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Rapid Clinical Updates: Advanced Therapy for End-Stage Heart Failure

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Disclosures

All speakers and planners have no relevant financial or advisory relationships with corporate organizations related to this activity.

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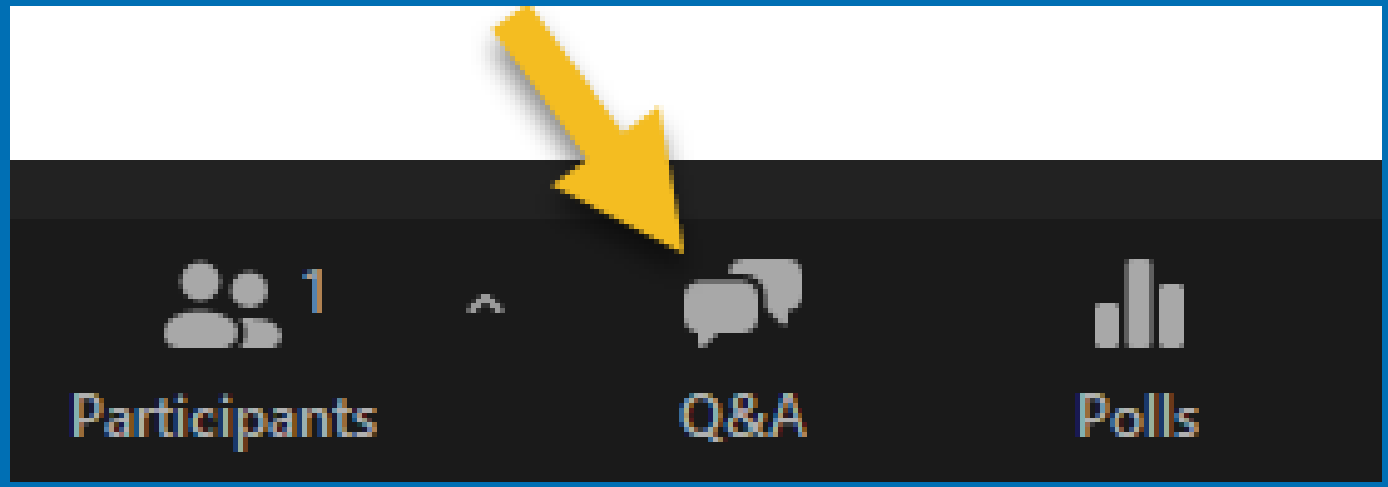
Please submit questions using Q&A feature

We will have Q&A time after



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POLL QUESTIONS

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Question 1

1. The PAL-HF trial demonstrated significant improvements in patients with advanced heart failure who received interdisciplinary palliative care compared to usual care alone. **Which of the following outcomes showed statistically significant improvement at 6 months?**
    A. Reduced hospitalizations and mortality rates
    B. Improved quality of life scores (KCCQ and FACIT-Pal) and decreased anxiety/depression
    C. Increased tolerance to guideline-directed medical therapy
    D. Enhanced left ventricular ejection fraction

Question 2

2. The "I-NEED-HELP" mnemonic assists clinicians in recognizing patients with advanced heart failure who may benefit from specialty referral. **Which combination of criteria from this mnemonic indicates the highest priority for advanced heart failure evaluation?**
    A. Intravenous inotropes, NYHA class IIIB-IV symptoms, and hospitalizations >1
    B. Edema despite diuretics, low systolic BP ≤90mmHg, and EF ≤35%
    C. End-organ dysfunction, defibrillator shocks, and prognostic medication intolerance
    D. All of the above warrant specialty referral consideration

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Advanced Therapy for End-Stage Heart Failure

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Advanced Therapy for End-Stage Heart Failure

Advanced Therapy for End-Stage Heart Failure

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COI: Dr. Barkoudah reports research support payments from National Institutes of Health/National Heart, Lung, and Blood Institute, Bristol Myers Squibb and Janssen, payments made to Brigham and Women's Hospital for performing clinical endpoints sponsored by various entities, payments from WebMD and Advisory Board fees from Medscape, Janssen, Novartis, Pfizer, and travel expenses from Alexion. Editor in Chief, Journal of Clinical Outcomes Management

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Attestation Disclosure to the Audience

The activity director(s), planning committee member(s), speaker(s), author(s) or anyone in a position to control the content

NO financial interest or relationship which could be perceived as a real or apparent conflict of interest. There were no individuals in a position to control the content that refused to disclose.

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Scenario: Evaluation

Mr. Rodriguez, a 62-year-old man with ischemic cardiomyopathy (LVEF 20%), presents with NYHA class IV symptoms despite maximally tolerated medical therapy including ACE inhibitor, beta-blocker, and MRA. He has experienced frequent hospitalizations, requires continuous intravenous inotropic support, and has developed worsening renal function. His functional status has declined significantly, and he reports being unable to perform activities of daily living without severe dyspnea.

Clinical Considerations: This patient demonstrates multiple I-NEED-HELP criteria including inotrope dependence, NYHA class IV symptoms, end-organ dysfunction, and recurrent hospitalizations. This warrants urgent evaluation for advanced therapies such as left ventricular assist device or cardiac transplantation at an advanced heart failure center.

Scenario: Care Integration

78-year-old woman with HFrEF, presents with her third hospitalization in six months despite optimal guideline-directed medical therapy. She reports persistent NYHA class III symptoms, significant fatigue, and depression affecting her quality of life. Her family expresses concerns about her prognosis and treatment goals. Laboratory results show elevated NT-proBNP levels and mild renal dysfunction limiting further medication optimization.

Clinical Considerations:

This patient meets criteria for palliative care consultation based on recurrent hospitalizations, symptom burden, and psychosocial distress. The PAL-HF trial evidence supports early palliative care integration to address quality of life, depression, and advance care planning while continuing heart failure management

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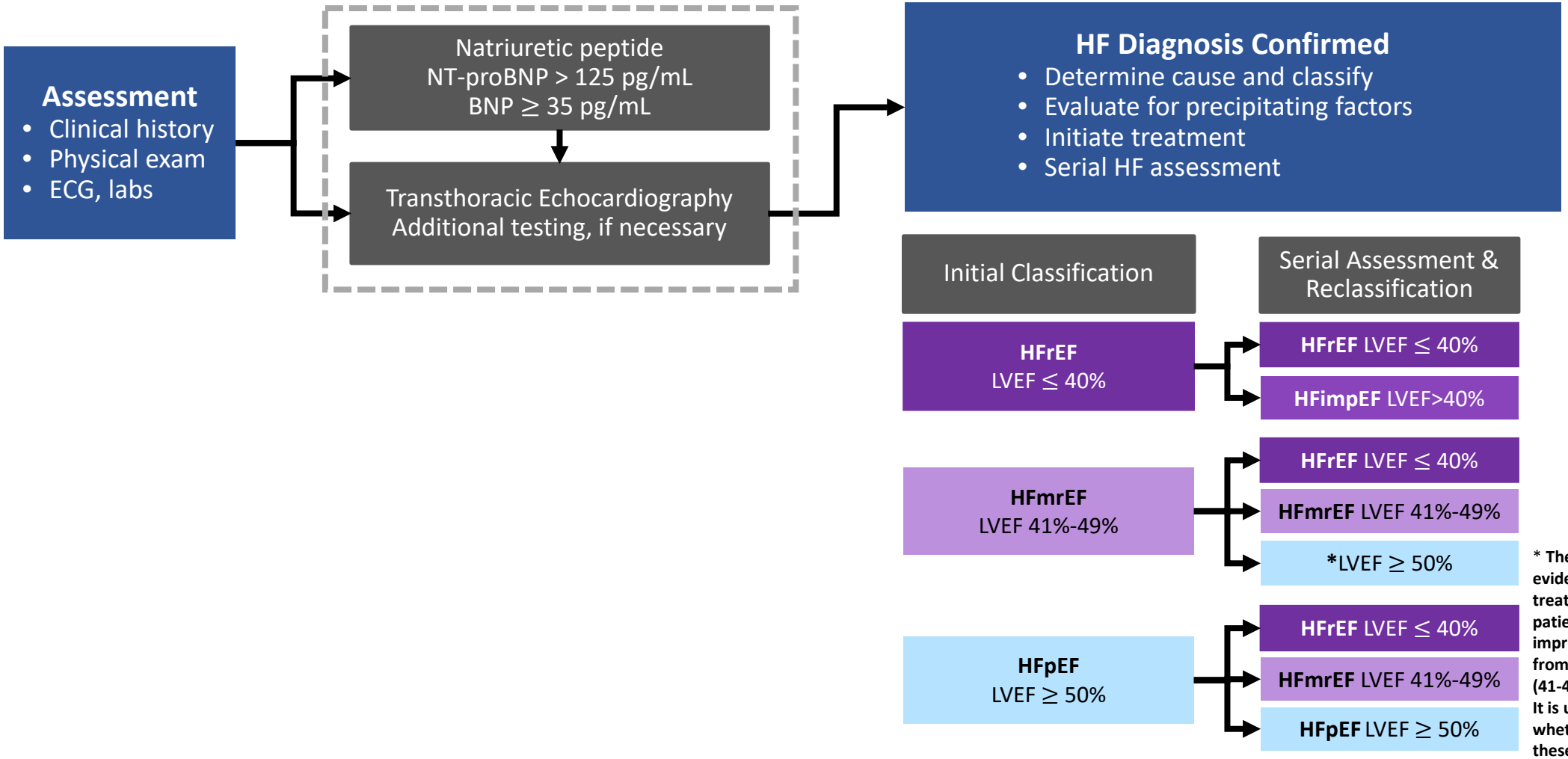
Diagnostic Algorithm for HF and LVEF Based on HF Classification



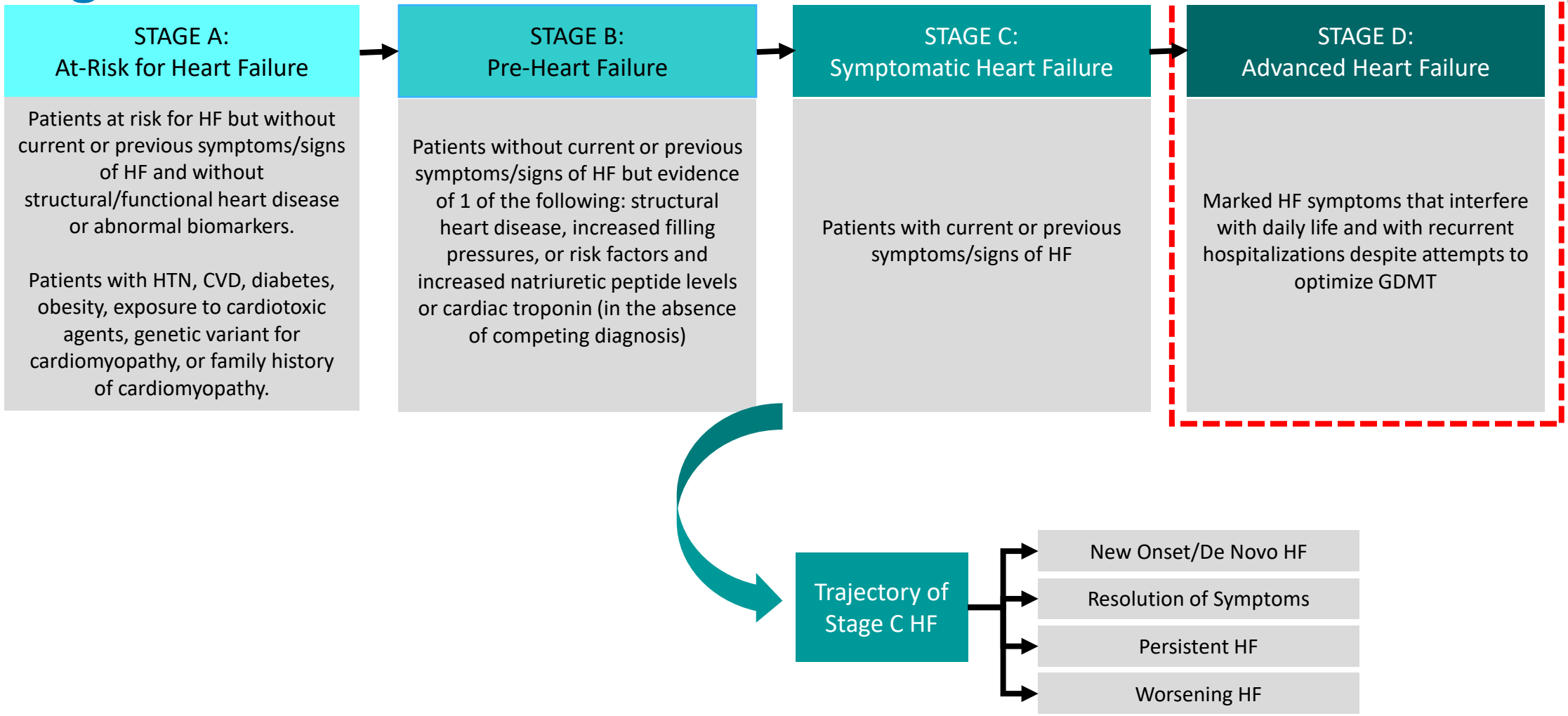
*** There is limited evidence to guide treatment for patients who improve their LVEF from mildly reduced (41-49%) to ≥50%. It is unclear whether to treat these patients as HFpEF or HFmrEF.**

Abbreviations: BNP indicates B-type natriuretic peptide; ECG, electrocardiogram; HF, heart failure; HFimpEF, heart failure with improved ejection fraction; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; LV, left ventricle; LVEF, left ventricular ejection fraction; and NT-proBNP, N-terminal pro-B type natriuretic peptide.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

American Heart Association.

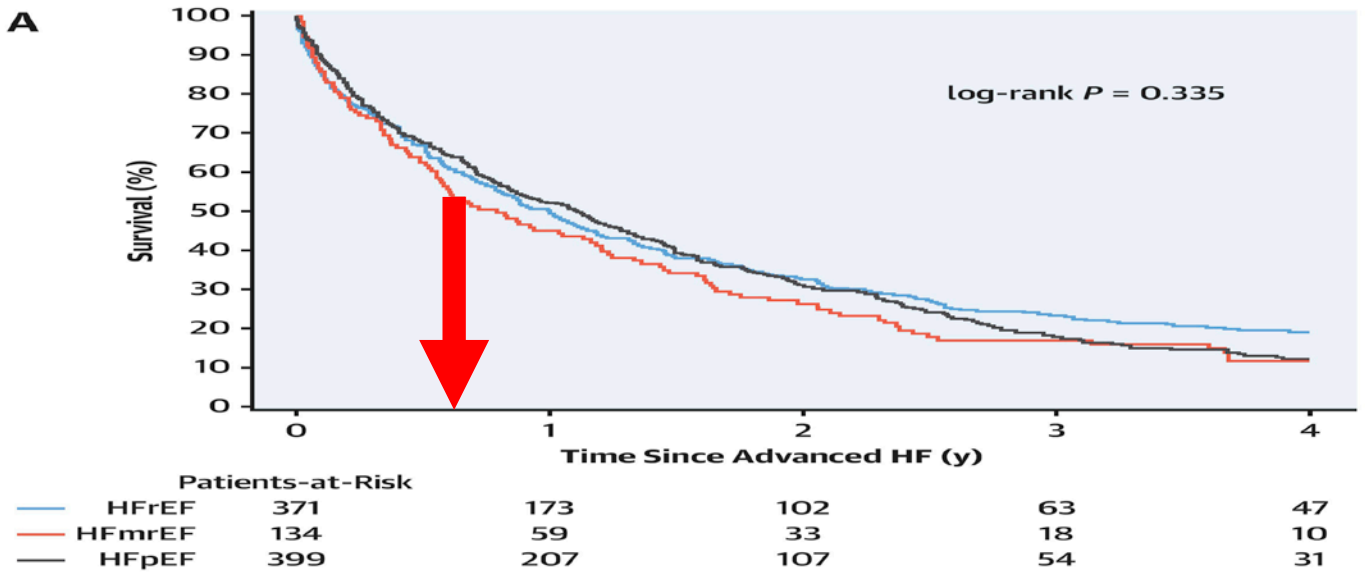
Stages of Heart Failure



Abbreviations: CVD indicates cardiovascular disease; GDMT, guideline-directed medical therapy; HF, heart failure; HTN, hypertension; and NYHA, New York Heart Association.

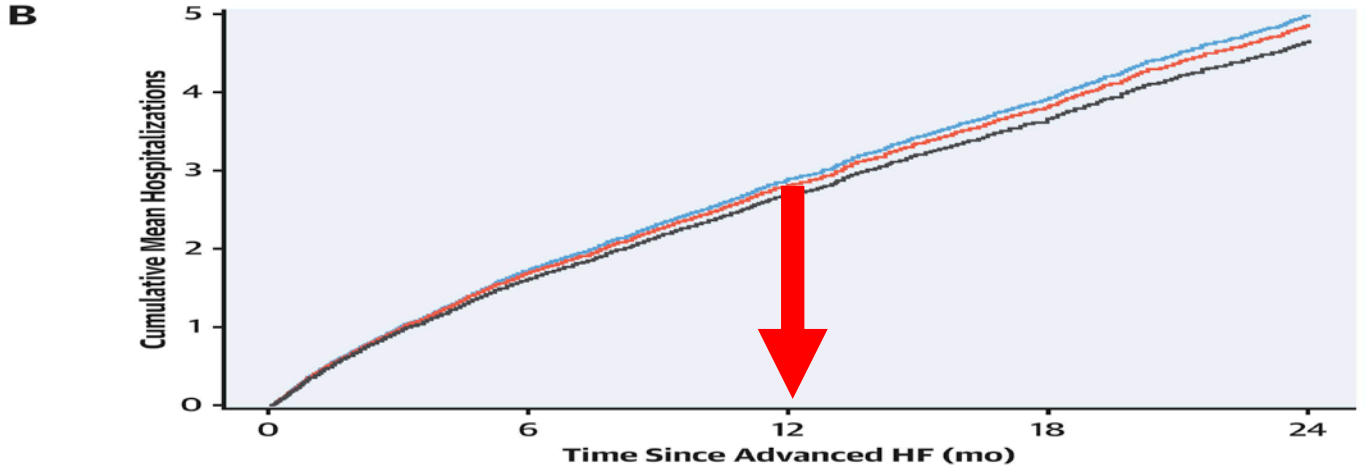
American Heart Association.

CENTRAL ILLUSTRATION: Survival and Hospitalizations After Advanced HF



Patients-at-Risk

HFrEF	371	173	102	63	47
HFmrEF	134	59	33	18	10
HFpEF	399	207	107	54	31



Patients-at-Risk

HFrEF	371	239	173	126	102
HFmrEF	134	83	59	44	33
HFpEF	399	267	207	144	107

Dunlay, S.M. et al. J Am Coll Cardiol HF. 2021;9(10):722–732.

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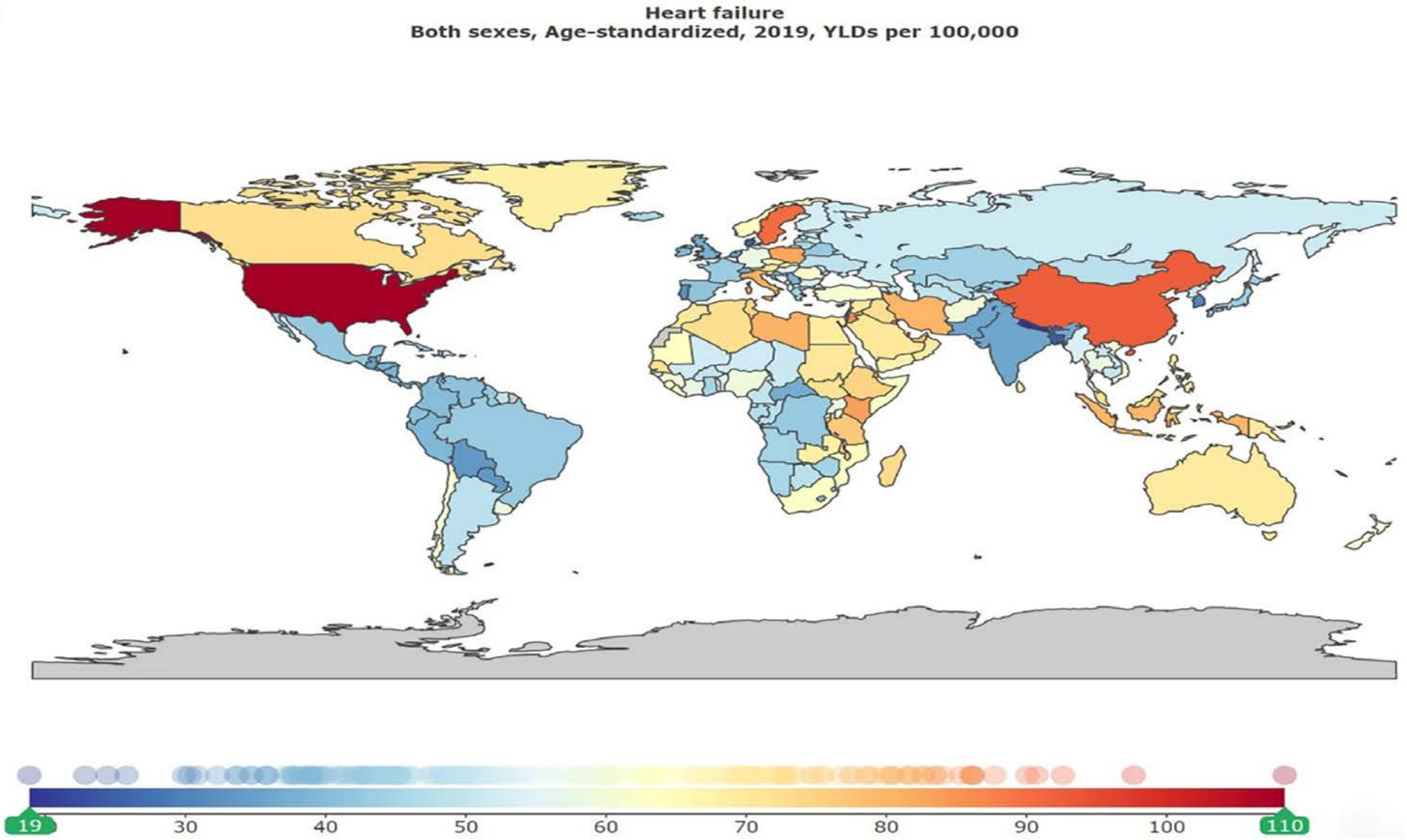


Tao Yan. Journal of the American Heart Association. Burden, Trends, and Inequalities of Heart Failure Globally, 1990 to 2019: A Secondary Analysis Based on the Global Burden of Disease 2019 Study, Volume: 12, Issue: 6, DOI: (10.1161/JAHA.122.027852)

Value Statements for GDMT for HFrEF

Take Home Point: An important aspect of HF care, Class 1 recommended medical therapies for HFrEF have very high value (low cost).

In patients:

With previous or current symptoms of chronic HFrEF, in whom ARNi is not feasible, tx with ACEi or ARB provides high economic value.
Value Statement: High Value (A)

With chronic symptomatic HFrEF, tx with an ARNi instead of an ACEi provides high economic value.
Value Statement: High Value (A)

With HFrEF and NYHA class II to IV symptoms, MRA therapy provides high economic value.
Value Statement: High Value (A)

With HFrEF, with current or previous symptoms, beta-blocker therapy provides high economic value.
Value Statement: High Value (A)

With symptomatic chronic HFrEF, SGLT2i therapy provides intermediate economic value.
Value Statement: Intermediate Value (A)

Self-identified as African American with NYHA class III to IV HFrEF who are receiving optimal medical therapy with ACEi or ARB, beta blockers, and MRA, the combination of hydralazine and isosorbide dinitrate provides high economic value.
Value Statement: High Value (B-NR)

Abbreviations: ACEi indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNi, angiotensin receptor-neprilysin inhibitor; HFrEF, heart failure with reduced ejection fraction; MRA, mineralocorticoid receptor antagonist; SGLT2i, NR, non-randomized; sodium-glucose cotransporter 2 inhibitor; and tx, treatment.

American Heart Association.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Value Statements for Device Therapy

A transvenous ICD provides high economic value in the primary prevention of SCD particularly when the patient's risk of death caused by ventricular arrythmia is deemed high and the risk of nonarrhythmic death (either cardiac or noncardiac) is deemed low based on the patient's burden of comorbidities & functional status.

