A Hospital-based Approach to Achieving Better Health Outcomes in Heart Failure

INTEGRITY CONTINUING EDUCATION

PIM Postgraduate Institute for Medicine

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Faculty Disclosures

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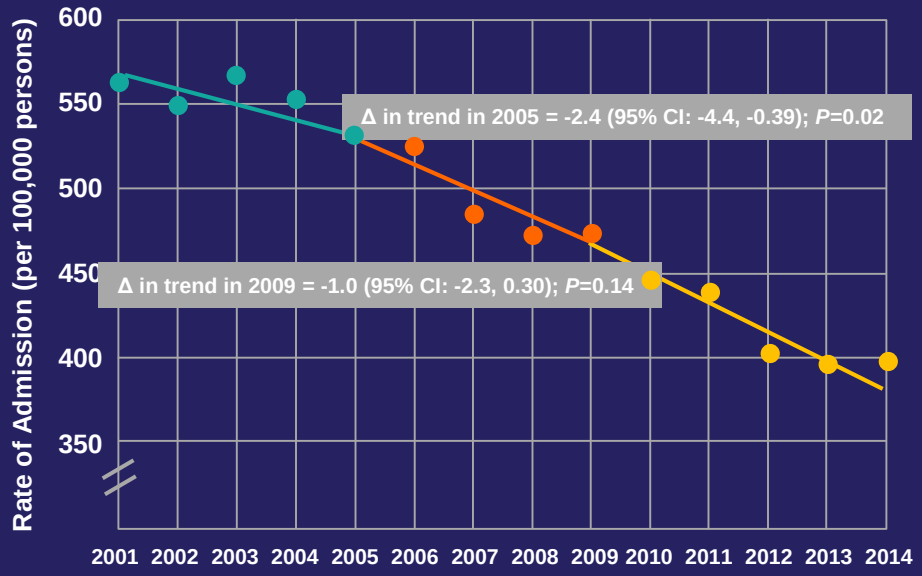
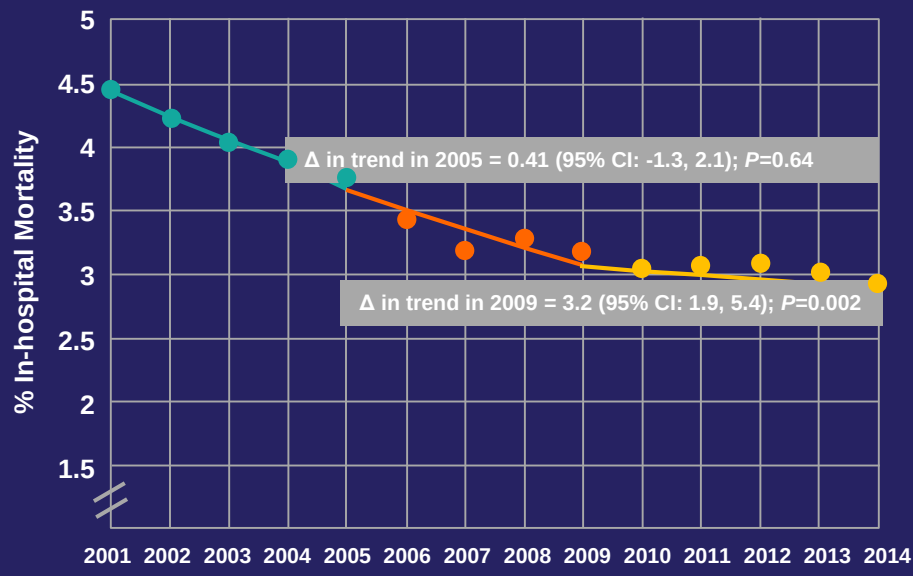
Learning Objectives

- Utilize an evidence-based approach to the diagnosis and evaluation of patients with heart failure (HF) that is consistent with current guideline recommendations
- Summarize current clinical evidence regarding the efficacy and safety of new pharmacologic therapies for the treatment of heart failure with reduced ejection fraction (HFrEF)
- Implement guideline-directed medical therapy for patients with HF
- Identify transitional care strategies to prevent disease progression and future hospitalizations among patients with HF

