Advanc*ing* HF: Definition and Management

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MEHA
MIDDLE EAST HEART ACADEMY

Case Presentation:

A 70 year old male with a PMH pf HTN, hyperlipidemia, with an established history of ischemic cardiomyopathy, who presented to the HF clinic for further evaluation and management.

Initial echo revealed LVEF of 35% and LVIDD of 5.6 cm, with mild to moderate MR.

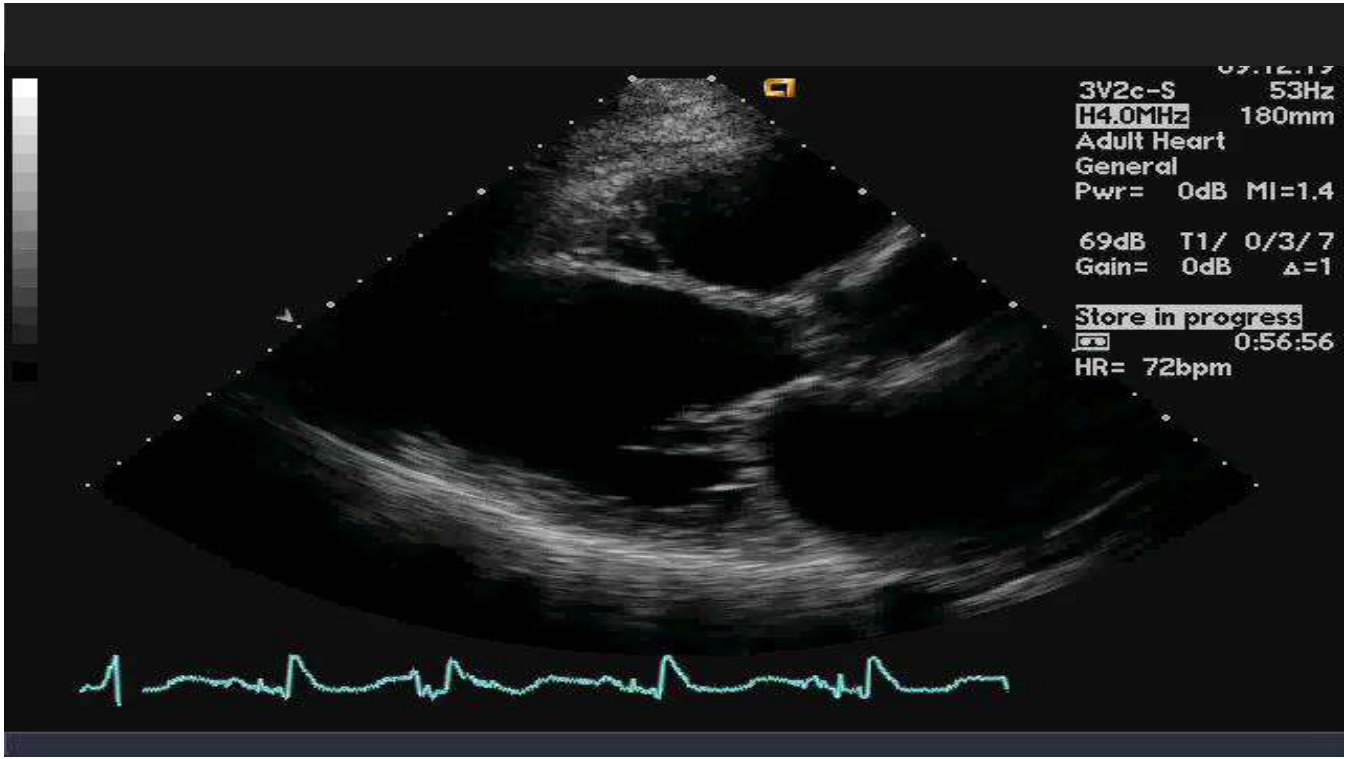
He was already on carvedilol, enalapril, spironolactone, ASA, clopidogrel, and atorvastatin.

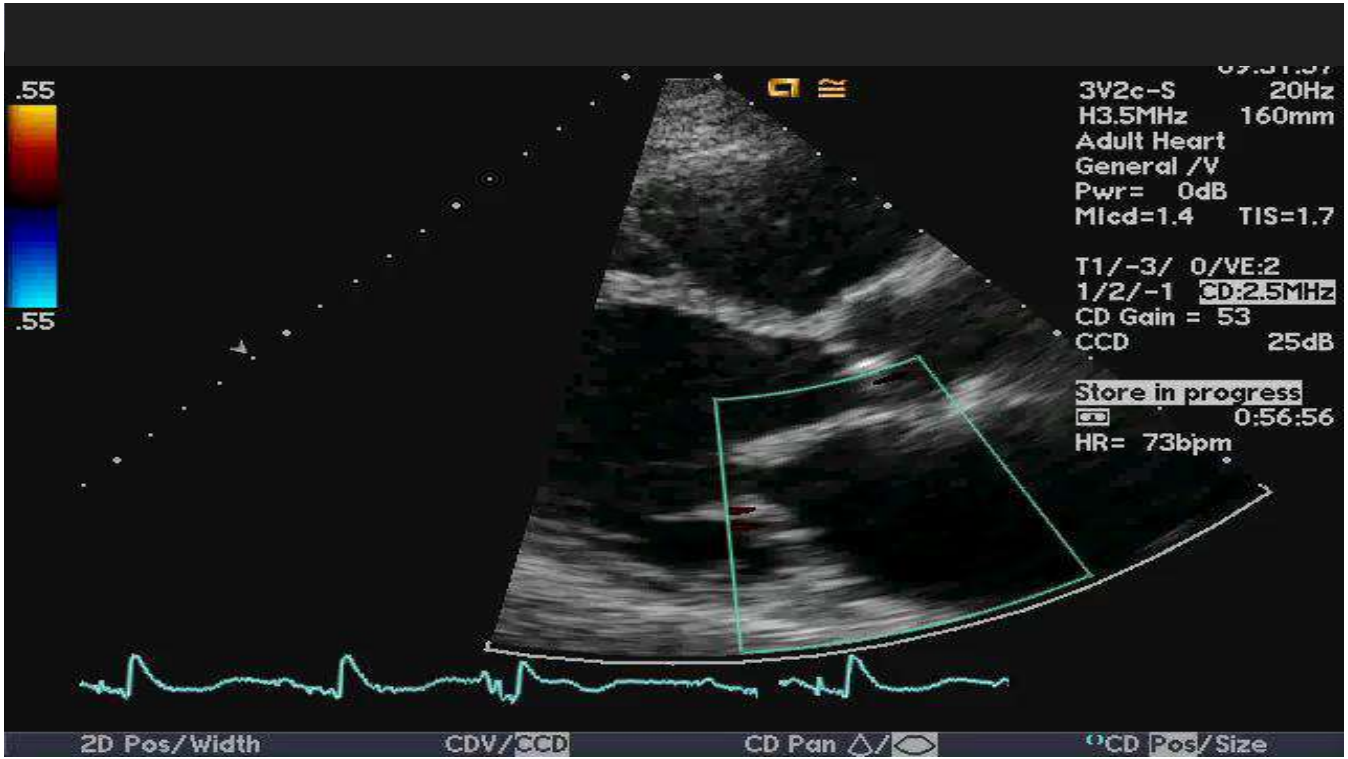
We tried to uptitrate his carvedilol, and then we switched him from enalapril to sacubitril/valsartan, and uptitrated that too. We added empagliflozin.

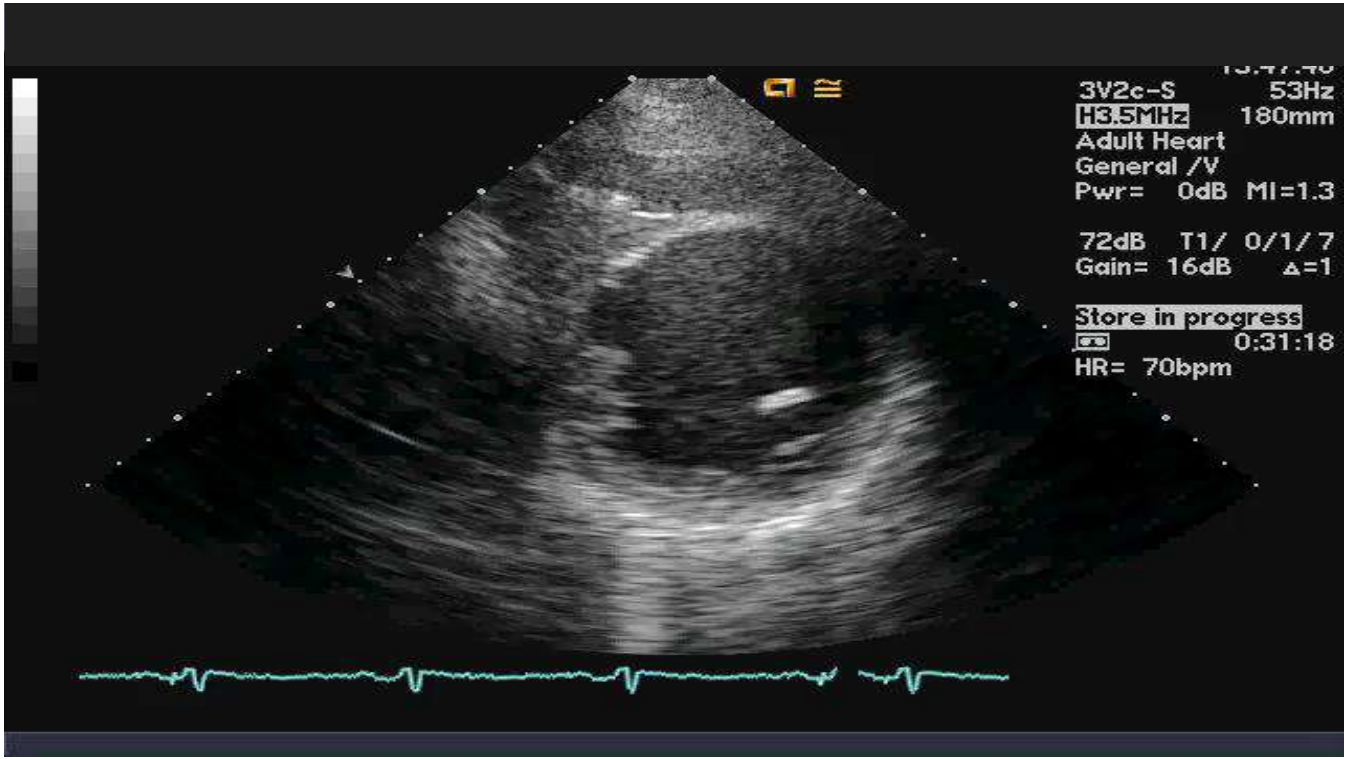
He then underwent CRT-D placement.

