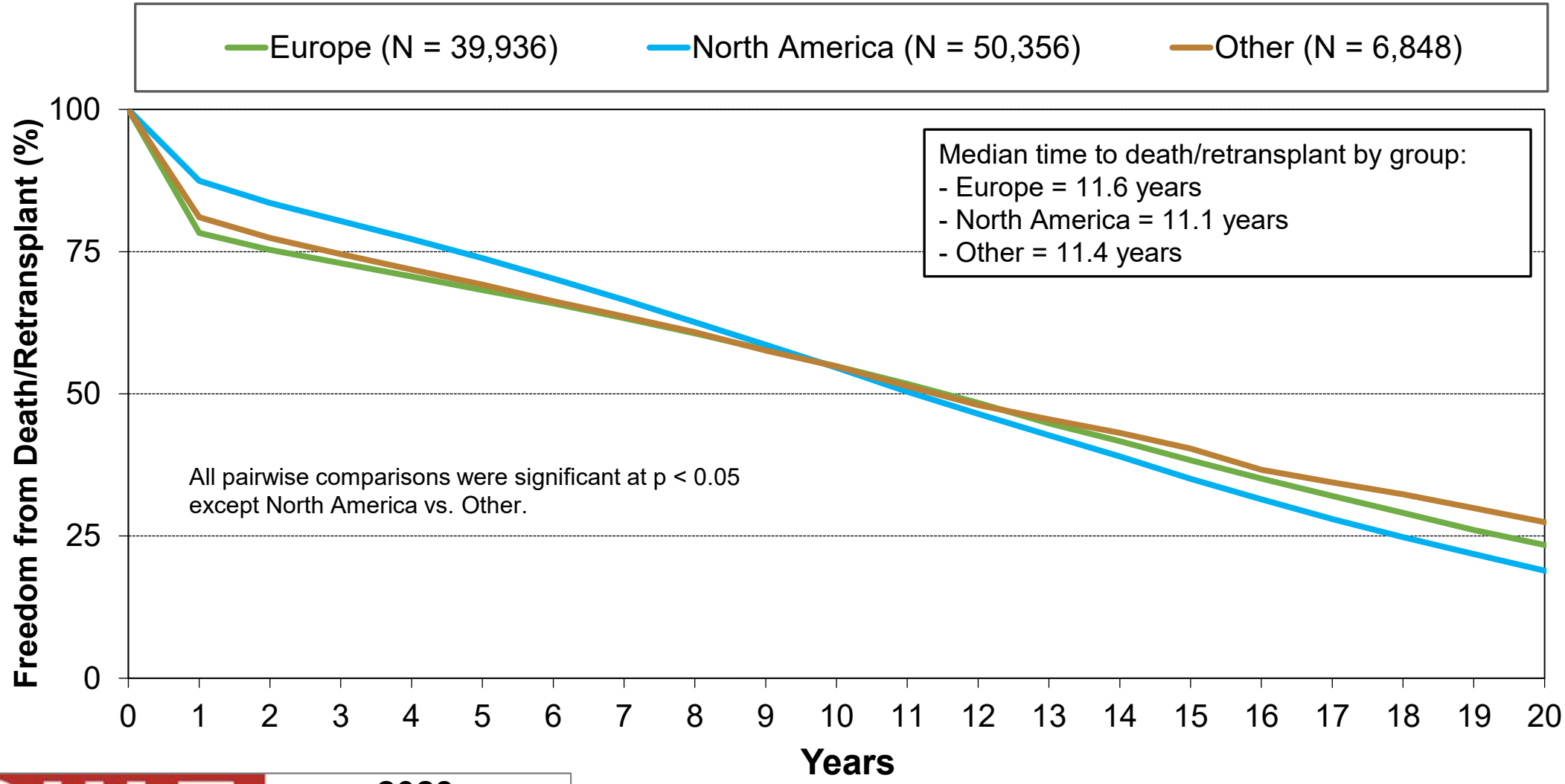


ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION 2026

NOTE: This figure includes only the transplants that are reported to the ISHLT Transplant Registry. As such, the presented data may not mirror the changes in the number of transplants performed worldwide.

Kaplan-Meier Freedom from Death/Retransplant for Adult Heart Recipients by Geographic Location

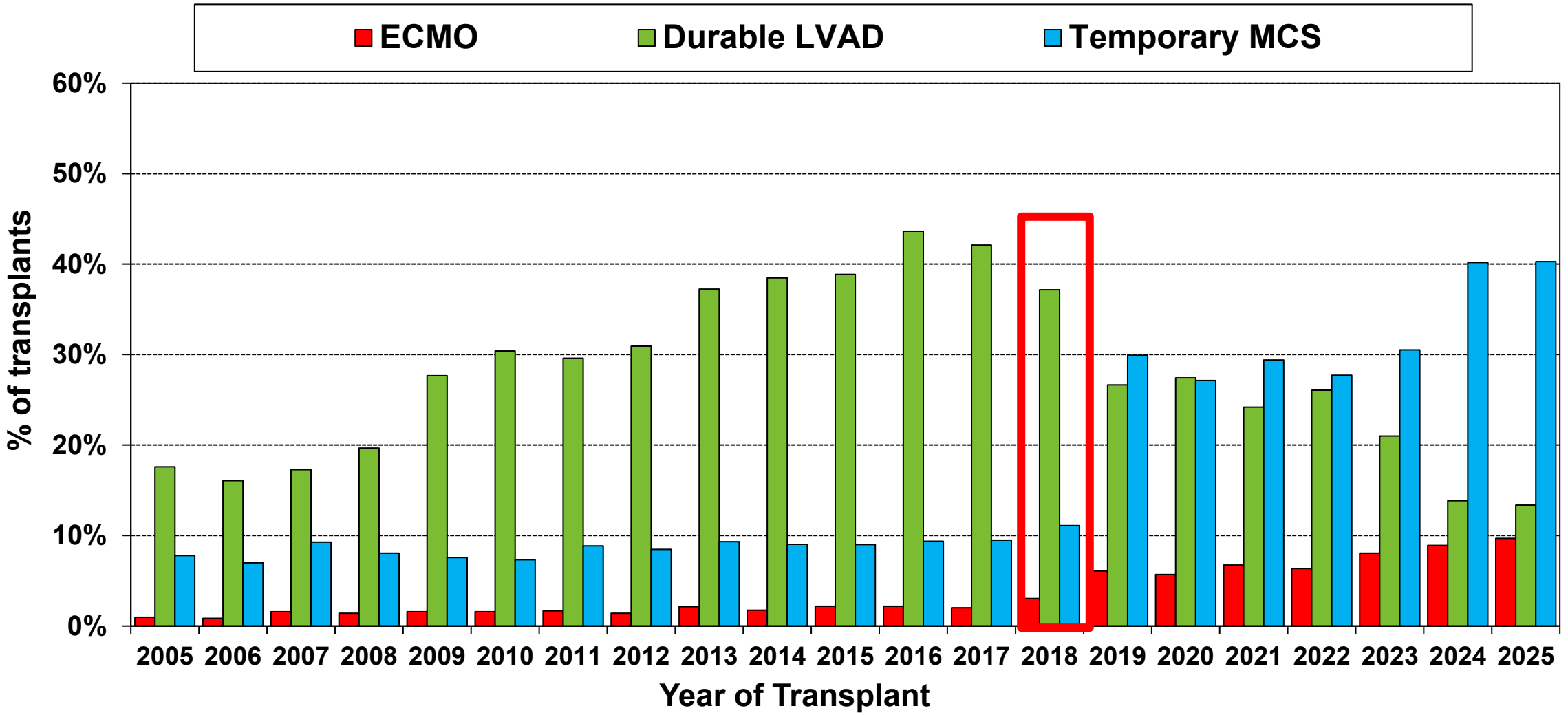
(Deceased Donor Transplants: January 1992 – June 2017)



ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION 2023

JHLT. 2023 Oct; 42(10): 1321-1333

Percentage of Adult Heart Transplants on Mechanical Circulatory Support by Year, 2005-2025



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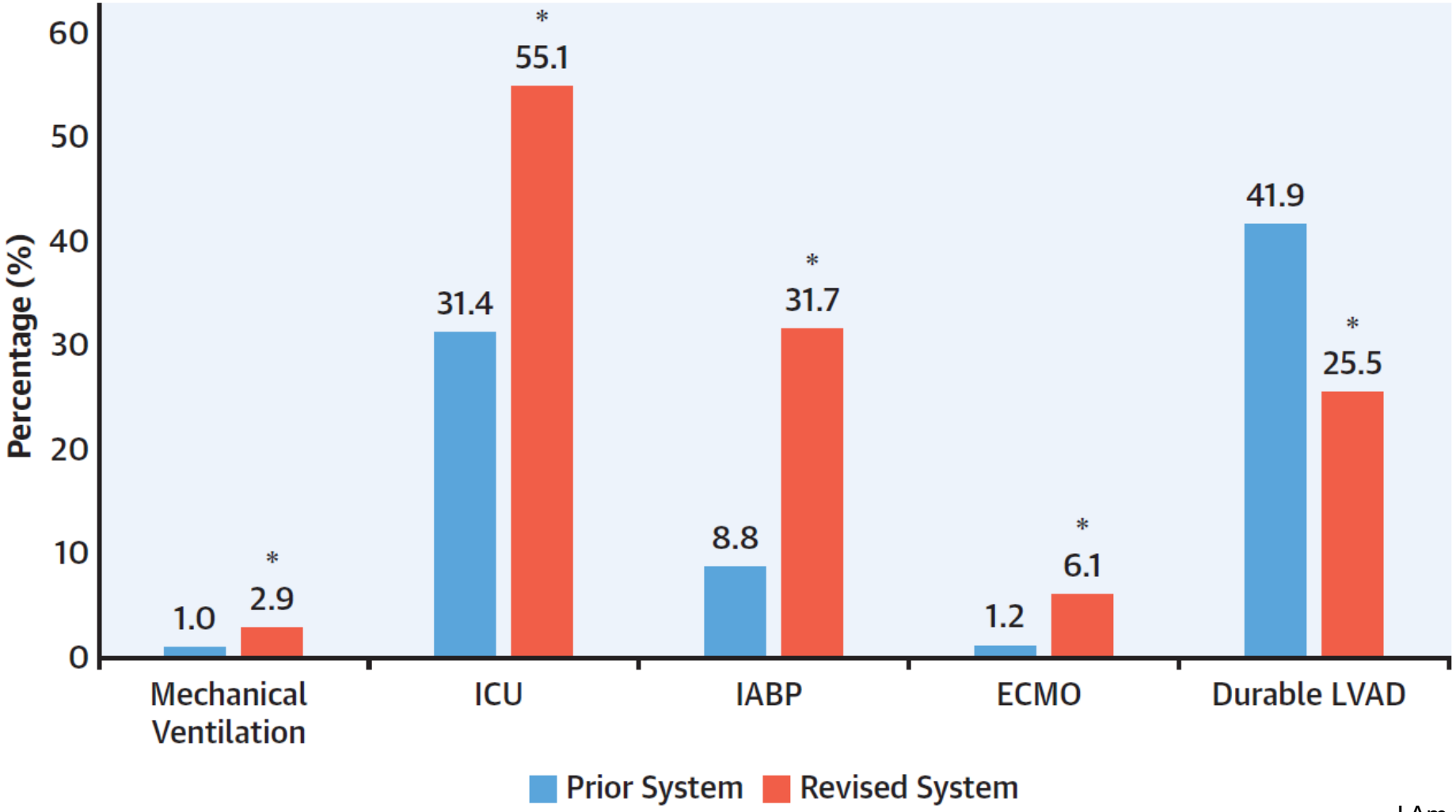
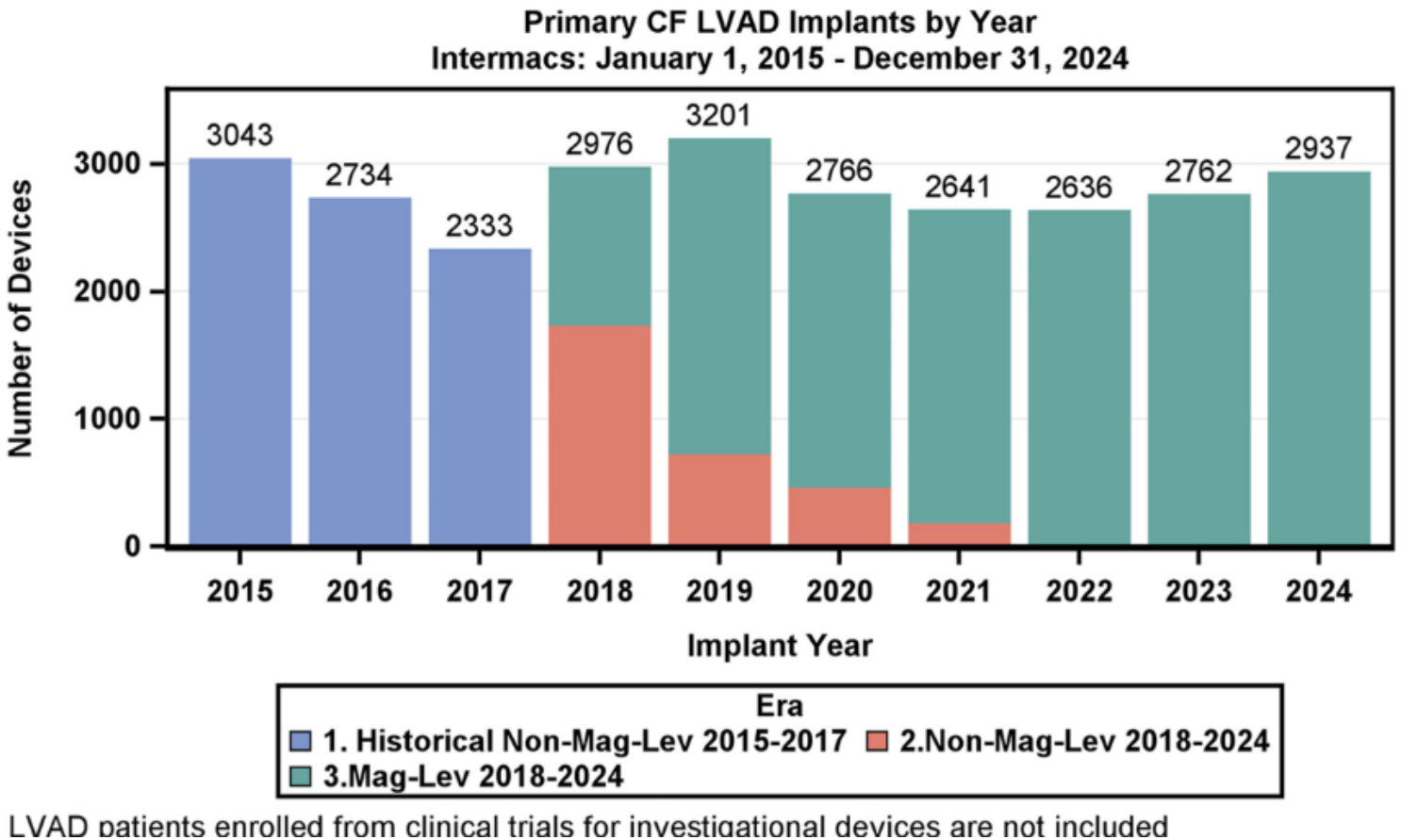
Note: Temporary MCS includes IABP, microaxial LVAD, extracorporeal LVAD. Excludes transplants with RVAD, BiVAD, or TAH. Annual percentage was calculated among all transplants each year.