Heart Failure in the Hospital Setting

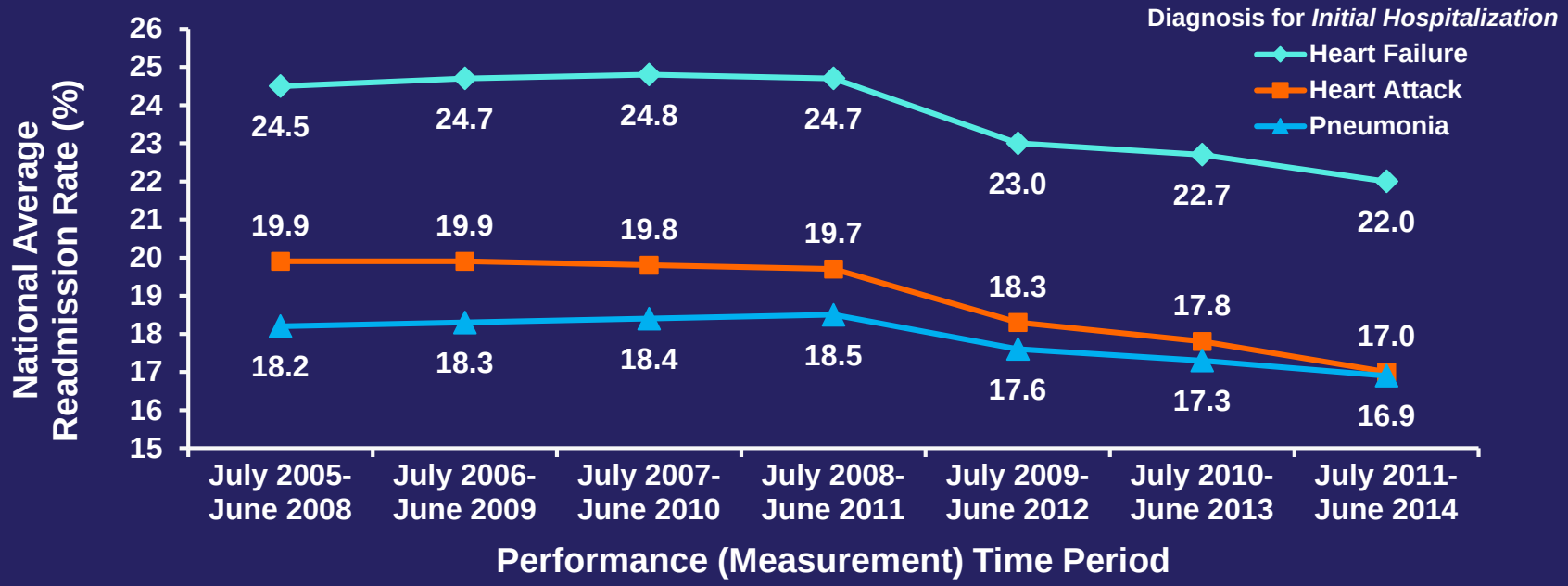
Trends in Primary HF Admissions and In-hospital Mortality (2001-2014)





Akintoye, et al. *J Am Heart Assoc*. 2017;6:e006955.

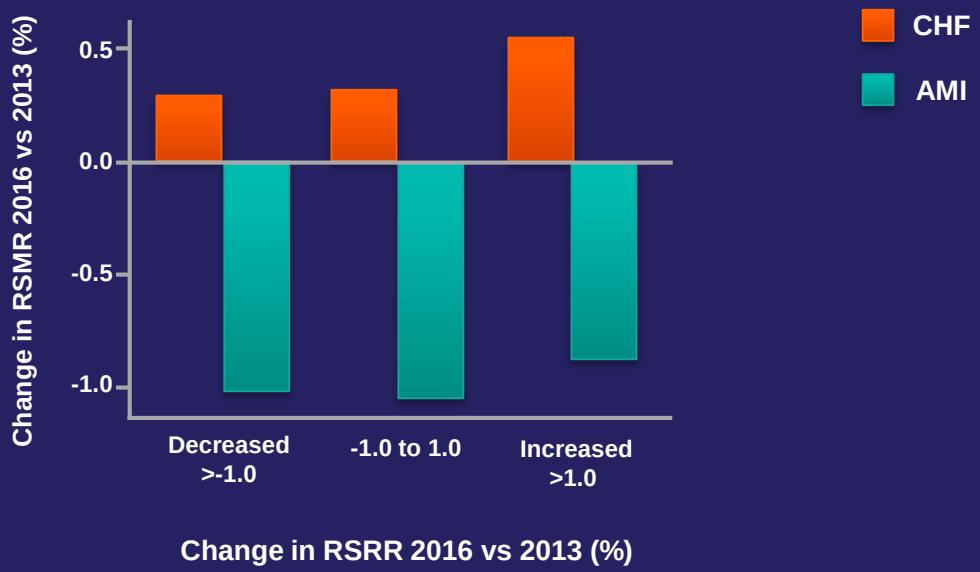
Medicare Readmission Rates Among Patients Hospitalized for HF



Despite recent decreases, a significant percentage (22%) of patients hospitalized with HF are readmitted within 30 days.

Available at: http://kff.org/medicare/issue-brief/aiming-for-fewer-hospital-u-turns-the-medicare-hospital-readmission-reduction-program/

30-Day Risk Standardized HF Mortality Rates Under HRRP



While 30-day readmission rates have improved for HF, 30-day HF mortality rates have <u>increased</u> at more than half of US hospitals since the advent of Centers for CMS readmission penalties.

RSMR, risk standardized mortality rate; RSRR, risk standardized readmission rate; CMS, Centers for Medicare and Medicaid Services.