In the next 6 months, he was admitted 3 times with ADHF. His echo revealed a change of LVIDD from 5.6 to 7.1 cm; with a drop in LVEF to 20%, and moderate MR and TR despite maximum tolerated GDMT.

A CMR revealed no ischemia or viability, but a very large anterior and septal scars.


3V2c-S
53Hz
H4.0MHz
180mm
Adult Heart
General
Pwr= 0dB MI=1.4
69dB T1/ 0/3/ 7
Gain= 0dB Δ=1
Store in progress
0:56:56
HR= 72bpm


.55
.55
3V2c-S 20Hz
H3.5MHz 160mm
Adult Heart
General /V
Pwr= 0dB
MIcd=1.4 TIS=1.7
T1/-3/ 0/VE:2
1/2/-1 CD:2.5MHz
CD Gain = 53
CCD 25dB
Store in progress
0:56:56
HR= 73bpm
2D Pos/Width
CDV/CCD
CD Pan
CD Pos/Size

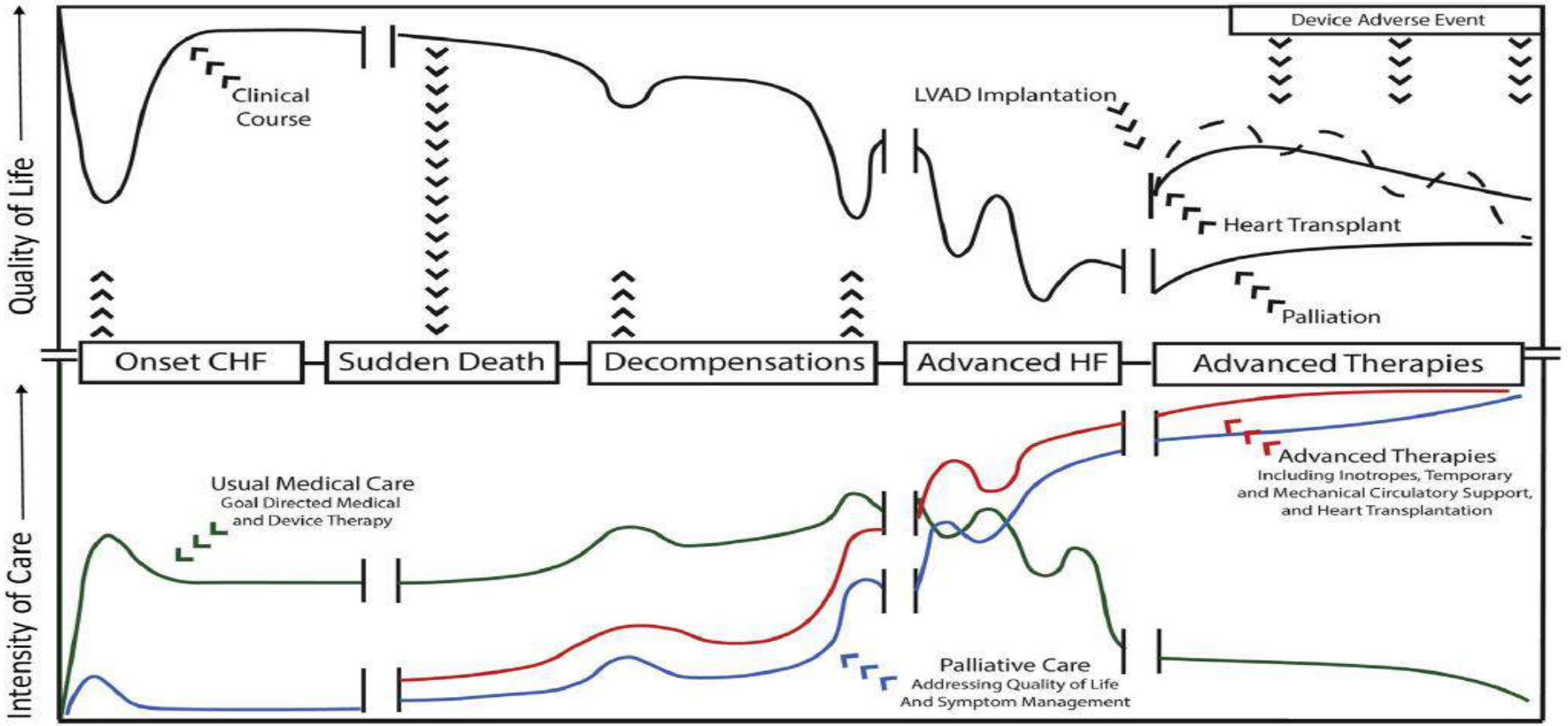

3V2c-S
53Hz
H3.5MHz
180mm
Adult Heart
General /V
Pwr= 0dB MI=1.3
72dB T1/ 0/1/7
Gain= 16dB Δ=1
Store in progress
0:31:18
HR= 70bpm

During the same period and in between admissions, we were only able to increase carvedilol to 6.25 mg bid, and sacubitril/valsartan to 100 mg bid. Volume status continued to be very labile.

He had progressive cachexia.

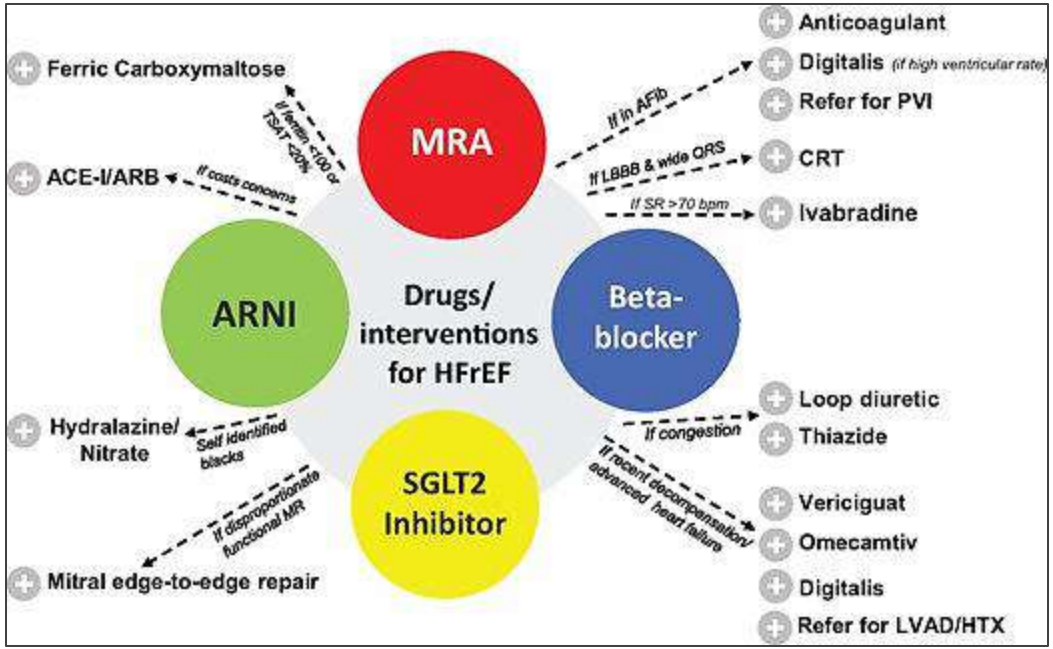
We decided to evaluate him for advanced HF therapies.