Value Statement: High Value (A)

For patients who have LVEF ≤35%, sinus rhythm, LBBB with a QRS duration of ≥150 ms, and NYHA class II, III, or ambulatory IV symptoms on GDMT, CRT implantation provides high economic value.

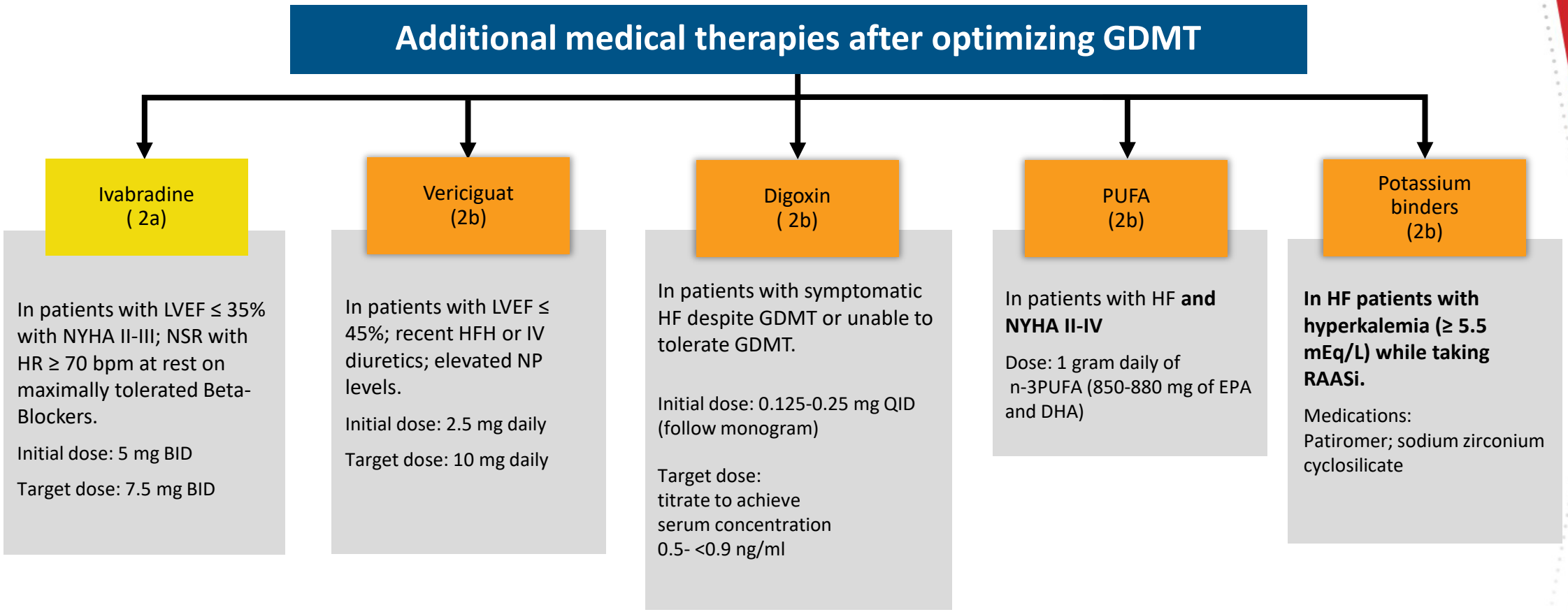
Value Statement: High Value (B-NR)

Abbreviations: CRT indicates cardiac resynchronization therapy; GDMT, guideline-directed medical therapy; ICD; implantable cardioverter-defibrillator; LBBB, left bundle branch block; LVEF, left ventricular ejection fraction; ms; millisecond; NR, nonrandomized; NYHA, New York Heart Association; and SCD, sudden cardiac death.

American Heart Association.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Additional Medical Therapies after GDMT Optimization

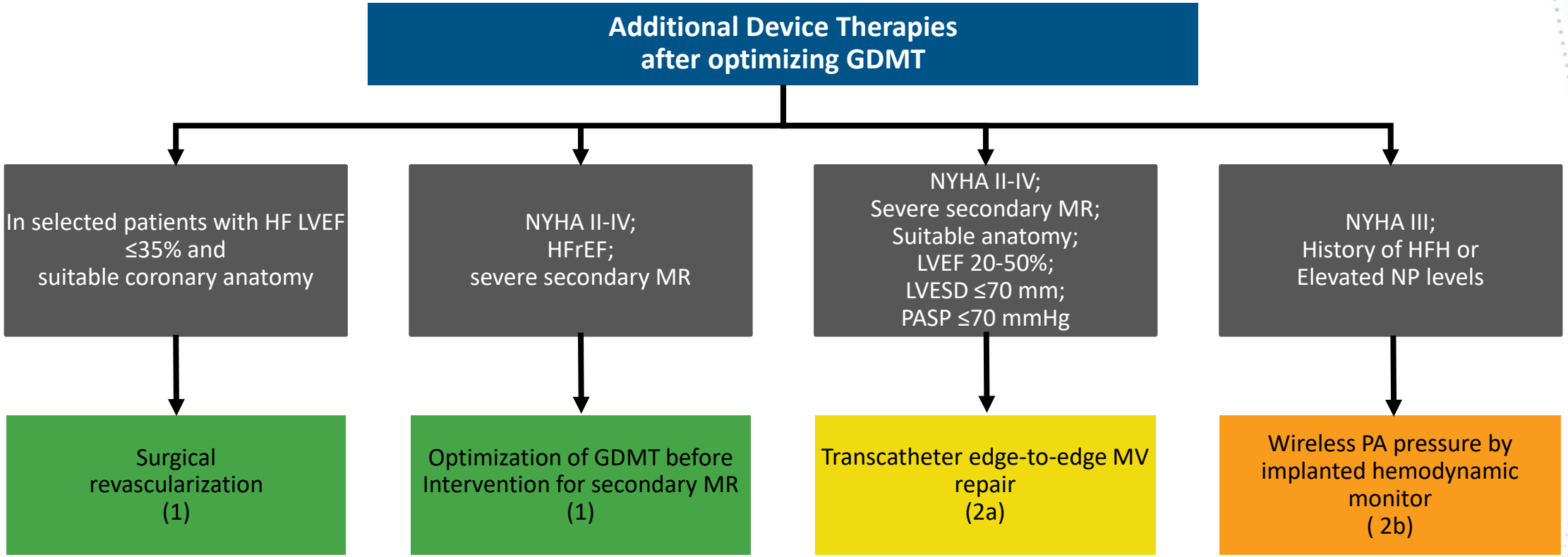


Abbreviations: DHA indicates docosaexaenoic acid; EPA, eicosapentaenoic acid; GDMT, guideline-directed medical therapy; HF, heart failure; HFH, heart failure hospitalization; HR, heart rate; IV, intravenous; LVEF, left ventricular ejection fraction; NP, natriuretic peptide; NSR, normal sinus rhythm; NYHA, New York Heart Association; PUFA, polyunsaturated fatty acid; and RAASi, renin-angiotensin-aldosterone system inhibitors.

American Heart Association.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Additional Device Therapies after GDMT Optimization

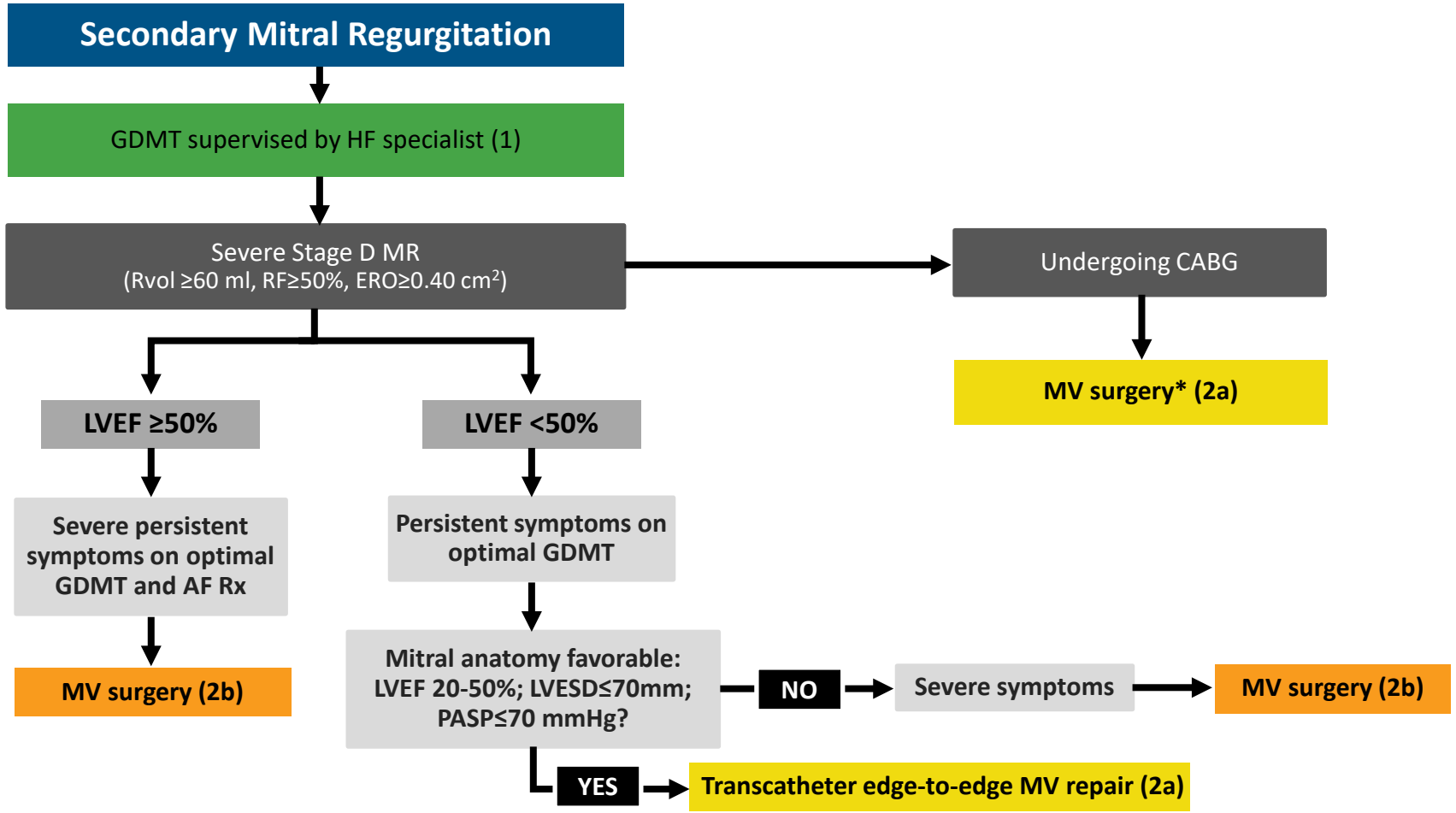


Abbreviations: GDMT indicates guideline-directed medical therapy; HF, heart failure; HFH, heart failure hospitalization; HFrEF, heart failure with reduced ejection fraction; LVEF, left ventricular ejection fraction; LVESD, left ventricular end systolic dimension; MR, mitral regurgitation; MV, mitral valve; NP, natriuretic peptide; NSR, normal sinus rhythm; NYHA, New York Heart Association; and PASP, pulmonary artery systolic pressure.

American Heart Association.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Treatment Approach in Secondary Mitral Regurgitation



NOTE:
*Chordal-sparing MV replacement may be reasonable to choose over downsized annuloplasty repair.

Abbreviations: AF indicates atrial fibrillation; CABG, coronary artery bypass graft; ERO, effective regurgitant orifice; GDMT, guideline-directed medical therapy; HF, Heart Failure; LVEF, left ventricular ejection fraction; LVESD, left ventricular end-systolic diameter; MR, mitral regurgitation; MV, mitral valve; PASP, pulmonary artery systolic pressure; RF, regurgitant fraction; Rvol, regurgitant volume; and Rx, medication.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Inotropic Support

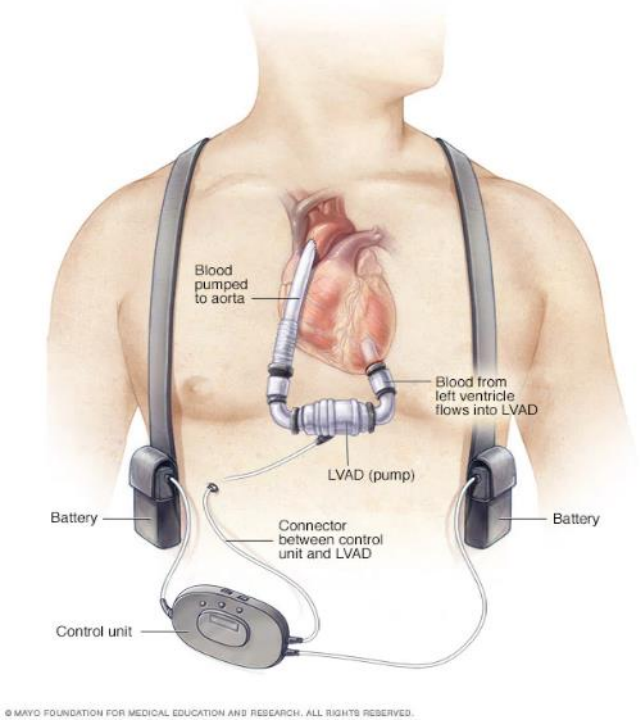
Despite improving hemodynamic compromise, positive inotropic agents have not shown improved survival in patients with HF in either the hospital or outpatient setting.

COR	RECOMMENDATIONS
2a	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" (Class 2a)
2b	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
3: Harm	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

Abbreviations: GDMT indicates guideline-directed medical therapy; HF, heart failure; and MCS, mechanical circulatory support.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Durable Mechanical Support with Left Ventricular Assist Device



SOURCE: https://www.mayoclinic.org/tests-procedures/ventricular-assist-device/multimedia/left-ventricular-assist-device/img-20006714

INDICATIONS

- Frequent hospitalizations for HF
- NYHA class IIIB to IV symptoms despite maximal GDMT
- Intolerance of GDMT
- Increasing diuretic requirement
- Symptomatic despite CRT
- Inotrope dependence
- Low peak VO_2 (<14-16 ml/kg/m^2)
- End-organ dysfunction attributable to low cardiac output

CONTRAINDICATIONS

Absolute

- Irreversible hepatic, renal or neurological disease
- Medical non-adherence
- Severe psychosocial limitations

Relative

- Age >80 years for destination therapy
- Obesity or malnutrition
- Musculoskeletal disease that impairs rehabilitation
- Active systemic infection or prolonged intubation
- Untreated malignancy
- Severe PVD
- Active substance abuse
- Impaired cognitive function
- Unmanaged psychiatric disorder
- Lack of social support

Abbreviations: CRT indicates cardiac resynchronization therapy; GDMT, guideline-directed medical therapy; LVAD, left ventricular assist device; NYHA, New York Heart Association; PVD, peripheral vascular disease; and VO_2, oxygen uptake.

American Heart Association.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Mechanical Circulatory Support

Despite improving hemodynamic compromise, positive inotropic agents have not shown improved survival in patients with HF in either the hospital or outpatient setting.

COR	RECOMMENDATIONS
1	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.
2a	2. In select patients who have NYHA class IV symptoms despite GDMT, durable MCS can be beneficial to improve symptoms, functional class and reduce mortality.
2a	3. 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.”

In patients with advanced HFrEF who have NYHA class IV symptoms despite GDMT, durable MCS devices provide low to intermediate economic value based on current costs and outcomes

Value Statement: Uncertain Value (B-NR)

Abbreviations: GDMT indicates guideline-directed medical therapy; HFrEF, heart failure with reduced ejection fraction; IV, intravenous; LVAD, left ventricular assist device; MCS, mechanical circulatory support; NR, nonrandomized; NYHA, New York Heart Associations; and QOL, quality of life.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Cardiac Transplantation

Median survival of adult transplant recipients is >12 years; versus <2 years for patients with stage D HF without advanced therapies.

COR	RECOMMENDATIONS
1	1. For selected patients with advanced HF despite GDMT, cardiac transplantation is indicated to improve survival and QOL (1)

In patients with stage D HF despite GDMT, cardiac transplantation provides intermediate economic value.

Value Statement: Intermediate Value (C-LD)

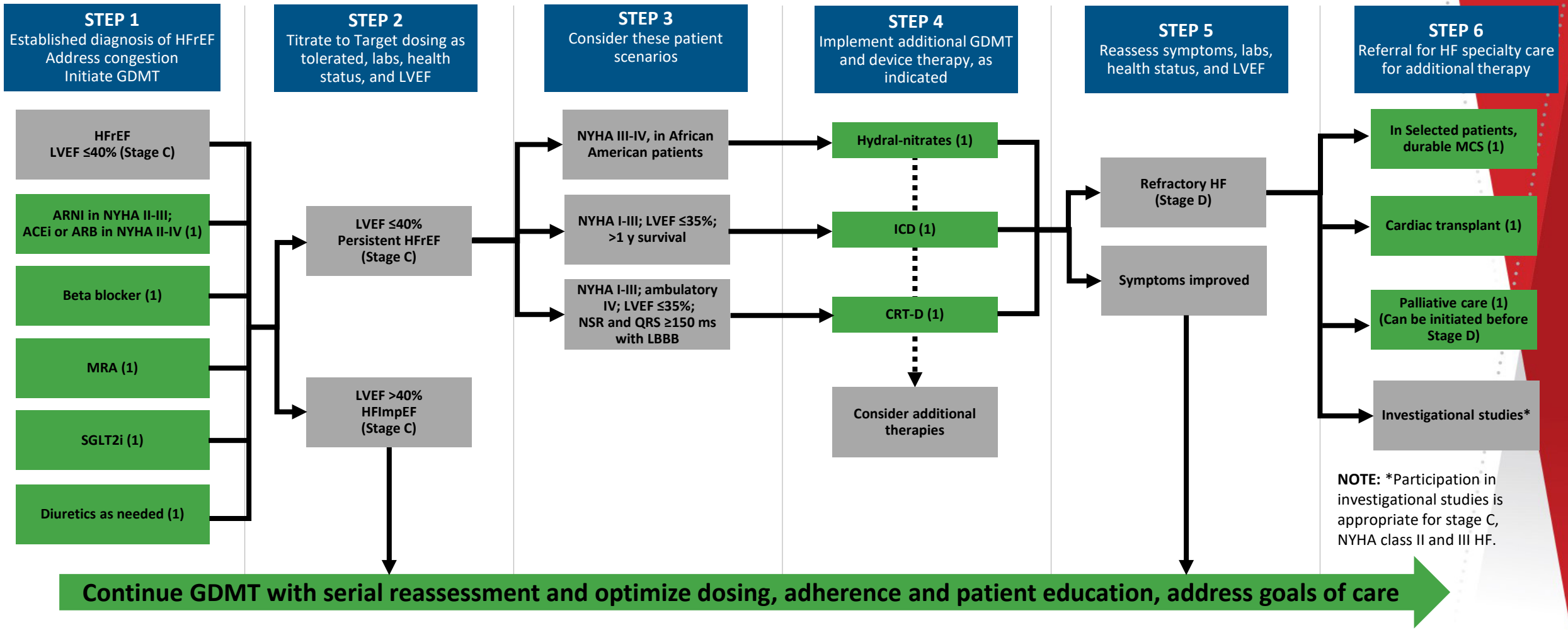
PATIENT SELECTION

- Minimizing waitlist mortality while maximizing post-transplant outcomes is a priority
- CPET can refine candidate prognosis and selection
- Appropriate patient selection should include integration of comorbidity burden, caretaker status and goals of care

Abbreviations: CPET indicates cardiopulmonary exercise test; GDMT, guideline-directed medical therapy; HF, heart failure; LD, limited data; and QOL, quality of life.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Treatment of HFrEF Stages C and D



Abbreviations: ACEi indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNi, angiotensin receptor-neprilysin inhibitor; CRT, cardiac resynchronization therapy; GDMT, guideline-directed medical therapy; HF, heart failure; HFrEF, heart failure with reduced ejection fraction; hydral-nitrates, hydralazine and isosorbide dinitrate; ICD, implantable cardioverter-defibrillator; LBBB, left bundle branch block; LVEF, left ventricular ejection fraction; MCS, mechanical circulatory support; MRA, mineralocorticoid receptor antagonist; NSR, normal sinus rhythm; NYHA, New York Heart Association; SCD, sudden cardiac death; and SGLT2i, sodium-glucose cotransporter 2 inhibitor.

American Heart Association.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

The Evolving Landscape of Advanced Heart Failure Care

The Unmet Need in Advanced Heart Failure

- Advanced HF represents a significant global health challenge, characterized by a high burden of debilitating symptoms, frequent hospitalizations, and substantial mortality.
- Advanced Heart Failure imposes a **Profound Burden** on patients, families, and healthcare systems, necessitating focused research and care strategies.

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Recommendation for Specialty Referral to Advanced HF

COR	RECOMMENDATIONS
1	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).

Consider if "I-Need-Help" to aid with recognition of patients with advanced HF:

- Complete assessment is not required before referral
- After patients develop end-organ dysfunction or cardiogenic shock, they may no longer quality for advanced therapies

I Intravenous inotropes

N New York Heart Association class IIIB or IV, or persistently elevated natriuretic peptides

E End-organ dysfunction

E EF ≤35%

D Defibrillator shocks

H Hospitalizations >1

E Edema despite escalating diuretics

L Low systolic BP ≤90mmHg

P Prognostic medication; intolerance of GDMT

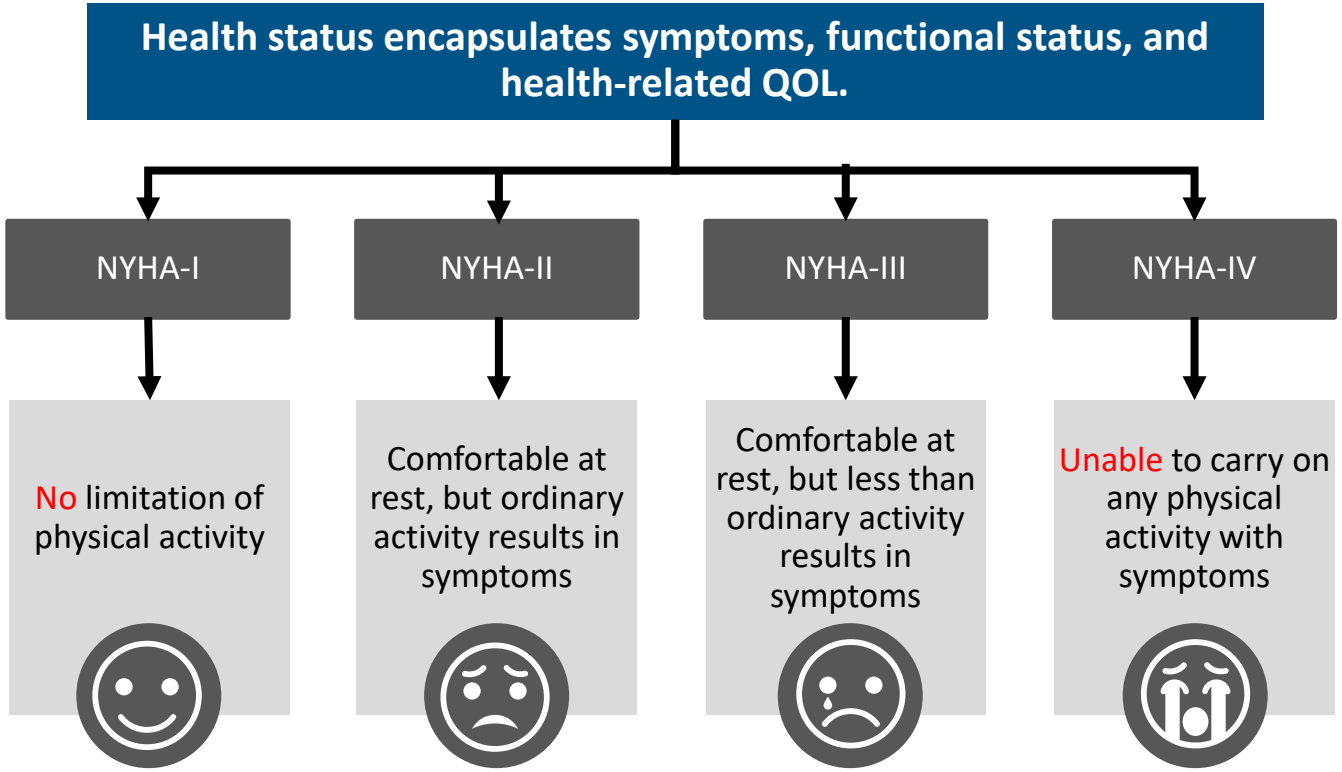
Abbreviations: BP indicates blood pressure; EF, ejection fraction; GDMT, guideline-directed medical therapy; and LVAD, left ventricular assist device.

