HEART FAILURE – A GROWING DIAGNOSIS

Nandini Nair MD, PhD, FACC, FACP, FAHA, FHFSA

Professor of Medicine, Division of Cardiology,
Medical Director, Advanced Heart Failure/
Transplant Cardiology.
TTUHSC , Lubbock, TX

Education

Medical School

- St. George's University, Grenada, West Indies

Post-Doctorate, Molecular Virology

- UMASS Medical Center, Worcester, MA

Doctorate, Biochemistry

- Indian Institute of Science, Bangalore, India

Clinical Training

- **Fellow, Advanced Heart Failure/Cardiac Transplant**, Stanford University School of Medicine, Stanford, CA
- **Fellow, Cardiovascular Medicine**, Drexel University College of Medicine, Philadelphia, PA
- **Fellow, Vascular Medicine**, Stanford University School of Medicine, Stanford, CA
- **Intern/Resident, Internal Medicine**, Drexel University College of Medicine, Philadelphia, PA

Contact Information

Phone: 806.743.1501

Fax: 806.743.1183

Center for Cardiovascular Health
3601 4th Street
Lubbock, Texas 79430

American Heart Association.

Cardiology Procedures:

- Advanced Heart Failure
- Medical Management of Mechanical
- Circulatory support--LVADs/ECMOs
- Transplant Cardiology
- Echocardiography
- Nuclear Cardiology
- Vascular Medicine

Contact Information

Phone: 806.743.1501

Fax: 806.743.1183

Center for Cardiovascular Health
3601 4th Street
Lubbock, Texas 79430

Texas Tech Physicians. | UMC HEALTH SYSTEM

American Heart Association.

DISCLOSURES

FINANCIAL DISCLOSURE:
No financial relationships to disclose

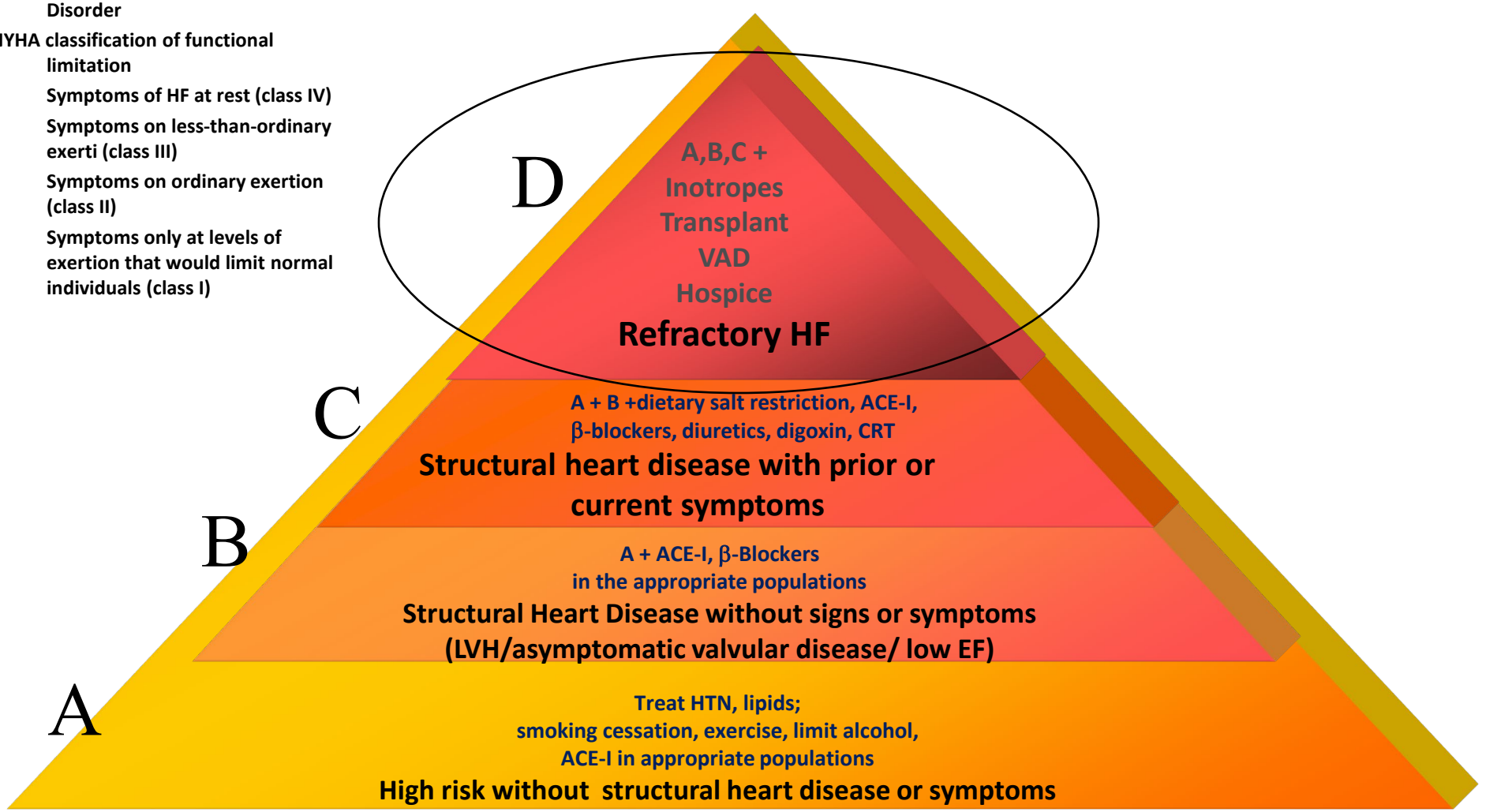
UNLABELED/UNAPPROVED USES DISCLOSURE:
None to disclose

Heart Failure is a Progressive Disorder

Heart Failure As a Symptomatic Disorder

NYHA classification of functional limitation

- **Symptoms of HF at rest (class IV)**
- **Symptoms on less-than-ordinary exerti (class III)**
- **Symptoms on ordinary exertion (class II)**
- **Symptoms only at levels of exertion that would limit normal individuals (class I)**



Hunt SA et al. *J Am Coll Cardiol.* 2001;38:2101–2113.

American Heart Association.

Heart Failure

- Heart failure happens when the heart cannot pump enough blood and oxygen to support other organs in your body

- Heart failure is a serious condition, but it does not mean that the heart has stopped beating

- About **6.5 million** adults in the United States have heart failure

- Heart failure was a contributing cause of **1 in 8 deaths** in 2017

- Heart failure costs the nation an estimated **$30.7 billion** in 2012

- This total includes the **cost of health care services, medicines to treat heart failure, and missed days of work.**

TYPES OF HEART FAILURE

- HEART FAILURE CAN BE CLASSIFIED AS LEFT SIDED AND /OR RIGHT SIDED.
- WHEN FLUID BACKS UP INTO THE LUNGS AND TISSUES IT IS CALLED **CONGESTIVE HEART FAILURE** .
- THE PUMPING ACTION OF THE HEART MOVES OXYGEN-RICH BLOOD TO THE REST OF THE BODY.
- THE LEFT SIDE OF THE HEART SUPPLIES MOST OF THE HEART'S PUMPING POWER, SO IT'S LARGER THAN THE OTHER CHAMBERS AND ESSENTIAL FOR NORMAL FUNCTION.
- IN LEFT-SIDED FAILURE, THE LEFT SIDE OF THE HEART MUST WORK HARDER TO PUMP THE SAME AMOUNT OF BLOOD MAKING IT WEAKER AND EVENTUALLY FAIL.
- IN RIGHT SIDED FAILURE THE HEART FAILS TO PUMP BLOOD BACK OUT OF THE HEART INTO THE LUNGS TO BE REPLENISHED WITH OXYGEN.

TYPES OF HEART FAILURE

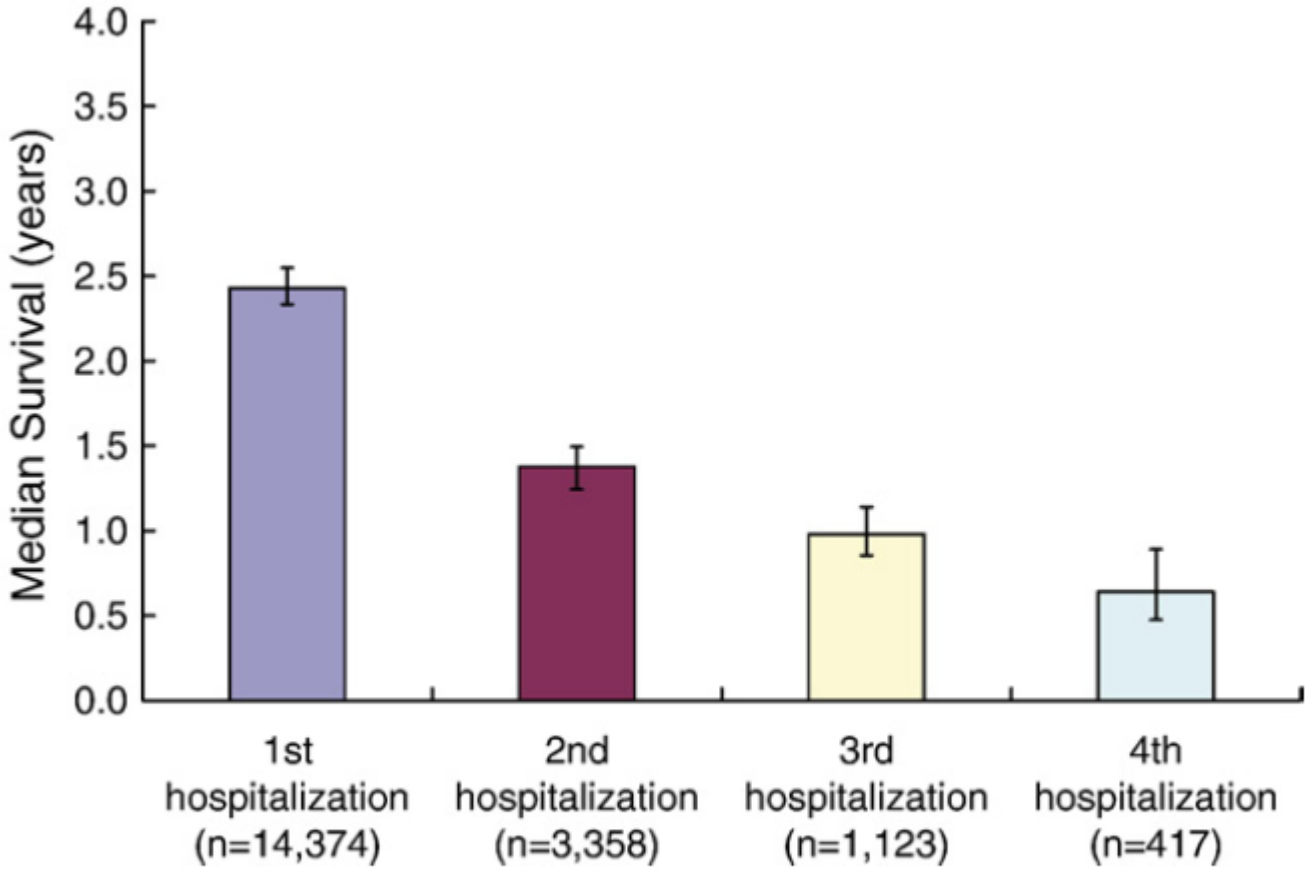
- RIGHT-SIDED HEART FAILURE USUALLY IS A CONSEQUENCE OF LEFT-SIDED FAILURE.
- WHEN THE LEFT SIDE FAILS IT CAUSES INCREASED FLUID PRESSURE DAMAGING THE RIGHT SIDE.
- WHEN THE RIGHT SIDE LOSES PUMPING POWER, BLOOD BACKS UP INTO THE VEINS.
- THIS USUALLY CAUSES SWELLING IN THE LEGS, ANKLES AND ABDOMEN INTESTINES AND THE LIVER. THIS IS WHAT CAUSES LIVER FAILURE.
- HEART FAILURE ALSO AFFECTS THE KIDNEYS CAUSING RETENTION OF SODIUM AND WATER WHICH LEADS TO SWELLING IN THE TISSUES.