Clinical Course of HF



Truby, Rogers. JACC HF 2020;8 (7): 523-36

Guideline Directed Medical Therapy: The Fantastic Four

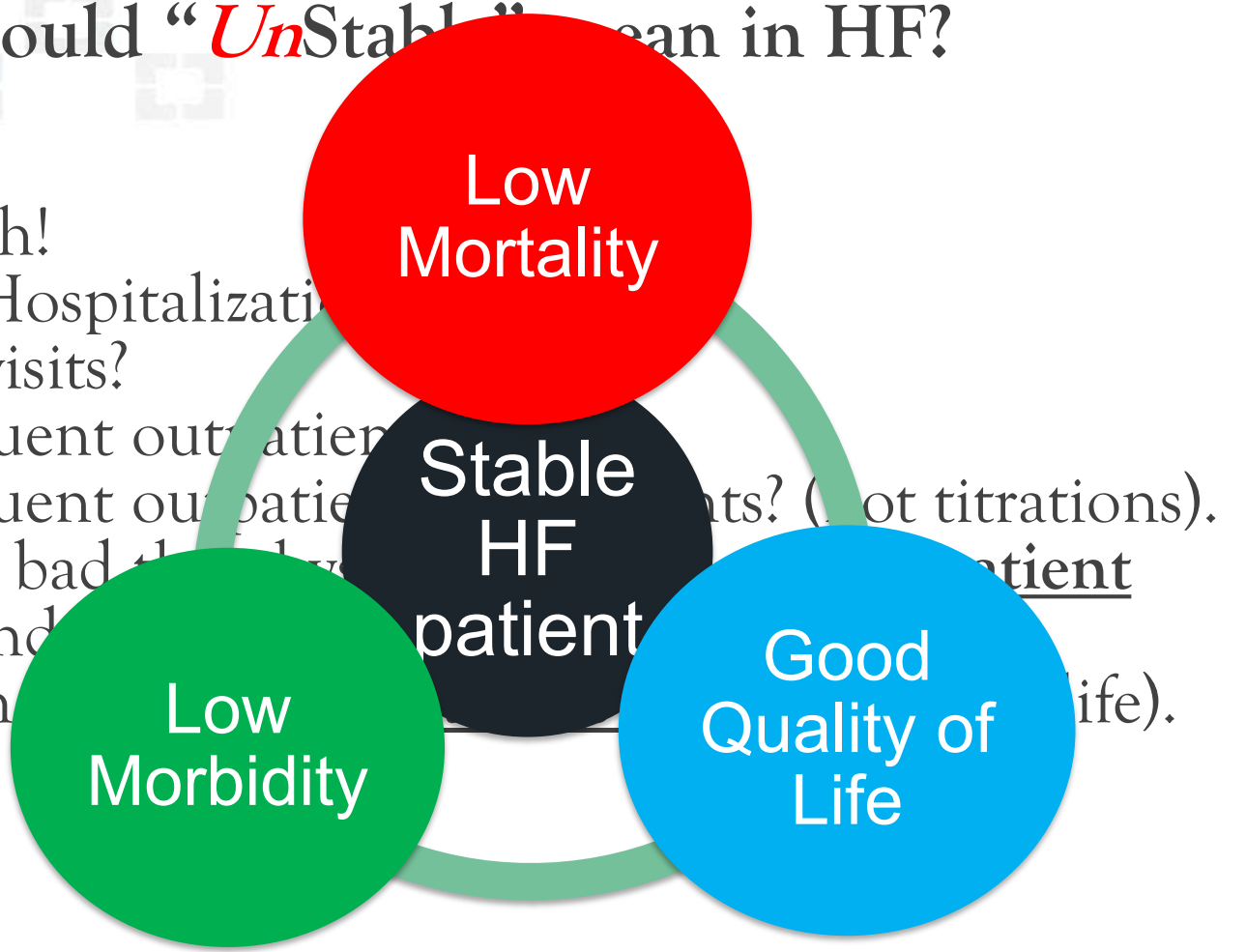


"The totality of evidence now suggests that patients with HFrEF should be treated early with a combination of the four drugs: an ARNI, beta-blocker, MRA, and SGLT2 inhibitor in order to benefit from substantial and sustained reductions of mortality, heart failure hospitalizations, and symptoms."

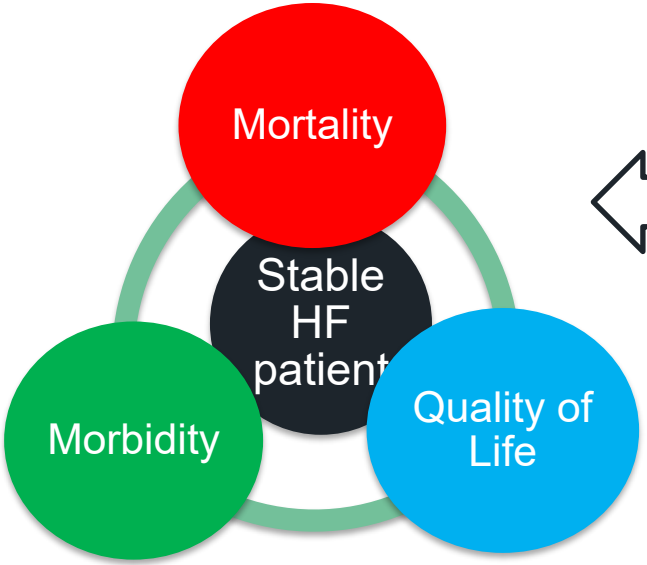
Johann Bauersachs.Eur *Heart J 2021;42(6):* 681–683

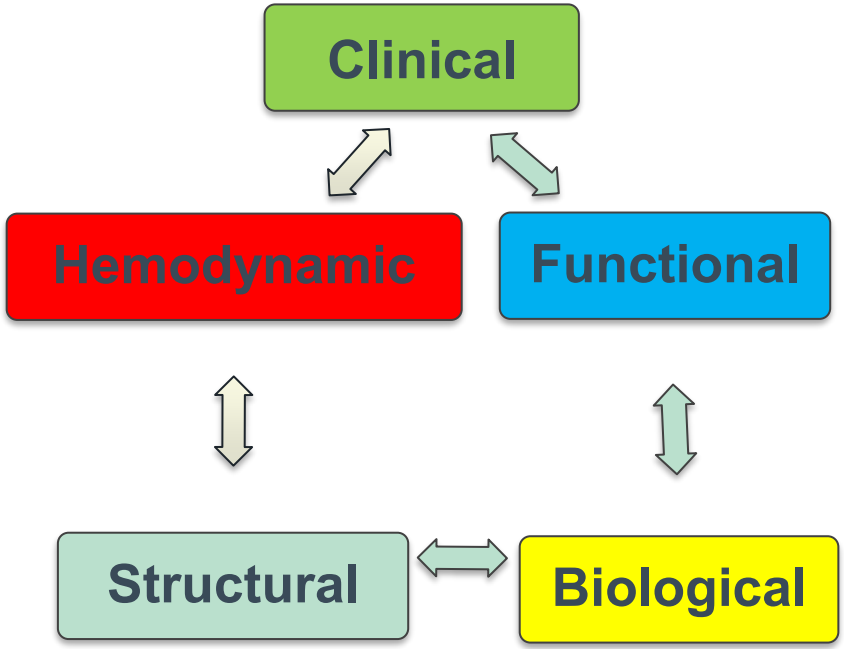
What should "*Un*Stabl[illegible]ean in HF?

- Death!
- HF Hospitalizati[illegible]
- ED visits?
- Frequent out[illegible]atien[illegible]
- Frequent ou[illegible]patie[illegible]nts? ([illegible]ot titrations).
- How bad [illegible]<u>atient</u> (abund[illegible]
- Or, h[illegible]ife).

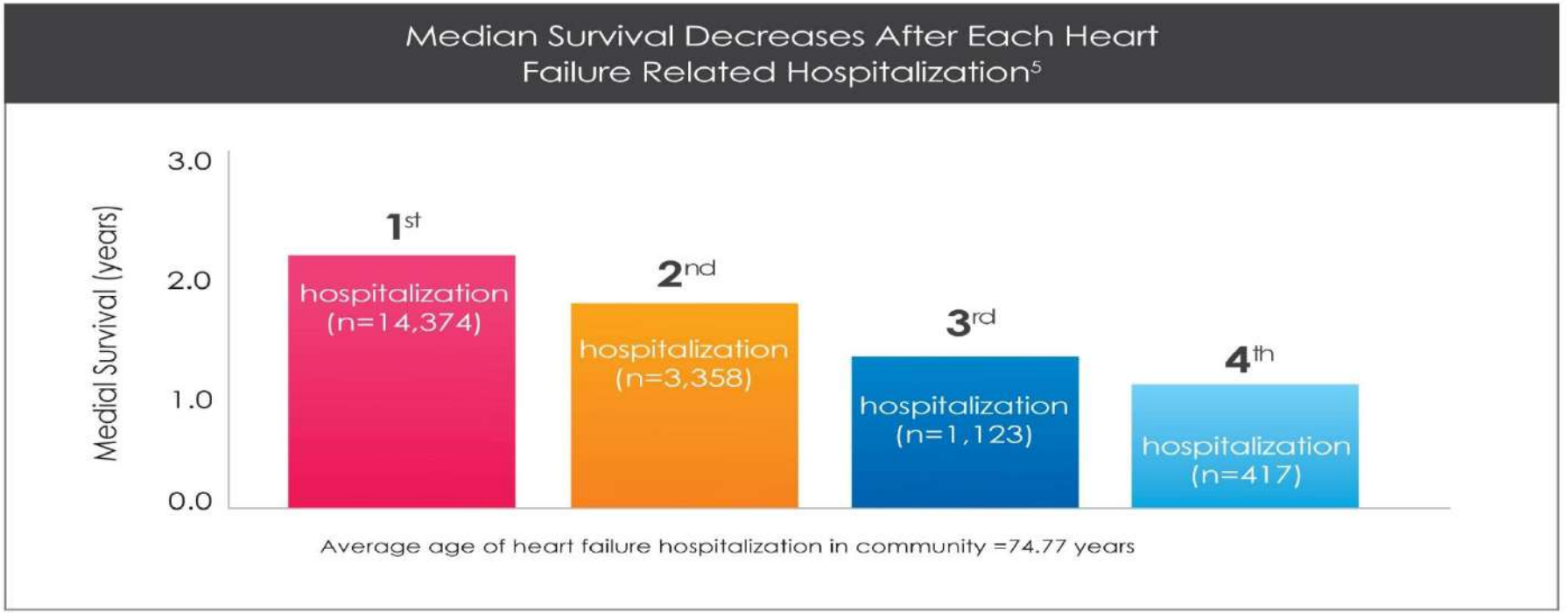


How do we evaluate "*stability*"?
How do we predict "*instability*"?





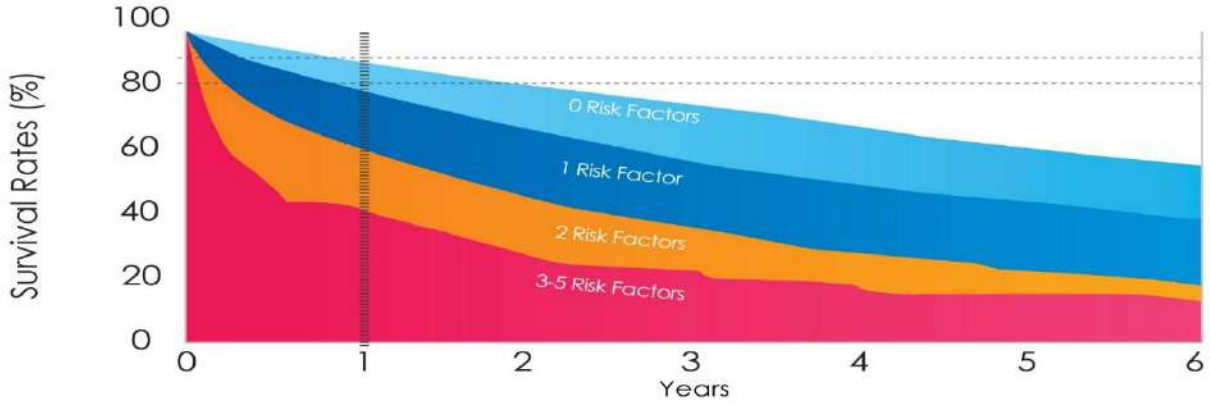
Hospitalizations



[5] Miller L, Guglin M. Patient selection for ventricular assist devices: A moving target. J Am Coll Cardiol. 2013;61:1209-21.