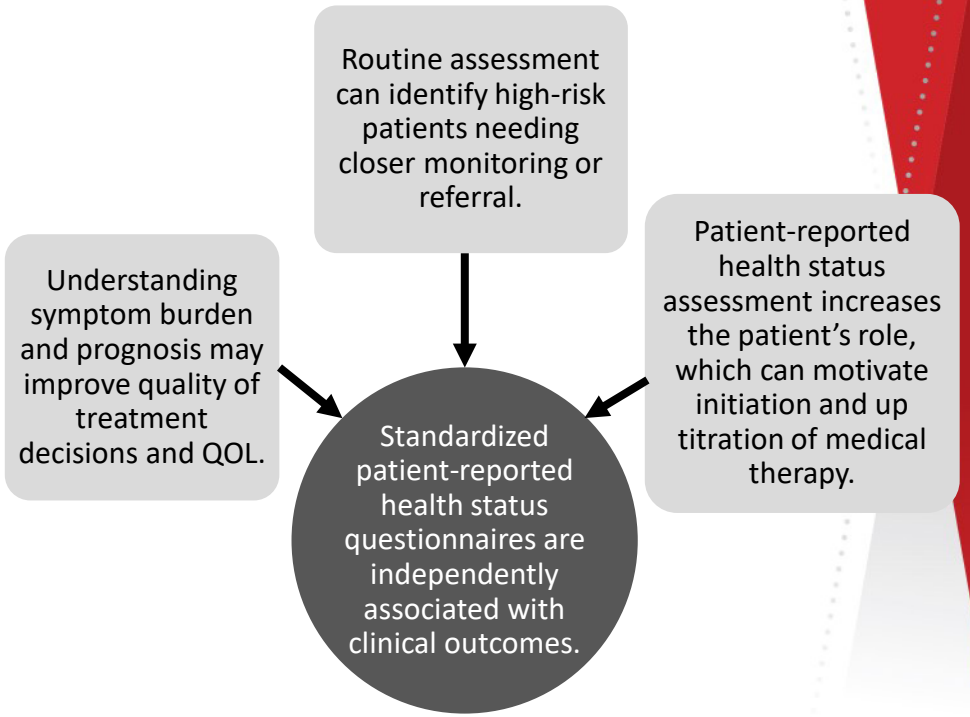
American Heart Association.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Patient Reported Outcomes

COR	RECOMMENDATIONS
2a	In patients with HF, standardized assessment of patient reported health status using a validated questionnaire can be useful to provide incremental information for patient functional status, symptoms burden and prognosis.





Abbreviations: HF indicates heart failure; NYHA, New York Heart Association; and QOL, quality of life.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

QoL in Advanced HF Patient Groups

- QoL is generally poor to fair among older patients with advanced HF, with variations observed based on eligibility for advanced therapies like heart transplant (HT) or mechanical circulatory support (MCS).

Technological Frontiers: Advanced Therapies

- The landscape of advanced heart failure treatment is continually evolving, with innovations in device therapies and pharmacological agents offering new hope.
- Clinical trials play a pivotal role in evaluating the efficacy and safety of these cutting-edge interventions, aiming to improve survival and quality of life for patients with end-stage disease.

Measuring What Matters: Quality of Life-QoL

Improving and maintaining QoL is a central therapeutic goal in advanced heart failure

Factors Impacting Quality of Life

Multiple factors contribute to the QoL experienced by patients with advanced HF, including physical symptoms, psychological well-being, social support, and comorbidities.

- 💔 Physical Symptoms (Dyspnea, Fatigue, Pain)
- 😟 Psychological Distress (Anxiety, Depression)
- 🤝 Social & Caregiver Support
- 🩺 Comorbid Conditions & Treatment Burden
- ⏳ Disease Progression & Prognosis Uncertainty

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Palliative Care: A Paradigm Shift in HF Management

- Palliative care (PC), focused on improving quality of life for patients and families facing serious illness, is increasingly recognized as a vital component of comprehensive heart failure management.
- PC has significant benefits beyond end-of-life, including symptom relief, psychosocial support, and improved patient-reported outcomes throughout the advanced HF trajectory.

Key Benefits of Palliative Care Integration

- The PAL-HF trial, a landmark study, highlighted that interdisciplinary palliative care significantly improves multiple aspects of patient well-being in advanced heart failure.

Impact on Healthcare Utilization

- Studies, such as matched analyses by AHA/JAHA, indicate that palliative care consultations can lead to more stable care trajectories and reduced healthcare burdens.
- Conceptual comparison based on research findings suggesting reduced rehospitalizations.

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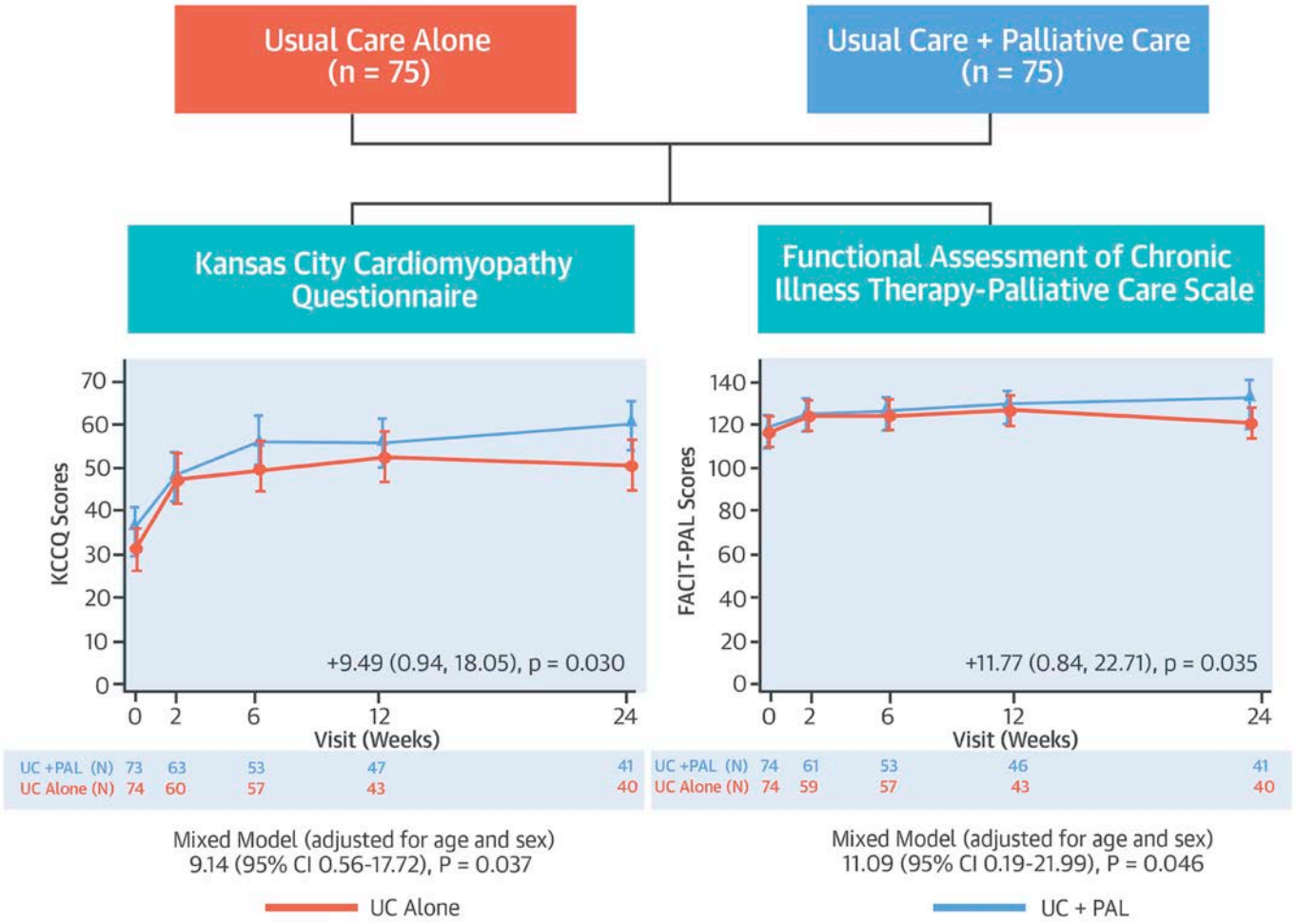
CENTRAL ILLUSTRATION: The PAL-HF Study Randomized 150 Patients With Advanced Heart Failure to Usual Care or Usual Care + a Multidimensional Palliative Care Intervention



Rogers, J.G. et al. J Am Coll Cardiol. 2017;70(3):331-41.

An interdisciplinary palliative care intervention in advanced HF patients showed consistently greater benefits in quality of life, anxiety, depression, and spiritual well-being compared with UC alone. (Palliative Care in Heart Failure [PAL-HF]

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From: **Effect of an Early Palliative Care Telehealth Intervention vs Usual Care on Patients With Heart Failure: The ENABLE CHF-PC Randomized Clinical Trial**

JAMA Intern Med. 2020;180(9):1203-1213. doi:10.1001/jamainternmed.2020.2861

Table 2. Outcomes From Baseline to 16 Weeks (Intervention vs Usual Care)

Outcome, No. of weeks after baseline	Intervention group			Usual care group			Between-group difference in change from baseline[a]		
	No.	Mean (SE)	Mean (SE) change from baseline	No.	Mean (SE)	Mean (SE) change from baseline	Mean (SE)	*P* value	Effect size, Cohen *d* (95% CI)
KCCQ clinical summary									
0	208	54.3 (1.6)	NA	206	50.9 (1.6)	NA	NA	NA	NA
8	118	56.6 (1.8)	3.9 (1.3)	142	51.8 (1.7)	2.3 (1.2)	1.6 (1.7)	.37	0.07 (−0.09 to 0.24)
16	120	59.7 (1.8)		125	54.8 (1.8)				
FACIT Pal-14									
0	208	36.9 (0.7)	NA	206	36 (0.7)	NA	NA	NA	NA
8	117	38.1 (0.8)	1.4 (0.6)	142	35.8 (0.8)	0.2 (0.5)	1.2 (0.8)	.12	0.12 (−0.03 to 0.28)
16	119	38.5 (0.8)		123	36.8 (0.8)				
HADS-anxiety									
0	208	6.6 (0.3)	NA	206	6.8 (0.3)	NA	NA	NA	NA
8	116	6.5 (0.3)	0 (0.2)	142	6.7 (0.3)	0.1 (0.2)	−0.1 (0.3)	.83	−0.02 (−0.20 to 0.16)
16	119	6.6 (0.3)		122	7.1 (0.3)				
HADS-depression									
0	208	5.7 (0.3)	NA	206	5.8 (0.3)	NA	NA	NA	NA
8	116	5.2 (0.3)	−0.7 (0.2)	142	5.5 (0.3)	−0.3 (0.2)	−0.4 (0.3)	.24	−0.09 (−0.24 to 0.06)
16	119	4.9 (0.3)		122	5.6 (0.3)				

did not demonstrate improved quality of life or mood with a 16-week early palliative care telehealth intervention

Abbreviations: FACIT Pal-14, Functional Assessment of Chronic Illness Therapy–Palliative-14 items; HADS, Hospital Anxiety Depression Scale; KCCQ, Kansas City Cardiomyopathy Questionnaire; NA, not applicable.

[a] Intervention minus usual care group, calculated as a mean of weeks 8 and 16 combined minus baseline. *P* values from time by group interaction term in longitudinal models; *d* = mean difference in change from baseline divided by baseline pooled SD.

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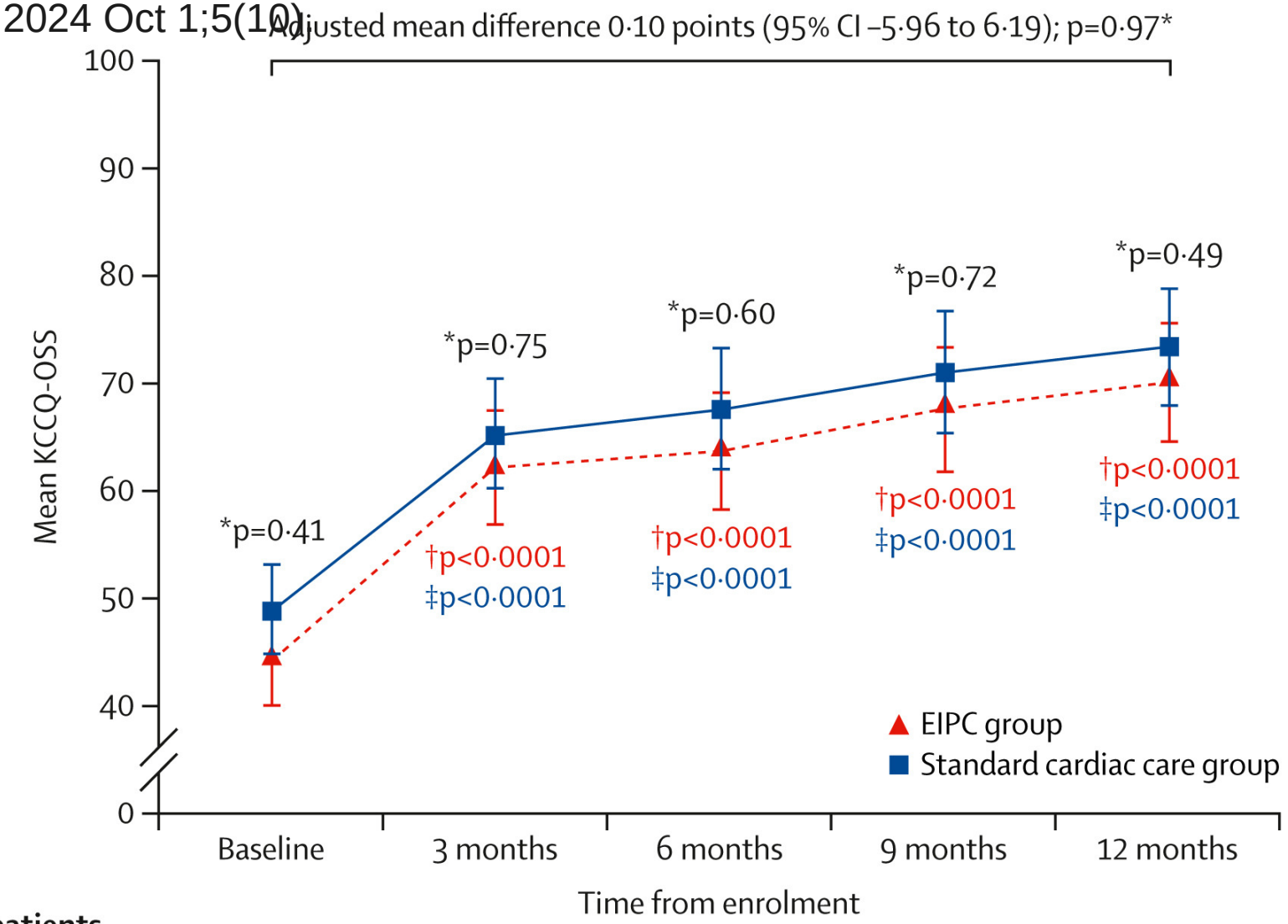
Early integration of palliative care versus standard cardiac care for patients with heart failure (EPCHF): a multicentre, parallel, two-arm, open-label, randomised controlled trial

The Lancet Healthy Longevity. 2024 Oct 1;5(10)

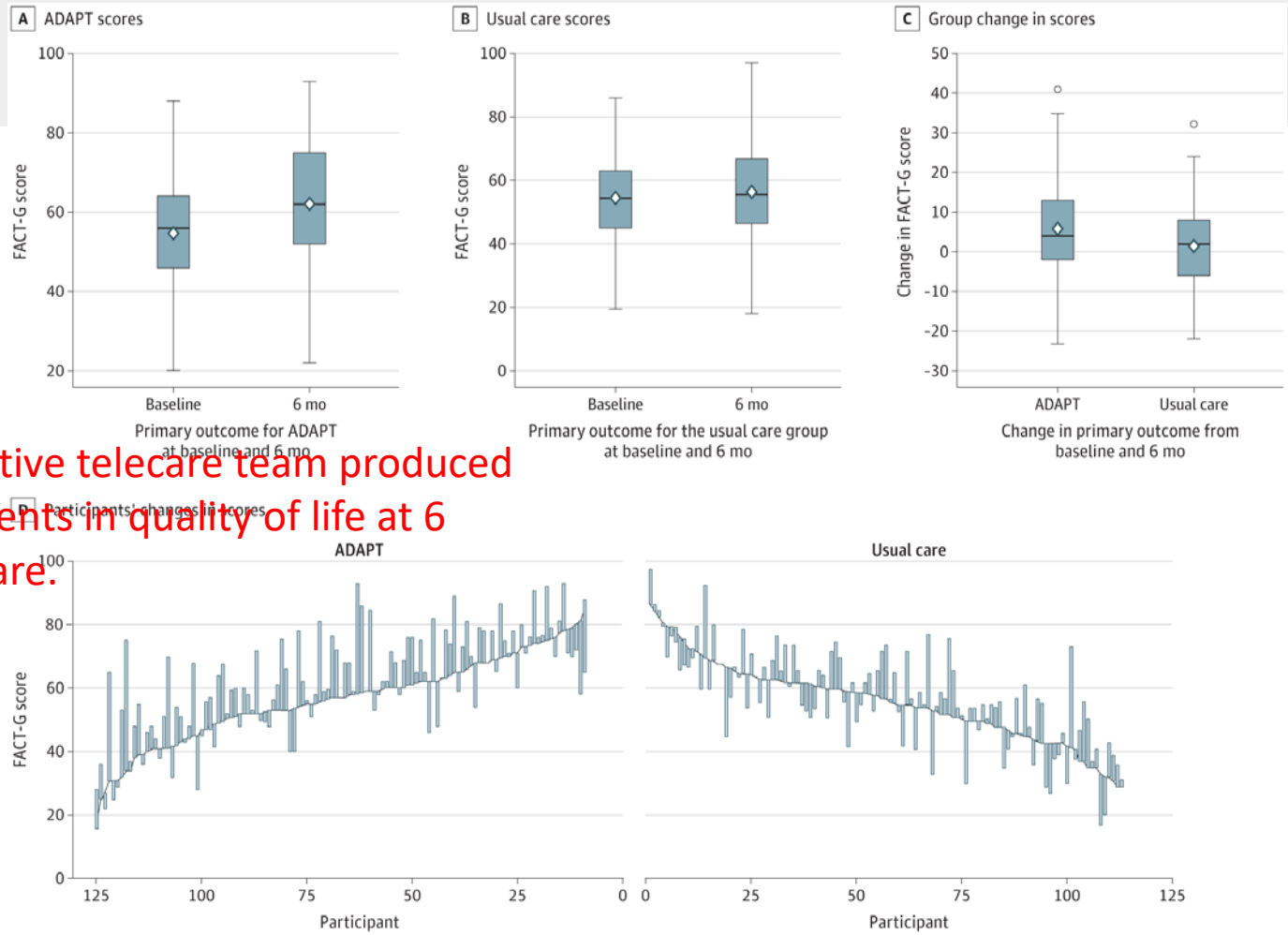


Number of patients					
EIPC group	98	78	74	66	75
Standard cardiac care group	104	77	66	61	71

From: **Nurse and Social Worker Palliative Telecare Team and Quality of Life in Patients With COPD, Heart Failure, or Interstitial Lung Disease: The ADAPT Randomized Clinical Trial**

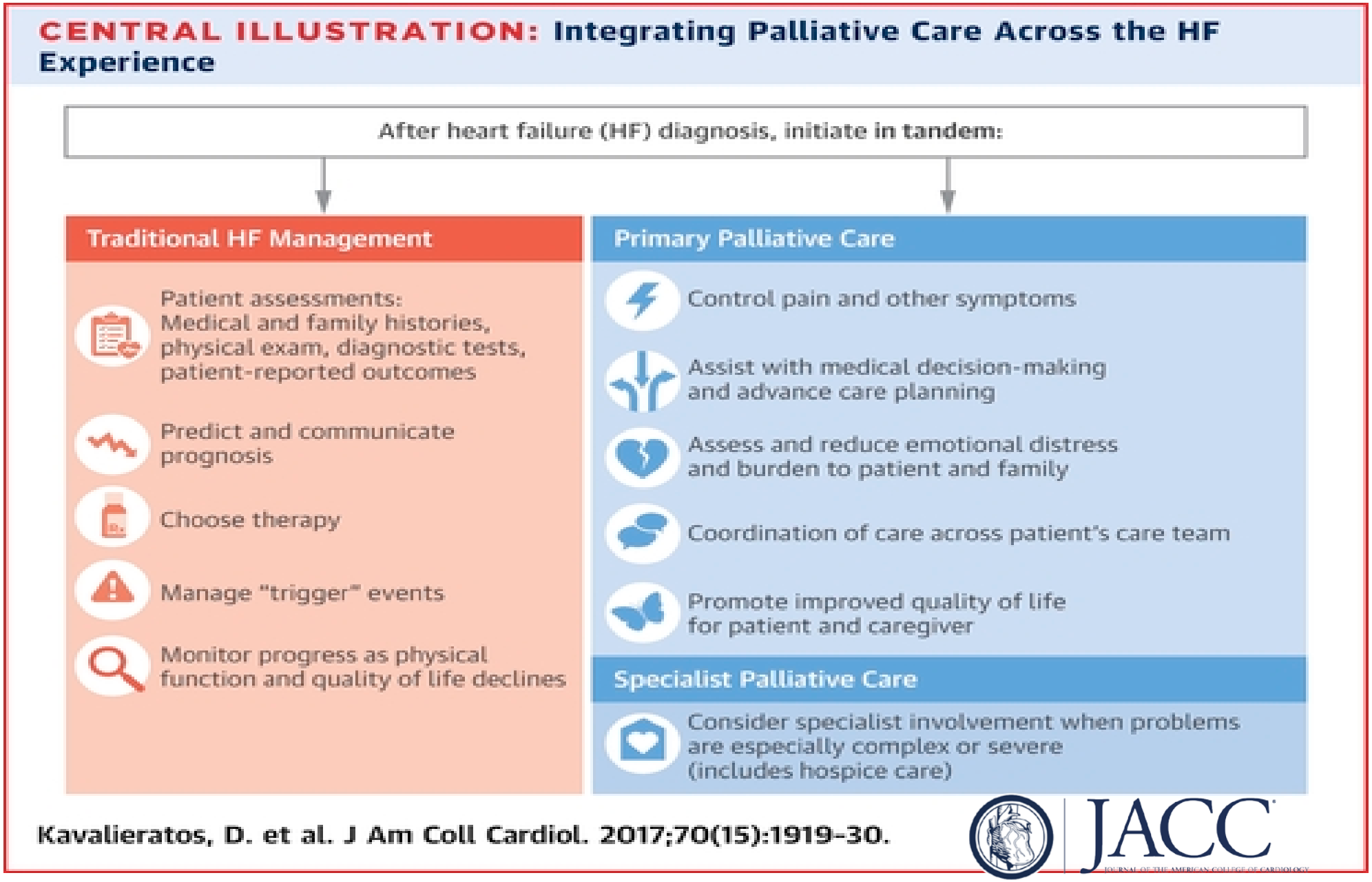
JAMA. 2024;331(3):212-223. doi:10.1001/jama.2023.24035

a nurse and social worker palliative telecare team produced clinically meaningful improvements in quality of life at 6 months compared with usual care.



Six-Month Change in FACT-G Score (Primary Outcome) by Participant and Randomization GroupThe FACT-G is patient-reported (score range, 0-108, with higher scores indicating better quality of life; minimal clinically important difference, 4). For box plots, the ends of the boxes are located at the first and third quartiles. The horizontal black line in the middle illustrates the median, and the diamonds indicate the mean. Whiskers extend to the highest and lowest values within 1.5 times the IQR, and markers outside the boxes indicate outlying data. The parallel line plot contains 1 vertical line for each participant, which extends from their baseline value to their 6-month value. Descending lines indicate a reduction in outcome. Baseline values are placed in ascending order for the ADAPT intervention group and descending order for

Palliative Care in Heart Failure: Rationale, Evidence, and Future Priorities



Bridging the Gaps: Challenges & Opportunities

Despite significant advancements, the management of advanced heart failure faces persistent challenges, including the **underutilization of proven beneficial services like palliative care**, difficulties in accurate prognostication, and communication gaps. Identifying these challenges

The Palliative Care Utilization Gap

Research indicates that a small fraction of eligible advanced HF patients in the US receive palliative care consultations within 5

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- **Integration Opportunities**: Major opportunities exist to systematically integrate palliative care earlier in the heart failure trajectory and develop better prognostic tools to guide care decisions.