Length of Stay and 30-day Readmission and Mortality

REDUCTIONS IN LENGTH OF STAY AND INPATIENT/30 DAY MORTALITY AS WELL AS READMISSIONS ARE INVERSELY PROPORTIONAL (BUENO H JAMA 2010 303 --- MEDICARE POP 1993 TO 2006)

VA STUDY FROM 1997 TO 2010 SHOWED NO INCREASE IN READMISSION RATE WITH DECREASE IN LENGTH OF STAY (KABOLI ET AL ANN INTERN MED 2012 157; 837)

Figure 2



Median survival (50% mortality) and 95% confidence limits in patients with HF after each HF hospitalization.

Setoguchi et al AM Heart J 2007 154 260-266

American Heart Association.

CMS PENALTIES

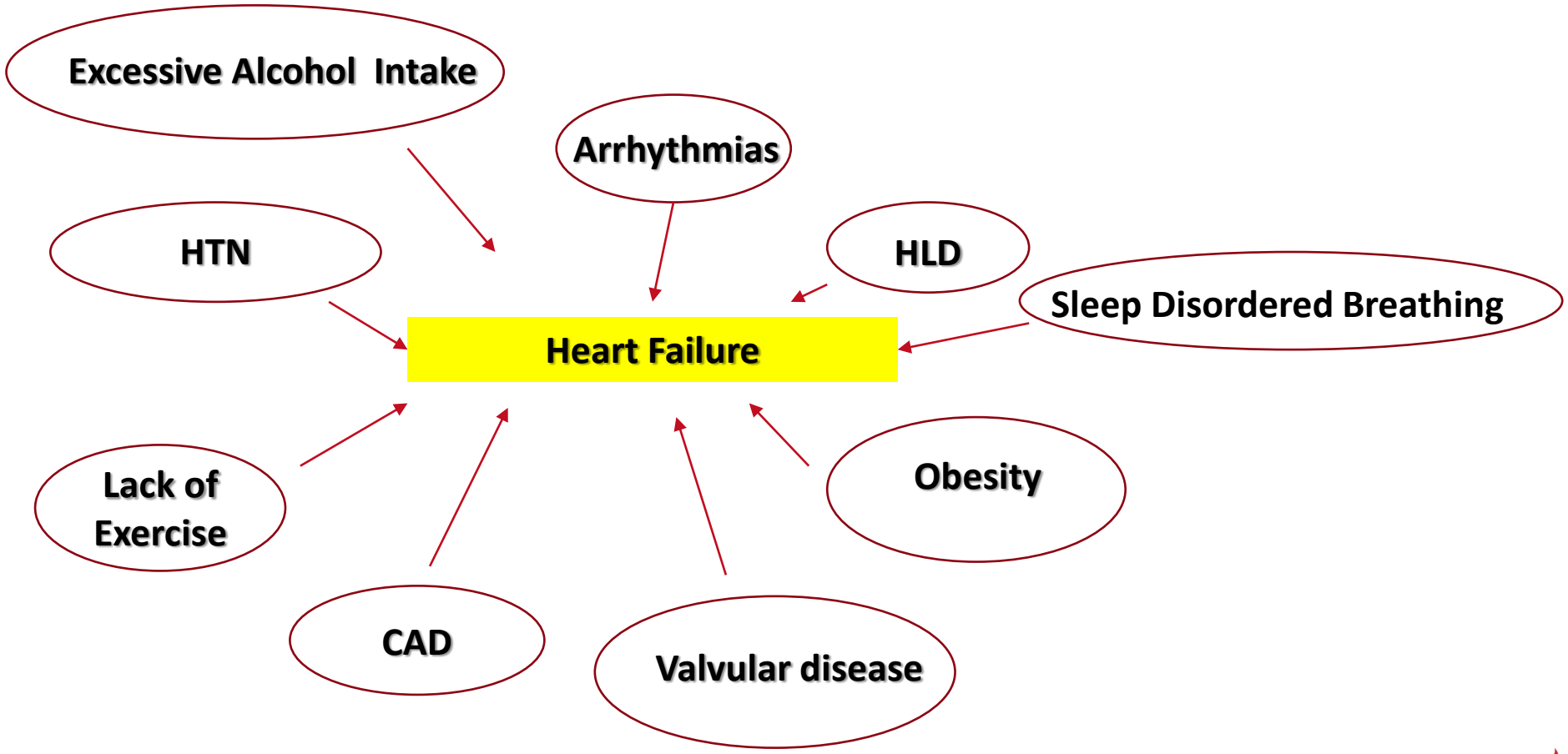
BASED ON 3-YEAR DISCHARGE DATA

MAX PENALTY 3% IN 2015 ONWARDS FOR ALL CMS HOSPITAL PAYMENTS NOT DISEASE SPECIFIC PAYMENTS

www.cms.gov

American Heart Association.

Risk Factors for Heart Failure

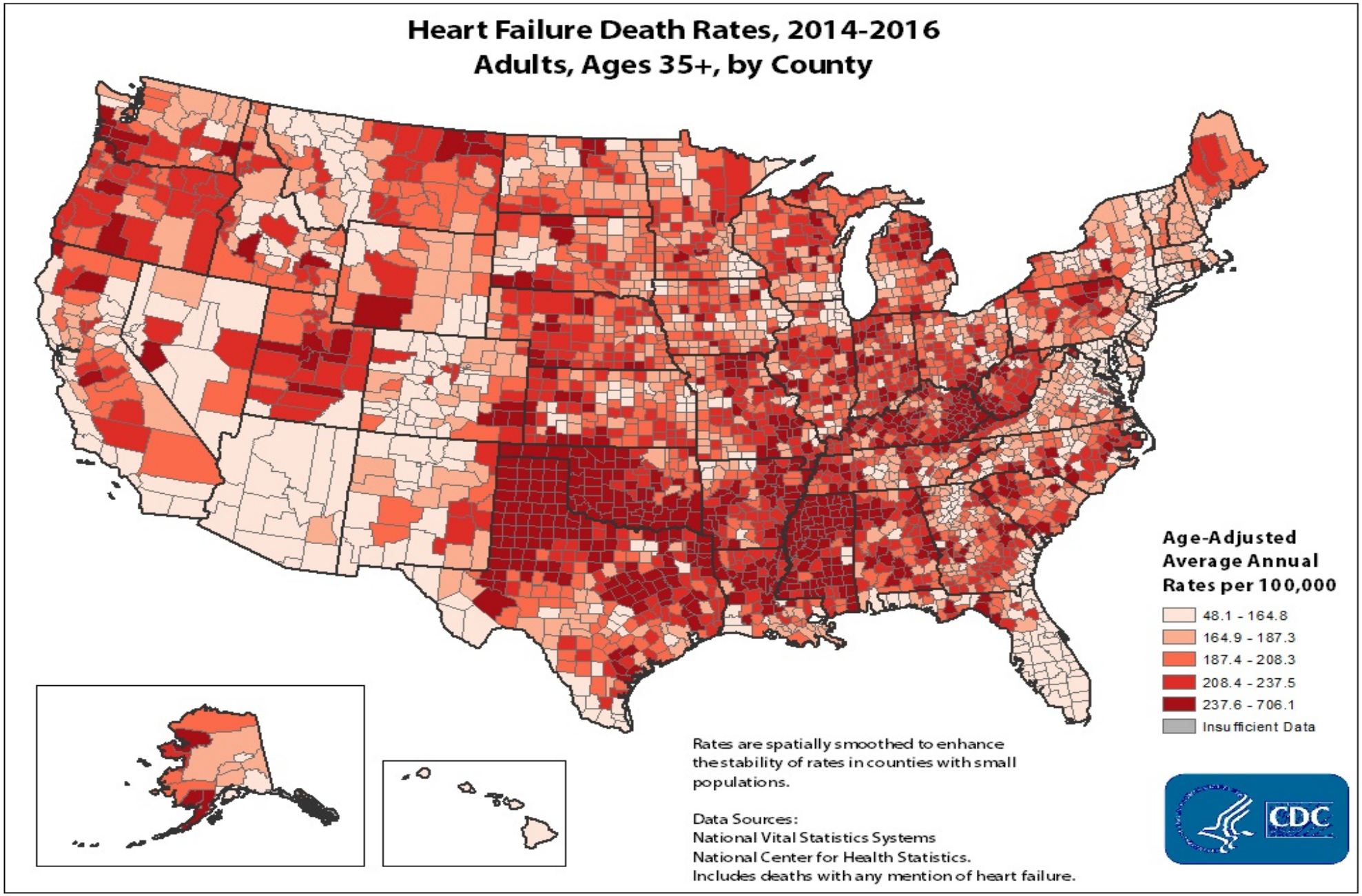


American Heart Association.

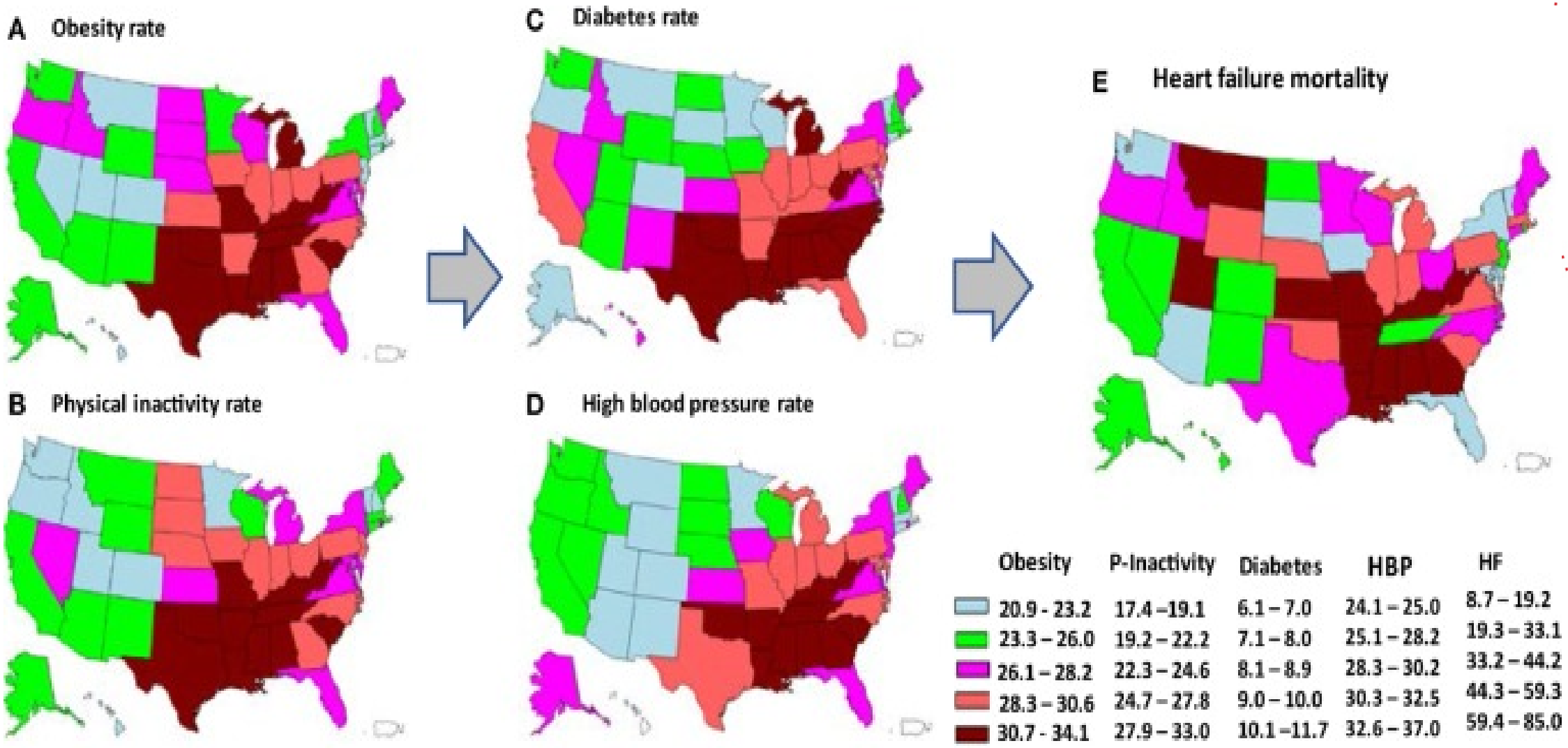
RISK FACTORS

Unhealthy behaviors can also increase your risk for heart failure, especially for people with risk factors

- Smoking tobacco
- Eating foods high in fat, cholesterol, and sodium
- Not getting enough physical activity
- Excessive alcohol intake



American Heart Association.