Worsening Clinical Parameters

Observed Mortality by Number of the Specified Risk Factors [7]

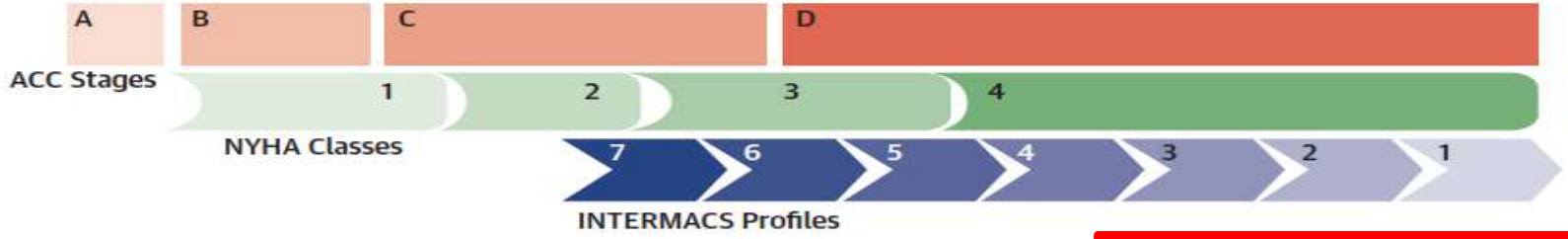


No. at Risk Risk Factors	0	1	2	3	4	5	6
0	3156	3156	2446	1893	1318	869	530
1	1343	1343	979	708	494	329	192
2	369	369	246	157	100	63	32
3-5	80	80	45	29	18	13	6

One or more risk factors should trigger generalist to refer to an advanced heart failure center.[7]

- Systolic blood pressure ≤90 mm Hg
- Creatinine ≥160 µmol/l
- Hemoglobin ≤120 g/l
- No treatment with renin-angiotensin system antagonist
- No treatment with beta-blocker

[7] Thorvaldsen, T, et al. Triage of patients with moderate to severe heart failure who should be referred to a heart failure center. J Am Coll Cardiol.2014;63:661-671.



ACC Stages

A: Patient is at high risk for developing heart failure but has no functional or structural heart disorder

B: Structural heart disorder without symptoms

C: Past or current symptoms or heart failure associated with structural disorder

D: Advanced heart disease requiring hospital-based support, transplant, or palliative care.

NYHA Classes

I: No limitation in normal physical activity

II: Mild symptoms with normal activity

III: Markedly symptomatic during daily activities, asymptomatic only at rest

IV: Severe limitations, symptoms even at rest

INTERMACS Profiles

Profile 1: Critical Cardiogenic Shock

Profile 2: Progressive Decline

Profile 3: Stable. But Inotrope Dependent

Profile 4: Resting Symptoms

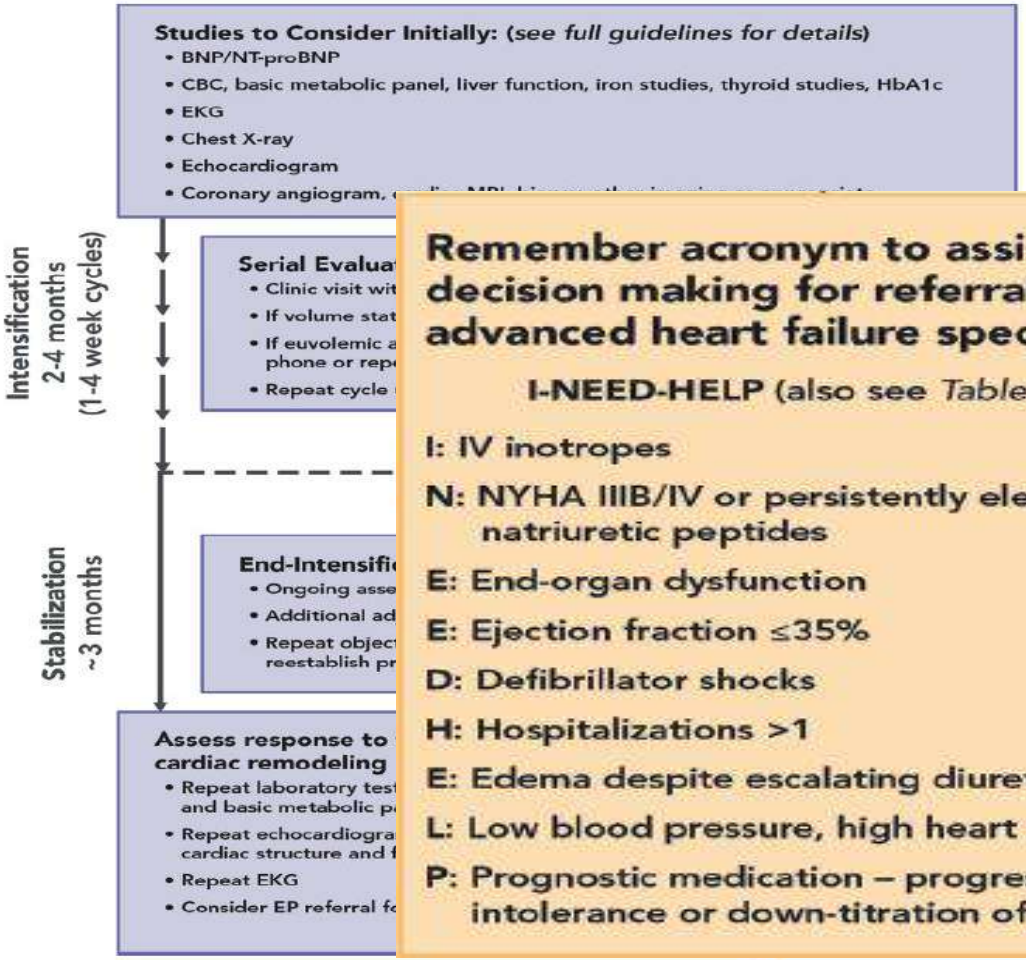
Profile 5: Exertion Intolerant

Profile 6: Exertion Limited

Profile 7: Advanced NYHA Class III

Truby, Rogers. JACC HF 2020;8 (7): 523-36

FIGURE 4 Testing and Medication Titration Following Diagnosis of HFrEF



JACC 2018; 71 (2): 201-30

TABLE 16 ESC Definition of Advanced HF

All these criteria must be present despite optimal guideline-directed treatment:

1. Severe and persistent symptoms of HF (NYHA class III [advanced] or IV)
2. Severe cardiac dysfunction defined by ≥1 of these:
   - LVEF ≤30%
   - Isolated RV failure
   - Nonoperable severe valve abnormalities
   - Nonoperable severe congenital heart disease
   - EF ≥40%, elevated natriuretic peptide levels and evidence of significant diastolic dysfunction
3. Hospitalizations or unplanned visits in the past 12 mo for episodes of:
   - Congestion requiring high-dose intravenous diuretics or diuretic combinations
   - Low output requiring inotropes or vasoactive medications
   - Malignant arrhythmias
4. Severe impairment of exercise capacity with inability to exercise or low 6-minute walk test distance (<300 m) or peak VO_2 (<12–14 mL/kg/min) estimated to be of cardiac origin

Options for advanced HF patients

- Palliative care, aiming at symptom control and minimization of hospitalizations, with or without chronic inotropic therapy.
- Ventricular assist devices (VADs).
- Heart transplant.

2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure

A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

COR	LOE	RECOMMENDATION
1	C-LD	1. In patients with advanced HF, when consistent with the patient's goals of care, timely referral for HF specialty care is recommended to review HF management and assess suitability for advanced HF therapies (e.g., LVAD, cardiac transplantation, palliative care, and palliative inotropes) (1-6).

Inotropic Therapy

2a	B-NR	1. In patients with advanced (stage D) HF refractory to GDMT and device therapy who are eligible for and awaiting MCS or cardiac transplantation, continuous intravenous inotropic support is reasonable as "bridge therapy" (1-4).
2b	B-NR	2. In select patients with stage D HF, despite optimal GDMT and device therapy who are ineligible for either MCS or cardiac transplantation, continuous intravenous inotropic support may be considered as palliative therapy for symptom control and improvement in functional status (5-7).
3: Harm	B-R	3. In patients with HF, long-term use of either continuous or intermittent intravenous inotropic agents, for reasons other than palliative care or as a bridge to advanced therapies, is potentially harmful (5,6,8-11).