- **System-Level Barriers**: Healthcare system inertia, reimbursement models, and resource allocation challenges pose significant threats to expanding palliative care access and implementation.

- **Care Model Evolution**: moving toward more holistic, patient-centered care models with enhanced education and shared decision-making despite ongoing access disparities and disease trajectories.

- **Proven Value with Underutilization**: Palliative care demonstrates clear benefits for quality of life and symptom relief in heart failure patients, yet remains significantly underused in clinical practice.

- **Technology Advances vs. Communication Challenges**: While medical technologies like LVADs and CCM are advancing, significant gaps persist in prognostication accuracy and life expectancy discussions with patients and families.

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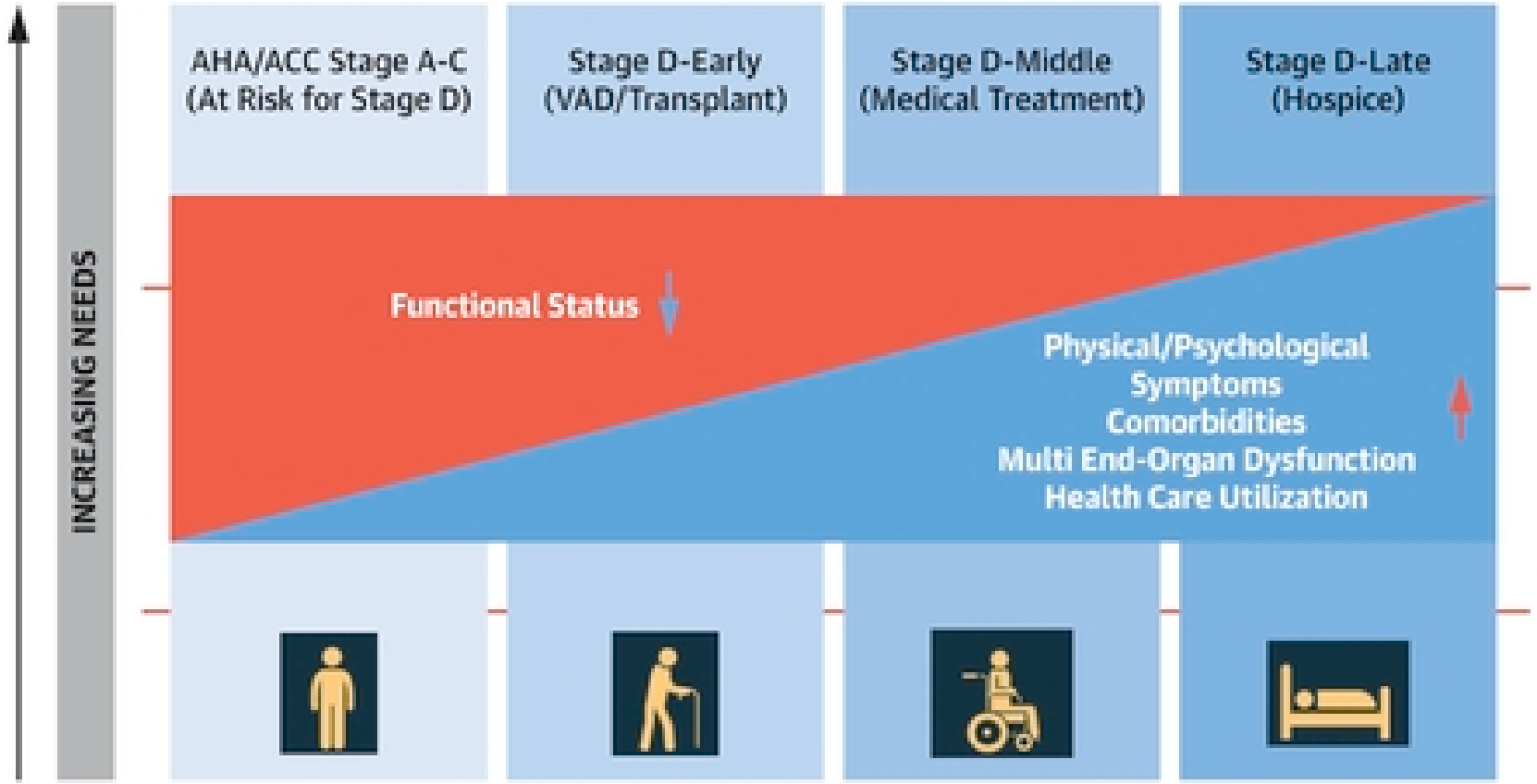
Laura P. Gelfman et al. *J Am Coll Cardiol HF* 2024; 12:973-989.

JACC Heart Failure

CENTRAL ILLUSTRATION: Opportunities for Integrating Palliative Care Across the Spectrum of Patients With Heart Failure (Palliative Care for Patients With Heart Failure)



Gelfman LP, et al. J Am Coll Cardiol HF. 2024;12(6):973-989.

Laura P. Gelfman et al. *J Am Coll Cardiol HF* 2024; 12:973-989.

JACC Heart Failure

The Path Forward:

Integrated Patient-Centered Care

- The evolving landscape of advanced heart failure care underscores the necessity of a multi-faceted, collaborative approach.
- **Integrating evidence-based palliative care principles**, leveraging technological advancements judiciously, and fostering open communication are paramount.
- **Effective management of advanced heart failure demands a holistic strategy, blending medical innovation with compassionate, individualized care to enhance both longevity and the quality of every life lived.**

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Thank you

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shm
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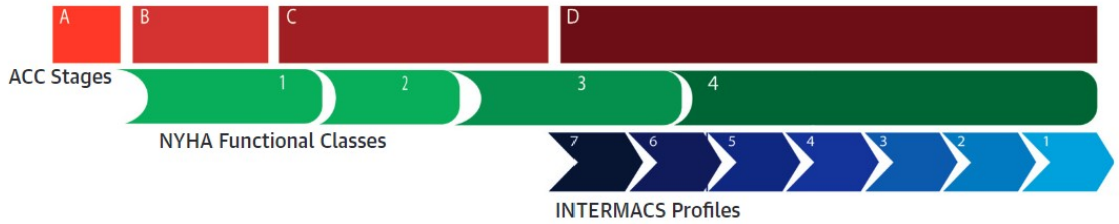
Empowering hospitalists.
Transforming patient care.

UCLA Health | David Geffen School of Medicine

Background

Heart Failure Stages and Symptoms

CENTRAL ILLUSTRATION **Heart Failure Stages and Symptoms Across Multiple Classification Schemes**



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 Functional 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

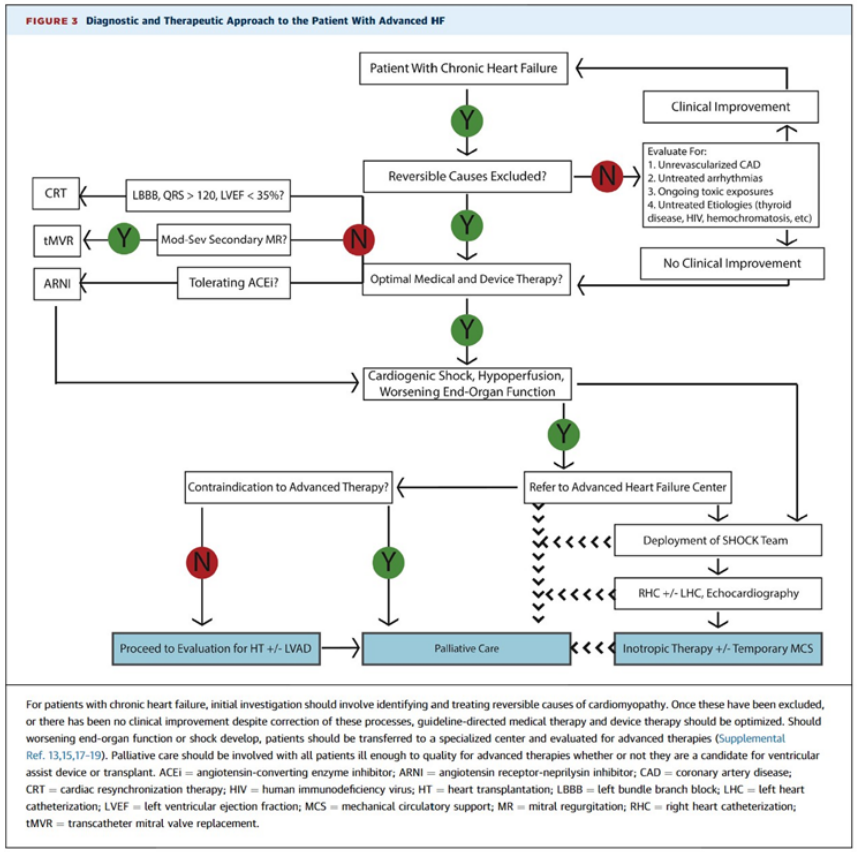
Profile 6: Exertion Limited

Profile 7: Advanced NYHA Class III

Truby, L.K. et al. J Am Coll Cardiol HF. 2020;8(7):523-36.

Stages of heart failure as described by American College of Cardiology (ACC) and New York Heart Association (NYHA) functional classes as well as Interagency Registry for Mechanically Assisted Circulation (INTERMACS) profiles (8,9).

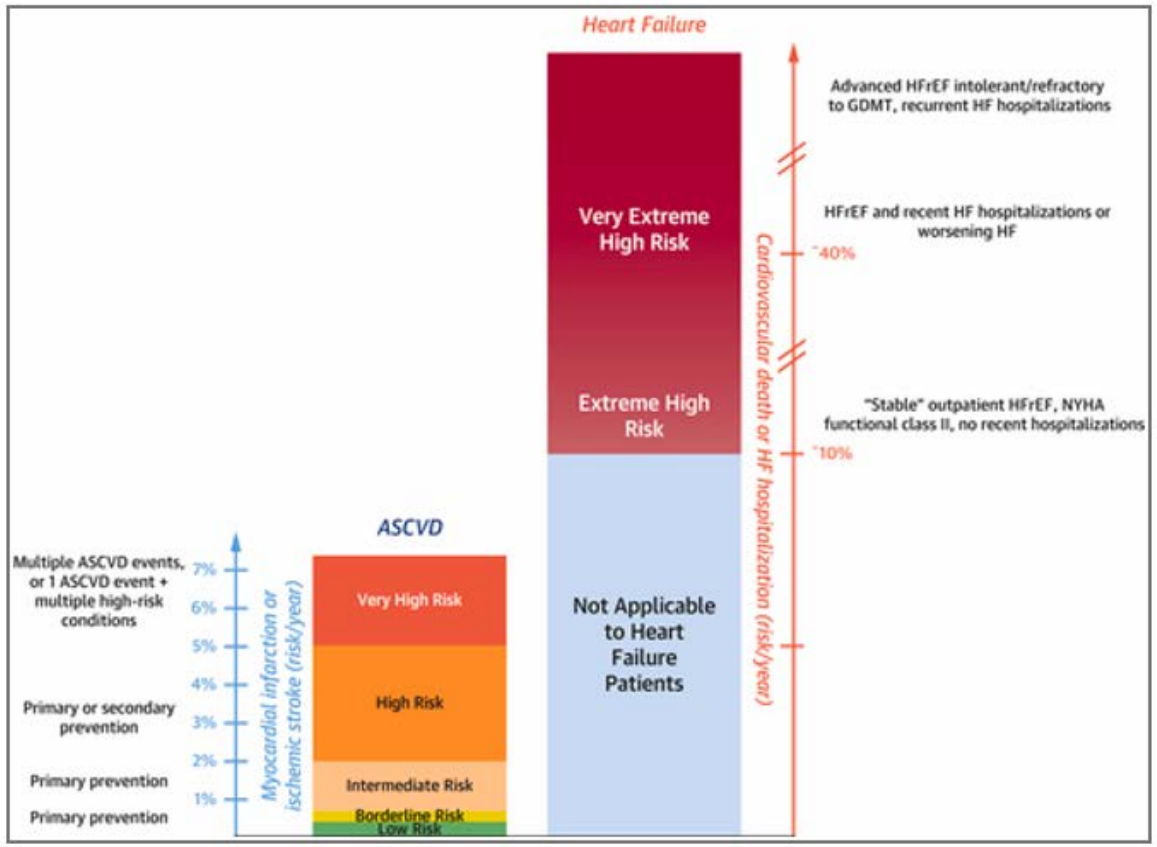
Diagnostic Approach to Patients with Advanced Heart Failure



For patients with chronic heart failure, initial investigation should involve identifying and treating reversible causes of cardiomyopathy. Once these have been excluded, or there has been no clinical improvement despite correction of these processes, guideline-directed medical therapy and device therapy should be optimized. Should worsening end-organ function or shock develop, patients should be transferred to a specialized center and evaluated for advanced therapies (Supplemental Ref. 13,15,17-19). Palliative care should be involved with all patients ill enough to quality for advanced therapies whether or not they are a candidate for ventricular assist device or transplant. ACEi = angiotensin-converting enzyme inhibitor; ARNI = angiotensin receptor-neprilysin inhibitor; CAD = coronary artery disease; CRT = cardiac resynchronization therapy; HIV = human immunodeficiency virus; HT = heart transplantation; LBBB = left bundle branch block; LHC = left heart catheterization; LVEF = left ventricular ejection fraction; MCS = mechanical circulatory support; MR = mitral regurgitation; RHC = right heart catheterization; tMVR = transcatheter mitral valve replacement.

Truby L, Rogers J, et al. Advanced Heart Failure. *J Am Coll Cardiol HF.* 2020 Jul, 8 (7) 523–536.https://doi.org/10.1016/j.jchf.2020.01.014

Heart Failure Patients are at the Highest Risk



Stephen J. Greene et al. *J Am Coll Cardiol* 2023; 81:413-424.

When should I refer to an Advanced Heart Failure Center

TABLE 2 Simplified Signs Prompting Referrals to Advanced HF Center

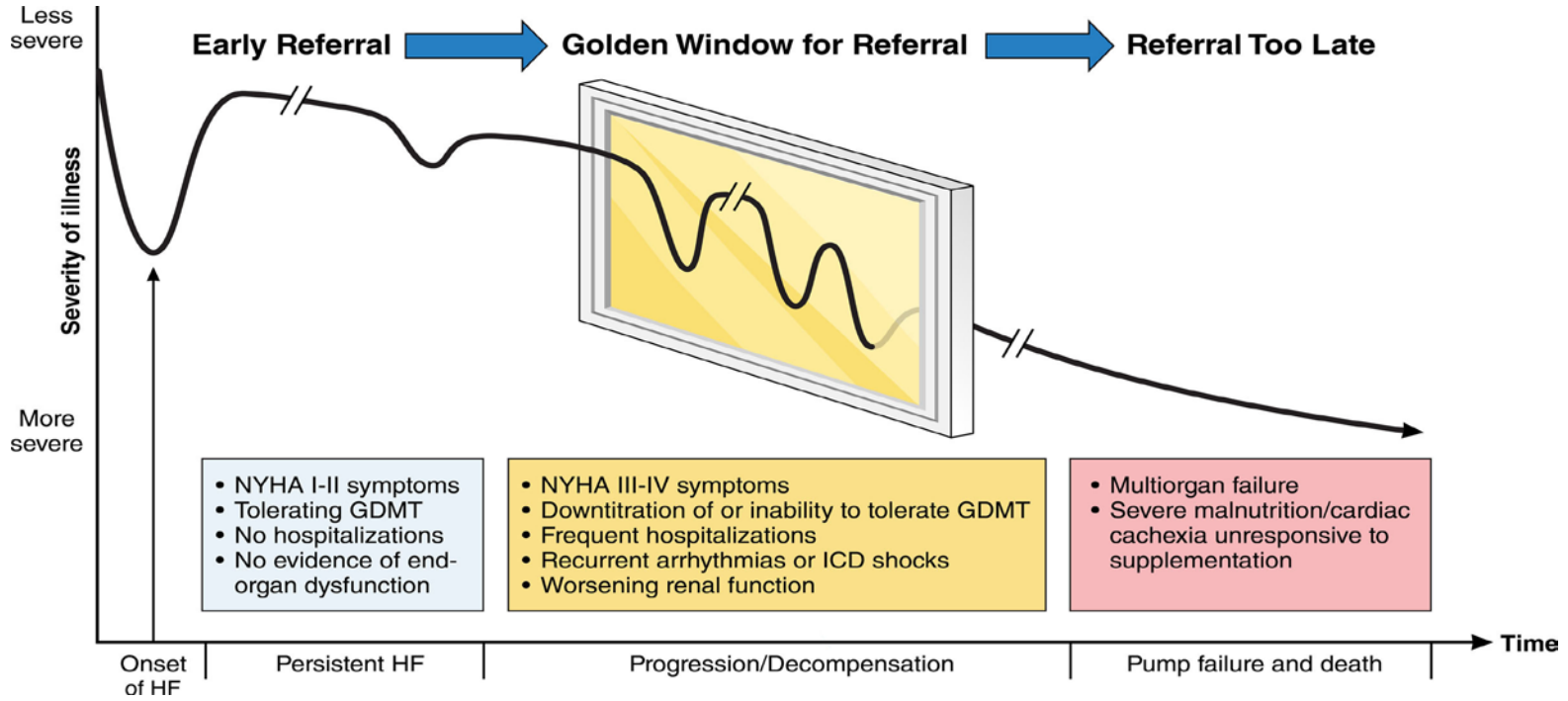
I	Inotropes	Previous or ongoing requirement for dobutamine, milrinone, dopamine, or levosimendan
N	NYHA class/natriuretic peptides	Persisting NYHA functional class III/IV and/or high BNP or NT-proBNP
E	End-organ dysfunction	Worsening renal or liver dysfunction
E	Ejection fraction	Very low ejection fraction (<25%)
D	Defibrillator shocks	Recurrent appropriate defibrillator shocks
H	Hospitalizations	At least 1 hospitalization with HF in the past 12 months
E	Edema/escalating diuretic agents	Persistent fluid overload and/or increased diuretic requirement
L	Low BP	Consistently low BP (systolic <90 to 100 mm Hg)
P	Prognostic medications	Inability to up-titrate (or need to decrease/cease) ACE inhibitors, beta-blockers, ARNIs, or MRAs

Modified with permission from Baumwol (21).

ACE = angiotensin-converting enzyme; ARNI = angiotensin-receptor neprilysin inhibitor; BNP = B-type natriuretic peptide; BP = blood pressure; MRA = mineralocorticoid receptor antagonist; NT-proBNP = N-terminal pro-B-type natriuretic peptide; other abbreviations as in Table 1.

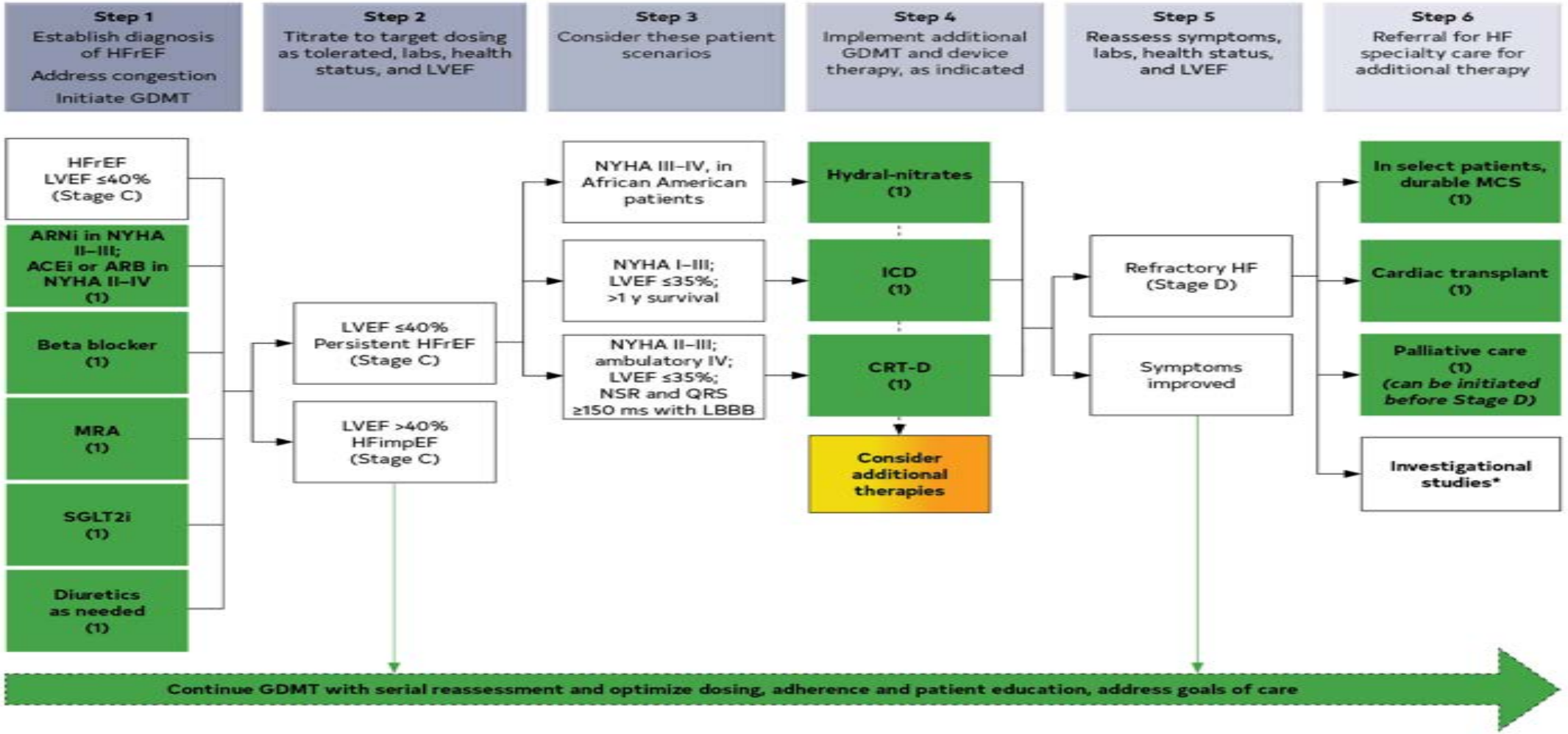
Truby L, Rogers J, et al. Advanced Heart Failure. *J Am Coll Cardiol HF.* 2020 Jul, 8 (7) 523–536.https://doi.org/10.1016/j.jchf.2020.01.014

Why is it important to refer early?