Change in MCS in the Revised Heart Allocation System

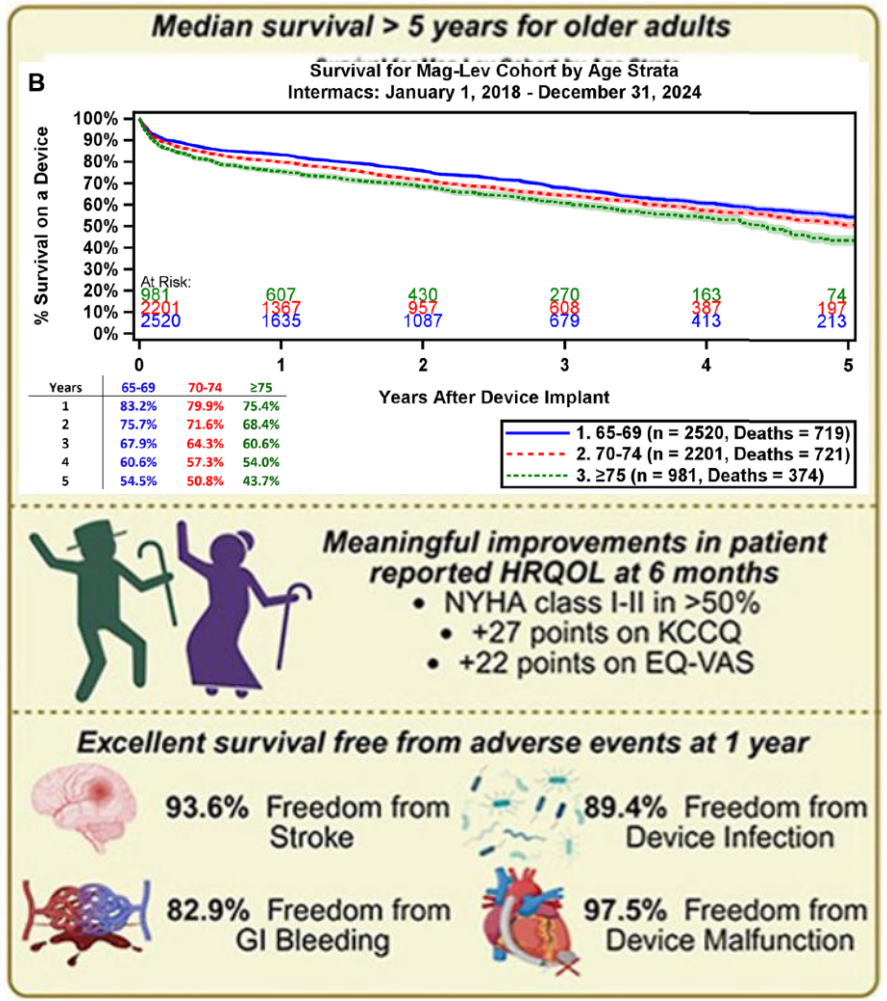


J Am Coll Cardiol 2022;79:1108-1123

LVAD use in the Current Era



Outcomes in older adults (≥ 65 years) with the Mag-Lev device



Nayak A, et al. Ann Thorac Surg 2026, 121, 15-38

Which patients should get an LVAD?

- Older age
- Recent malignancy
- Irreversible Pulmonary Hypertension
- Morbid Obesity
- Contraindications to Immunosuppression
- Patients not transplanted after waiting on Status 2
- Patient preference
- Recovery

Contemporary Epidemiology

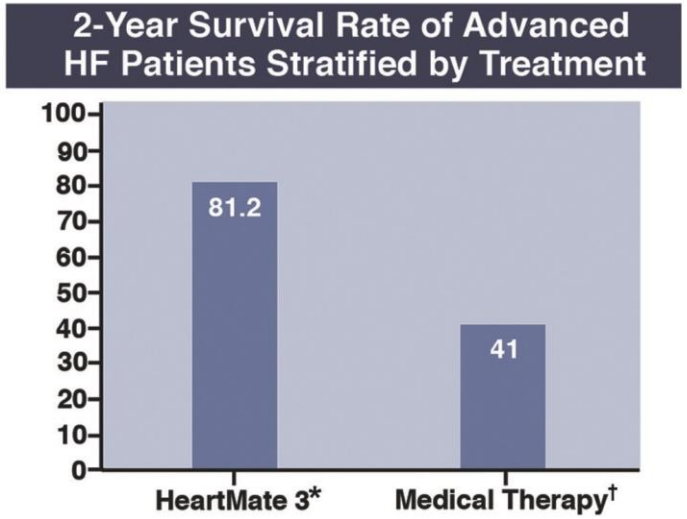
Recipient Phenotype

⬆Comorbidities

⬆Preoperative illness severity
> 50% in cardiogenic shock
> 1/3 on pre-implant TMCS

Implant Strategy

DT (73.1%) >> BTT (8.9%)
⬇Durable LVAD at time of HT



Varshney A et al. JACC 2022;79(11):1092-1107

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Change to Allocation Policy 2018

UNOS Allocation Policy Change 2018

Previous System

Status	Criteria
1A	**a) MCS with acute hemodynamic decompensation:** I. ECMO II. IABP III. TAH IV. VAD
	b) MCS with device-related complications
	c) Continuous Mechanical Ventilation
	d) Continuous IV inotropes (single or mult) + hemodynamic monitor
1B	aa) Continuous IV inotropes
	bb) Stable LVAD/RVAD
2	*All other candidates*

New 6-Tier System (2018)

Status	Criteria
1	• VA-ECMO* · Non-dischargeable Bi-VADs • MCSD with life-threatening arrhythmias
2	• Dischargeable TAH, RVAD, BiVAD • "Non-Dischargeable" LVAD • IABP or Percutaneous Endovascular MCS* • MCSD with Malfunction · Sustained VT or VF
3	• Continuous IV inotropes + hemodynamic monitoring* • 30-day exception for LVADs · MCSD with complication
4	• Continuous IV inotropes* · Stable LVAD • Congenital HD · Restrictive CM · Re-Transplant
5	• Combined Organ Transplant
6	• All other candidates

Why the change was needed:

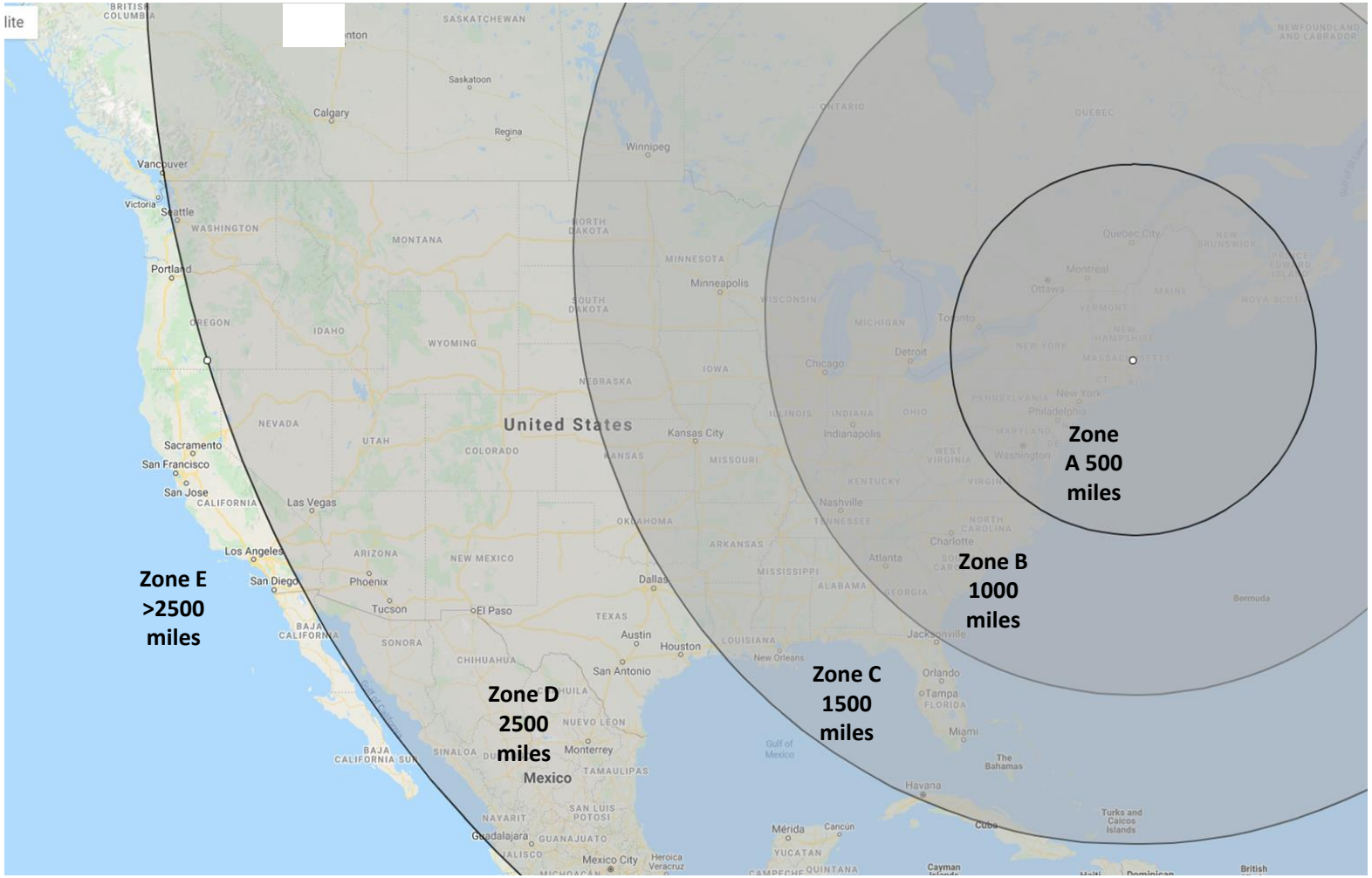
- 67% of HT recipients were Status 1A/1B
- Waitlist mortality 5–36%
- Growing donor-demand mismatch (3× increase 2006–2013)
- Unacceptably high transplant list mortality
- Geographic allocation inequities

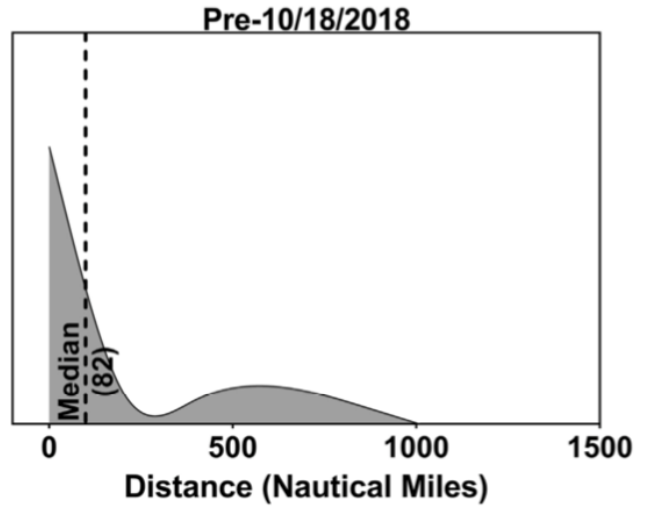
Standardized definition of shock
Broader sharing

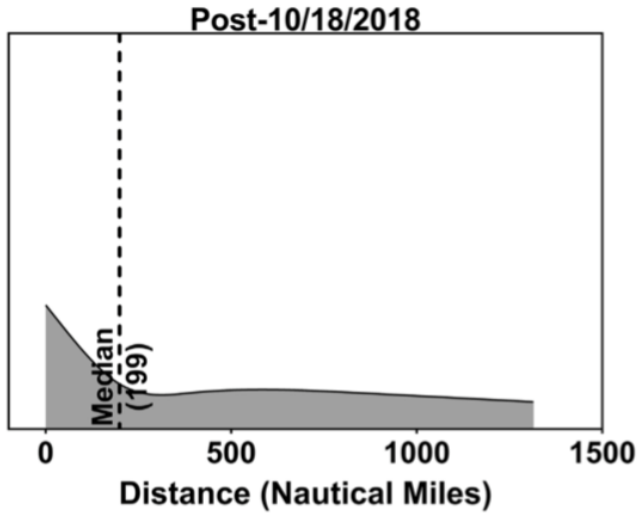
Key improvements:

- 6-tier system → more granular prioritization of sickest patients
- Standardized definition of shock for Status 1
- Broader geographic sharing (Status 1 & 2: within DSA and 500 NM of listing center)