Inotropic Therapy

TABLE 20 Intravenous Inotropic Agents Used in the Management of HF

Inotropic Agent	Dose (mcg/kg) Bolus	Dose (mcg/kg) Infusion (/min)	Drug Kinetics and Metabolism	Effects CO	Effects HR	Effects SVR	Effects PVR	Adverse Effects	Special Considerations
Adrenergic agonists									
Dopamine	NA	5–10	$t_{1/2}$: 2–20 min	↑	↑	↔	↔	T, HA, N, tissue necrosis	Caution: MAO-I
	NA	10–15	R, H, P	↑	↑	↑	↔		
Dobutamine	NA	2.5–20	$t_{1/2}$: 2–3 min H	↑	↑	↔	↔	↑/↓BP, HA, T, N, F, hypersensitivity	Caution: MAO-I; CI: sulfite allergy
PDE 3 inhibitor									
Milrinone	NR	0.125–0.75	$t_{1/2}$: 2.5 h H	↑	↑	↓	↓	T, ↓BP	Accumulation may occur in setting of renal failure; monitor kidney function and LFTs
Vasopressors									
Epinephrine	NR	5–15 mcg/min	$t_{1/2}$: 2–3 min	↑	↑	↑ (↓)	↔	HA, T	Caution: MAO-I
		15–20 mcg/min	$t_{1/2}$: 2–3 min	↑	↑↑	↑↑	↔	HA, T	Caution: MAO-I
Norepinephrine	NR	0.5–30 mcg/min	$t_{1/2}$: 2.5 min	↔	↑	↑↑	↔	↓ HR, tissue necrosis	Caution: MAO-I

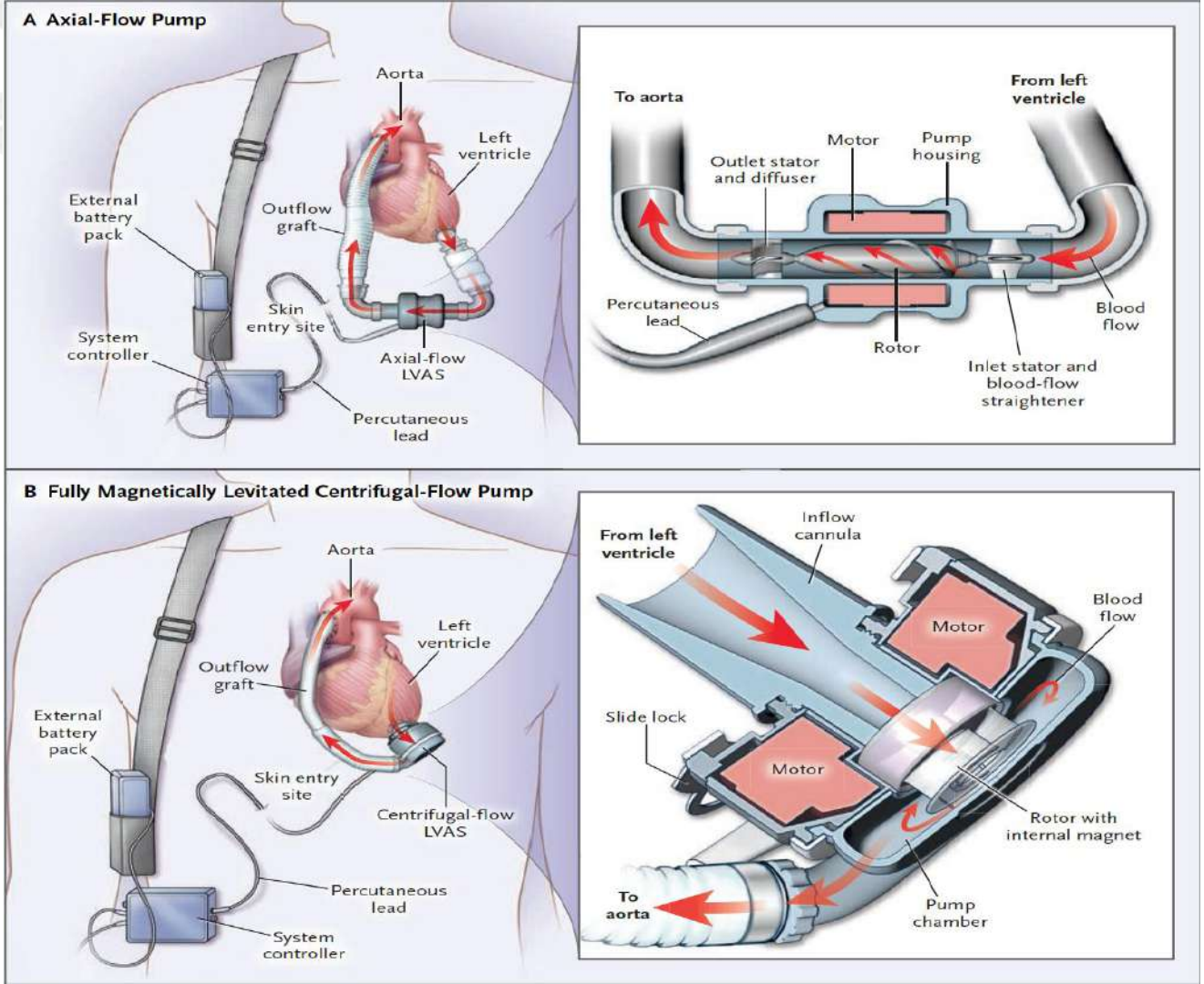
Mechanical Circulatory Support

1	A	1. In select patients with advanced HFrEF with NYHA class IV symptoms who are deemed to be dependent on continuous intravenous inotropes or temporary MCS, durable LVAD implantation is effective to improve functional status, QOL, and survival (1-18).
2a	B-R	2. In select patients with advanced HFrEF who have NYHA class IV symptoms despite GDMT, durable MCS can be beneficial to improve symptoms, improve functional class, and reduce mortality (2,4,7,10,12-17,19).
2a	B-NR	4. In patients with advanced HFrEF and hemodynamic compromise and shock, temporary MCS, including percutaneous and extracorporeal ventricular assist devices, are reasonable as a "bridge to recovery" or "bridge to decision" (25-29).

Types of LVAD Indications

Bridge to candidacy (BTC)	Use of MCS (usually LVAD) to improve end-organ function in order to make an ineligible patient eligible for heart transplantation.
Bridge to transplantation (BTT)	Use of MCS (LVAD or BiVAD) to keep patient alive who is otherwise at high risk of death before transplantation until a donor organ becomes available.
Bridge to recovery (BTR)	Use of MCS (typically LVAD) to keep patient alive until cardiac function recovers sufficiently to remove MCS.
Destination therapy (DT)	Long-term use of MCS (LVAD) as an alternative to transplantation in patients with end-stage HF ineligible for transplantation or long-term waiting for heart transplantation.

European Heart Journal (2016) **37**, 2129–2200


A Axial-Flow Pump
Aorta
Left ventricle
External battery pack
Outflow graft
Skin entry site
System controller
Axial-flow LVAS
Percutaneous lead
To aorta
From left ventricle
Outlet stator and diffuser
Motor
Pump housing
Percutaneous lead
Rotor
Blood flow
Inlet stator and blood-flow straightener
B Fully Magnetically Levitated Centrifugal-Flow Pump
Aorta
Left ventricle
Outflow graft
External battery pack
Skin entry site
Centrifugal-flow LVAS
Percutaneous lead
System controller
From left ventricle
Inflow cannula
Motor
Blood flow
Slide lock
Motor
Rotor with internal magnet
To aorta
Pump chamber

JAMA | Original Investigation

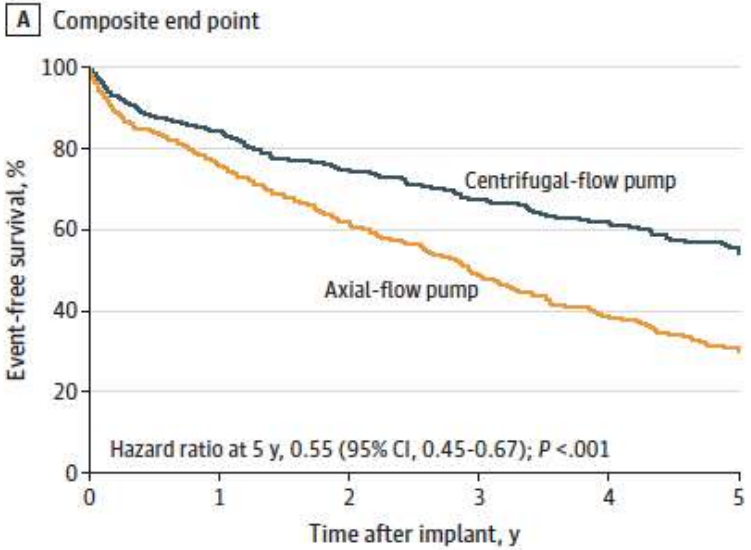
Five-Year Outcomes in Patients With Fully Magnetically Levitated vs Axial-Flow Left Ventricular Assist Devices in the MOMENTUM 3 Randomized Trial

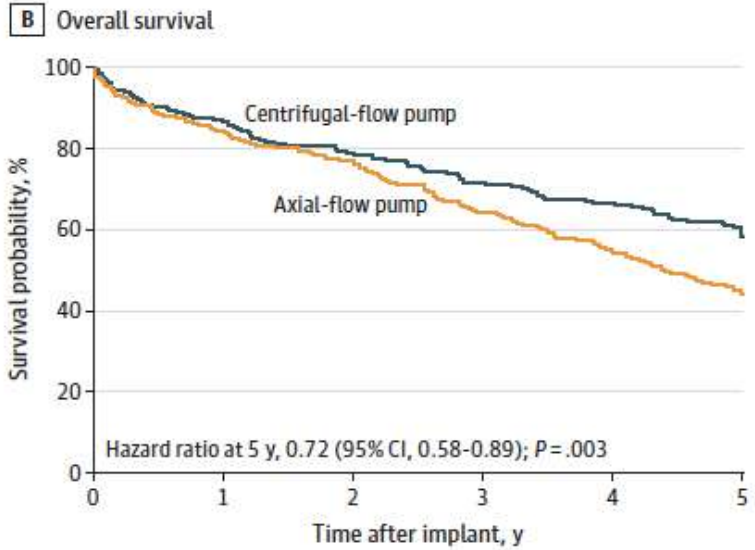
Mandeep R. Mehra, MD, MSc; Daniel J. Goldstein, MD; Joseph C. Cleveland, MD; Jennifer A. Cowger, MD, MS; Shelley Hall, MD; Christopher T. Salerno, MD; Yoshifumi Naka, MD, PhD; Douglas Horstmanshof, MD; Joyce Chuang, PhD; AiJia Wang, MPH; Nir Uriel, MD, MSc

- *Analysis included 477 patients of the 536 survivors at 2 years of the MOMENTUM 3 trial.*

- *Composite endpoint of survival to transplant, recovery, or LVAD support free of debilitating stroke (Modified Rankin Scale score >3) or reoperation to replace the pump 5 years after the implant.*

Five-Year Outcomes in Patients With Fully Magnetically Levitated vs Axial-Flow Left Ventricular Assist Devices in the MOMENTUM 3 Randomized Trial