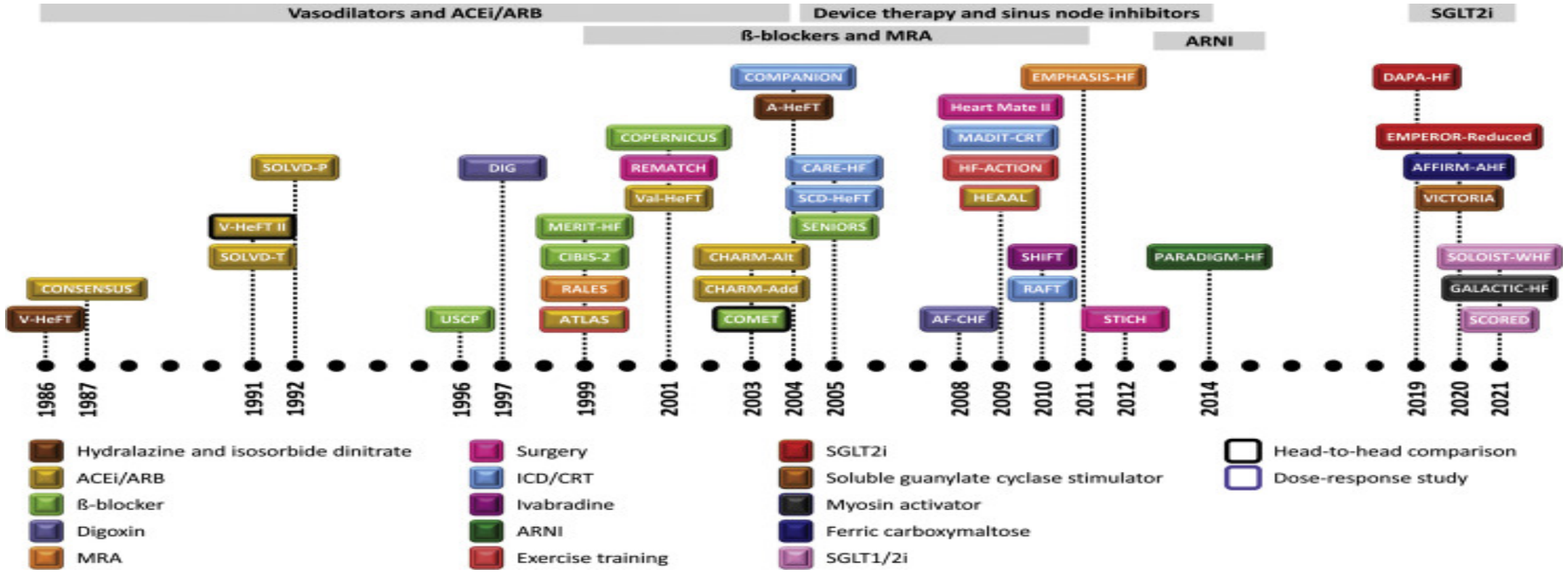
Alanna A. Morris. Circulation. Guidance for Timely and Appropriate Referral of Patients With Advanced Heart Failure: A Scientific Statement From the American Heart Association, Volume: 144, Issue: 15, Pages: e238-e250, DOI: (10.1161/CIR.0000000000001016)

Treatment Algorithm for HFrEF



Heidenreich P et al. **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** https://doi.org/10.1161/CIR.0000000000001063Circulation. 2022;145:e895–e1032

The Spectrum of GDMT over the last 30 years



Abhinav Sharma et al,Optimizing Foundational Therapies in Patients With HFrEF: How Do We Translate These Findings Into Clinical Care?,JACC: Basic to Translational Science, Volume 7, Issue 5, 2022: 504-517

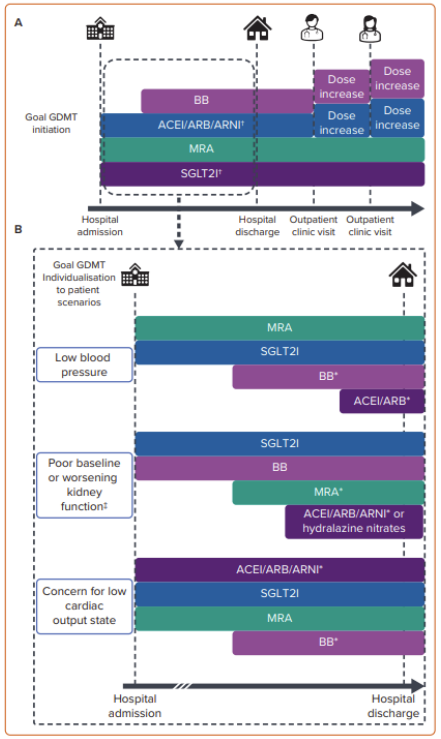
In-Hospital Initiation and Rapid Uptitration is Better

Table 1: Common Initiation and Goal Doses of Guideline-directed Medical Therapy

Medication	Initial Dose	Goal Dose	Titration Comments*	All-cause Mortality, HR [95% CI]†	Mortality Relative Risk Reduction[81]
Angiotensin-Converting Enzyme Inhibitors					
Captopril	6.25 mg 3 times daily	50 mg 3 times daily	Titrate every few days in-hospital and weekly as an outpatient	0.89 [0.82–0.96]	17%
Enalapril	2.5 mg twice daily	10 mg twice daily			
Lisinopril	2.5 mg daily	40 mg daily			
Ramipril	1.25 mg daily	10 mg daily			
Angiotensin Receptor Blocker					
Candesartan	4 mg daily	32 mg daily	Titrate every few days in-hospital and weekly as an outpatient	0.95 [0.88–1.02]	17%
Losartan	25 mg daily	150 mg daily			
Valsartan	40 mg twice daily	160 mg twice daily			
Angiotensin Receptor–Neprilysin Inhibitor					
Sacubitril/valsartan	24/26 mg–49/51 mg twice daily	97/103 mg twice daily	Titrate every week	0.75 [0.66–0.85]	16%‡
β-blockers					
Bisoprolol	1.25–2.5 mg daily	10 mg daily	Titrate every 2 weeks	0.78 [0.72–0.84]	35%
Carvedilol	3.125 mg twice daily	25–50 mg twice daily			
Metoprolol XL	25 mg daily	200 mg daily			
Mineralocorticoid Receptor Antagonists					
Spironolactone	12.5–25 mg daily	25–50 mg daily	Titration often not required	0.76 [0.67–0.85]	30%
Eplerenone	25 mg daily	25–50 mg daily			
Sodium–Glucose Cotransporter 2 Inhibitors					
Empagliflozin	10 mg daily	10 mg daily	Titration not required	0.88 [0.78–0.99]	17%
Dapagliflozin	10 mg daily	10 mg daily			
ARNI + BB + MRA + SGLT2I Quadruple Therapy					
ARNI + BB + MRA + SGLT2I				0.39 [0.31–0.49]	74%

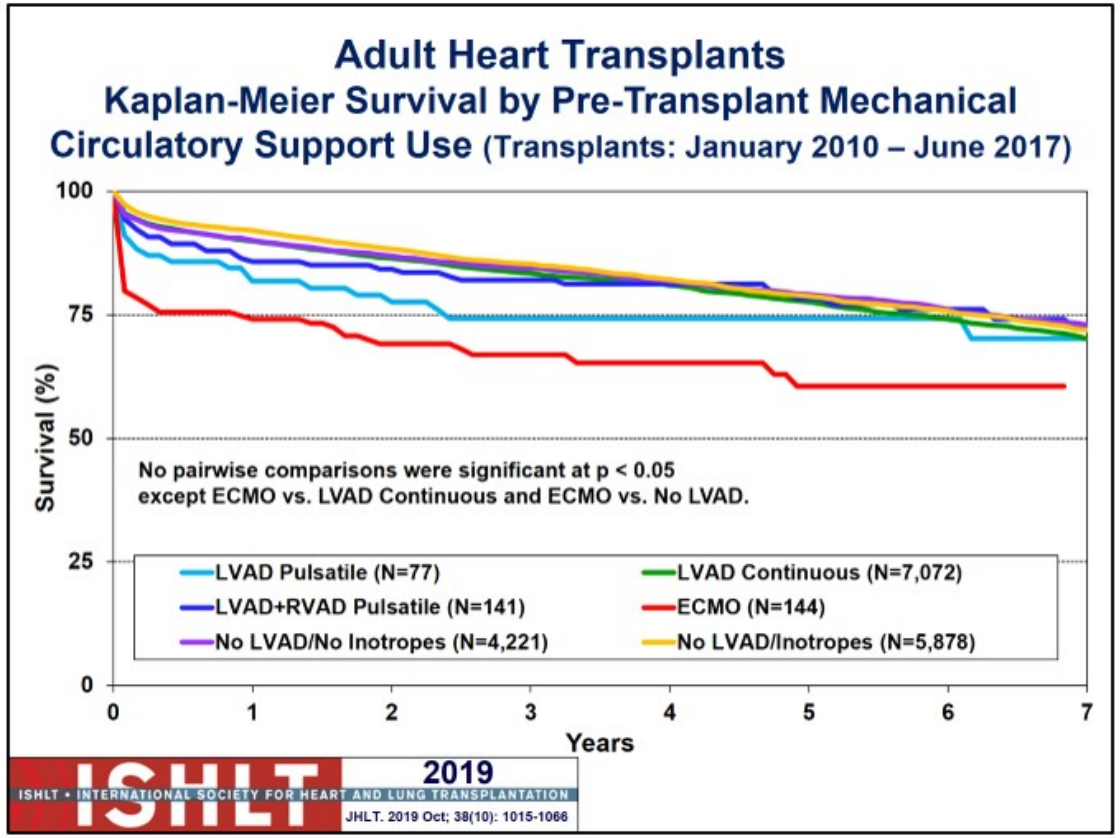
*Titration should be as tolerated and guided by clinical parameters. †HR for all-cause mortality relative risk reduction compared with placebo from source: Tromp et al.[82] ‡Replacing ACEI/ARB.
ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin-receptor blocker; ARNI = angiotensin receptor–neprilysin inhibitor; BB = β-blocker; MRA = mineralocorticoid receptor antagonist; SGLT2I = sodium–glucose cotransporter 2 inhibitor.

Figure 2: Potential Guideline-directed Medical Therapy Optimisation Strategies



Cox ZL, Nandkeolyar S, Johnson AJ, Lindenfeld J, Rali AS. In-hospital Initiation and Up-titration of Guideline-directed Medical Therapies for Heart Failure with Reduced Ejection Fraction. Card Fail Rev. 2022 Jun 24;8:e21. doi: 10.15420/cfr.2022.08. PMID: 35815257; PMCID: PMC9253962.

Choose wisely… survival at stake



Relative and Absolute Contraindications to Advanced Heart Failure Therapies

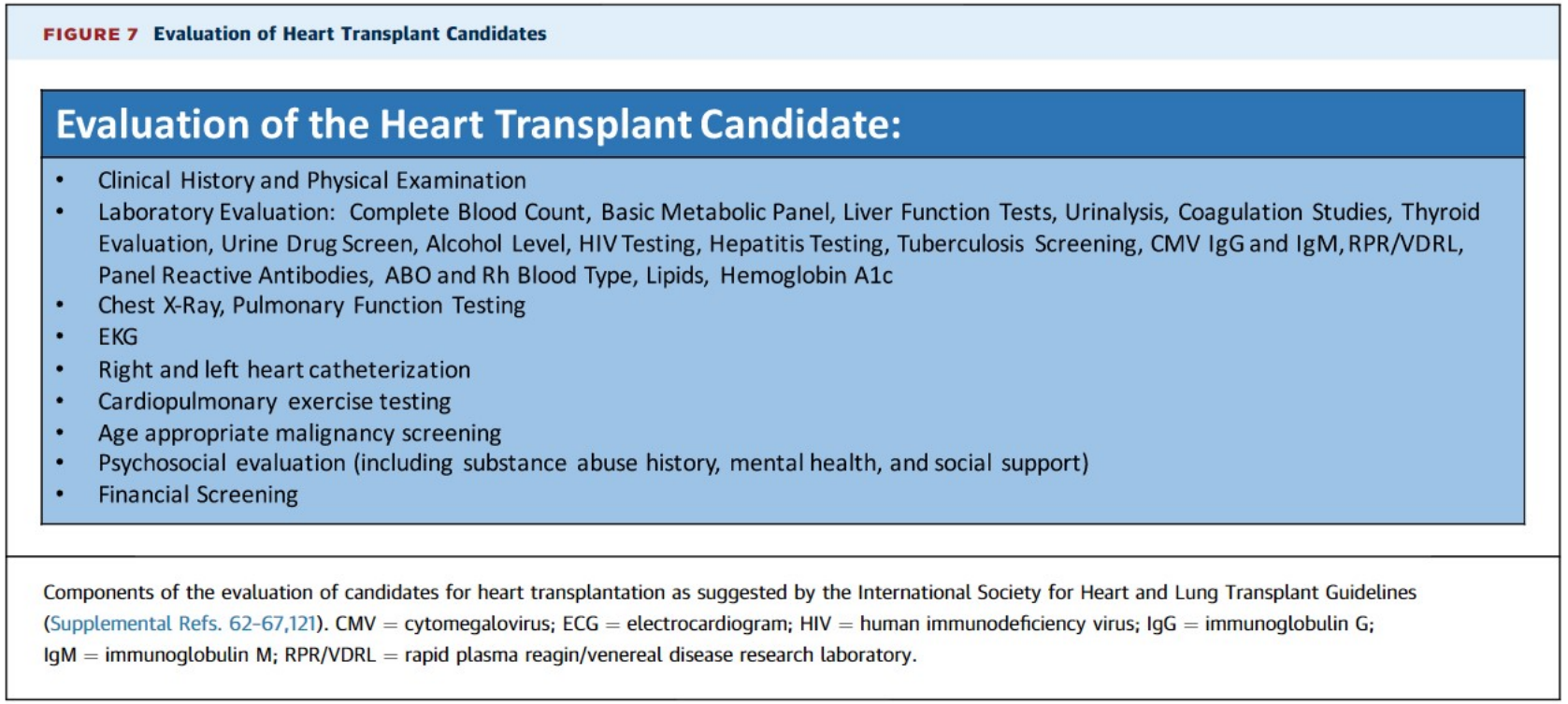
FIGURE 6 Relative and Absolute Contraindications to Advanced HF Therapies

Absolute Contraindications	Relative Contraindications	Relative Contraindications	Absolute Contraindications
• Systemic Illness with a life expectancy < 2 years • Fixed Pulmonary Hypertension	• Age > 72 years old • Any active infection (with the exception of device related infections in VAD) • Severe diabetes with end-organ damage • Severe peripheral vascular disease or cerebrovascular disease • Active peptic ulcer disease • Morbid obesity or cachexia • Creatinine > 2.5 or creatinine clearance < 25 • FEV1 < 40% expected • Difficult to control hypertension • Irreversible neurologic or neuromuscular disorder • Active mental illness or psychosocial instability • Medical nonadherence • Drug, tobacco, alcohol use within 6 mos. • Liver dysfunction with total bilirubin > 2.5, serum transaminases > 3x normal, and/or INR >1.5 off warfarin • Heparin induced thrombocytopenia within 100 days	• Age > 80 • Morbid obesity or cachexia • Musculoskeletal disease that impairs rehabilitation • Active systemic infection or prolonged intubation • Untreated malignancy • Severe peripheral vascular disease or cerebrovascular disease • Drug, tobacco, alcohol use within 6 mos. • Impaired cognitive function • Psychosocial instability	• Irreversible hepatic disease • Irreversible renal disease • Irreversible neurologic or neuromuscular disorder • Medical nonadherence • Active mental illness or psychosocial instability
Heart Transplantation		**Left Ventricular Assist Device**	

Review of the absolute and relative contraindications for heart transplantation and left ventricular assist device therapy (Supplemental Ref. 62,119,120). FEV1 = 1-min forced expiratory volume; HF = hears failure; INR = international normalized ratio; VAD = ventricular assist device.

Evaluation of the Advanced Therapies Candidate

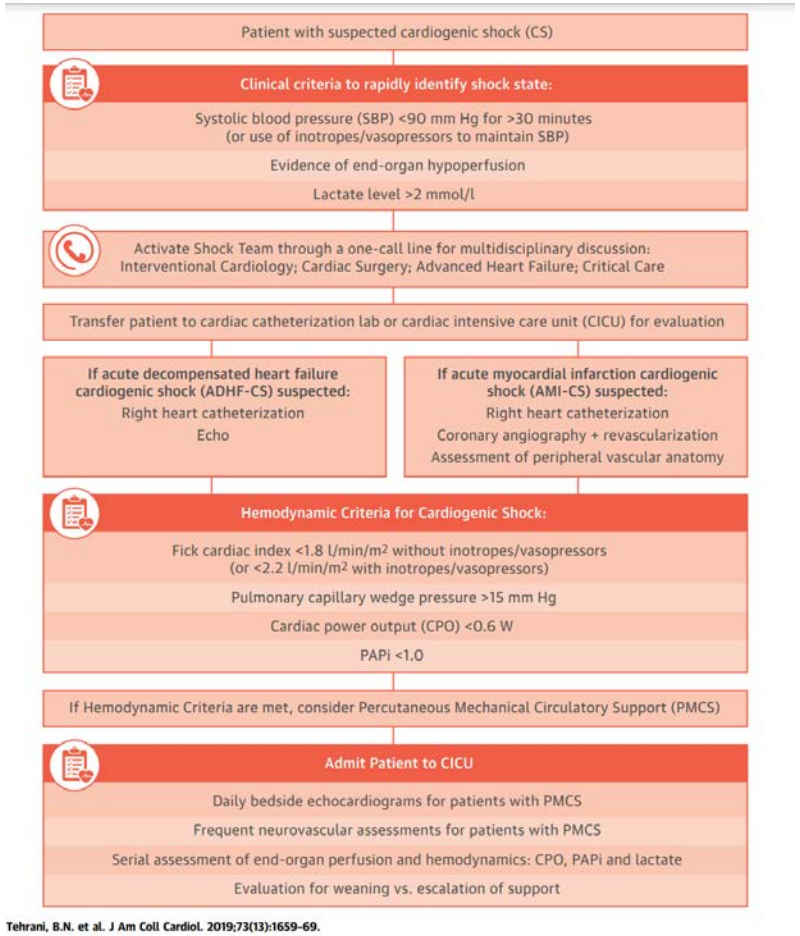
FIGURE 7 Evaluation of Heart Transplant Candidates



Components of the evaluation of candidates for heart transplantation as suggested by the International Society for Heart and Lung Transplant Guidelines (Supplemental Refs. 62-67,121). CMV = cytomegalovirus; ECG = electrocardiogram; HIV = human immunodeficiency virus; IgG = immunoglobulin G; IgM = immunoglobulin M; RPR/VDRL = rapid plasma reagin/venereal disease research laboratory.

Cardiogenic Shock Team Approach/MCS

A New Era in Cardiogenic Shock Care



Tehrani, B.N. et al. J Am Coll Cardiol. 2019;73(13):1659-69.

Possible Short Term MCS Options

TABLE 1 Comparison of Commercially Available Devices for Short-Term Mechanical Circulatory Support

Device	VA-ECMO	IABP	Tandem Heart	Impella (2.5; CP; 5; RP)
Flow, l/min	4–6	0.5–1	4–6	2.5–5
Duration of support, FDA approved	6 h (limited by oxygenator durability)	9 days	21 days	4 days (2.5, CP), 6 days (5) 14 days (RP)
Ventricles supported	LV and RV	LV	LV or RV	LV or RV
Cannula size, F	Inflow 18–21 Outflow 15–22	7–9	Inflow 21 Outflow 15–17	12–21
Additional requirements	Potential need for LV venting, possible cutdown		Transseptal puncture	Surgical cutdown for Impella 5
Advantages	Highest cardiac output Complete cardiopulmonary support (including oxygenation and CO_2 removal)	Easy to place Good safety profile Fewer side effects, especially vascular	Highest cardiac output, comparable with VA-ECMO, and no LV distension	Multiple devices to choose from
Disadvantages	Requires more resources and support staff than other devices Retrograde blood flow with worsening of afterload (LV distension) Vascular complications Thrombocytopenia	Limited hemodynamic support Contraindicated in severe aortic regurgitation	Need tertiary or quaternary specialized care center Necessitates atrial transseptal puncture with its potential complications Vascular complications Retrograde blood flow	More invasive and complex to implant than the IABP Unstable position Frequent hemolysis Vascular complications

CO_2 = carbon dioxide; FDA = U.S. Food and Drug Administration; IABP = intra-aortic balloon pump; LV = left ventricle/ventricular; RV = right ventricle; VA-ECMO = venoarterial extracorporeal membrane oxygenation.

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
VOL. 73, NO. 6, 2019

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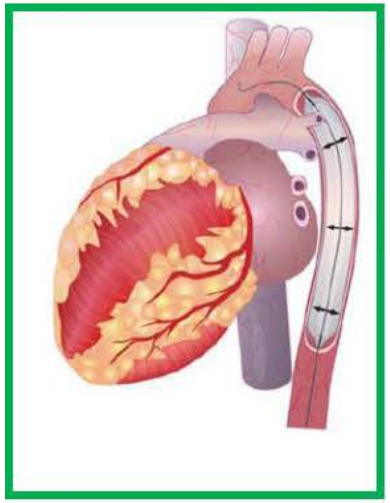
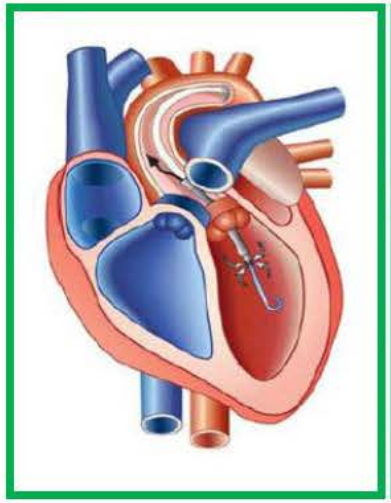
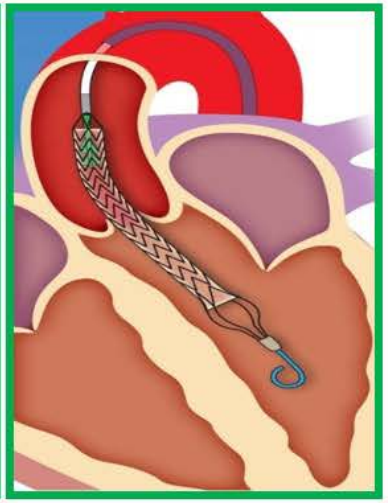
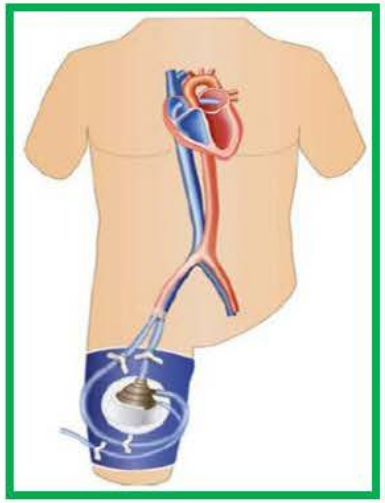
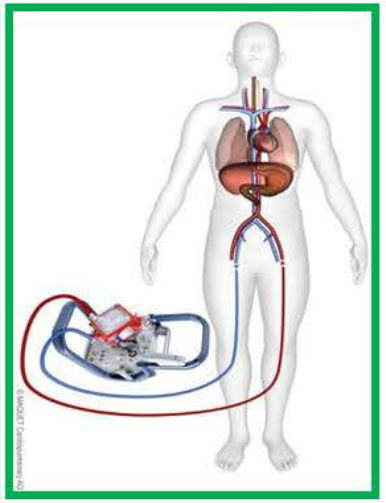
LV Support Options

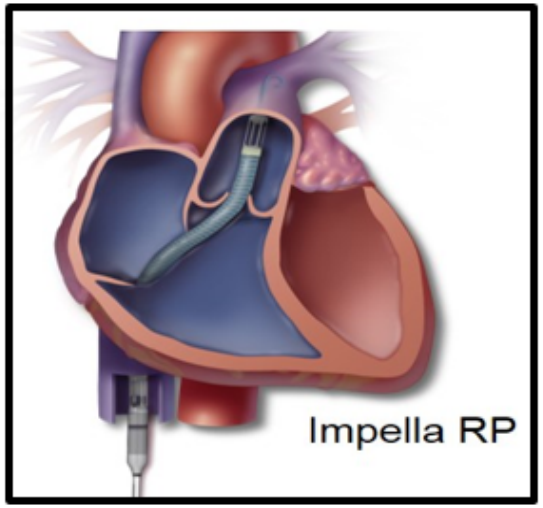
Continuous Flow Pumps

Pulsatile	Axial-Flow		Centrifugal Flow	
				
IABP	Impella CP	PHP *	TandemHeart	VA-ECMO
	Intracorporeal		**Extracorporeal**	

RV Support Options

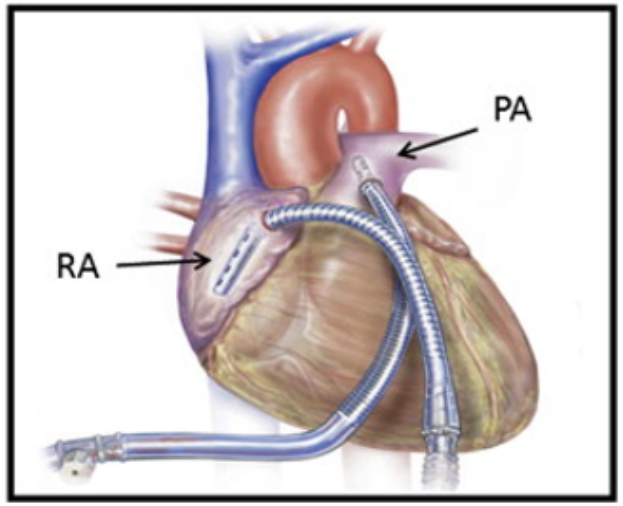
Axial Flow

Centrifugal Flow

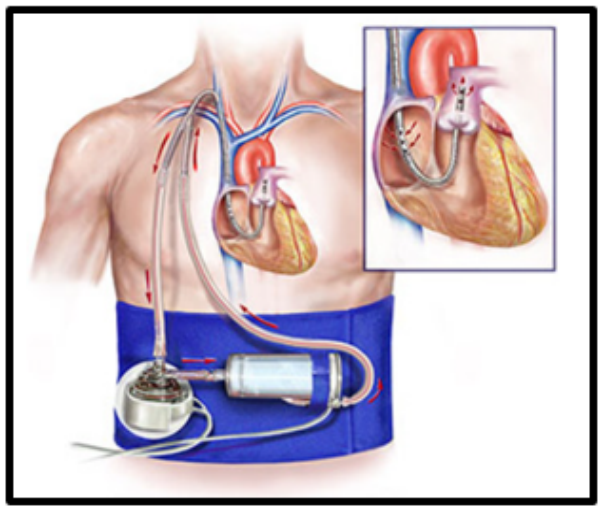


Impella RP

VA-ECMO



Tandem pRVAD



Protek Oxy-RVAD

Goals of Temporary MCS depend on underlying reason for why we are using it

High Risk PCI

Maintain BP and CO during proximal coronary occlusion to maximize CBF to other myocardial regions and blood flow to the body