UNOS Allocation Policy Change 2018







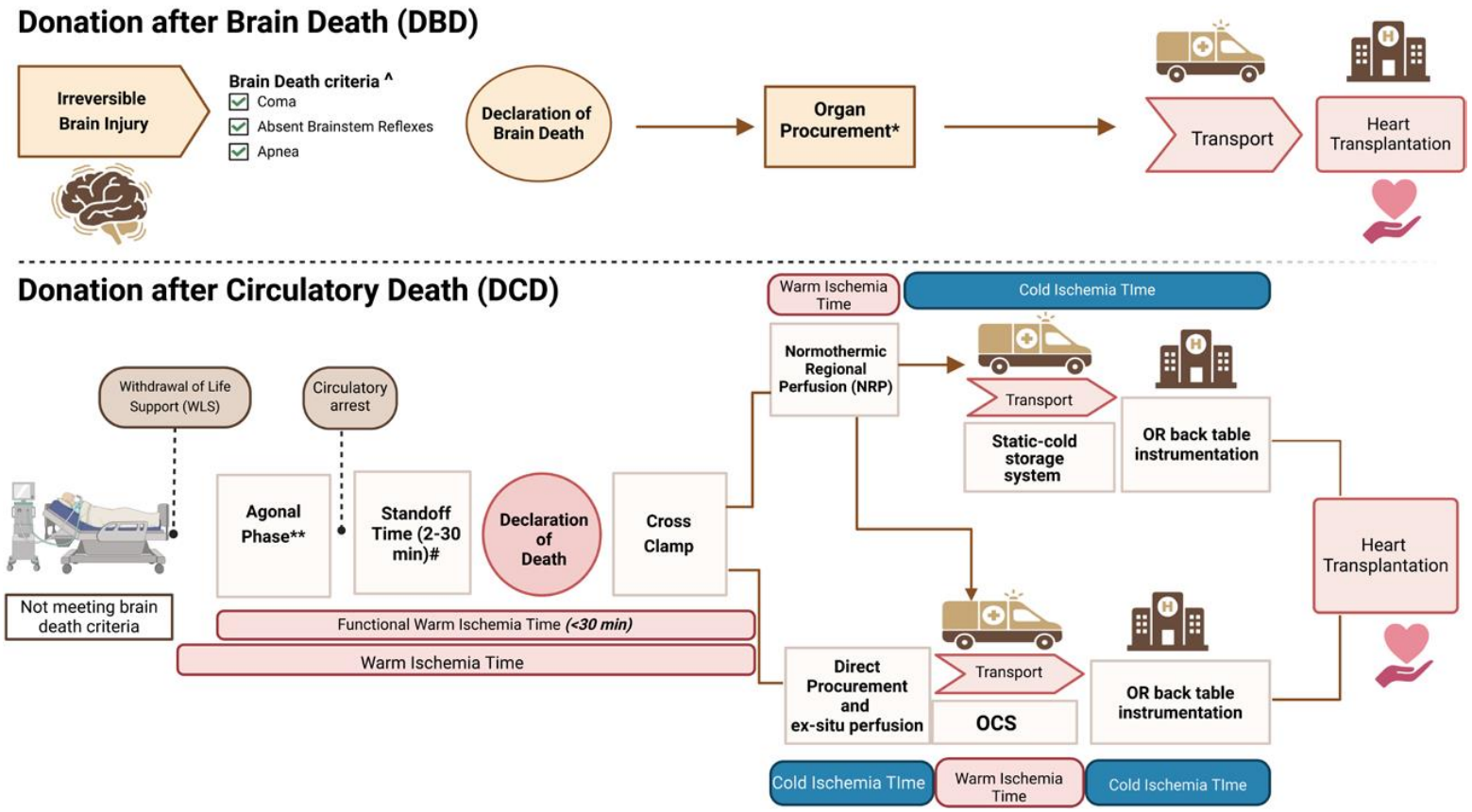
Mullan, C.W. et al. J Am Coll Cardiol HF. 2021;9(6):420–9.