American Heart Association.

QUESTIONS

American Heart Association

GUIDELINES FOR CARE OF HEART FAILURE PATIENTS – IN THE HOSPITAL AND BEYOND

Nandini Nair MD, PhD, FACC, FACP, FAHA, FHFSA

Professor of Medicine, Division of Cardiology,
Medical Director, Advanced Heart Failure/
Transplant Cardiology.
TTUHSC , Lubbock, TX

DEFINITION OF HEART FAILURE

Classification	Ejection Fraction	Description
I. **Heart Failure with Reduced Ejection Fraction (HF*r*EF)**	≤40%	Also referred to **as systolic HF**. Randomized clinical trials have mainly enrolled patients with HF*r*EF and **it is only in these patients that efficacious therapies have been demonstrated to date.**
II. Heart Failure with Preserved Ejection Fraction (HF*p*EF)	≥50%	Also referred to as diastolic HF. Several different criteria have been used to further define HF*p*EF. The diagnosis of HF*p*EF is challenging because it is **largely one of exclusion**. To date, **efficacious therapies have not been identified.**
a. HF*p*EF, Borderline	41% to 49%	These patients fall into a borderline or intermediate group. Their characteristics, treatment patterns, and outcomes appear similar to those of patient **with HF*p*EF.**
b. HF*p*EF, Improved	>40%	It has been recognized that a subset of patients with HF*p*EF previously had **HF*r*EF.** These patients with improvement or recovery in EF may be clinically distinct from those with persistently preserved or reduced EF. **Further research is needed to better characterize these patients.**

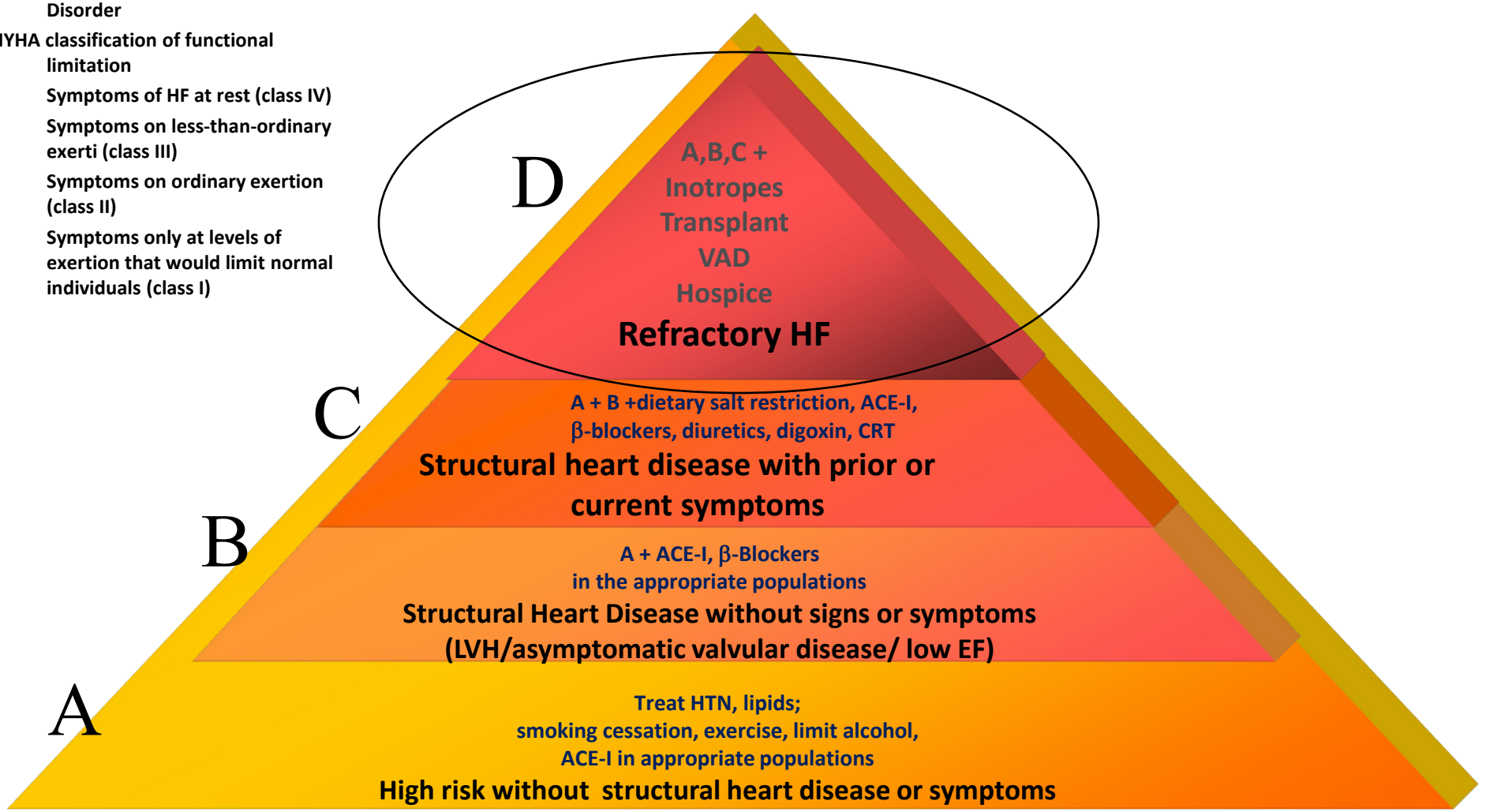
Yancy C et al 2013 ACC/AHA guidelines

Heart Failure as a Progressive Disorder

Heart Failure As a Symptomatic Disorder

NYHA classification of functional limitation

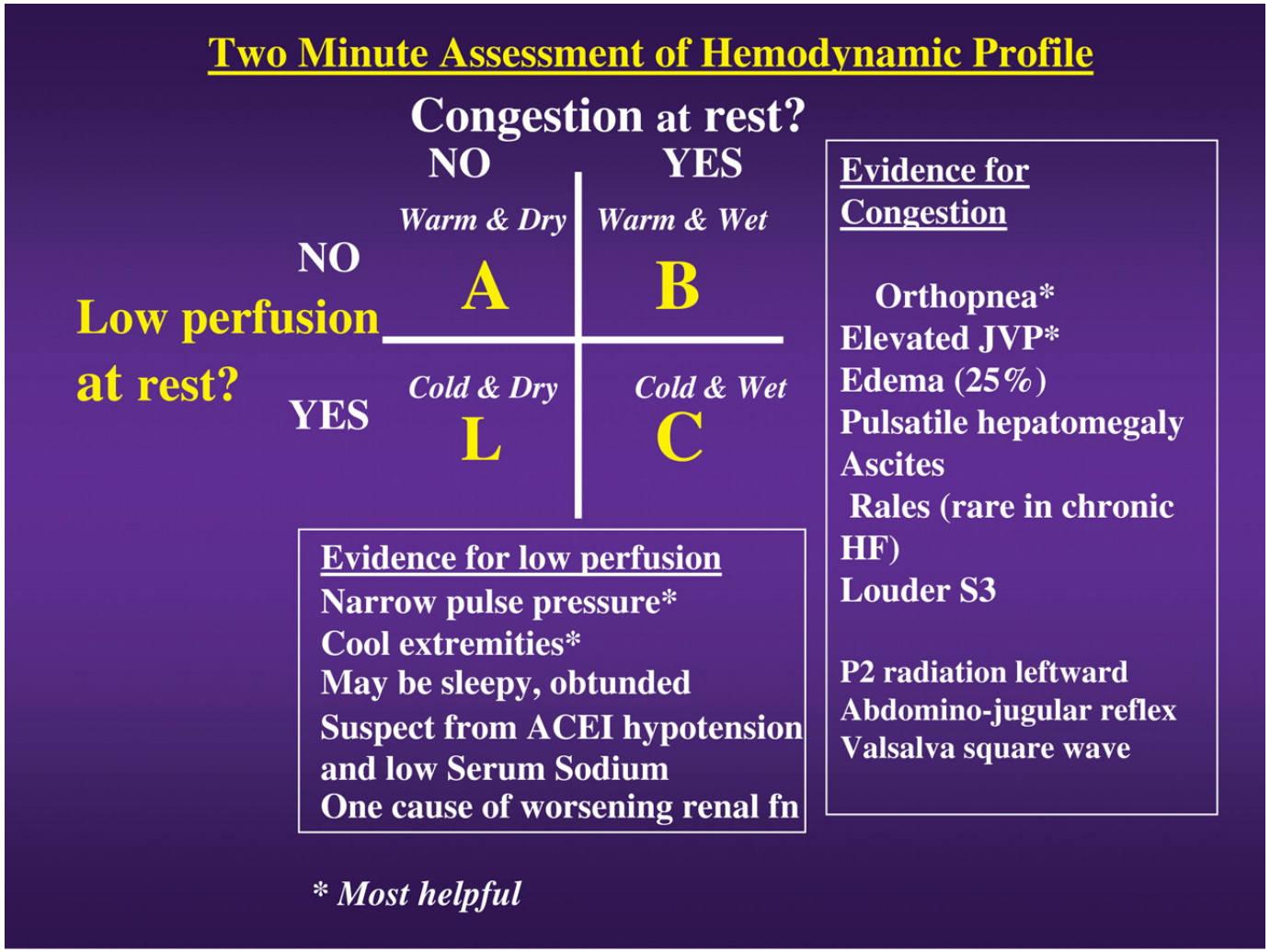
- **Symptoms of HF at rest (class IV)**
- **Symptoms on less-than-ordinary exerti (class III)**
- **Symptoms on ordinary exertion (class II)**
- **Symptoms only at levels of exertion that would limit normal individuals (class I)**



Hunt SA et al. *J Am Coll Cardiol.* 2001;38:2101–2113.

American Heart Association.