Enable complete revascularization

Cardiogenic shock (±AMI)/ Decompensated Heart Failure

Normalize CO, BP, Cardiac Power Output (CPO= MAP x CO)

Decrease PCWP

Optimize blood oxygen saturation

'Bridge to Decision' enabling

Minimize myocardial damage and optimize recovery

Decrease myocardial work and oxygen consumption while optimizing myocardial perfusion

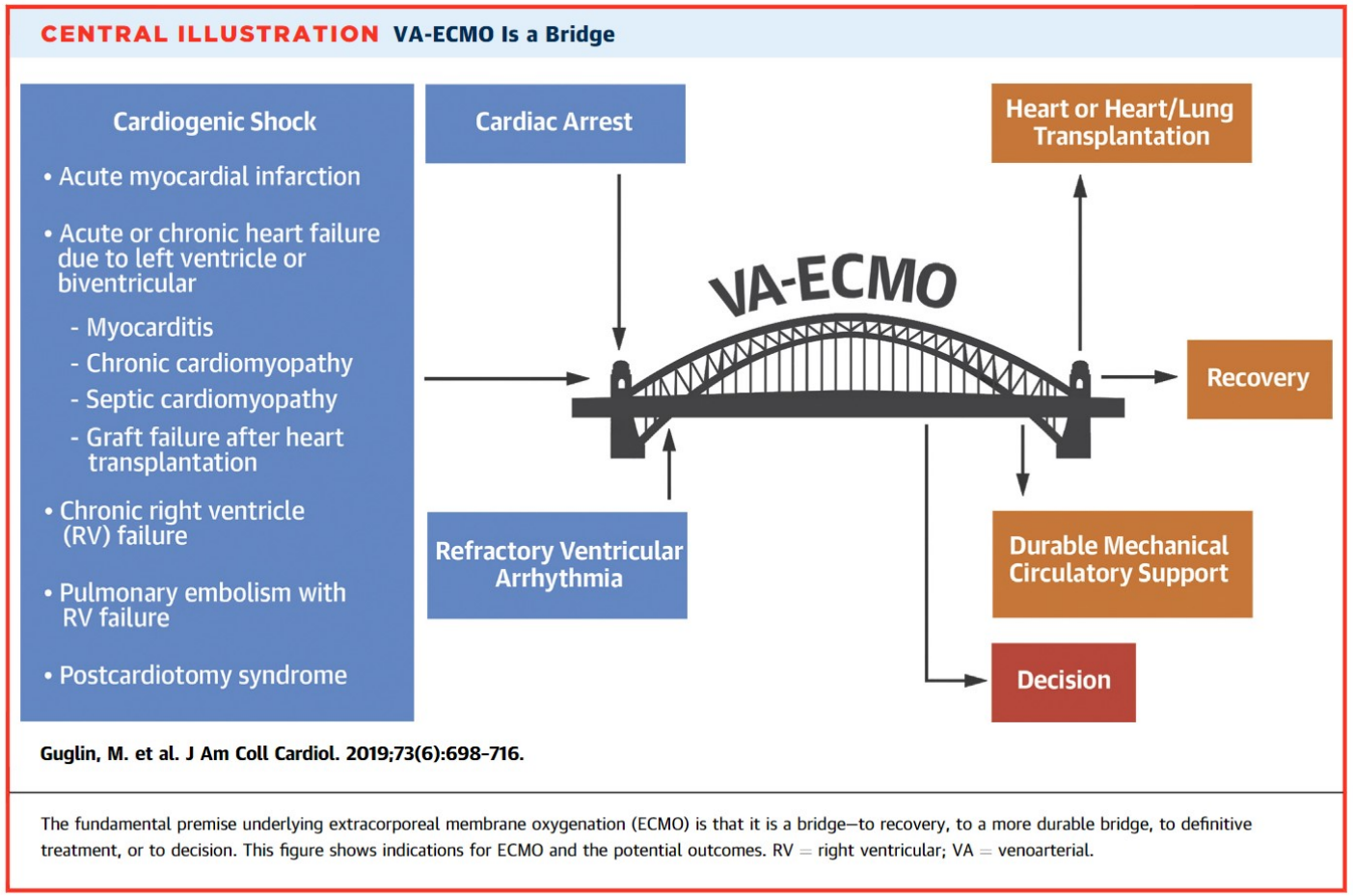
Myocardial Salvage in Setting of AMI

Reduce LV workload (and oxygen demand) to minimize necrosis and optimize myocardial recovery

Early Trials for Percutaneous MCS

Trial	Study Device	Indication	Primary Outcome
IABP SHOCK II	IABP	Cardiogenic Shock	No difference in 30-day mortality or secondary endpoints
CRISP	IABP	Acute Anterior Myocardial Infarction	Trend toward higher infarct size and vascular complications with IABP
PROTECT II	Impella 2.5 vs IABP	High Risk PCI	No difference in 30-day MAE; halted for futility and DSMB concerns for safety trends
BCIS	IABP	High Risk PCI	No difference in in-hospital MACCE; improved 5-year survival
IMPRESS	Impella CP vs IABP	Cardiogenic Shock	No difference in 30-day mortality or secondary endpoints

VA ECMO is a Bridge- Begin with the Exit in Mind



The fundamental premise underlying extracorporeal membrane oxygenation (ECMO) is that it is a bridge—to recovery, to a more durable bridge, to definitive treatment, or to decision. This figure shows indications for ECMO and the potential outcomes. RV = right ventricular; VA = venoarterial.

UNOS Listing Criteria 10/2018-present

Status	Criteria	Admitted to hospital that registered candidate	Cardiogenic Shock	Primary Mechanical Circulatory Support Devices						Requires time spent at previous status	Use of Inotropes	V-Tach or V-Fib	Eligible for extension
				VA ECMO	Discharge-able VAD	Non-Discharge-able VAD	Percu-taneous Device	TAH	IABP				
Status 1	VA ECMO	*	*	*									RRB
	Non-dischargeable, surgically implanted, non-endovascular biventricular support device	*				*							Y
	MCSD with life threatening ventricular arrhythmia	*		*	*	*	*	*	*			*	Y
Status 2	Non-dischargeable, surgically implanted, non-endovascular left ventricular support device (LVAD)	*				*							RRB
	TAH, BiVAD, RVAD, or VAD for single ventricle patients				*	*		*					Y
	MCSD with malfunction	*		*	*	*	*	*	*				Y
	Percutaneous endovascular MCSD	*	*				*						RRB
	Intra-Aortic Balloon Pump (IABP)	*	*						*				RRB
	Ventricular Tachycardia (VT) or Ventricular Fibrillation (VF)	*										*	Y
Status 3	Dischargeable LVAD for discretionary 30 days				*								N
	Multiple inotropes or a single high dose inotrope and hemodynamic monitoring	*	*								*		Y
	MCSD with Hemolysis			*	*	*	*	*	*				Y
	MCSD with Pump Thrombosis			*	*	*	*	*	*				Y
	MCSD with Right Heart Failure			*	*	*	*	*	*		*		Y
	MCSD with Device Infection			*	*	*	*	*	*				Y
	MCSD with Mucosal Bleeding	*		*	*	*	*	*	*				Y
	MCSD with Aortic Insufficiency (AI)			*	*	*	*	*	*				Y
	VA ECMO after 7 Days	*		*						*			Y
	Non-dischargeable, surgically implanted, non-endovascular LVAD after 14 Days	*				*				*			Y
	Percutaneous Endovascular Circulatory Support Device after 14 Days	*					*			*			Y
	IABP after 14 Days	*							*	*			Y
Status 4	Dischargeable LVAD without discretionary 30 days				*								Y
	Inotropes without Hemodynamic Monitoring										*		Y
	Congenital Heart Disease												Y
	Ischemic Heart Disease with Intractable Angina												Y
	Amyloidosis, or Hypertrophic or Restrictive Cardiomyopathy												Y
	Heart Re-transplant												Y
Status 5	On the Waitlist for at least one other organ at the same hospital												Y
Status 6	Adult Candidate Suitable for Transplant												Y

* indicates a criteria requirement
RRB indicates RRB submission required for extension

LV Unloading: VA ECMO increases LV afterload

Table. LV Unloading Strategies During VA-ECMO Support (Table view)

Strategy	Advantage	Disadvantage
Inotropes	Simple to implement	Limited LV unloading; increases myocardial oxygen consumption
Vasodilators	Simple to implement	Limited LV unloading; blood pressure may not be sufficient
IABP	Bedside implementation possible; increased coronary blood flow	Unreliable degree of unloading
Balloon atrial septostomy	Bedside implementation possible	Indirect LV unloading; possible need for ASD closure after decannulation
LA→Ao cannula connected to venous port of ECMO circuit	More controlled LA decompression than septostomy	Indirect LV unloading; possible need for ASD closure after decannulation
Surgical LV vent	Direct LV venting; provides reliable LV unloading	Requires surgical placement and removal; impacts apex of the heart; blood stasis in proximal aorta still possible
Percutaneous LV vent	Bedside implementation possible; direct LV unloading; provides reliable LV unloading	Limited LV unloading compared with surgical LV vent; blood stasis in proximal aorta still possible
Percutaneous ventricular support	Impella FDA approved for this indication; direct LV unloading; antegrade flow support; aortic root washing; offers the possibility for ECMO to be weaned with continued circulatory support	North-south syndrome still possible
Off-pump central VA-ECMO	Direct LV unloading; total antegrade flow support; allows for ambulation; minimizes risk of vascular injury	Requires surgical placement and removal; impacts apex of the heart

Impella Devices

UCLA

Impella CP

Left side, partial support
Maximum flow 4.3 Lpm
FDA approved for 4 days

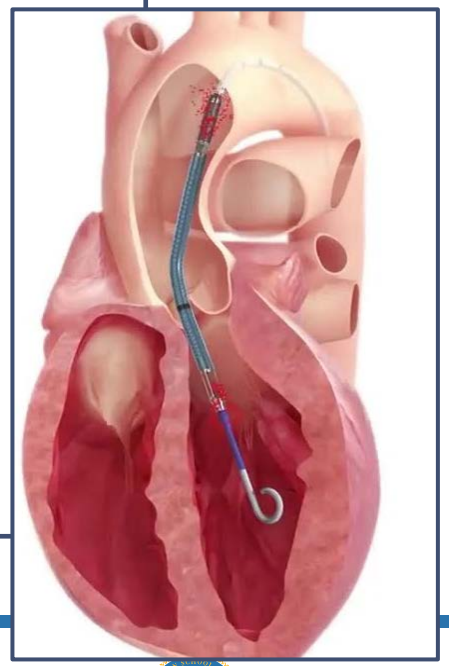
Impella 5.5

Left side, full support
Maximum flow 6.2 Lpm
FDA approved for 14 days

Impella RP FLEX

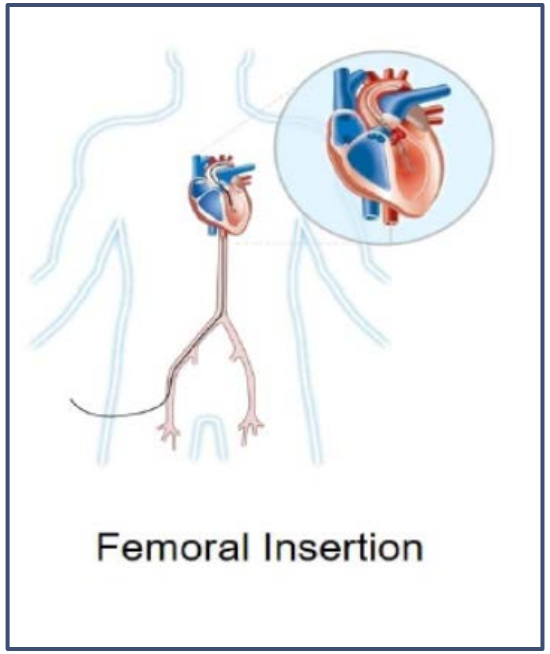
Right side, partial support
Maximum flow 4.3 Lpm
FDA approved for 14 days

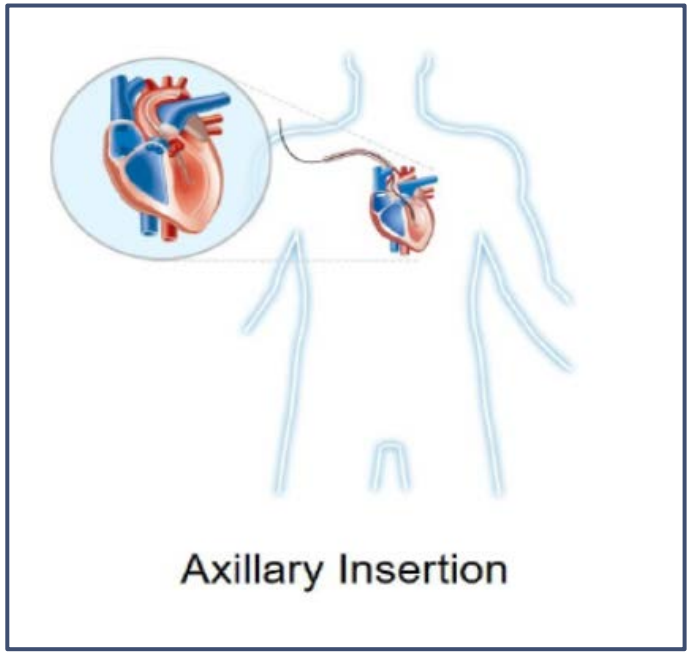
Impella CP



Left side, partial support
Maximum flow 4.3 Lpm
FDA approved for 4 days

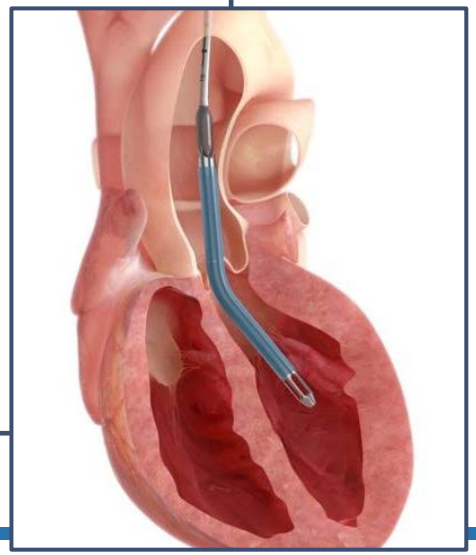
Insertion Techniques



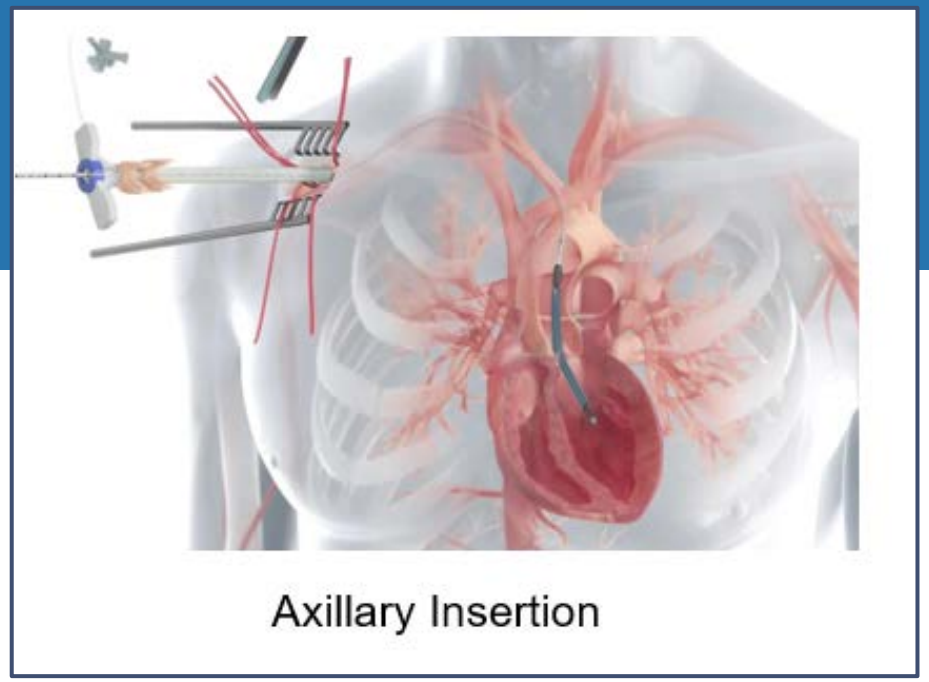


For femoral insertion, HOB < 30 degrees
(Patients must be on strict bedrest)

Impella 5.5



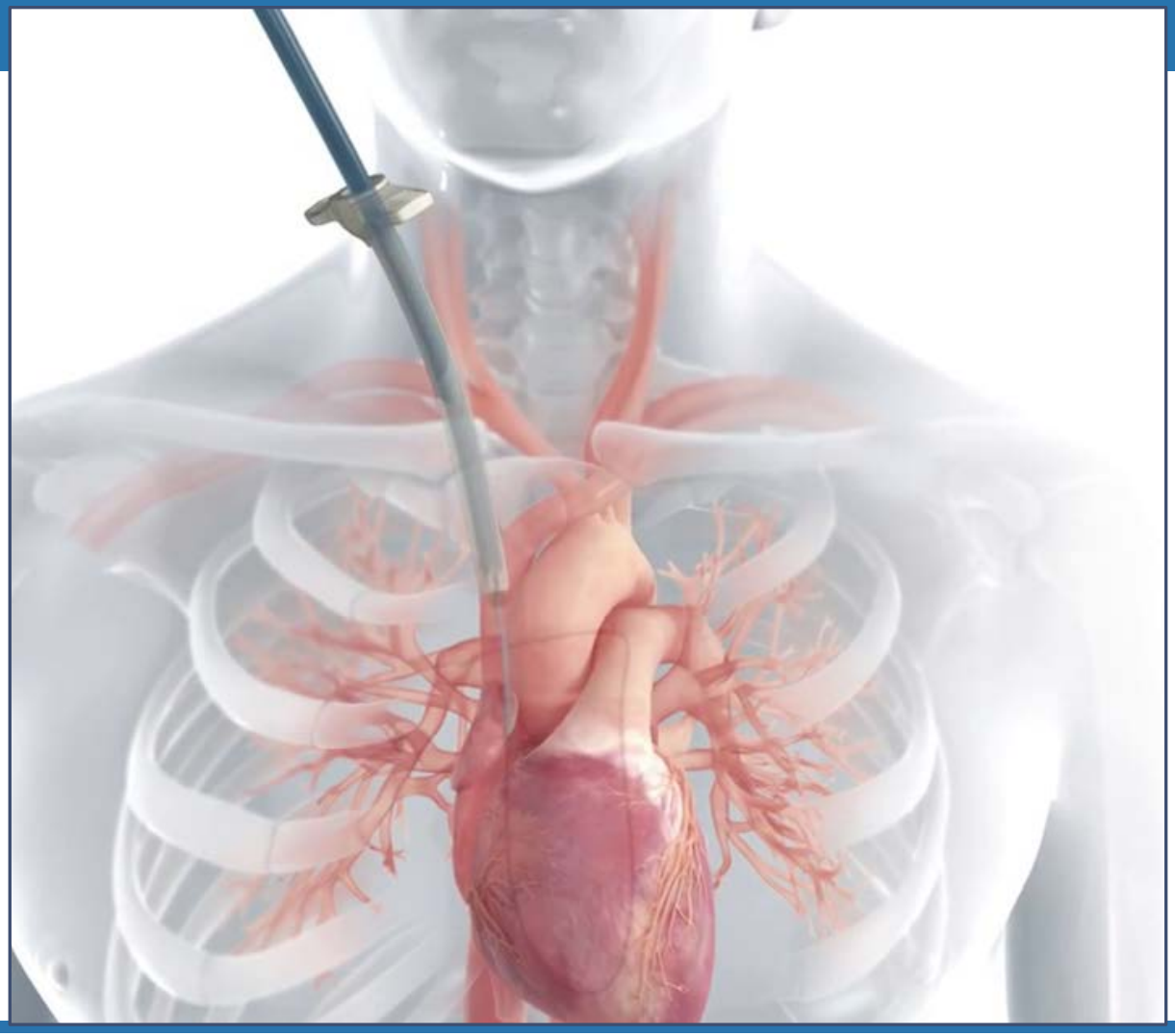
Left side, full support
Maximum flow 6.2 Lpm
FDA approved for 14 days



Axillary Insertion

Direct Aortic Insertion

Impella RP FLEX



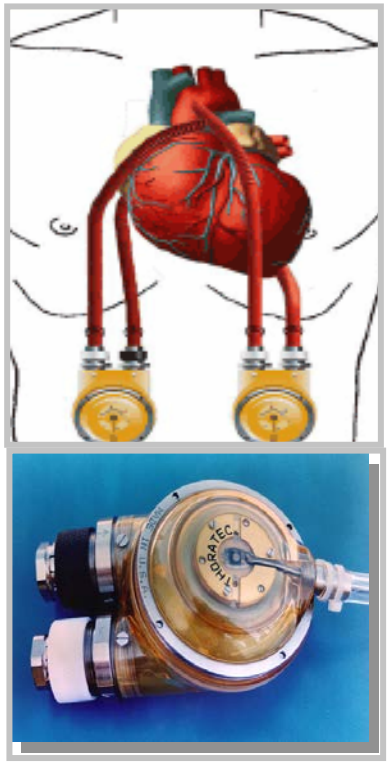
Right side support device
Maximum flow 4.3 Lpm
FDA approved for 14 days

MCS/Durable VAD

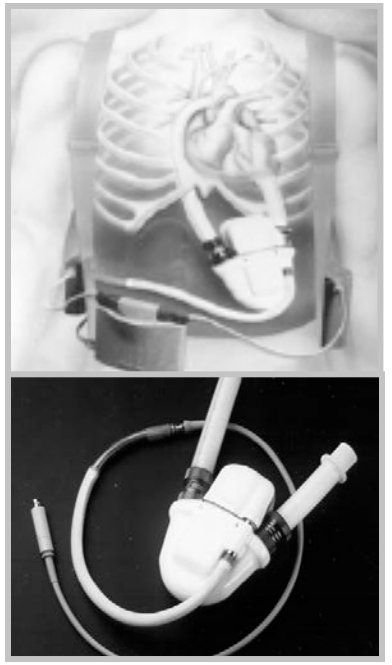
1st Generation:
Pulsatile Ventricular Assist Devices

Thoratec HeartMate I
Bridge
Destination (XVE - REMATCH)