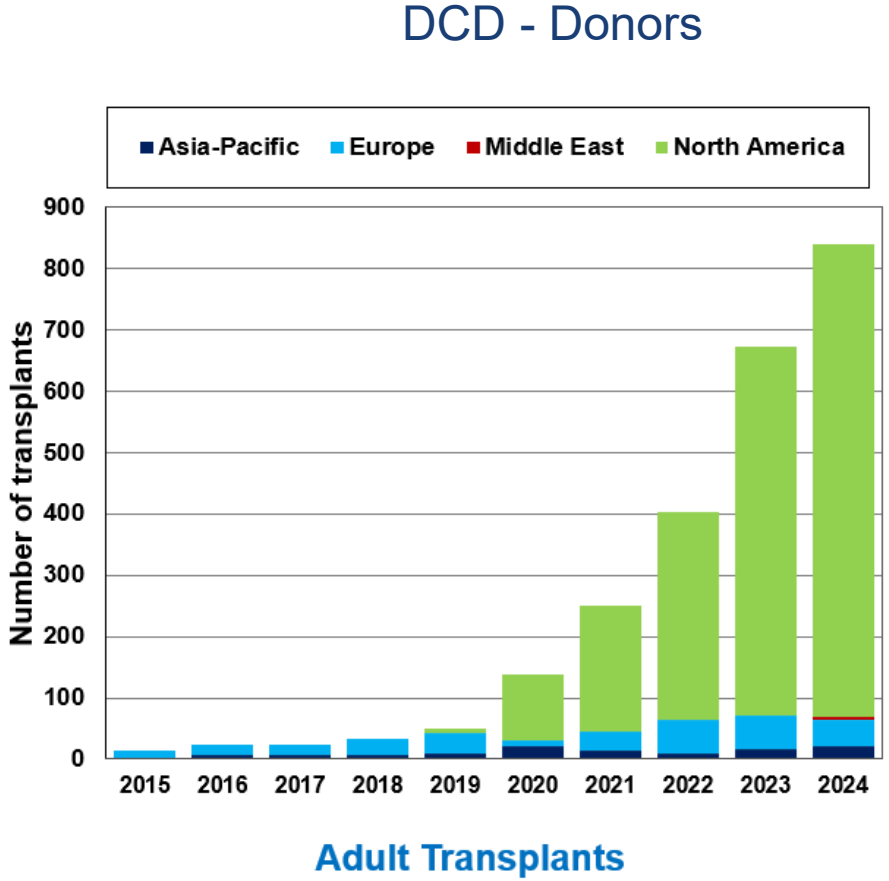
New Technological Advances

TransMedics OCS™

Paragonix Technologies SherpaPak

We Expanded the Donor Pool





Kharawala A et al. Circ Heart Fail 2024 Jul;17 (7):e011678

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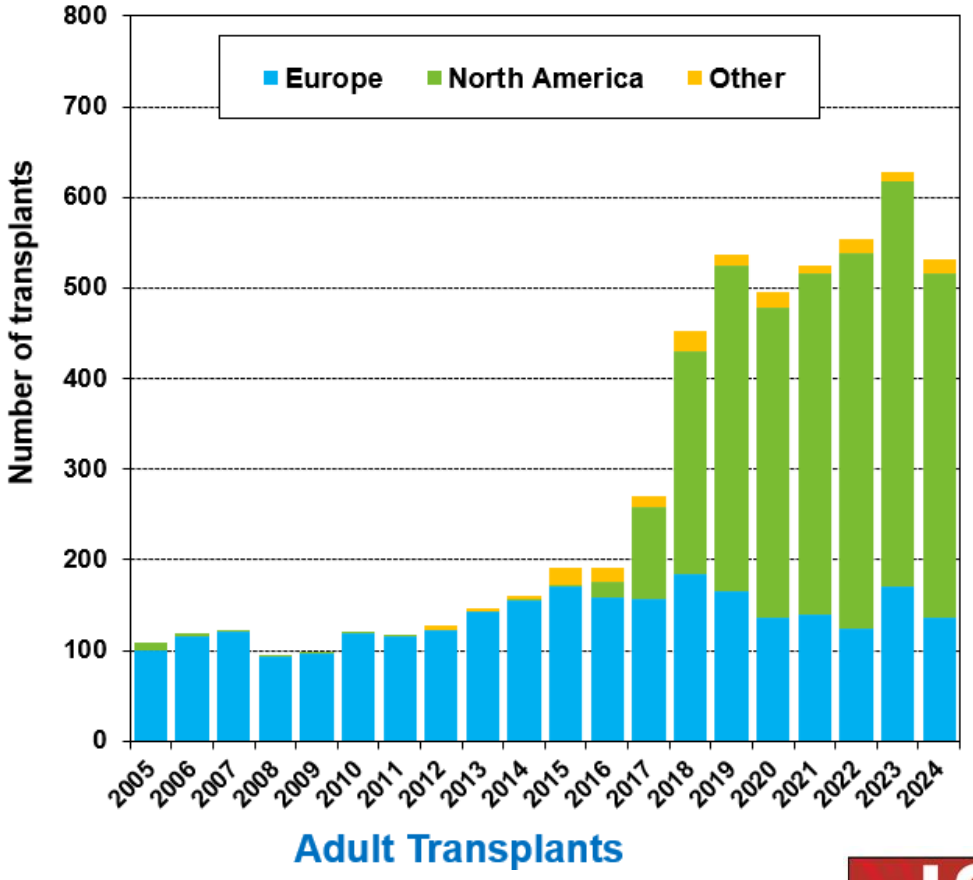
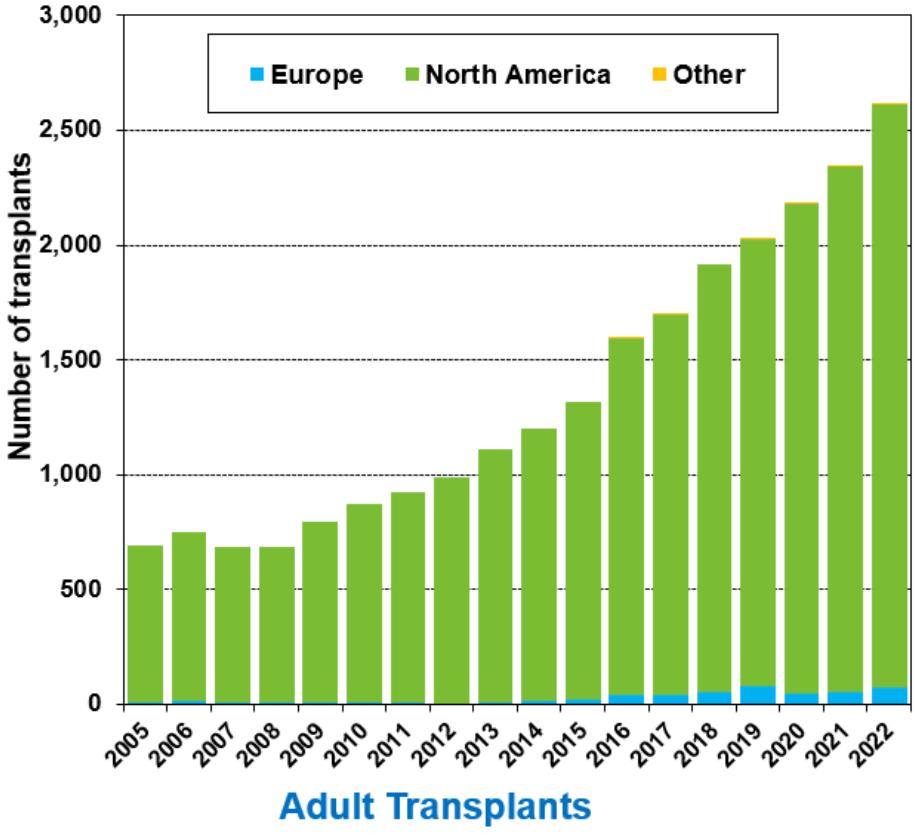
We Expanded the Donor Pool

HCV Seropositive Donors



Donors with Drug Use



ISHLT 2026
ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION

Overview

- Heart Failure Statistics & Disease Trajectory
- Warning Sings of Progression to Advanced Heart Failure
- Advanced Heart Failure Therapies Options
- New Allocation System and expanding the donor pool
- Power of Collaboration saves life

Case continuation – Power of Collaboration

- Arrived at BIDMC – Day 0
- She had recurrent VT which required lidocaine/amiodarone drip + stellate ganglion block
- Heart transplant evaluation was initiated

- Our vascular team evaluated her – given SCAD, axillary dissection and femoral dissection at A-line site.
- CT head / neck small cervical segment ICA dissection on the R with beading- diagnosed with fibromuscular dysplasia (FMD)

Case continuation – Power of Collaboration

- Presented at selection meeting (Day 5) - **Accepted**
- Suitable donor offer – (Day 9) underwent OHT

- Discharged home with services (Day 27)