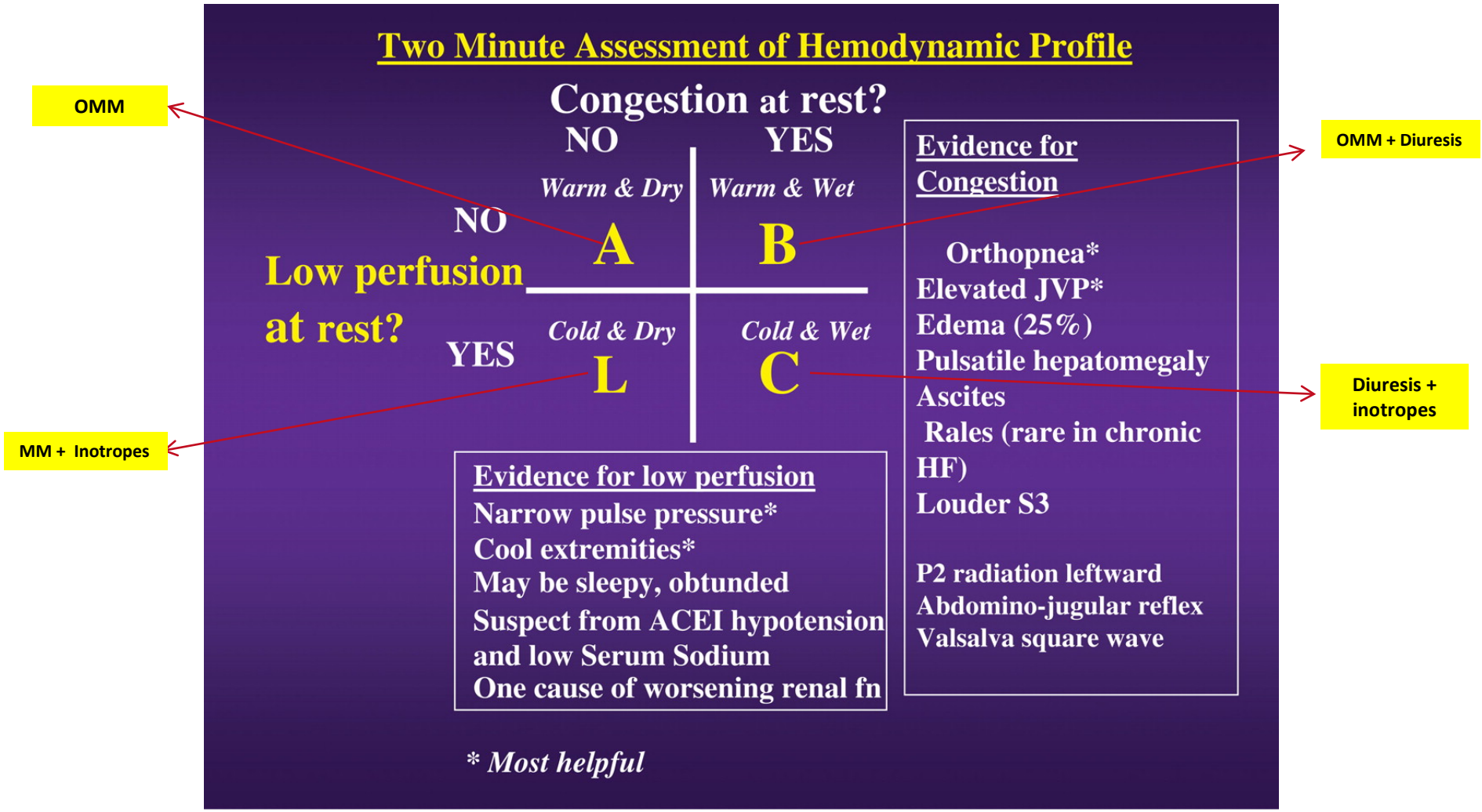
Four basic hemodynamic profiles to be determined during 2 min clinical assessment for patients with advanced heart failure.



Stevenson L W Eur J Heart Fail 2005;7:323-331

EUROPEAN JOURNAL OF HEART FAILURE

Four basic hemodynamic profiles to be determined during 2 min clinical assessment for patients with advanced heart failure.

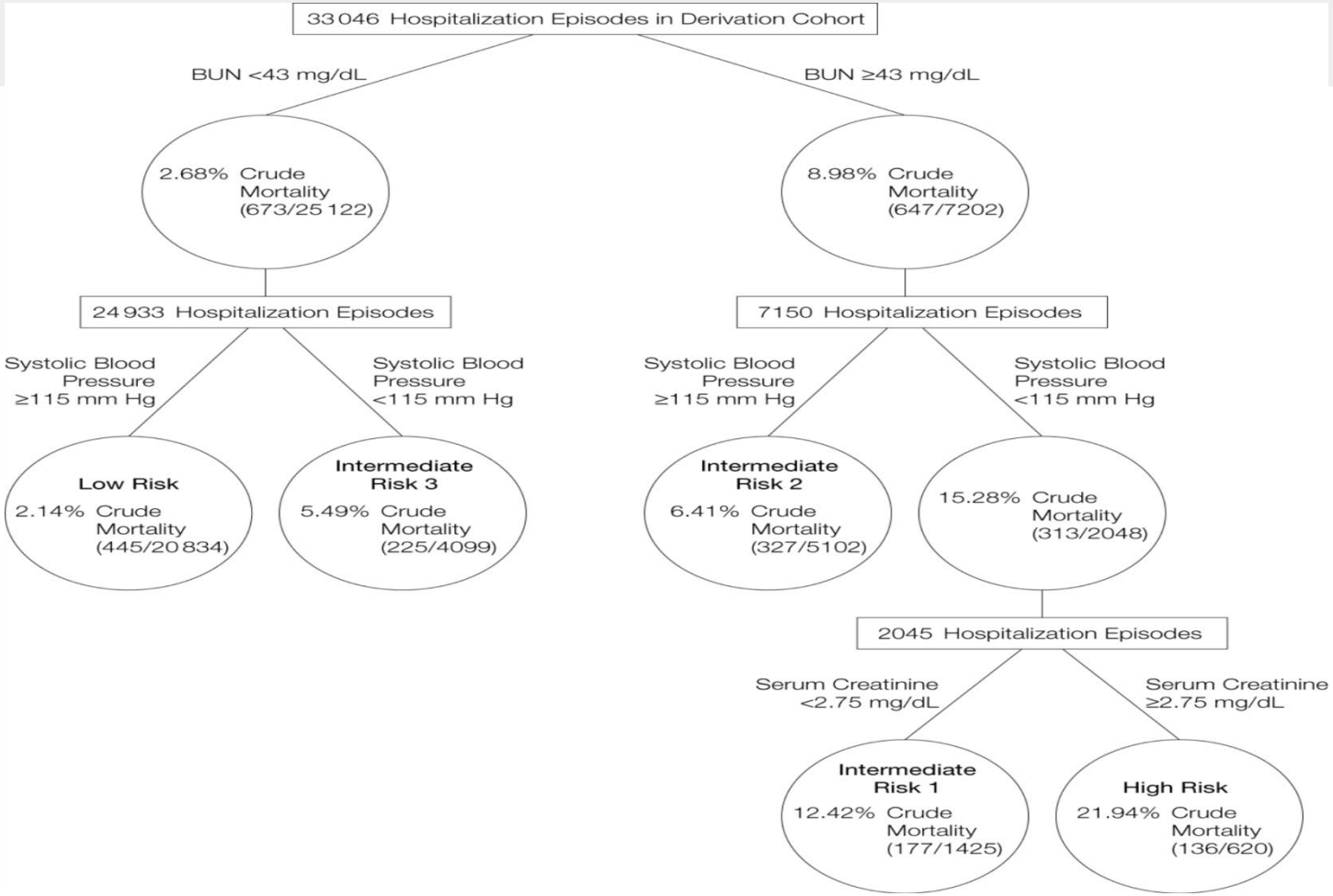


Stevenson L W Eur J Heart Fail 2005;7:323-331

EUROPEAN JOURNAL OF HEART FAILURE

ADHERE-CART trial

From: **Risk Stratification for In-Hospital Mortality in Acutely Decompensated Heart Failure: Classification and Regression Tree Analysis Fonorow et al** JAMA. 2005;293(5):572-580.



RECOMMENDATIONS FOR BIOMARKERS IN HF

Biomarker, Application	Setting	COR	LOE
Natriuretic peptides			
Diagnosis or exclusion of HF	Ambulatory, Acute	I	A
Prognosis of HF	Ambulatory, Acute	I	A
Achieve GDMT	Ambulatory	IIa	B
Guidance of acutely decompensated HF therapy	Acute	IIb	C
Biomarkers of myocardial injury			
Additive risk stratification	Acute, Ambulatory	I	A
Biomarkers of myocardial fibrosis			
Additive risk stratification	Ambulatory	IIb	B
	Acute	IIb	A

CAUSES FOR ELEVATED NATRIURETIC PEPTIDE LEVELS

Cardiac	Noncardiac
• Heart failure, including RV syndromes • Acute coronary syndrome • Heart muscle disease, including LVH • Valvular heart disease • Pericardial disease • Atrial fibrillation • Myocarditis • Cardiac surgery • Cardioversion	• Advancing age • Anemia • Renal failure • Pulmonary causes: obstructive sleep apnea, severe pneumonia, pulmonary hypertension • Critical illness • Bacterial sepsis • Severe burns • Toxic-metabolic insults, including cancer chemotherapy and envenomation

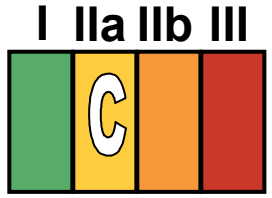
RECOMMENDATIONS FOR TREATMENT OF STAGE B HF

Recommendations	COR	LOE
In patients with a history of MI and reduced EF, ACE inhibitors or ARBs should be used to prevent HF	I	A
In patients with MI and reduced EF, evidence-based beta blockers should be used to prevent HF	I	B
In patients with MI, statins should be used to prevent HF	I	A
Blood pressure should be controlled to prevent symptomatic HF	I	A
ACE inhibitors should be used in all patients with a reduced EF to prevent HF	I	A
Beta blockers should be used in all patients with a reduced EF to prevent HF	I	C
An ICD is reasonable in patients with asymptomatic ischemic cardiomyopathy who are at least 40 d post-MI, have an LVEF ≤30%, and on GDMT	IIa	B
Nondihydropyridine calcium channel blockers may be harmful in patients with low LVEF	III: Harm	C

STAGE C: NONPHARMACOLOGICAL INTERVENTIONS

PATIENTS WITH HF SHOULD RECEIVE SPECIFIC EDUCATION TO FACILITATE HF SELF-CARE.

EXERCISE TRAINING (OR REGULAR PHYSICAL ACTIVITY) IS RECOMMENDED AS SAFE AND EFFECTIVE FOR PATIENTS WITH HF WHO ARE ABLE TO PARTICIPATE TO IMPROVE FUNCTIONAL STATUS.

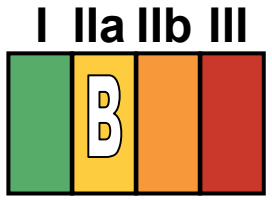


SODIUM RESTRICTION IS REASONABLE FOR PATIENTS WITH SYMPTOMATIC HF TO REDUCE CONGESTIVE SYMPTOMS.

American Heart Association.

STAGE C: NONPHARMACOLOGICAL INTERVENTIONS (CONT.)