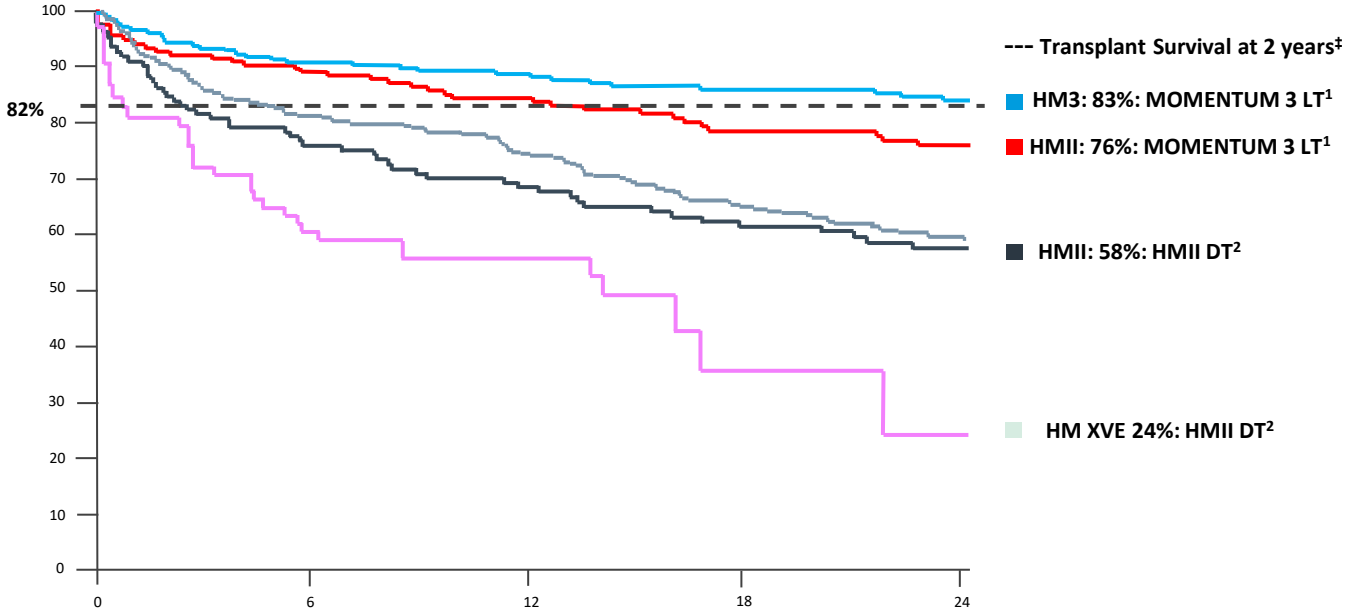


No. of patients

Centrifugal-flow pump	515	373	280	208	177	138
Axial-flow pump	505	321	223	147	106	71

515	383	289	213	184	141
505	339	247	165	124	85

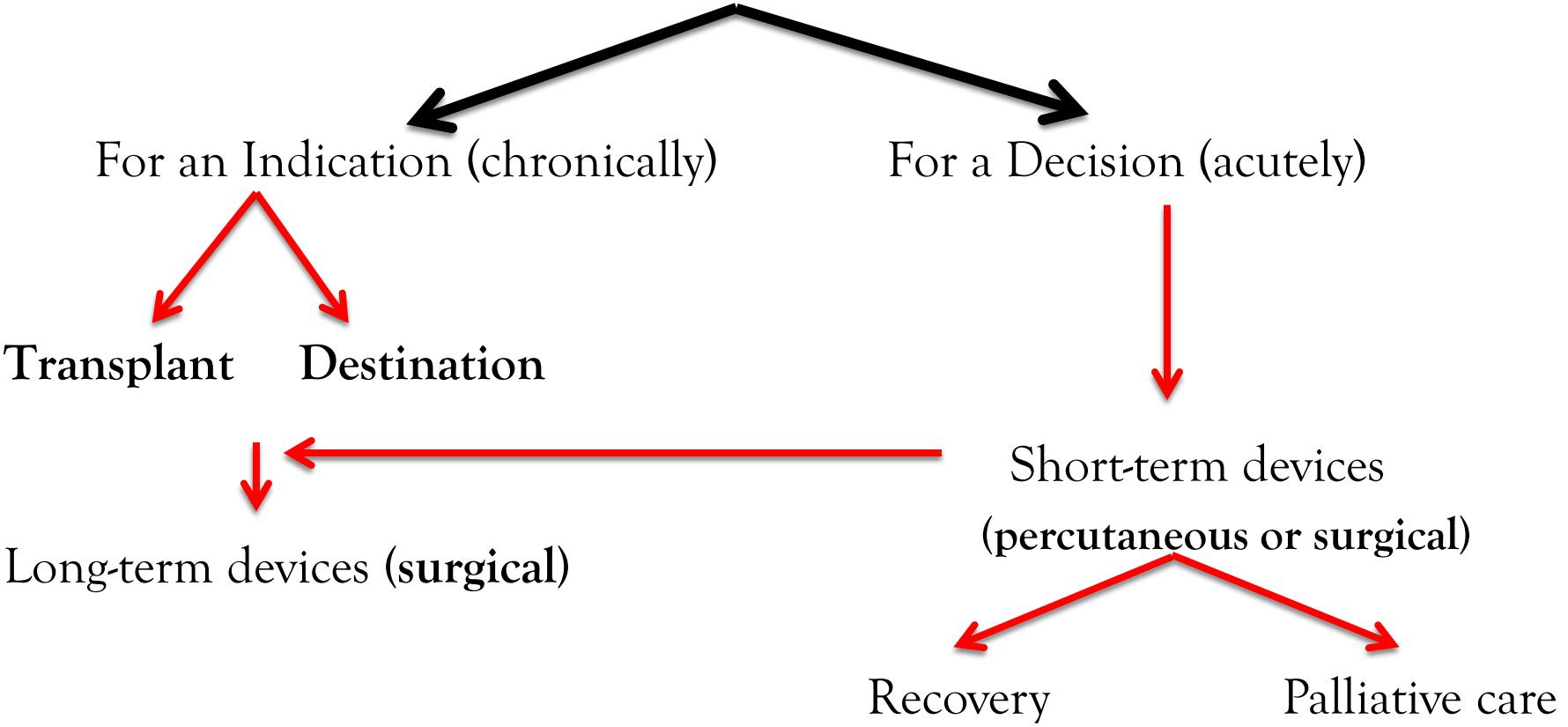
Improvement in Survival Rates through Time
A new standard has been set



1. Mehra MR, et al., for the MOMENTUM 3 investigators. N Engl J Med. 2018. **2.** Slaughter, et al. NEJM

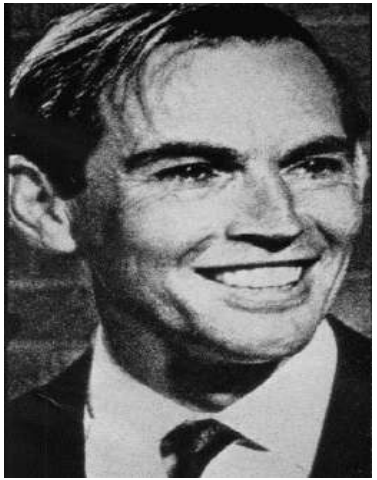
‡ The International Society for Heart & Lung Transplantation. http://www.ishlt.org/registries/slides.asp?slides=heartLungRegistry. Accessed March 11, 2018.

Ventricular Assist Devices



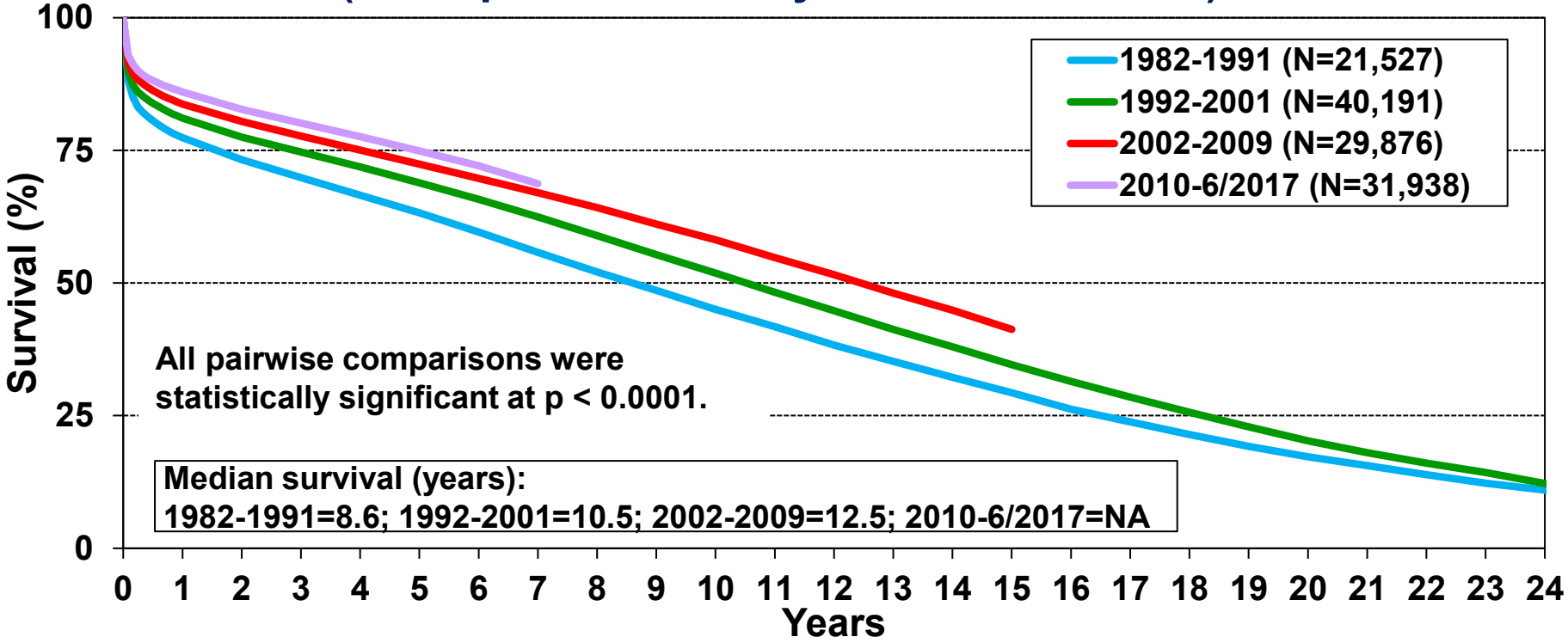
A Historical Perspective

- On December 3, 1967, 55 year-old Lewis Washkansky receives the first successful heart transplant at Groote Schuur Hospital in Cape Town, South Africa by Professor Christiaan Barnard.