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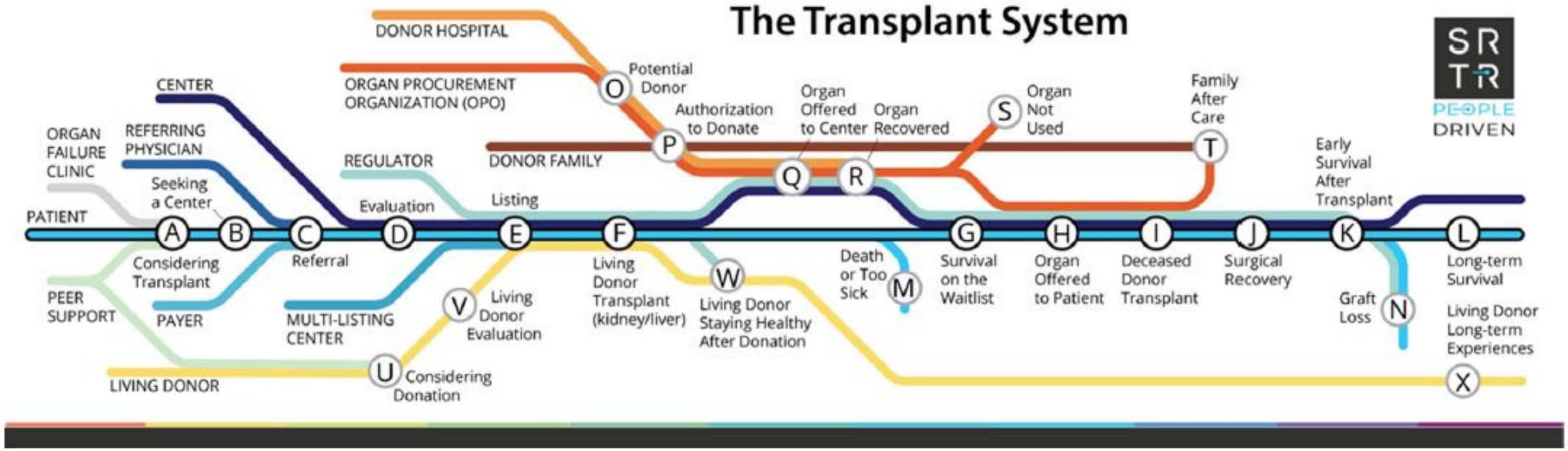
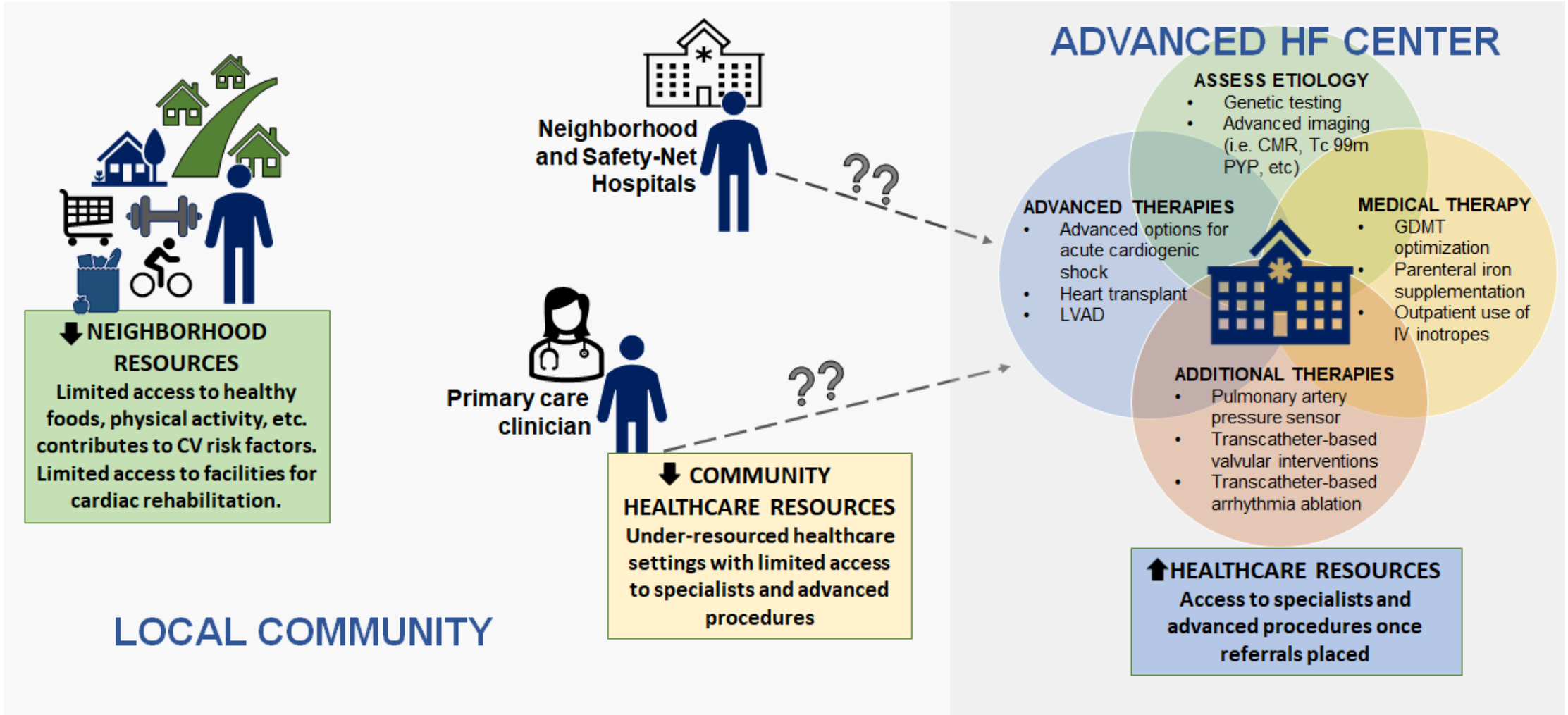
The Transplant System



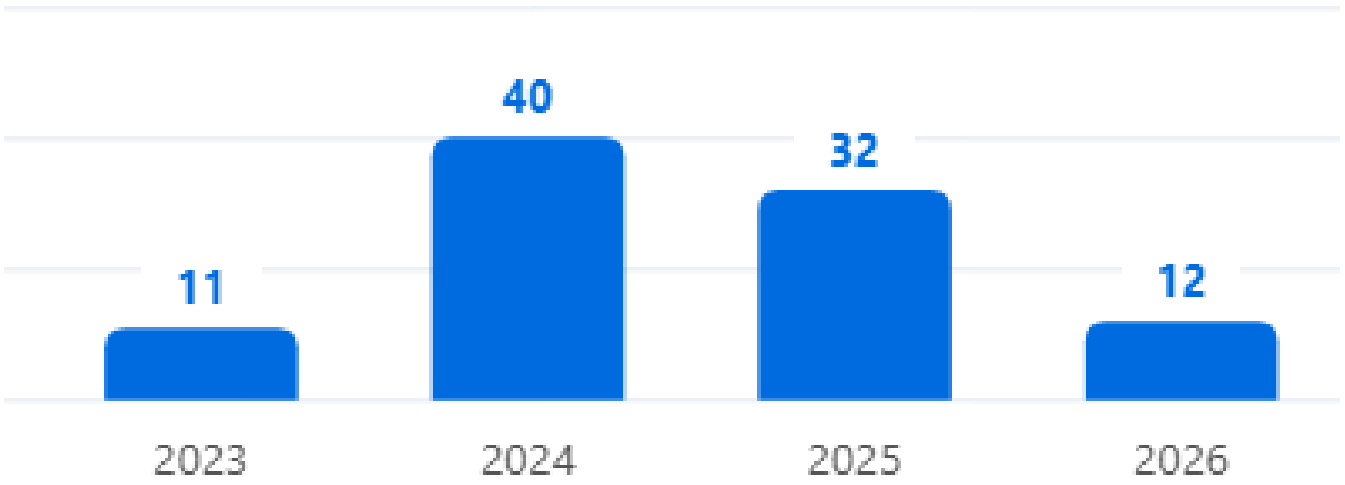
Pinney S, Walsh N. JACC HF Vol 12. No 7. 2024: 1288-.