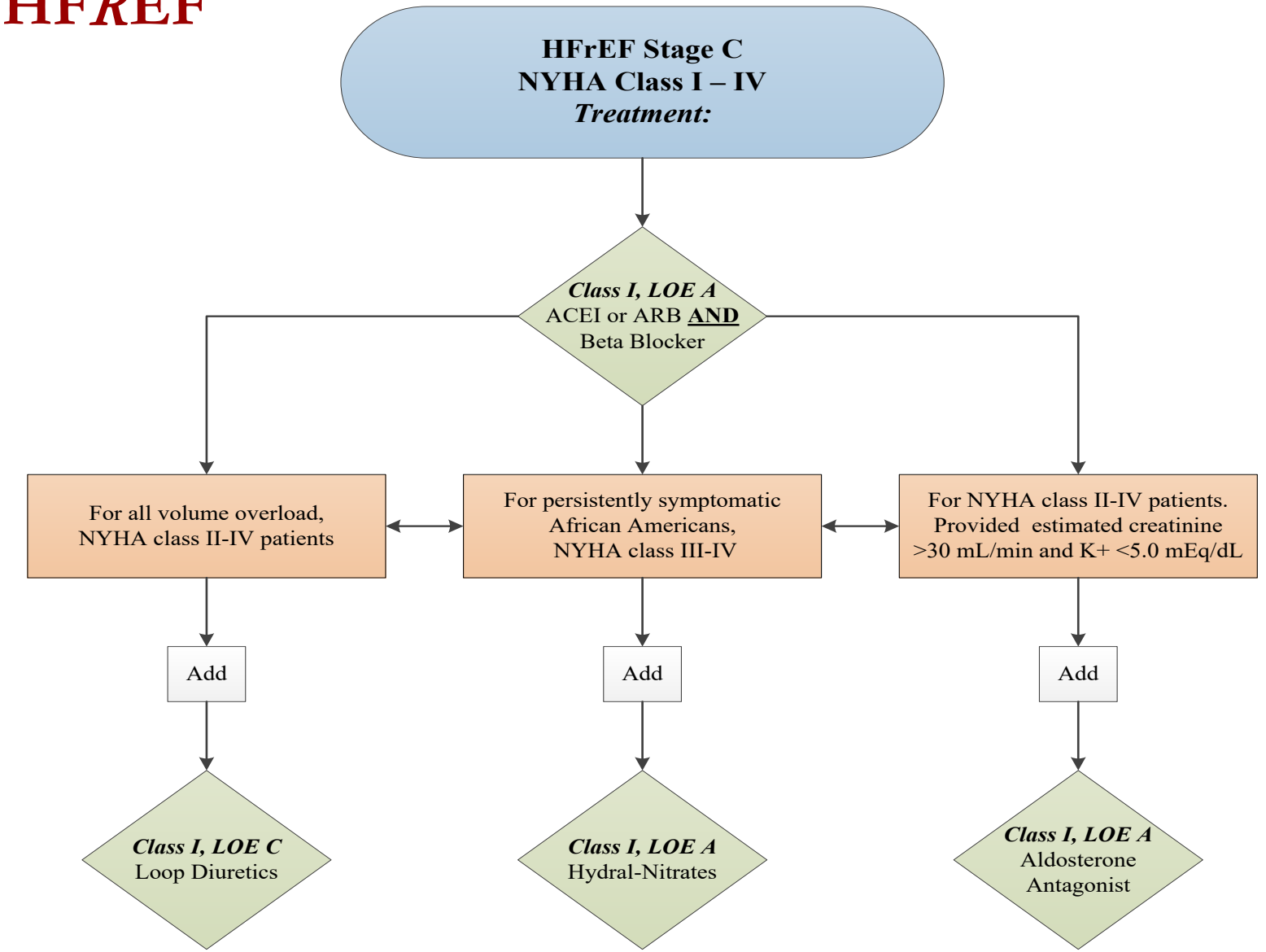
CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) CAN BE BENEFICIAL TO INCREASE LVEF AND IMPROVE FUNCTIONAL STATUS IN PATIENTS WITH HF AND SLEEP APNEA.



CARDIAC REHABILITATION CAN BE USEFUL IN CLINICALLY STABLE PATIENTS WITH HF TO IMPROVE FUNCTIONAL CAPACITY, EXERCISE DURATION, HRQOL, AND MORTALITY.

American Heart Association.

PHARMACOLOGIC TREATMENT FOR STAGE C HF*R*EF



American Heart Association.

PHARMACOLOGICAL TREATMENT FOR STAGE C HF*R*EF (CONT.)

DIURETICS ARE RECOMMENDED IN PATIENTS WITH HF*R*EF WHO HAVE EVIDENCE OF FLUID RETENTION, UNLESS CONTRAINDICATED, TO IMPROVE SYMPTOMS.

ACE INHIBITORS ARE RECOMMENDED IN PATIENTS WITH HF*R*EF AND CURRENT OR PRIOR SYMPTOMS, UNLESS CONTRAINDICATED, TO REDUCE MORBIDITY AND MORTALITY.

ARBS ARE RECOMMENDED IN PATIENTS WITH HF*R*EF WITH CURRENT OR PRIOR SYMPTOMS WHO ARE ACE INHIBITOR–INTOLERANT, UNLESS CONTRAINDICATED, TO REDUCE MORBIDITY AND MORTALITY.

American Heart Association.

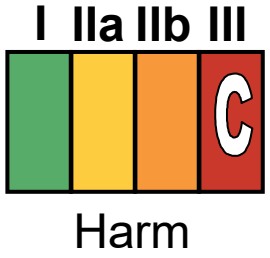
DRUGS COMMONLY USED FOR HF*R*EF (STAGE C HF)

Drug	Initial Daily Dose(s)	Maximum Doses(s)	Mean Doses Achieved in Clinical Trials
ACE Inhibitors			
Captopril	6.25 mg 3 times	50 mg 3 times	122.7 mg/d (421)
Enalapril	2.5 mg twice	10 to 20 mg twice	16.6 mg/d (412)
Fosinopril	5 to 10 mg once	40 mg once	---------
Lisinopril	2.5 to 5 mg once	20 to 40 mg once	32.5 to 35.0 mg/d (444)
Perindopril	2 mg once	8 to 16 mg once	---------
Quinapril	5 mg twice	20 mg twice	---------
Ramipril	1.25 to 2.5 mg once	10 mg once	---------
Trandolapril	1 mg once	4 mg once	---------
ARBs			
Candesartan	4 to 8 mg once	32 mg once	24 mg/d (419)
Losartan	25 to 50 mg once	50 to 150 mg once	129 mg/d (420)
Valsartan	20 to 40 mg twice	160 mg twice	254 mg/d (109)
Aldosterone Antagonists			
Spironolactone	12.5 to 25 mg once	25 mg once or twice	26 mg/d (424)
Eplerenone	25 mg once	50 mg once	42.6 mg/d (445)

DRUGS COMMONLY USED FOR HF*R*EF (STAGE C HF) (CONT.)

Drug	Initial Daily Dose(s)	Maximum Doses(s)	Mean Doses Achieved in Clinical Trials
Beta Blockers			
Bisoprolol	1.25 mg once	10 mg once	8.6 mg/d (118)
Carvedilol	3.125 mg twice	50 mg twice	37 mg/d (446)
Carvedilol CR	10 mg once	80 mg once	---
Metoprolol succinate extended release (metoprolol CR/XL)	12.5 to 25 mg once	200 mg once	159 mg/d (447)
Hydralazine & Isosorbide Dinitrate			
Fixed dose combination (423)	37.5 mg hydralazine/ 20 mg isosorbide dinitrate 3 times daily	75 mg hydralazine/ 40 mg isosorbide dinitrate 3 times daily	~175 mg hydralazine/90 mg isosorbide dinitrate daily
Hydralazine and isosorbide dinitrate (448)	Hydralazine: 25 to 50 mg, 3 or 4 times daily and isorsorbide dinitrate: 20 to 30 mg 3 or 4 times daily	Hydralazine: 300 mg daily in divided doses and isosorbide dinitrate 120 mg daily in divided doses	---

PHARMACOLOGICAL TREATMENT FOR STAGE C HF*R*EF (CONT.)



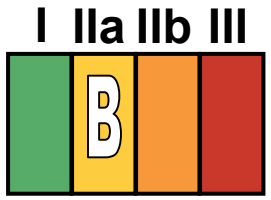
ROUTINE *COMBINED* USE OF AN ACE INHIBITOR, ARB, AND ALDOSTERONE ANTAGONIST IS POTENTIALLY HARMFUL FOR PATIENTS WITH HF*R*EF.

USE OF 1 OF THE 3 BETA BLOCKERS PROVEN TO REDUCE MORTALITY (I.E., BISOPROLOL, CARVEDILOL, AND SUSTAINED-RELEASE METOPROLOL SUCCINATE) IS RECOMMENDED FOR ALL PATIENTS WITH CURRENT OR PRIOR SYMPTOMS OF HF*R*EF, UNLESS CONTRAINDICATED, TO REDUCE MORBIDITY AND MORTALITY.

American Heart Association.

PHARMACOLOGICAL TREATMENT FOR STAGE C HF*R*EF (CONT.)

THE COMBINATION OF HYDRALAZINE AND ISOSORBIDE DINITRATE IS RECOMMENDED TO REDUCE MORBIDITY AND MORTALITY FOR PATIENTS SELF-DESCRIBED AS AFRICAN AMERICANS WITH NYHA CLASS III–IV HF*R*EF RECEIVING OPTIMAL THERAPY WITH ACE INHIBITORS AND BETA BLOCKERS, UNLESS CONTRAINDICATED.



A COMBINATION OF HYDRALAZINE AND ISOSORBIDE DINITRATE CAN BE USEFUL TO REDUCE MORBIDITY OR MORTALITY IN PATIENTS WITH CURRENT OR PRIOR SYMPTOMATIC HF*R*EF WHO CANNOT BE GIVEN AN ACE INHIBITOR OR ARB BECAUSE OF DRUG INTOLERANCE, HYPOTENSION, OR RENAL INSUFFICIENCY, UNLESS CONTRAINDICATED.

PHARMACOLOGICAL THERAPY FOR MANAGEMENT OF STAGE C HF*R*EF

Recommendations	COR	LOE
Diuretics		
Diuretics are recommended in patients with HFrEF with fluid retention	I	C
ACE Inhibitors		
ACE inhibitors are recommended for all patients with HFrEF	I	A
ARBs		
ARBs are recommended in patients with HFrEF who are ACE inhibitor intolerant	I	A
ARBs are reasonable as alternatives to ACE inhibitor as first line therapy in HFrEF	IIa	A
The addition of an ARB may be considered in persistently symptomatic patients with HFrEF on GDMT	IIb	A
Routine *combined* use of an ACE inhibitor, ARB, and aldosterone antagonist is potentially harmful	III: Harm	C

PHARMACOLOGICAL THERAPY FOR MANAGEMENT OF STAGE C HF*R*EF (CONT.)

Recommendations	COR	LOE
Beta Blockers		
Use of 1 of the 3 beta blockers proven to reduce mortality is recommended for all stable patients	I	A
Aldosterone Antagonists		
Aldosterone receptor antagonists are recommended in patients with NYHA class II-IV HF who have LVEF ≤35%	I	A
Aldosterone receptor antagonists are recommended in patients following an acute MI who have LVEF ≤40% with symptoms of HF or DM	I	B
Inappropriate use of aldosterone receptor antagonists may be harmful	III: Harm	B
Hydralazine and Isosorbide Dinitrate		
The combination of hydralazine and isosorbide dinitrate is recommended for African-Americans, with NYHA class III–IV HFrEF on GDMT	I	A
A combination of hydralazine and isosorbide dinitrate can be useful in patients with HFrEF who cannot be given ACE inhibitors or ARBs	IIa	B

PHARMACOLOGIC THERAPY FOR MANAGEMENT OF STAGE C HF*R*EF (CONT.)