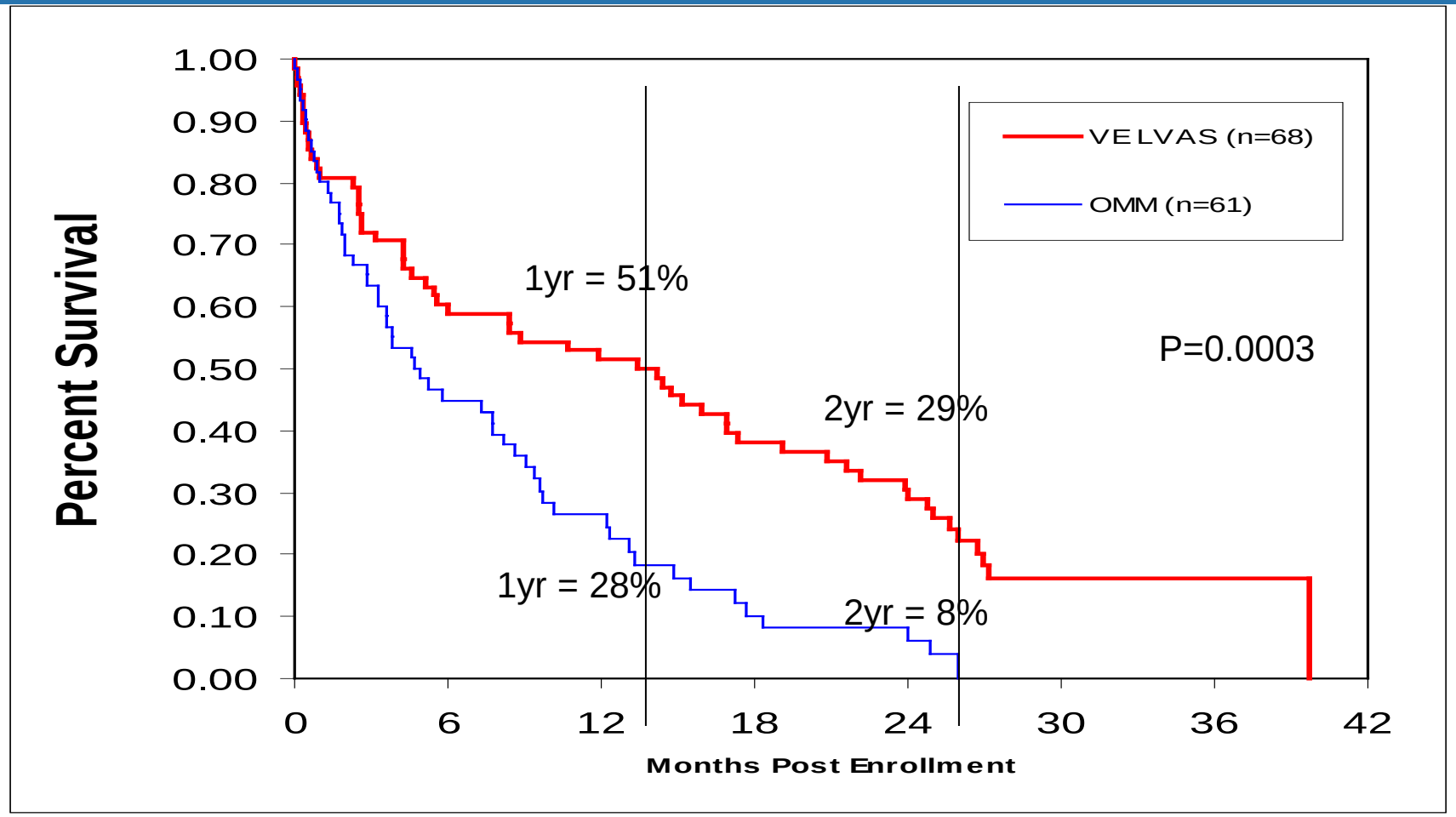
Thoratec PVAD
Bridge (L- R- or Bi-VAD)
Post-cardiotomy



Novacor LVAS
Bridge
Destination trial (INTrEPID)

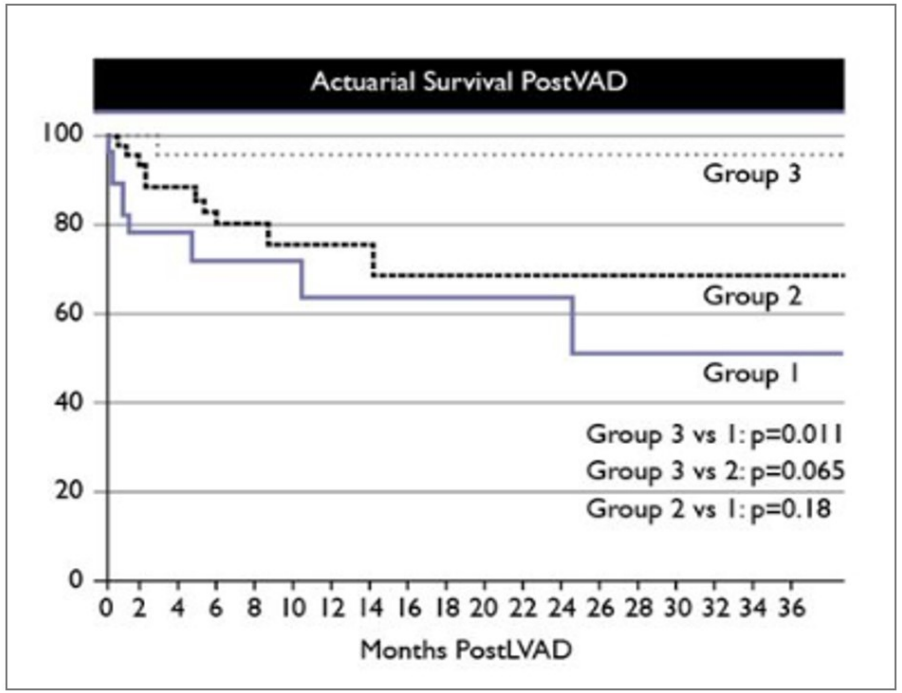


REMATCH: On Treatment Analysis



INTERMACS and Survival post LVAD

Survival post LVAD based on INTERMACS Profile



Group 1: INTERMACS 1

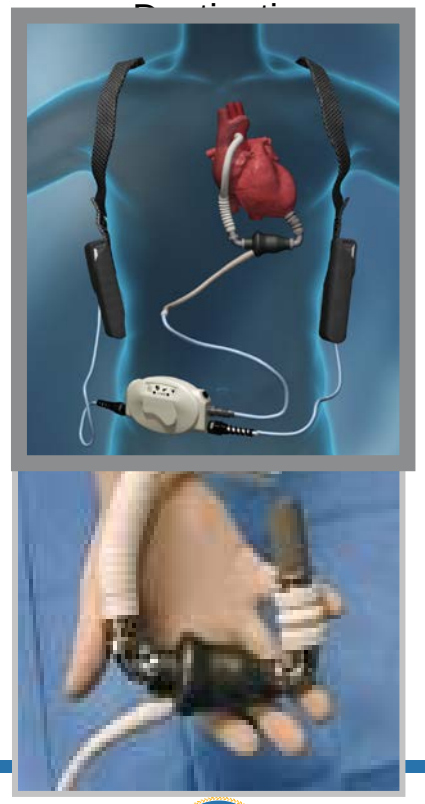
Group 2: INTERMACS 2

Group 3: INTERMACS 4-7

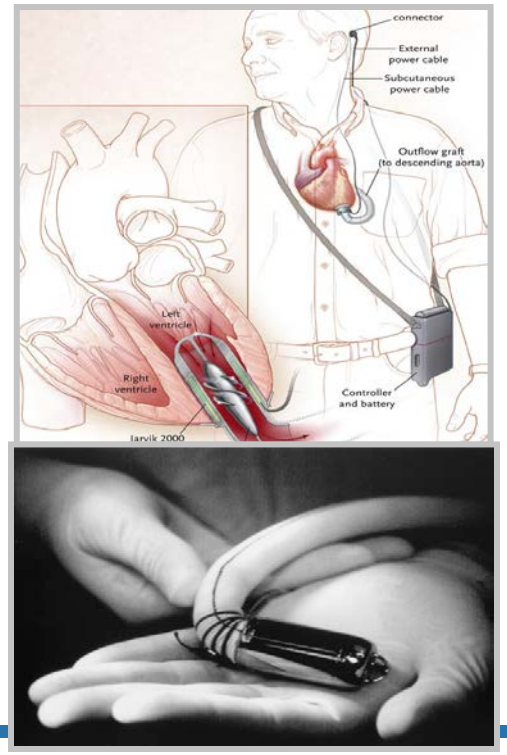
Boyle et al. JHLT. 2011;30:402-7

2nd and 3rd Generation: Continuous Flow Ventricular Assist Devices

Thoratec HeartMate II
Bridge/Destination



Jarvik 2000



Heartmate HVAD
Bridge
Destination

Durable LVAD

- Improved survival
- Increase functional capacity
- Improved quality of life
- Heavy burden of adverse events
  - Frequent readmission
  - Patient dissatisfaction
  - Healthcare costs

UNDERSTANDING THE PUMP AND PATIENT INTERACTION[1]

PRELOAD

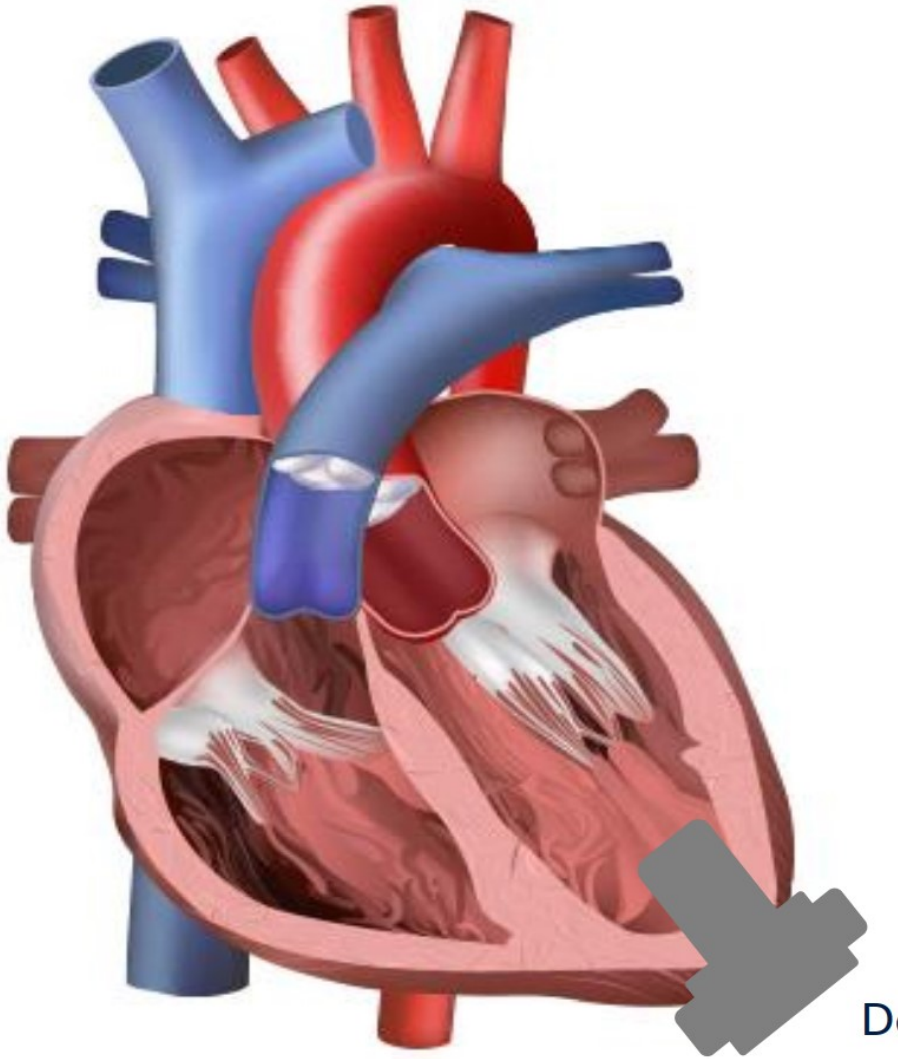
LOW
Hypovolemia
Right Heart Failure
Tamponade

HIGH
Hypervolemia

CONTRACTILITY

Low
Beta Blockers
Worsening Heart Failure

High
Beta Agonist
Left Ventricular Recovery



Device Set Speed

AFTERLOAD

LOW
Hypotension/Vasodilation

HIGH
Hypertension/Vasoconstriction

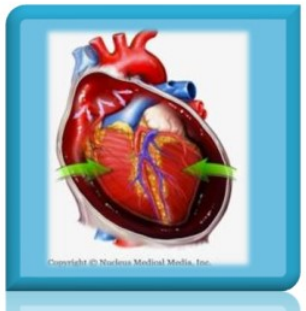
[1]Feldman, et.al., 2013 ISHLT MCS Guidelines. The Journal of Heart and Lung Transplantation, Vol 32, No 2, February 2013

POTENTIAL COMPLICATIONS

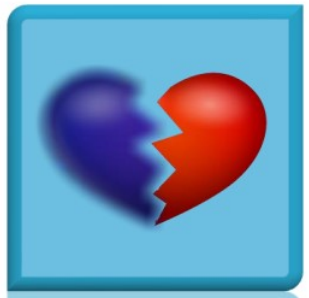
	↓ FLOW	↑ FLOW
↓ PULSATILITY	Hypovolemia RV Failure Cardiac Tamponade Sustained Arrhythmias Occlusion	Hypotension/Vasodilation Aortic Insufficiency (AI) Pump Thrombus (falsely elevated)
↑ PULSATILITY	Hypertension Low Speed Continuous Suction (negative deflection)	Hypervolemia Possible Recovery

POTENTIAL COMPLICATIONS*

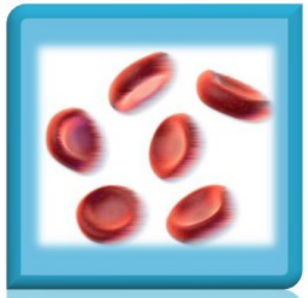

Bleeding


Tamponade

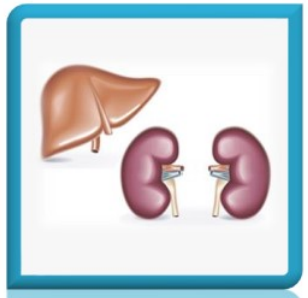

Arryhthmia


Right Heart Failure


Infection


Hemolysis


Thromboembolic Events


Kidney/Liver Dysfunction


Stroke


Respiratory Failure

Adverse Events with Durable Devices

Table 4. Various Adverse Events, Their Incidence, Timeline, Mechanism, and Proposed Therapies (Table view)

Adverse Event	Incidence Range, %	Timeline	Risk Factors	Diagnostic Modality	Treatment
Right heart failure	15 to 25	Bimodal (acute or delayed onset)	Pulmonary hypertension, existing right ventricular dysfunction	Clinical; echocardiography	Inotropy; right ventricular assist device
Pump thrombosis	1.1 to 12.2	Varied	Inadequate anticoagulation; mechanical; low-flow	Hemolysis; echocardiography; intraoperative	Thrombolytics; device exchange
Gastrointestinal bleeding	15 to 30	Varied; recurrent	Low pulsatility; acquired von Willebrand factor deficiency; arteriovenous malformation; anticoagulation	Endoscopy	Proton pump inhibitor; cauterization
Driveline infection	15 to 24	Varied	Driveline; poor hygiene; hematoma;	Clinical; visual inspection	Antibiotic therapy; device exchange if systemic
Stroke	13 to 30	Varied; possible hemorrhagic conversion	Hypertension; anticoagulation;	Computed tomography scan or magnetic resonance imaging	Multifactorial
Aortic insufficiency (moderate or severe)	30% at 2 yr	Chronic	Chronic nonopening of aortic valve	Echocardiography	Surgical or transcatheter valve repair or closure

Psychosocial Component of Evaluation

Bui et al; Psychosocial Evaluation in Advanced Heart Failure

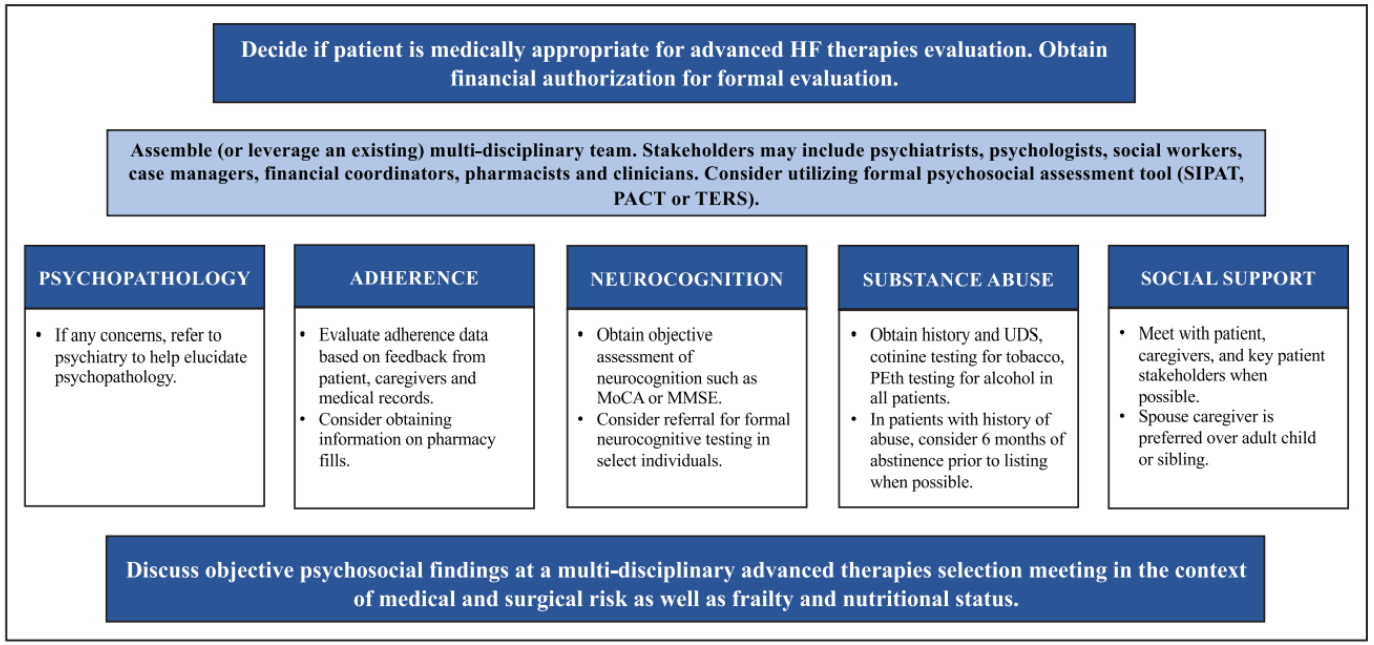


Figure 1. Stepwise approach to the psychosocial assessment.
HF indicates heart failure; MMSE, mini-mental state examination; MoCa, Montreal Cognitive Assessment; PACT, Psychosocial Assessment of Candidates for Transplantation; PEth, phosphatidylethanol; SIPAT, Stanford Integrated Psychosocial Assessment for Transplantation; TERS, Transplant Evaluation Rating Scale; and UDS, urine drug screen.

Shared Decision Making is Key

ENABLE LVAD

ENABLE (Educate, Nurture, Advise Before Life Ends) is an evidence-based training program designed to teach clinicians how to provide structured support and skill development to **caregivers** of patients with left ventricular assist devices (**LVADs**).

Palliative Care

Referral Criteria

TABLE 1 Diverging Referral Criteria to Specialty Palliative Care Services

AHA/ACC/HFSA 2022 HF Guideline[3]	ESC 2021 HF Guideline[103]	ESC 2020 Position Paper[25]	I Need Help[104]	Chang et al, 2022[33]
• Patients with refractory symptoms despite optimal medical therapy • Patients facing major medical decisions such as LVAD, and • Patients with multimorbidity, frailty or cognitive impairment.	• Progressive functional decline (physical and mental) and dependence in most ADLs • Severe HF symptoms with poor QoL despite optimal pharmacologic and nonpharmacologic therapies • Frequent admissions to hospital or other serious episodes of decompensation despite optimal treatment • Heart transplantation and MCS ruled out • Cardiac cachexia • Clinically judged to be close to end of life	• Refractory or complex symptoms • When there is spiritual or existential distress • Recurrent HF admissions • Increasingly frequent appropriate ICD shocks • When considering ICD deactivation or nonreplacement • Before LVAD implantation or transplant referral • When initiating palliative inotropic therapy • Declining functional status due to progressive HF or a comorbidity • If patients and/or informal caregivers/surrogates disagree on goals of care • If there is a request for assisted suicide	• Inotropes: Previous or ongoing requirement for dobutamine, milrinone, dopamine, or levosimendan • NYHA functional class/natriuretic peptides: persisting NYHA functional class III or IV and/or persistently high BNP or NT-proBNP • End-organ dysfunction: worsening renal or liver dysfunction in the setting of HF • Ejection fraction: very low ejection fraction <20% • Defibrillator shocks: recurrent appropriate defibrillator shocks • Hospitalizations: ≥1 hospitalization with HF in the last 12 mo • Edema/escalating diuretics: persisting fluid overload and/or increasing diuretic requirement • Low blood pressure: consistently low BP with systolic <90 to 100 mm Hg • Prognostic medication: inability to up-titrate (or need to decrease/cease) ACEIs, B-blockers, ARNIs, or MRAs	• Advanced/refractory HF, comorbidities, and complications ◦ Persistent LVEF <20% ◦ Cardiorenal syndrome ◦ Persistent malignant arrhythmias ◦ ICD shocks ◦ Cardiac cachexia ◦ Inability to tolerate or resistance to guideline-directed therapies ◦ Multiorgan failure ◦ Presence of ≥1 noncardiac life-threatening disease in addition to HF • Advanced HF therapies ◦ Chronic inotropes ◦ Mechanical circulatory support ◦ Cardiac transplant evaluation ◦ Eligible for, but did not receive for a specified reason, advanced HF therapies • Hospital utilization ◦ ≥2 ED visits within the last 3 mo ◦ ≥2 hospitalizations within the last 3 mo • Prognostic estimate ◦ Clinician-estimated life expectancy of ≤6 mo • Symptom burden/distress ◦ Severe physical symptoms ◦ Severe emotional symptoms ◦ Severe spiritual or existential distress ◦ Dependent in ≥3 basic ADLs ◦ Refractory symptoms requiring palliative sedation ◦ Request for hastened death/assisted suicide • Decision-making and social support ◦ Assistance with goals of care discussions/decision-making/care planning ◦ Discussion regarding withdrawal/de-escalation of life-prolonging interventions ◦ Hospice referral/discussion • Patient/family/care team request

ACC = American College of Cardiology; ACEI = angiotensin-converting enzyme inhibitor; ADL = activities of daily living; AHA = American Heart Association; ARNI = angiotensin II receptor blocker/neprilysin inhibitor; BP = blood pressure; BNP = brain natriuretic peptide; ED = emergency department; ESC = European Society of Cardiology; HF = heart failure; HFSA = Heart Failure Society of America; ICD = implantable cardioverter-defibrillator; LVAD = left ventricular assist device; LVEF = left ventricular ejection fraction; MCS = mechanical circulatory support; MRA = mineralocorticoid receptor antagonist; NT-proBNP = N-terminal pro-brain natriuretic peptide; QoL = quality of life.