Optimizing Care of the Community in Connection with the HF Center



Morris A, et al. J Card Fail 2022

BILH Heart Transplant



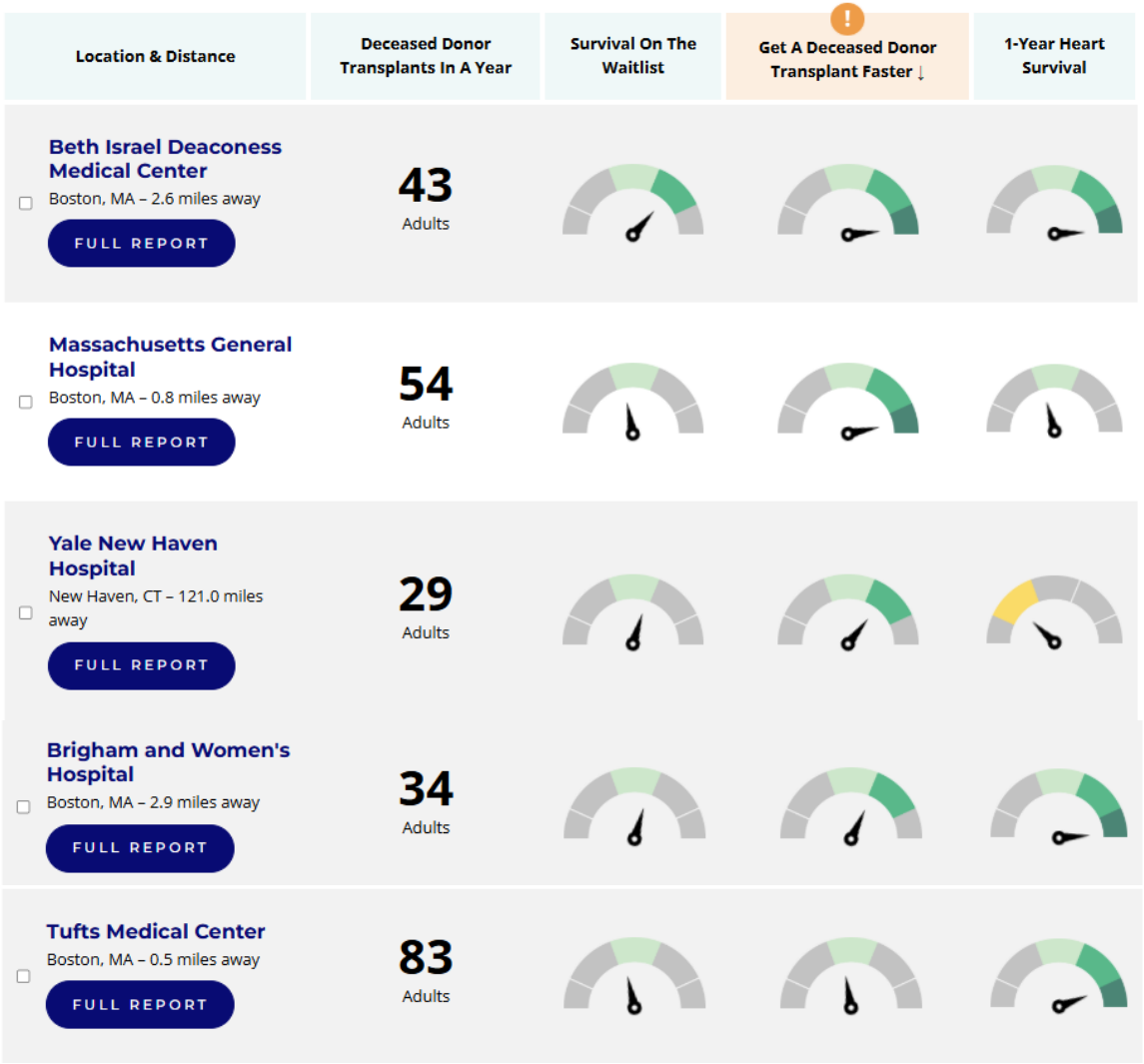
SRTR data – Overall Outcomes: #2 in US (153 programs)

	DISTANCE	DECEASED DONOR TRANSPLANTS IN A YEAR	SURVIVAL ON THE WAITLIST	GETTING A TRANSPLANT FASTER	1-YEAR HEART SURVIVAL
Beth Israel Deaconess Medical Center **Boston, MA** Report: PDF | Interactive	N/A	43 ADULTS			

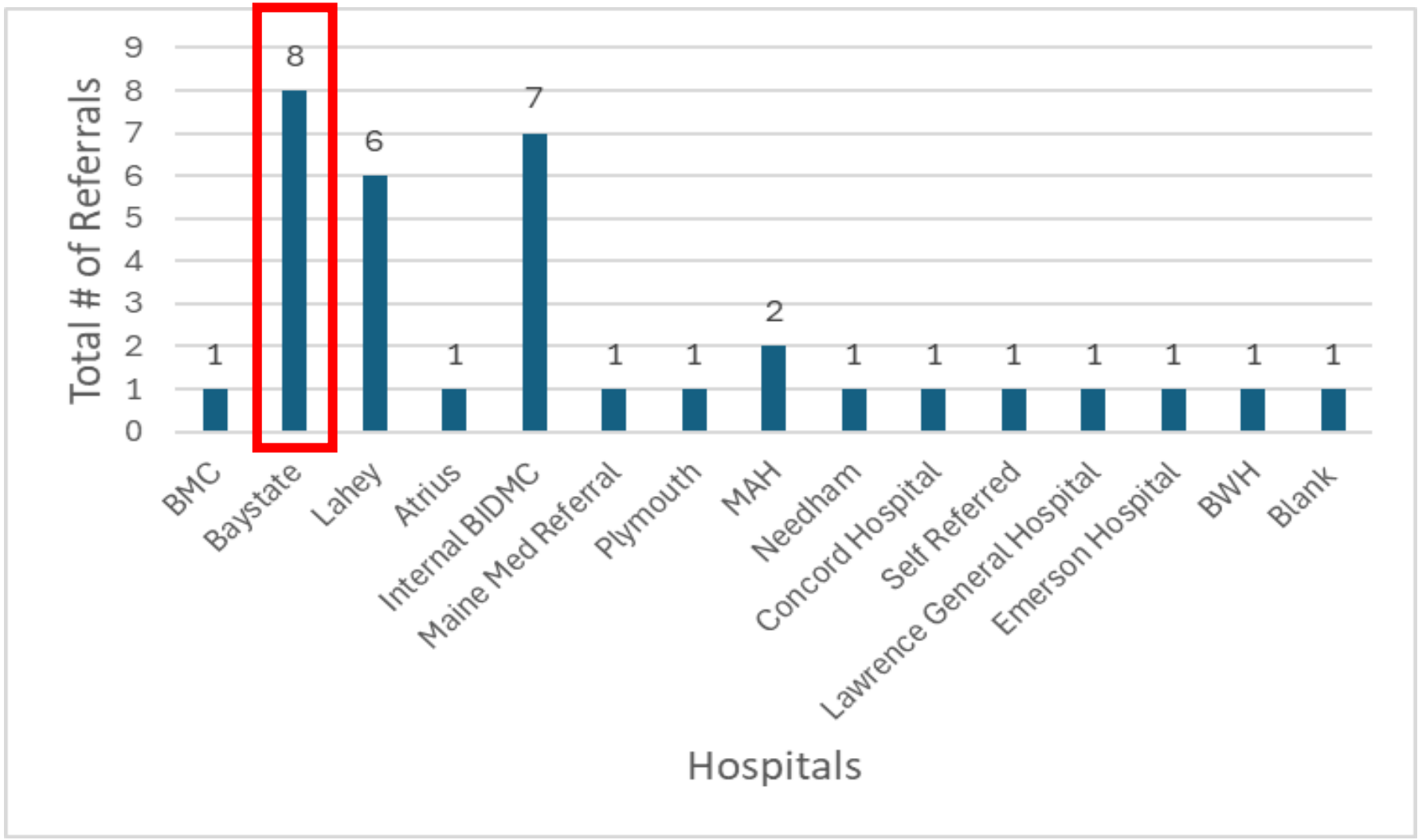
For heart transplant candidates, this measure has the **largest impact on survival after listing** among these three measures. 1 year heart survival includes only candidates who received a transplant.

National Average = 3 Bars

Overall Outcomes: #1 in Region 1 (New England)



Total Referrals: January – April 2026



Total Referrals: 34

*Tracking transfers of cardiogenic shock patients requiring additional support

Conclusions

- Heart transplant progression to stage D heart failure indicates a poor prognosis
- Evaluation for transplant or LVAD should occur at the recognition of advanced disease “red flags”
- UNOS allocation change in 2018 further expanded access to transplant but also lead to higher number of patients being transplanted from ICU and temporal MCS
- Closing the access gap to advanced heart failure therapies requires a strong collaboration between transplant centers and surrounding communities

Thank you

Citations

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