Recommendations	COR	LOE
Digoxin		
Digoxin can be beneficial in patients with HFrEF	IIa	B
Anticoagulation		
Patients with chronic HF with permanent/persistent/paroxysmal AF and an additional risk factor for cardioembolic stroke should receive chronic anticoagulant therapy*	I	A
The selection of an anticoagulant agent should be individualized	I	C
Chronic anticoagulation is reasonable for patients with chronic HF who have permanent/persistent/paroxysmal AF but without an additional risk factor for cardioembolic stroke*	IIa	B
Anticoagulation is not recommended in patients with chronic HFrEF without AF, prior thromboembolic event, or a cardioembolic source	III: No Benefit	B
Statins		
Statins are not beneficial as adjunctive therapy when prescribed solely for HF	III: No Benefit	A
Omega-3 Fatty Acids		
Omega-3 PUFA supplementation is reasonable to use as adjunctive therapy in HFrEF or HFpEF patients	IIa	B

PHARMACOLOGICAL THERAPY FOR MANAGEMENT OF STAGE C HF*R*EF (CONT.)

Recommendations	COR	LOE
Other Drugs		
Nutritional supplements as treatment for HF are not recommended in HFrEF	III: No Benefit	B
Hormonal therapies other than to replete deficiencies are not recommended in HFrEF	III: No Benefit	C
Drugs known to adversely affect the clinical status of patients with HFrEF are potentially harmful and should be avoided or withdrawn	III: Harm	B
Long-term use of an infusion of a positive inotropic drug is not recommended and may be harmful except as palliation	III: Harm	C
Calcium Channel Blockers		
Calcium channel blocking drugs are not recommended as routine in HFrEF	III: No Benefit	A

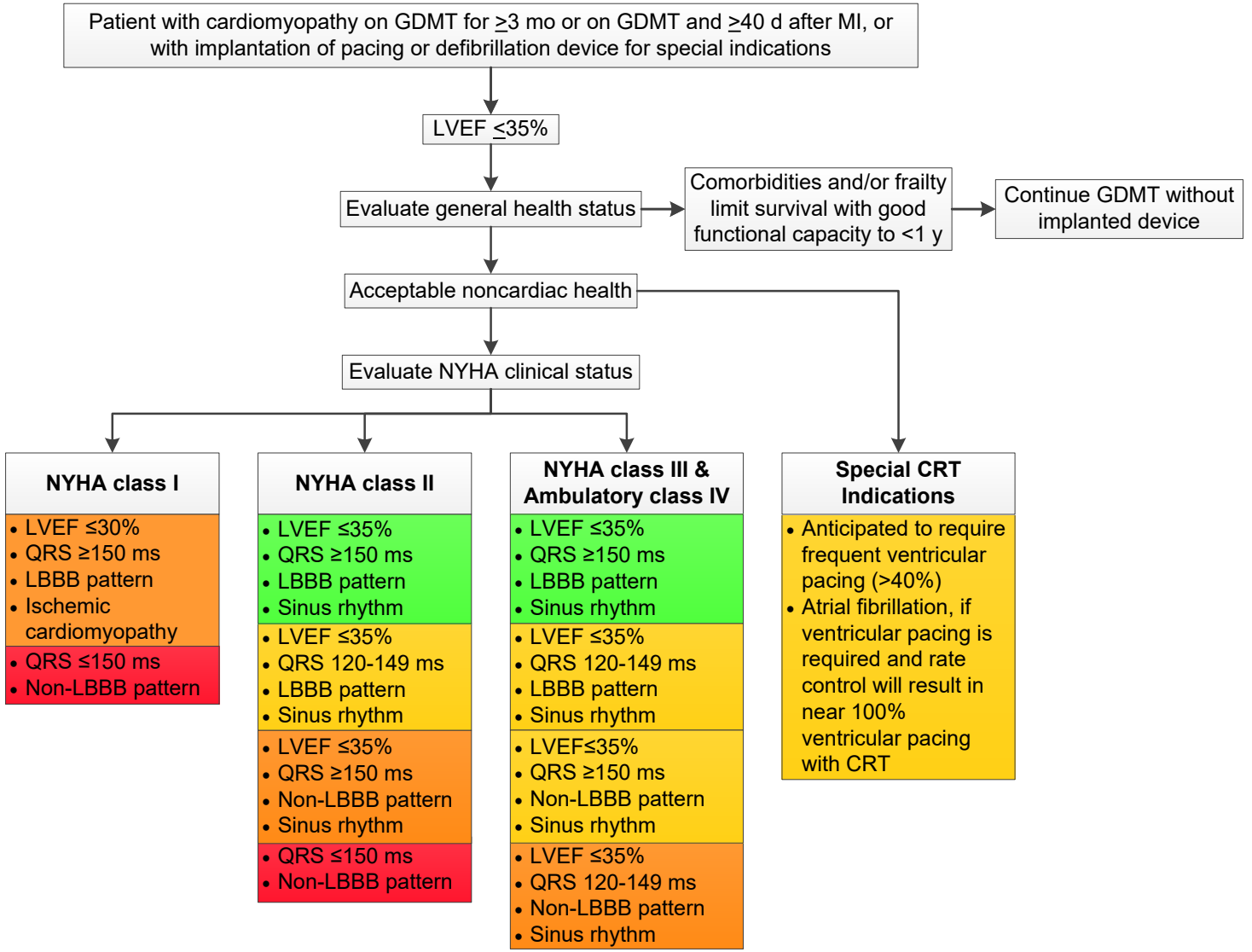
MEDICAL THERAPY FOR STAGE C HF*R*EF: MAGNITUDE OF BENEFIT DEMONSTRATED IN RCTS

GDMT	RR Reduction in Mortality	NNT for Mortality Reduction (Standardized to 36 mo)	RR Reduction in HF Hospitalizations
ACE inhibitor or ARB	17%	26	31%
Beta blocker	34%	9	41%
Aldosterone antagonist	30%	6	35%
Hydralazine/nitrate	43%	7	33%

TREATMENT OF HF*P*EF

Recommendations	COR	LOE
Systolic and diastolic blood pressure should be controlled according to published clinical practice guidelines	I	B
Diuretics should be used for relief of symptoms due to volume overload	I	C
Coronary revascularization for patients with CAD in whom angina or demonstrable myocardial ischemia is present despite GDMT	IIa	C
Management of AF according to published clinical practice guidelines for HFpEF to improve symptomatic HF	IIa	C
Use of beta-blocking agents, ACE inhibitors, and ARBs for hypertension in HFpEF	IIa	C
ARBs might be considered to decrease hospitalizations in HFpEF	IIb	B
Nutritional supplementation is not recommended in HFpEF	III: No Benefit	C

INDICATIONS FOR CRT THERAPY



Colors correspond to the class of recommendations in the ACCF/AHA Table 1.

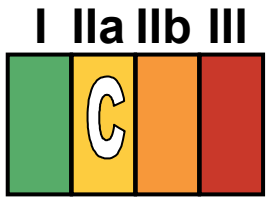
Benefit for NYHA class I and II patients has only been shown in CRT-D trials, and while patients may not experience immediate symptomatic benefit, late remodeling may be avoided along with long-term HF consequences. There are no trials that support CRT-pacing (without ICD) in NYHA class I and II patients. Thus, it is anticipated these patients would receive CRT-D unless clinical reasons or personal wishes make CRT-pacing more appropriate. In patients who are NYHA class III and ambulatory class IV, CRT-D may be chosen but clinical reasons and personal wishes may make CRT-pacing appropriate to improve symptoms and quality of life when an ICD is not expected to produce meaningful benefit in survival.

CLINICAL EVENTS AND FINDINGS USEFUL FOR IDENTIFYING PATIENTS WITH ADVANCED HF

Repeated (≥2) hospitalizations or ED visits for HF in the past year
Progressive deterioration in renal function (e.g., rise in BUN and creatinine)
Weight loss without other cause (e.g., cardiac cachexia)
Intolerance to ACE inhibitors due to hypotension and/or worsening renal function
Intolerance to beta blockers due to worsening HF or hypotension
Frequent systolic blood pressure <90 mm Hg
Persistent dyspnea with dressing or bathing requiring rest
Inability to walk 1 block on the level ground due to dyspnea or fatigue
Recent need to escalate diuretics to maintain volume status, often reaching daily furosemide equivalent dose >160 mg/d and/or use of supplemental metolazone therapy
Progressive decline in serum sodium, usually to <133 mEq/L
Frequent ICD shocks

Adapted from Russell et al. Congest Heart Fail. 2008;14:316-21.

WATER RESTRICTION

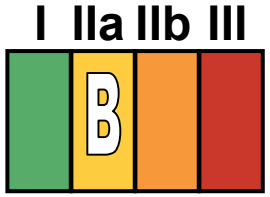


FLUID RESTRICTION (1.5 TO 2 L/D) IS REASONABLE IN STAGE D, ESPECIALLY IN PATIENTS WITH HYPONATREMIA, TO REDUCE CONGESTIVE SYMPTOMS.

American Heart Association.

INOTROPIC SUPPORT

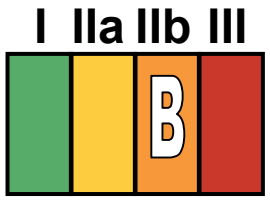
UNTIL DEFINITIVE THERAPY (E.G., CORONARY REVASCULARIZATION, MCS, HEART TRANSPLANTATION) OR RESOLUTION OF THE ACUTE PRECIPITATING PROBLEM, PATIENTS WITH CARDIOGENIC SHOCK SHOULD RECEIVE TEMPORARY INTRAVENOUS INOTROPIC SUPPORT TO MAINTAIN SYSTEMIC PERFUSION AND PRESERVE END-ORGAN PERFORMANCE.



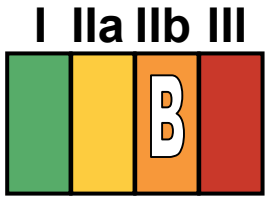
CONTINUOUS INTRAVENOUS INOTROPIC SUPPORT IS REASONABLE AS "BRIDGE THERAPY" IN PATIENTS WITH STAGE D REFRACTORY TO GDMT AND DEVICE THERAPY WHO ARE ELIGIBLE FOR AND AWAITING MCS OR CARDIAC TRANSPLANTATION.

American Heart Association.

INOTROPIC SUPPORT (CONT.)



SHORT-TERM, CONTINUOUS INTRAVENOUS INOTROPIC SUPPORT MAY BE REASONABLE IN THOSE HOSPITALIZED PATIENTS PRESENTING WITH DOCUMENTED SEVERE SYSTOLIC DYSFUNCTION WHO PRESENT WITH LOW BLOOD PRESSURE AND SIGNIFICANTLY DEPRESSED CARDIAC OUTPUT TO MAINTAIN SYSTEMIC PERFUSION AND PRESERVE END-ORGAN PERFORMANCE.



LONG-TERM, CONTINUOUS INTRAVENOUS INOTROPIC SUPPORT MAY BE CONSIDERED AS PALLIATIVE THERAPY FOR SYMPTOM CONTROL IN SELECT PATIENTS WITH STAGE D DESPITE OPTIMAL GDMT AND DEVICE THERAPY WHO ARE NOT ELIGIBLE FOR EITHER MCS OR CARDIAC TRANSPLANTATION.

American Heart Association.

INOTROPIC SUPPORT (CONT.)

Harm

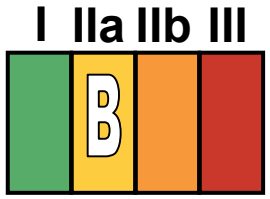
LONG-TERM USE OF EITHER CONTINUOUS OR INTERMITTENT, INTRAVENOUS PARENTERAL POSITIVE INOTROPIC AGENTS, IN THE ABSENCE OF SPECIFIC INDICATIONS OR FOR REASONS OTHER THAN PALLIATIVE CARE, IS POTENTIALLY HARMFUL IN THE PATIENT WITH HF.