Palliative Care During HF Hospitalization

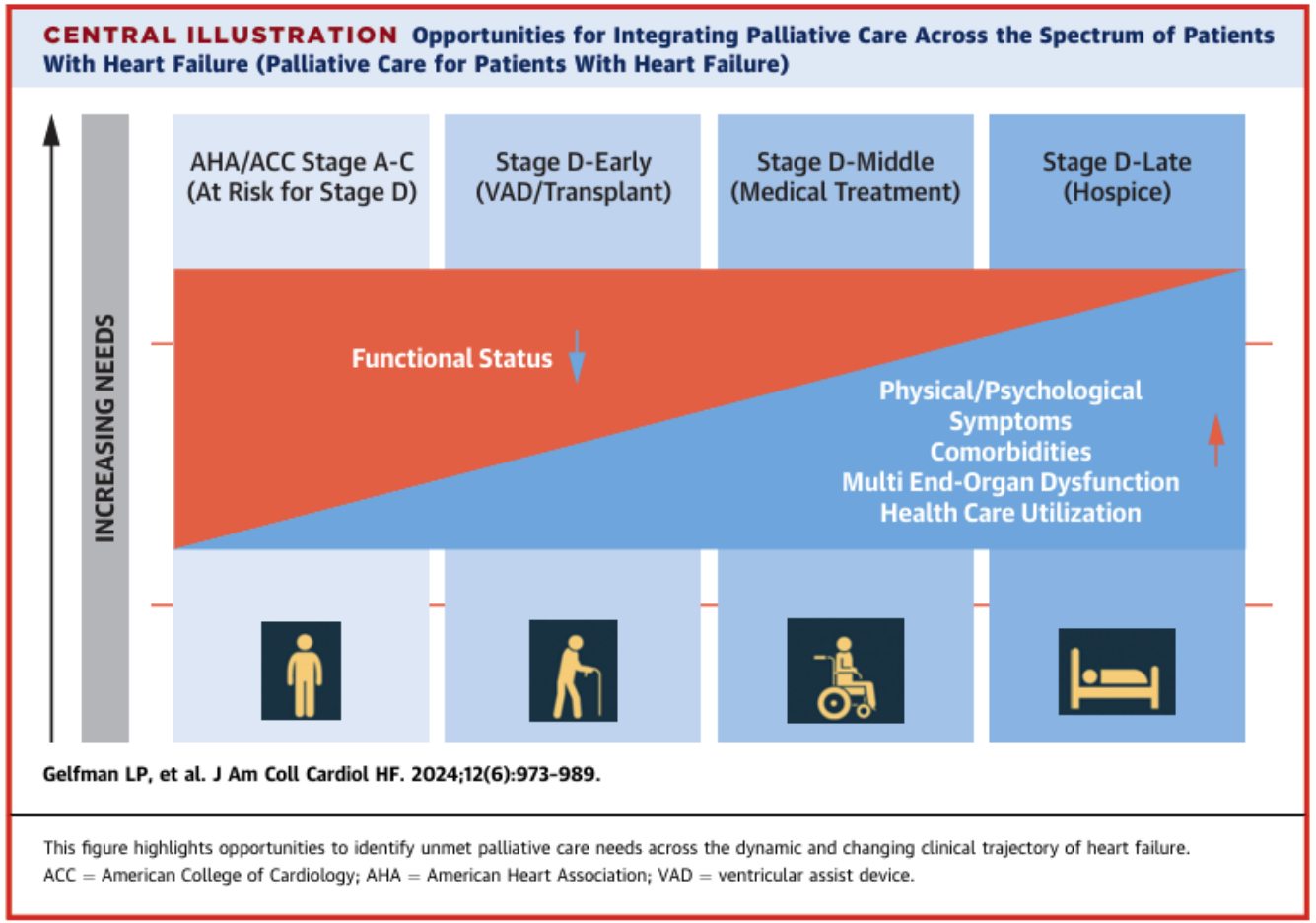
FIGURE 15 Common Aspects of Palliative Care During HF Hospitalization

This figure reflects recent data and publications, including:

1. A study demonstrating that a palliative care referral trigger tool decreased hospital readmission rates up to 90 days postdischarge while also increasing the completion of advanced directives.
2. The 2022 AHA/ACC/HFSA HF Guideline,[8] which advocates a need-based approach to palliative care, with emphasis on shared decision-making, caregiver and bereavement support, and hospice care.

HF = heart failure; ICU = intensive care unit.

Incorporate Palliative Care Earlier



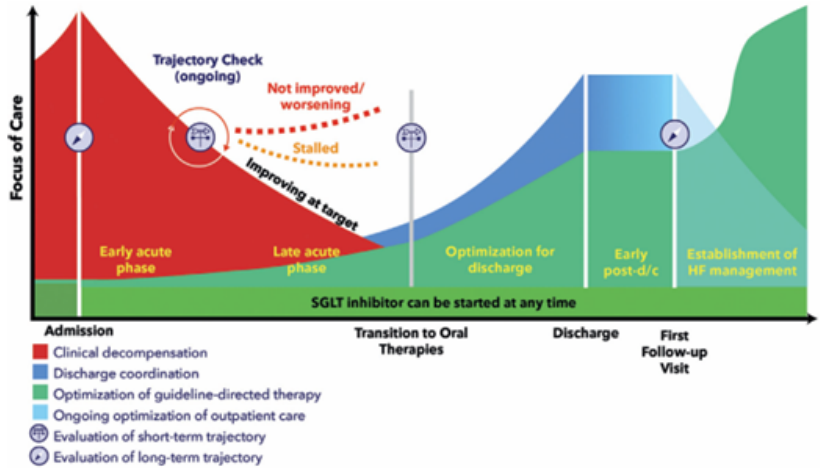
Clinical Pearls/Putting it All Together

Trajectory Check

Hollenberg et al
ECDP on Management of Patients Hospitalized With HF

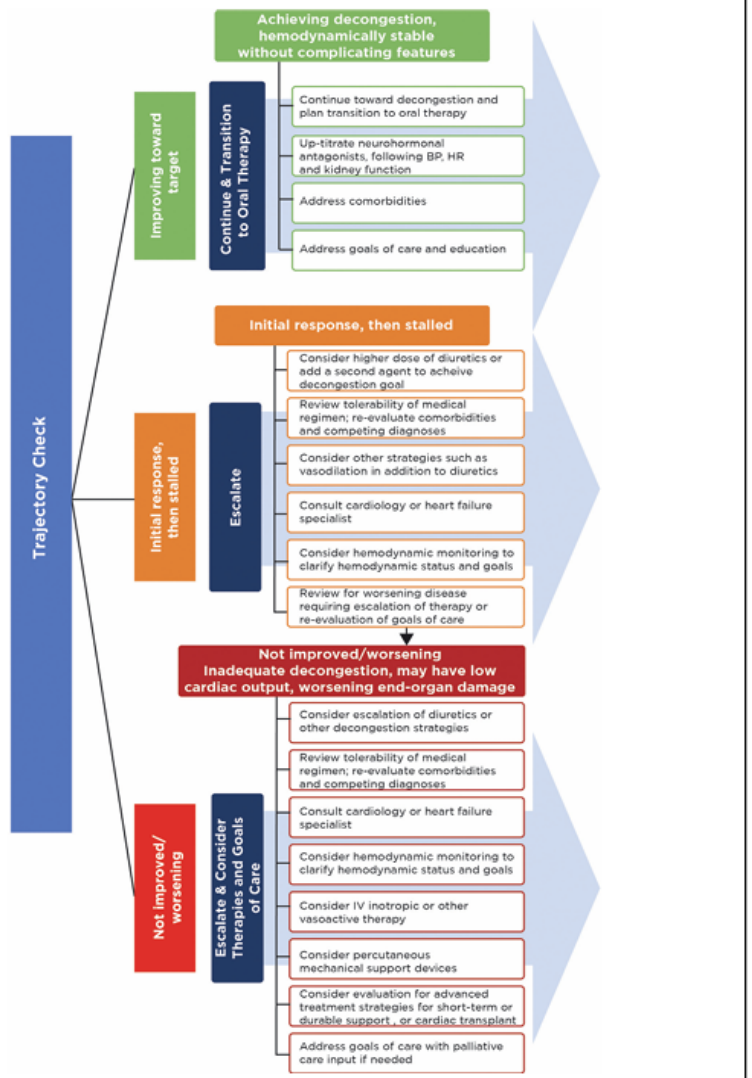
JACC VOL. 84, NO. 13, 2024
SEPTEMBER 24, 2024:1241–1267

FIGURE 1 Pathway Summary Graphic—Clinical Course of Heart Failure



Graphic depiction of the course of HF admission, showing the degree of focus on clinical decompensation (red), discharge coordination (blue), ongoing optimization of outpatient care (light blue), and optimization of guideline-directed therapy (green). Ongoing assessment of the inpatient clinical course is depicted as a circle of arrows, with key timepoints for evaluation of short-term trajectory indicated by weathervane signs. Key timepoints for evaluation of the long-term clinical trajectory for the HF journey are depicted by compass signs. HF = heart failure; post-d/c = postdischarge; SGLT = sodium-glucose cotransporter.

FIGURE 7A Clinical Trajectories in Patients With HF



The clinical trajectory during hospitalization reflects responsiveness to therapy. Three main in-hospital trajectories have been defined according to changes in patient symptoms, clinical signs, laboratory markers, hemodynamics, and complications: 1) *improving toward target*; 2) *initial response, then stalled*; or 3) *not improved/worsening*. This figure combines the 3 trajectories into 1 graphic. BP = blood pressure; HR = heart rate; IV = intravenous.

FIGURE 7A Clinical Trajectories in Patients With HF

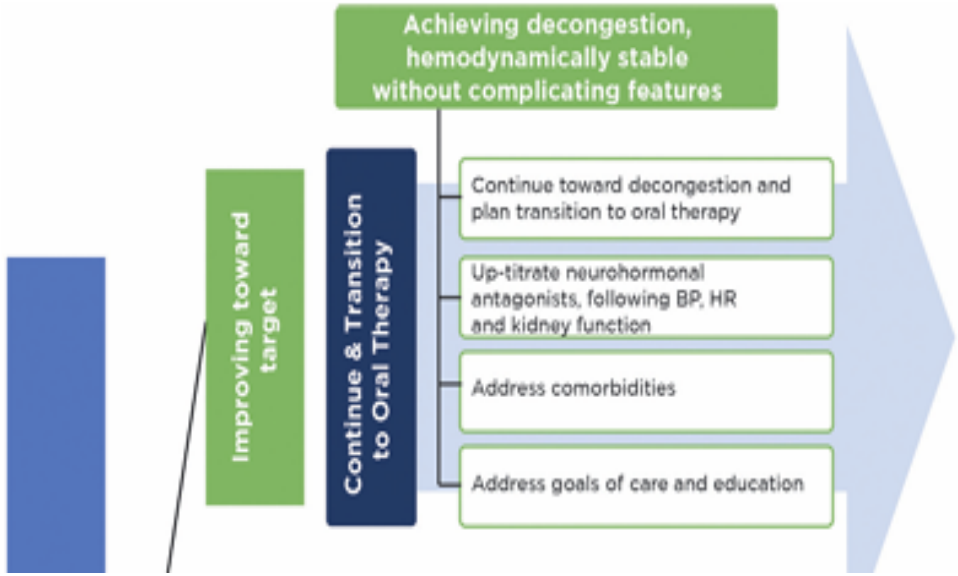
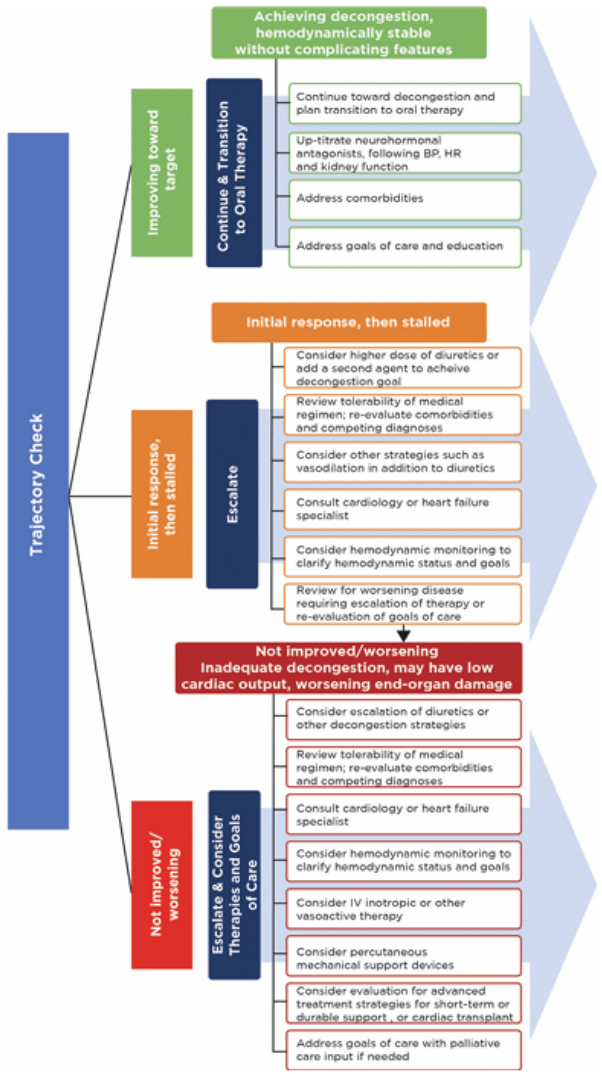


FIGURE 7A Clinical Trajectories in Patients With HF



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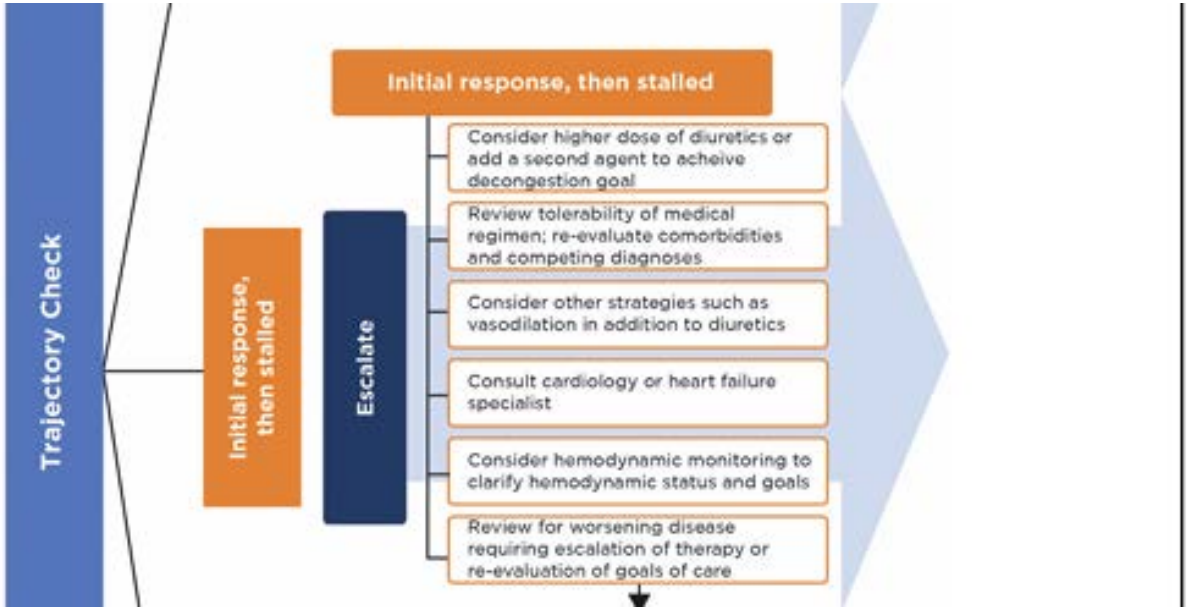

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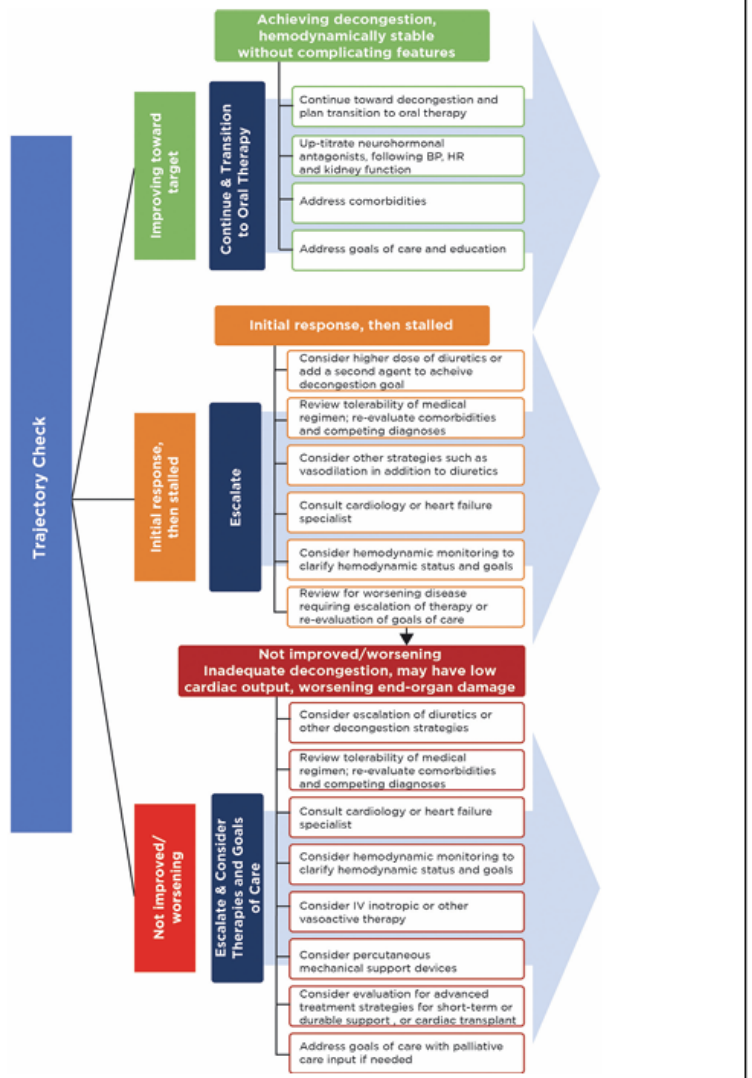
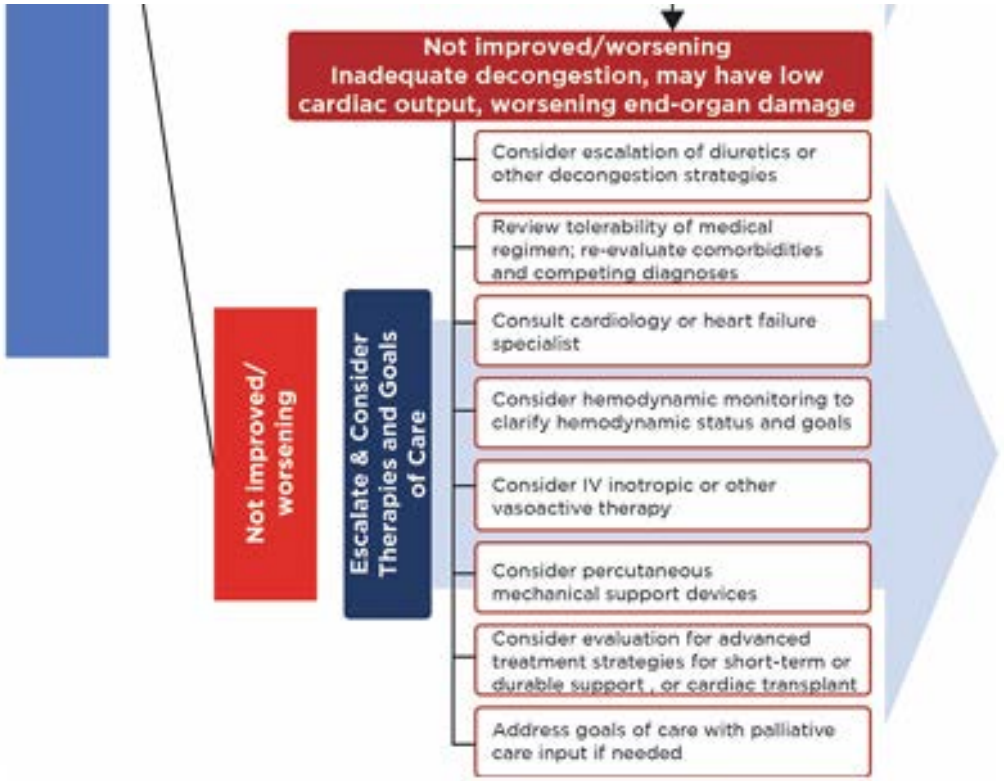
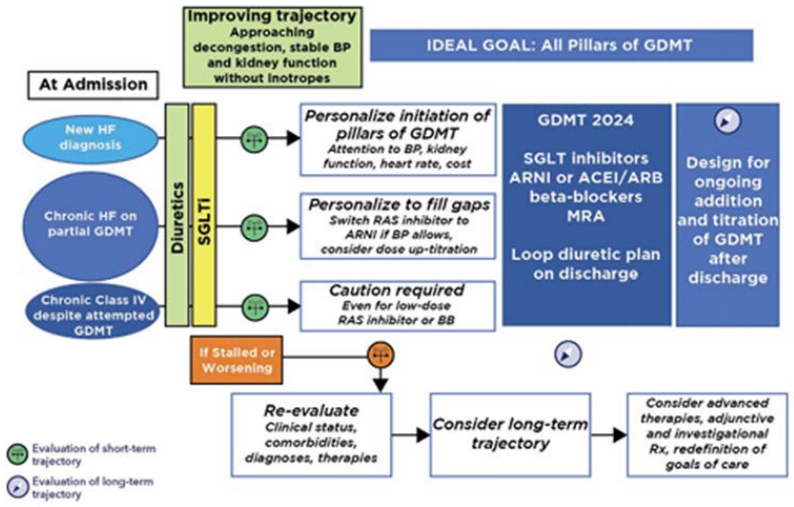


The clinical trajectory during hospitalization reflects responsiveness to therapy. Three main in-hospital trajectories have been defined according to changes in patient symptoms, clinical signs, laboratory markers, hemodynamics, and complications: 1) *improving toward target*; 2) *initial response, then stalled*; or 3) *not improved/worsening*. This figure combines the 3 trajectories into 1 graphic. BP = blood pressure; HR = heart rate; IV = intravenous.



Education, Assessment, and Planning

FIGURE 7B Titration of GDMT in HFrEF



Titration of GDMT in HFrEF by initial presentation and trajectory. Patients with decompensated HFrEF should be diuresed and started on SGLT inhibitor unless contraindicated or cost prohibitive. Those with an improving trajectory (denoted by the green weathervane icon) should have optimization of GDMT. Patients may have a new HF diagnosis, in which case initiation of all 4 pillars of GDMT should be attempted. Patients with chronic HF on partial GDMT should have personalized therapy to fill in gaps, considering a switch from an ACE inhibitor/ARB to ARNI if appropriate. Caution is required for patients with chronic Class IV HF with decompensated HF; these patients may not tolerate even low doses of beta blockers and RAS, although an attempt at titration may be made. Patients whose short-term trajectory is stalled or worsening (denoted by the orange weathervane icon) should have re-evaluation of comorbidities and consideration of other diagnoses. The long-term trajectory (denoted by the compass icon) should be reevaluated, with consideration of goals of care, candidacy for advanced therapies, and experimental treatments. The ideal goal is initiation of all 4 pillars of GDMT for HFrEF in the hospital on a baseline of diuretic therapy. A plan for ongoing addition and titration of GDMT after discharge should be fashioned as well. ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ARNI = angiotensin receptor/neprilysin inhibitor; BB = beta-blocker; BP = blood pressure; d/c = discharge; GDMT = guideline-directed medical therapy; MRA = mineralocorticoid antagonist; RAS = renin-angiotensin system; SGLT = sodium-glucose cotransporter.

FIGURE 10 Education for Patients, Families, and Caregivers

EDUCATION FOR PATIENTS, FAMILIES, AND CAREGIVERS

- ☐ Current medications
  - Indication
  - Dose/frequency
  - Potential side effects
  - Potential adherence barriers
- ☐ Activity level
- ☐ Dietary sodium restriction _____mg/day
- ☐ Fluid restriction ☐ Yes _____L/day or ☐ No
- ☐ Daily weight monitoring
  - Has scale ☐ Yes ☐ No
  - Records daily weights ☐ Yes ☐ No
- ☐ Assessment for peripheral edema
- ☐ Smoking cessation counseling for current or recent smokers
- ☐ Substance use counseling, if applicable
- ☐ List of warning signs of decompensation
- ☐ What to bring to each outpatient appointment
  - List of meds
  - Recordings of daily weights
- ☐ Who to call for increased weight / worsening symptoms / ICD discharge

_____

- ☐ Diuretic management plan
- ☐ Plans for continuation of care
  - Cardiology specialty clinic follow-up appointment _____/_____/_____

L = liter; ICD = implantable cardioverter-defibrillator.

Address SDOH and Disparities

Recommendations for Addressing SDOH and Disparities in Vulnerable Populations

COR	RECOMMENDATIONS
1	In patients presenting with HF, a thorough history and physical examination should be obtained and performed to identify cardiac and noncardiac disorders, lifestyle and behavioral factors, and social determinants of health that might cause or accelerate the development or progression of HF.

COR	RECOMMENDATIONS
1	Evidence of health disparities should be monitored and addressed at the clinical practice and the health care system levels.

COR	RECOMMENDATIONS
1	In vulnerable patient populations at risk for health disparities, HF risk assessments and multidisciplinary management strategies should target both known risks for CVD and social determinants of health, as a means toward elimination of disparate HF outcomes.

Take Home Point:

Class I recommendation to assess, monitor, and address SDOH and disparities impacting HF patients with multidisciplinary management, across phases of care.

American Heart Association.

Abbreviations: CVD indicates cardiovascular disease; and HF, heart failure.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

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It Takes a Village

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