- **In UAE, the first heart transplant was performed in December 2017.**

Adult Heart Transplants
Kaplan-Meier Survival by Era
(Transplants: January 1982 – June 2017)

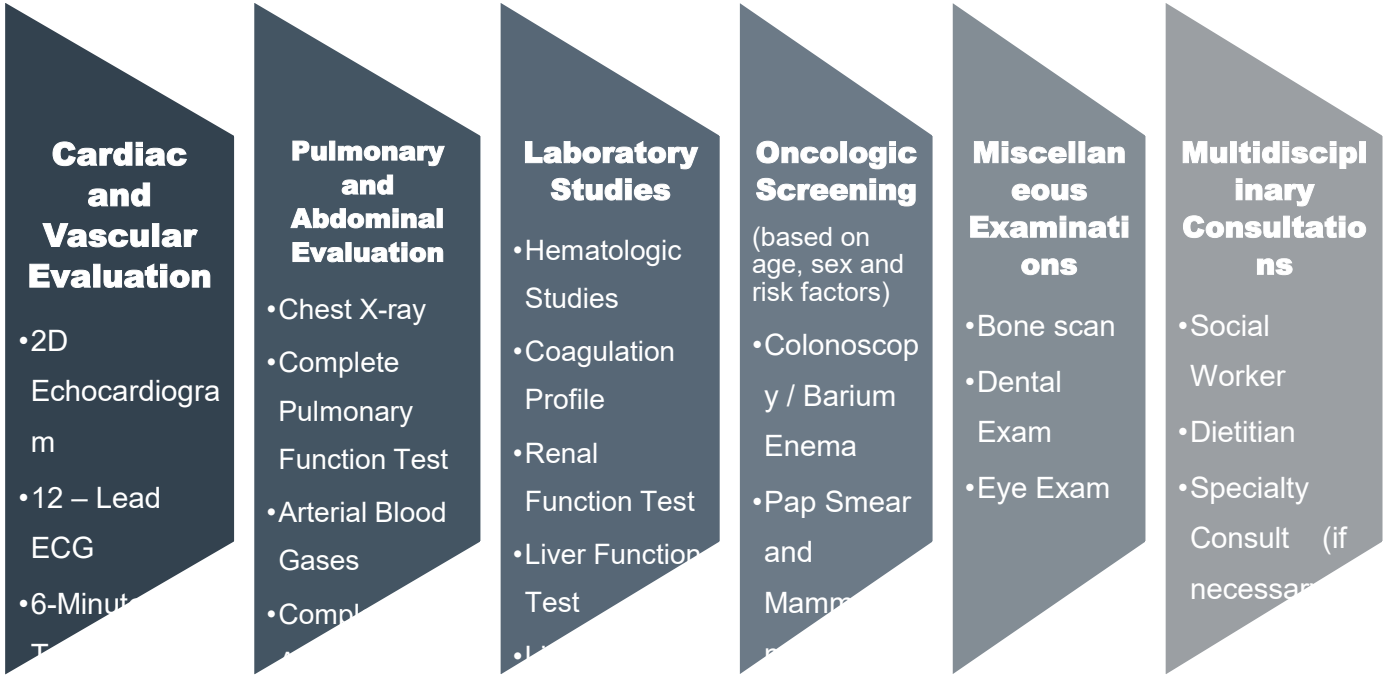


ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
2019
citation

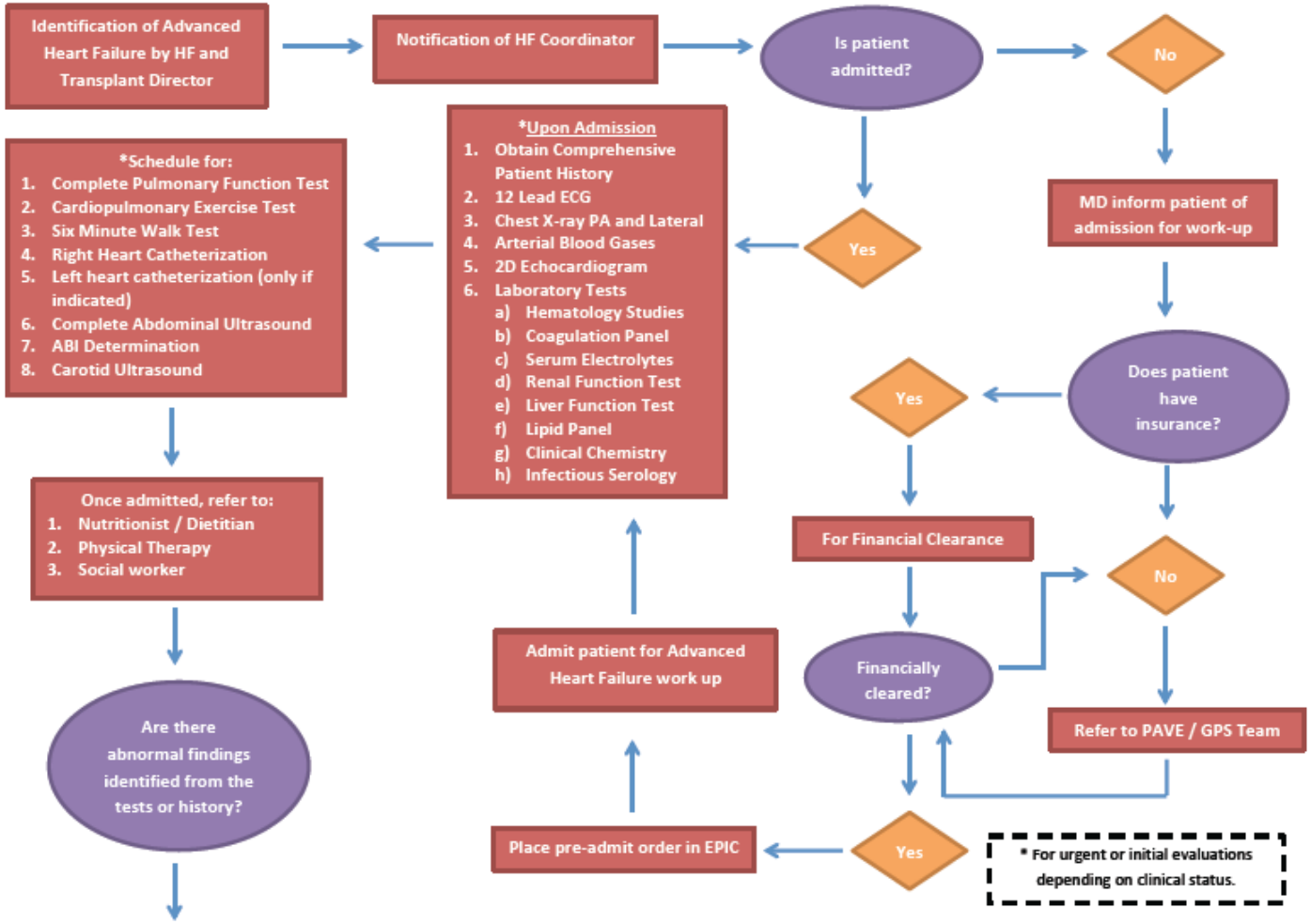
Heart Transplant

1 C-LD	1. For selected patients with advanced HF despite GDMT, cardiac transplantation is indicated to improve survival and QOL (1-3).
Value Statement: Intermediate Value (C-LD)	2. In patients with stage D (advanced) HF despite GDMT, cardiac transplantation provides intermediate economic value (4).

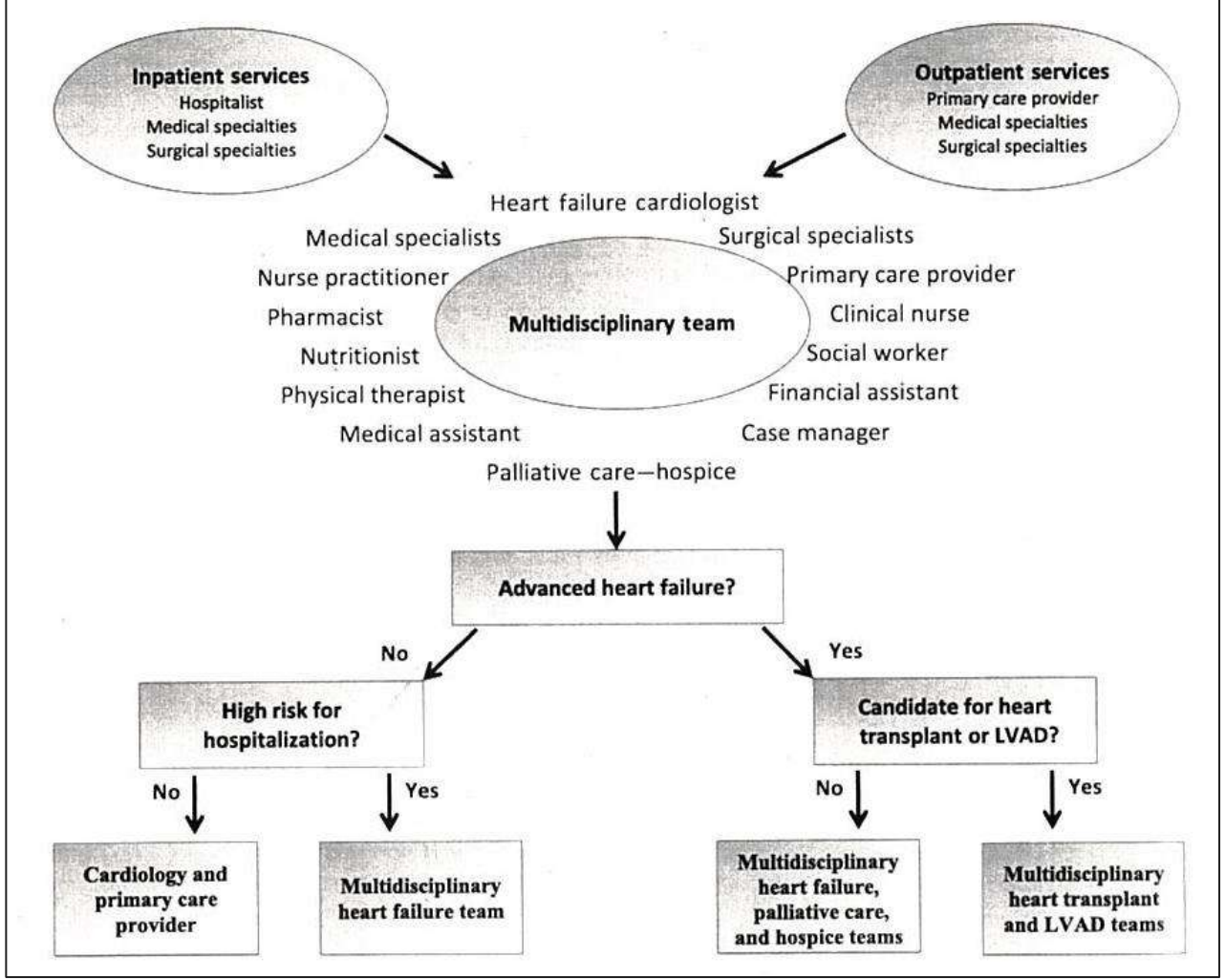
Advanced Heart Failure Therapy Evaluation Process