Harm

USE OF PARENTERAL INOTROPIC AGENTS IN HOSPITALIZED PATIENTS WITHOUT DOCUMENTED SEVERE SYSTOLIC DYSFUNCTION, LOW BLOOD PRESSURE, OR IMPAIRED PERFUSION, AND EVIDENCE OF SIGNIFICANTLY DEPRESSED CARDIAC OUTPUT, WITH OR WITHOUT CONGESTION, IS POTENTIALLY HARMFUL.

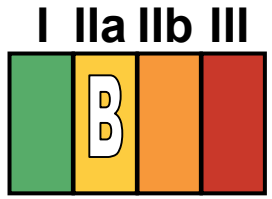
American Heart Association.

MECHANICAL CIRCULATORY SUPPORT



MCS USE IS BENEFICIAL IN CAREFULLY SELECTED* PATIENTS WITH STAGE D HF*R*EF IN WHOM DEFINITIVE MANAGEMENT (E.G., CARDIAC TRANSPLANTATION) OR CARDIAC RECOVERY IS ANTICIPATED OR PLANNED.

NONDURABLE MCS, INCLUDING THE USE OF PERCUTANEOUS AND EXTRACORPOREAL VENTRICULAR ASSIST DEVICES (VADS), IS REASONABLE AS A "BRIDGE TO RECOVERY" OR A "BRIDGE TO DECISION" FOR CAREFULLY SELECTED* PATIENTS WITH HF*R*EF WITH ACUTE, PROFOUND HEMODYNAMIC COMPROMISE.



DURABLE MCS IS REASONABLE TO PROLONG SURVIVAL FOR CAREFULLY SELECTED* PATIENTS WITH STAGE D HF*R*EF.

American Heart Association.

CARDIAC TRANSPLANTATION

EVALUATION FOR CARDIAC TRANSPLANTATION IS INDICATED FOR CAREFULLY SELECTED PATIENTS WITH STAGE D HF DESPITE GDMT, DEVICE, AND SURGICAL MANAGEMENT.

ARGININE VASOPRESSIN ANTAGONISTS

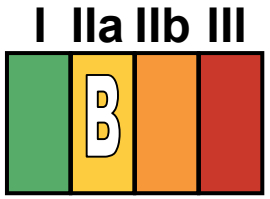
IN PATIENTS HOSPITALIZED WITH VOLUME OVERLOAD, INCLUDING HF, WHO HAVE PERSISTENT SEVERE HYPONATREMIA AND ARE AT RISK FOR OR HAVING ACTIVE COGNITIVE SYMPTOMS DESPITE WATER RESTRICTION AND MAXIMIZATION OF GDMT, VASOPRESSIN ANTAGONISTS MAY BE CONSIDERED IN THE SHORT TERM TO IMPROVE SERUM SODIUM CONCENTRATION IN HYPERVOLEMIC, HYPONATREMIC STATES WITH EITHER A V2 RECEPTOR SELECTIVE OR A NONSELECTIVE VASOPRESSIN ANTAGONIST.

THERAPIES IN THE HOSPITALIZED HF PATIENT

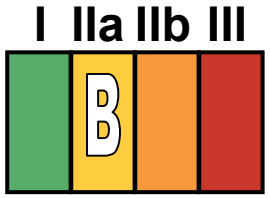
Recommendation	COR	LOE
HF patients hospitalized with fluid overload should be treated with intravenous diuretics	I	B
HF patients receiving loop diuretic therapy, should receive an initial parenteral dose greater than or equal to their chronic oral daily dose, then should be serially adjusted	I	B
HFrEF patients requiring HF hospitalization on GDMT should continue GDMT unless hemodynamic instability or contraindications	I	B
Initiation of beta-blocker therapy at a low dose is recommended after optimization of volume status and discontinuation of intravenous agents	I	B
Thrombosis/thromboembolism prophylaxis is recommended for patients hospitalized with HF	I	B
Serum electrolytes, urea nitrogen, and creatinine should be measured during the titration of HF medications, including diuretics	I	C

INPATIENT AND TRANSITIONS OF CARE

MULTIDISCIPLINARY HF DISEASE-MANAGEMENT PROGRAMS ARE RECOMMENDED FOR PATIENTS AT HIGH RISK FOR HOSPITAL READMISSION, TO FACILITATE THE IMPLEMENTATION OF GDMT, TO ADDRESS DIFFERENT BARRIERS TO BEHAVIORAL CHANGE, AND TO REDUCE THE RISK OF SUBSEQUENT REHOSPITALIZATION FOR HF.



SCHEDULING AN EARLY FOLLOW-UP VISIT (WITHIN 7 TO 14 DAYS) AND EARLY TELEPHONE FOLLOW-UP (WITHIN 3 DAYS) OF HOSPITAL DISCHARGE IS REASONABLE.



USE OF CLINICAL RISK PREDICTION TOOLS AND/OR BIOMARKERS TO IDENTIFY PATIENTS AT HIGHER RISK FOR POST-DISCHARGE CLINICAL EVENTS IS REASONABLE.

American Heart Association.

THERAPIES IN THE HOSPITALIZED HF PATIENT

Recommendation	COR	LOE
HF patients hospitalized with fluid overload should be treated with intravenous diuretics	I	B
HF patients receiving loop diuretic therapy, should receive an initial parenteral dose greater than or equal to their chronic oral daily dose, then should be serially adjusted	I	B
HFrEF patients requiring HF hospitalization on GDMT should continue GDMT unless hemodynamic instability or contraindications	I	B
Initiation of beta-blocker therapy at a low dose is recommended after optimization of volume status and discontinuation of intravenous agents	I	B
Thrombosis/thromboembolism prophylaxis is recommended for patients hospitalized with HF	I	B
Serum electrolytes, urea nitrogen, and creatinine should be measured during the titration of HF medications, including diuretics	I	C

CONCLUSIONS

EVIDENCE-BASED GUIDELINE DIRECTED DIAGNOSIS, EVALUATION AND THERAPY SHOULD BE THE MAINSTAY FOR ALL PATIENTS WITH HF.

EFFECTIVE IMPLEMENTATION OF GUIDELINE-DIRECTED BEST QUALITY CARE REDUCES MORTALITY, IMPROVES QOL AND PRESERVES HEALTH CARE RESOURCES.

ONGOING RESEARCH IS NEEDED TO ANSWER THE REMAINING QUESTIONS INCLUDING: PREVENTION, NONPHARMACOLOGICAL THERAPY OF HF INCLUDING DIETARY ADJUSTMENTS, TREATMENT OF HF*P*EF, MANAGEMENT OF HOSPITALIZED HF, EFFECTIVE REDUCTION IN HF READMISSIONS, MORE PRECISE USE OF DEVICE-BASED THERAPY, SMALLER MCS PLATFORMS AND CELL-BASED REGENERATIVE THERAPY.

WEARABLE DEFIBRILLATOR

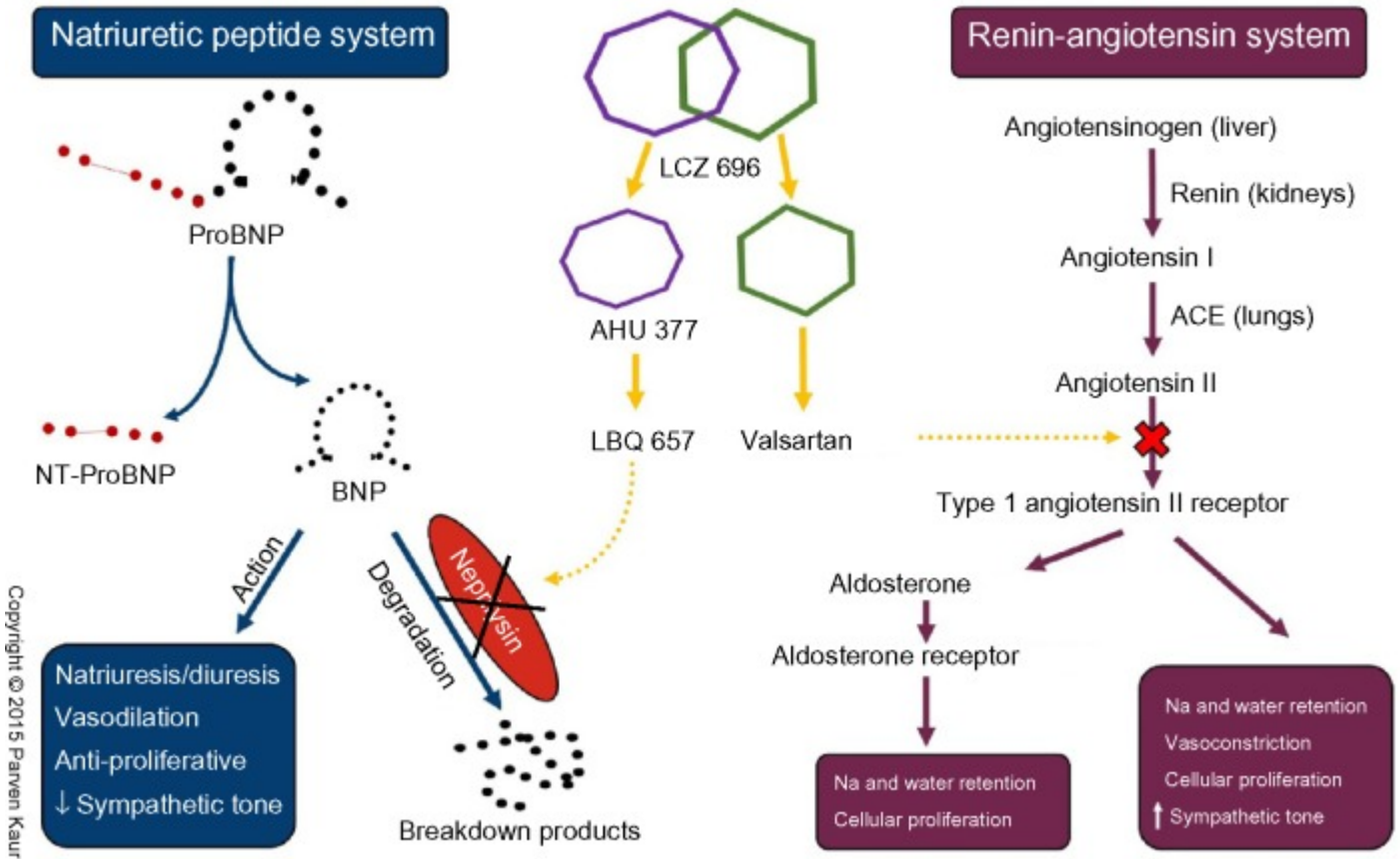
- FOR PRIMARY PREVENTION IN COMPLIANT PATIENTS
- AS A BRIDGE TO DECISION FOR ICD
- IE 3MONTHS POST REVASCULARIZATION BY CABG/PCI; 40 DAYS AFTER MI; 3 MONTHS POST DIAGNOSIS OF CARDIOMYOPATHY

ACC/AHA focused update

Recommendations for Renin-Angiotensin System Inhibition With ACE Inhibitor or ARB or ARNI		
COR	**LOE**	**Recommendations**
I	ACE: A ARB: A ARNI: B-R	The clinical strategy of inhibition of the renin-angiotensin system with ACE inhibitors *(Level of Evidence: A)* (9-14), OR ARBs *(Level of Evidence: A)* (15-18), OR ARNI *(Level of Evidence: B-R)* (19) in conjunction with evidence-based beta blockers (20-22), and aldosterone antagonists in selected patients (23, 24), is recommended for patients with chronic HF*r*EF to reduce morbidity and mortality.
I	ARNI: B-R	In patients with chronic symptomatic HF*r*EF NYHA class II or III who tolerate an ACE inhibitor or ARB, replacement by an ARNI is recommended to further reduce morbidity and mortality (19).
III: Harm	B-R	ARNI should not be administered concomitantly with ACE inhibitors or within 36 hours of the last dose of an ACE inhibitor (31, 32).
III: Harm	C-EO	ARNI should not be administered to patients with a history of angioedema.

Yancy CW et al . 2016 ACC/AHA/HFSA Focused Update on New Pharmacological Therapy for Heart Failure: J Am Coll Cardiol. 2016 May 17. pii: S0735-1097(16)33024-8. doi: 10.1016/j.jacc.2016.05.011

Mechanism of actin of ENTRESTO (LCZ696)

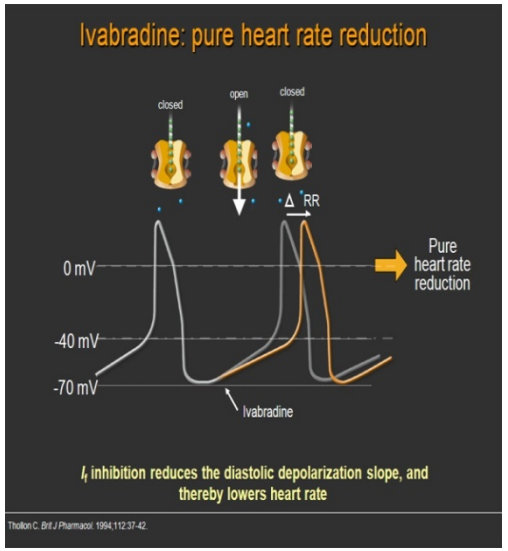


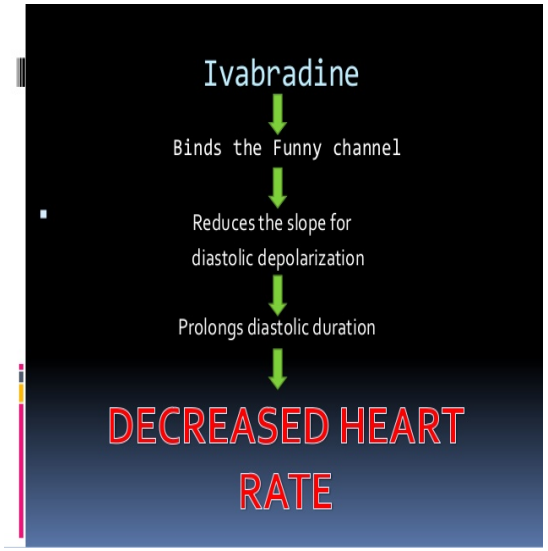
Ref : Singh JS, Lang CC. Angiotensin receptor-neprilysin inhibitors: clinical potential in heart failure and beyond.
Vasc Health Risk Manag. 2015 Jun 1;11:283-95. doi: 10.2147/VHRM.S55630

American Heart Association.

ACC/AHA focused update

Recommendation for Ivabradine		
COR	**LOE**	**Recommendation**
IIa	**B-R**	**Ivabradine can be beneficial to reduce HF hospitalization for patients with symptomatic (NYHA class II-III) stable chronic HF*r*EF (LVEF ≤35%) who are receiving GDEM, including a beta blocker at maximum tolerated dose, and who are in sinus rhythm with a heart rate of 70 bpm or greater at rest (37-40).**





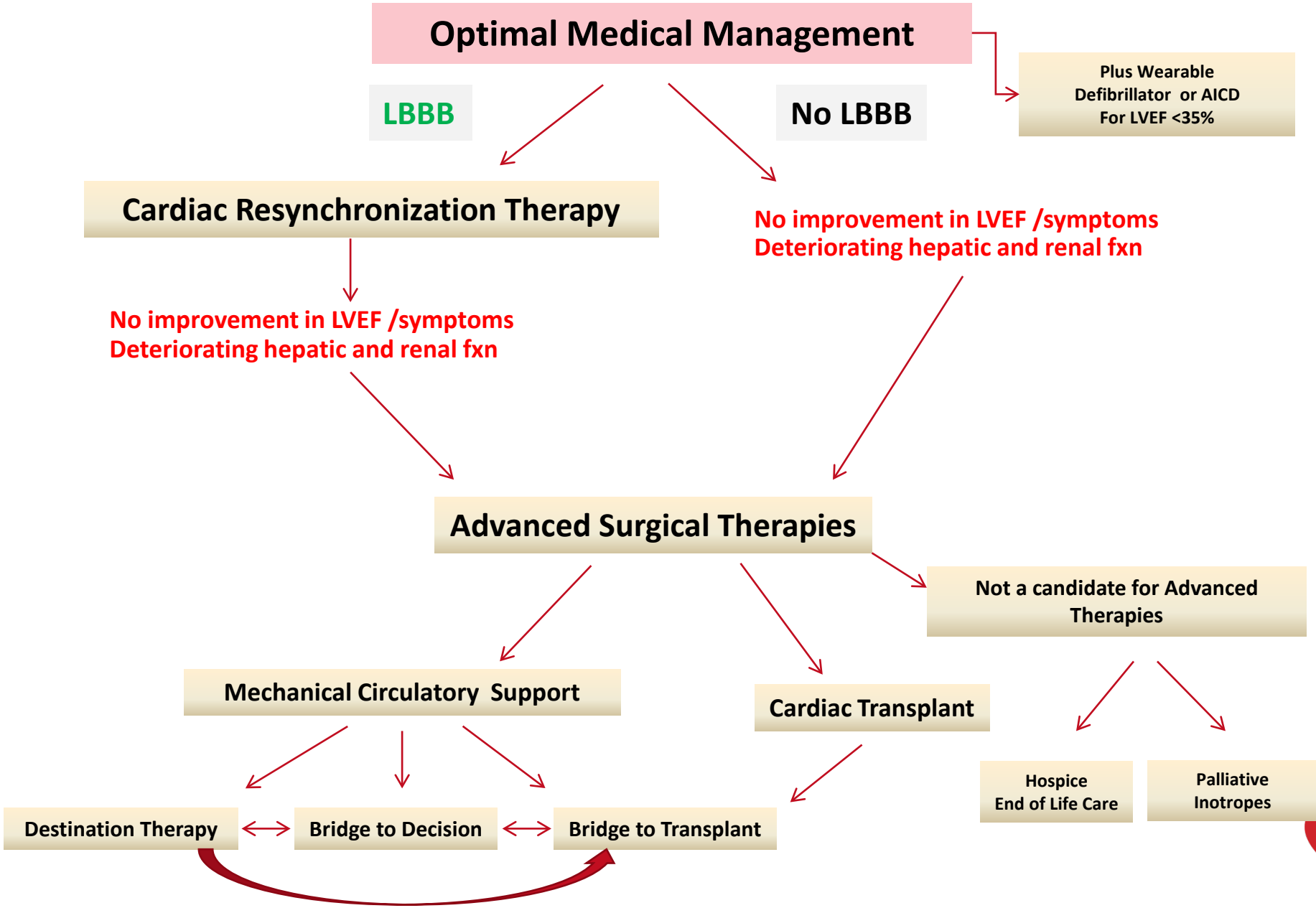
Yancy CW et al . 2016 ACC/AHA/HFSA Focused Update on New Pharmacological Therapy for Heart Failure: J Am Coll Cardiol. 2016 May 17. pii: S0735-1097(16)33024-8. doi: 10.1016/j.jacc.2016.05.011

Deedwania P **Selective and specific inhibition of If with ivabradine for the treatment of coronary artery disease or heart failure** Drugs. 201373(14):1569-86.

Borer JS et al Efficacy and safety of ivabradine in patients with severe chronic systolic heart failure (from the SHIFT study). Am J Cardiol. 2014;113(3):497-503

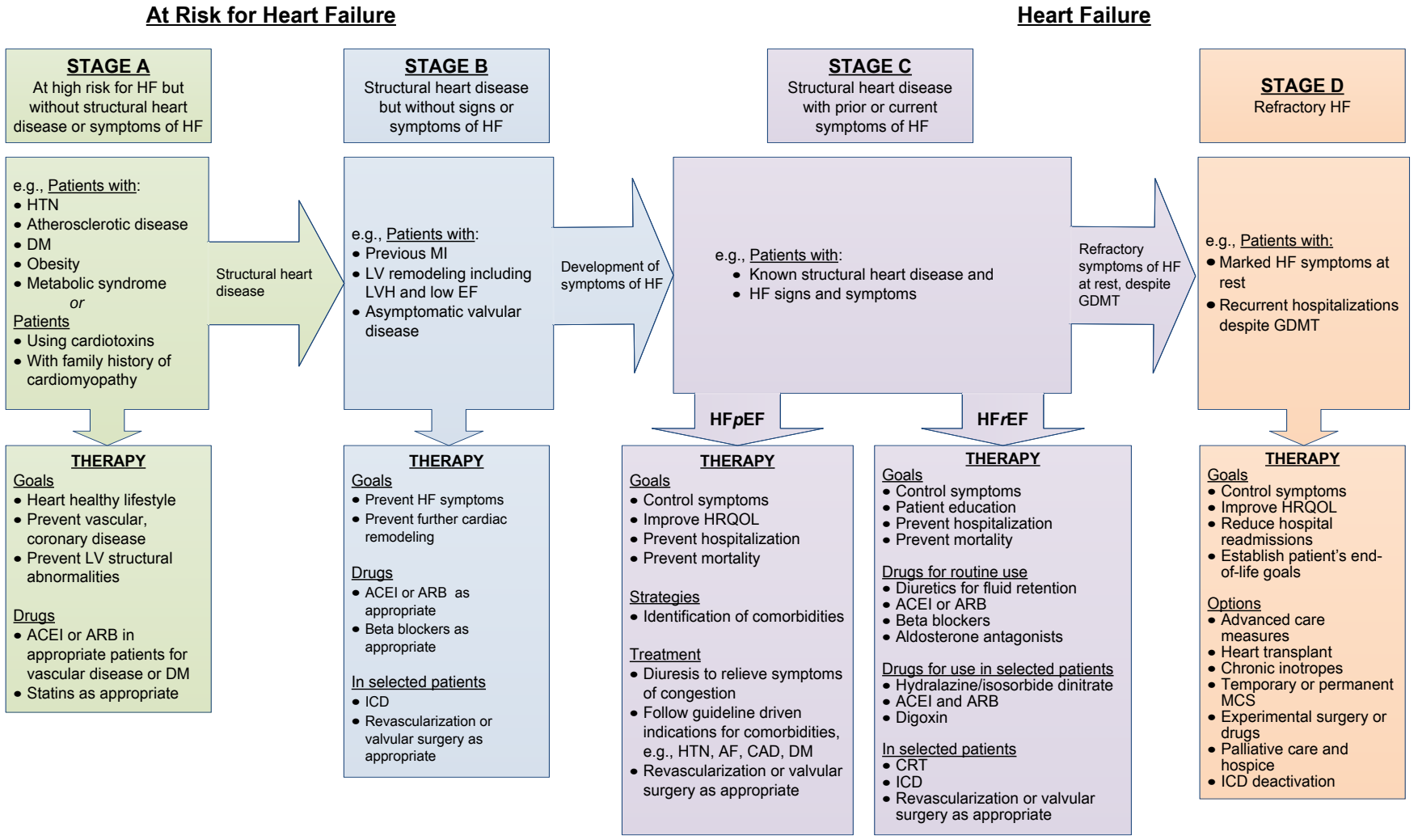
American Heart Association.

SUMMARY



American Heart Association.

STAGES, PHENOTYPES AND TREATMENT OF HF



American Heart Association.

QUESTIONS

American Heart Association