ADVANCED HEART FAILURE THERAPY EVALUATION

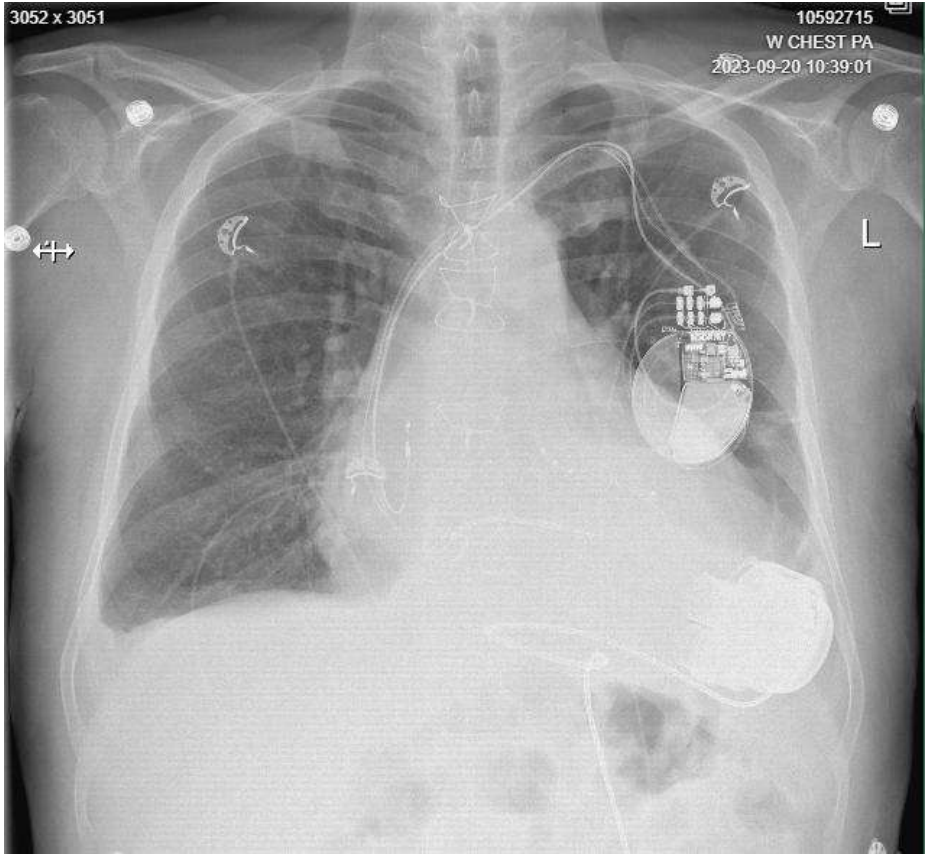



Possible Specialty Consultation
Refer patient for clearance:
1. Dentistry
2. Ophthalmology
Consider Age, Sex and Risk factors based on history
Schedule for:
1. Colonoscopy
2. Mammography
3. Pap Smear
4. Prostate Exam
5. DEXA scan
Work up complete
Patient can be discharged. Schedule the patient for next clinic visit.
Data Collection and Collation
Risk Scores calculated based on data from tests
Schedule for Multidisciplinary Discussion regarding appropriate Advanced HF therapy
Heart Failure Program Development Meeting Patient Presentation to Multidisciplinary Team
** Candidates who are high risk for Allosensitization
1. Ventricular Assist Device (VAD) patients
2. Patients receiving multiple blood transfusions
3. Patients with previous history of solid – organ transplantation.
4. Multiple pregnancies
Final Decision made after Multidisciplinary discussion
Inform patient of decision on the next clinic visit
Eligible for Ventricular Assist Device
Eligible for Heart Transplantation
Medical Management
Schedule appointment with Cardiac Surgeon
Request for Panel Reactive Antibody (Only for appropriate candidates**)
Close follow-up as outpatient
Plan and schedule for VAD Implantation Surgery

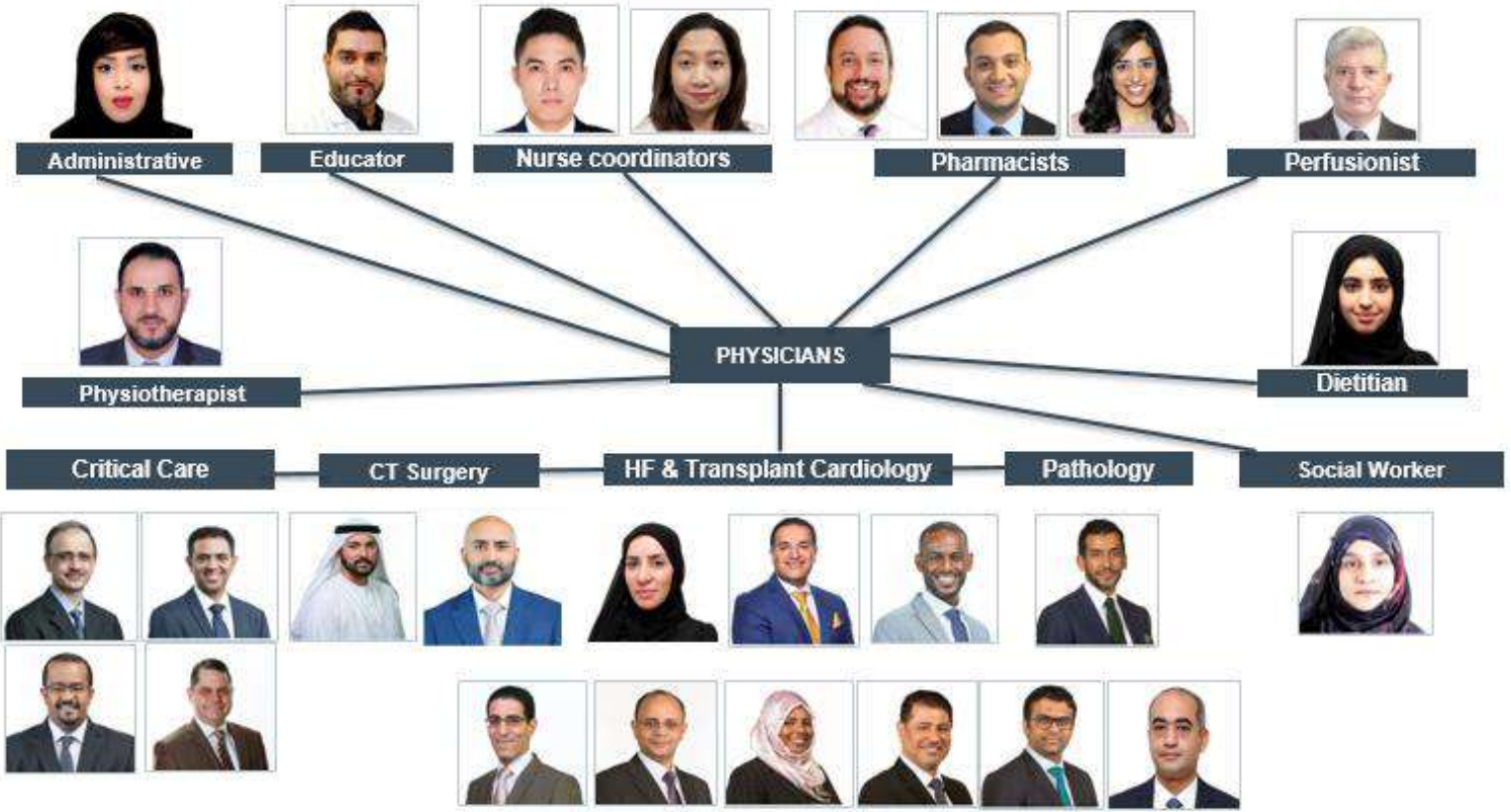


Wever- Pinzon, et al. HF Clinics, July 2015

Back to our patient



CCAD Advanced Heart Failure and Transplant Team



Summary

- *Advanced HF is associated with significant mortality and limited therapeutic options.*
- *Advanced therapies are still underutilized.*
- *The goal from referral to advanced therapies is to significantly impact survival and quality of life.*
- *Clinical, biological, imaging, and hemodynamic factors can help identify advanced patients.*
- *Advanced HF therapy should be individualized based on patient characteristics and excluded when prognosis is more influenced by conditions other than HF.*

Submit your abstracts

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