Abdul-Aziz AA, et al, *J Cardiac Fail.* 2017;23:S5-S6.

Opportunities to Improve Patient Outcomes: Principles for Successful HF Treatment

Implement GDMT

I. Initiate and switch treatment as appropriate
II. Titration to optimal dose

Address Specific Care Challenges

I. Referral
II. Care coordination
III. Adherence
IV. Specific patient cohorts
V. Cost of care

Manage Other Aspects of HF

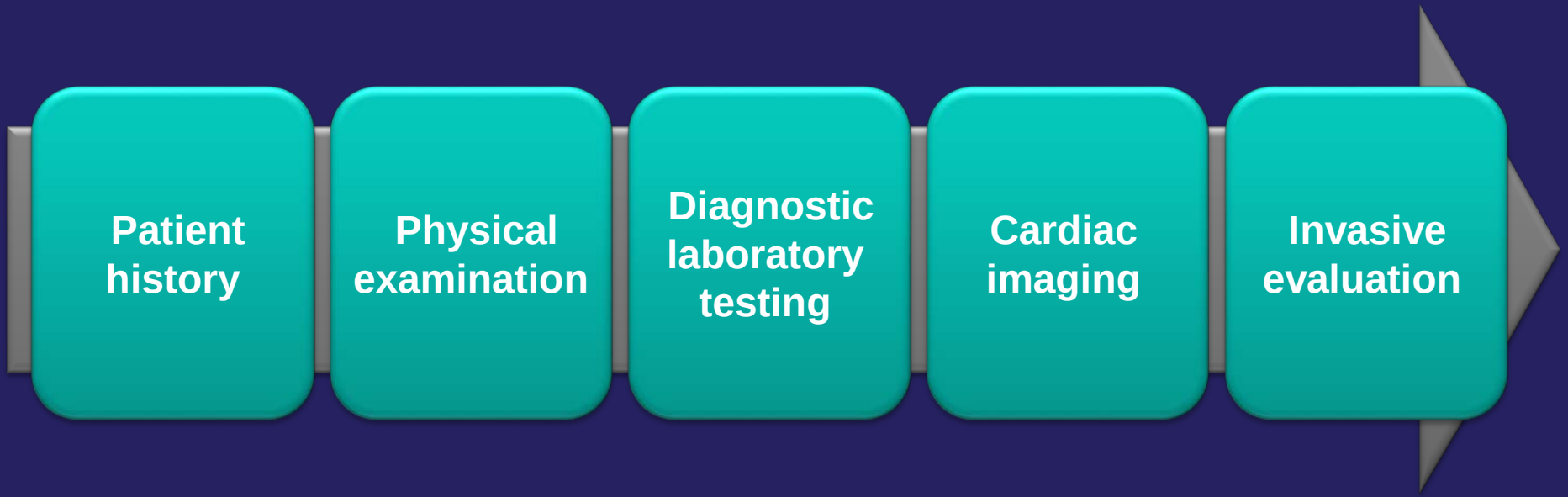
I. Increasing complexity of disease
II. Comorbidities
III. Palliative/hospice care

GDMT, guideline-directed medical therapy.

Adapted from: Yancey, et al. *J Am Coll Cardiol*. 2018;71(2):201-230.

Patient Evaluation

Assessment for HF



A careful history and physical examination remain the cornerstones of assessment

ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239.

Patient History

- Risk factors
  - Family history
  - Other conditions (eg, HTN, CAD/MI, thyroid disease, & diabetes)
- Duration of illness
- Symptoms
  - Type
  - Severity
- Recent/frequent prior hospitalizations for HF
- Diet
  - Sodium intake
- Medication
  - Discontinuation or nonadherence
  - Agents that may exacerbate HF
- De novo HF indicators
  - Inadequate BP control
  - New-onset or poorly controlled AF
  - New ischemia
  - Metabolic, respiratory, & other stressors

HTN, hypertension; CAD, coronary artery disease; MI, myocardial infarction; BP, blood pressure; AF, atrial fibrillation.

ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239.

Symptoms of HF

- Shortness of breath
- Chronic coughing/ wheezing
- Edema
- Fatigue/lightheadedness
- Nausea/lack of appetite
- Confusion/impaired thinking
- Elevated HR

HR, heart rate.

Available at: http://www.heart.org/HEARTORG/Conditions/HeartFailure/WarningSignsforHeartFailure/Warning-Signs-of-Heart-Failure_UCM_002045_Article.jsp#.V7YfgFsrL4Z.

Physical Examination

- Weight loss or gain
- BP (supine and upright)
- Pulse
- JVP at rest (sitting or standing) and/or positive Kussmaul's sign
- Presence of extra heart sounds and murmurs
- Size and location of PMI
- Presence of RV heave
- Pulmonary status: RR and pleural effusion
- Hepatomegaly and/or ascites
- Peripheral edema
- Presence of cool lower extremities

JVP, jugular venous pressure; PMI, point of maximal impulse; RV, right ventricular; RR, respiratory rate.

ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239.

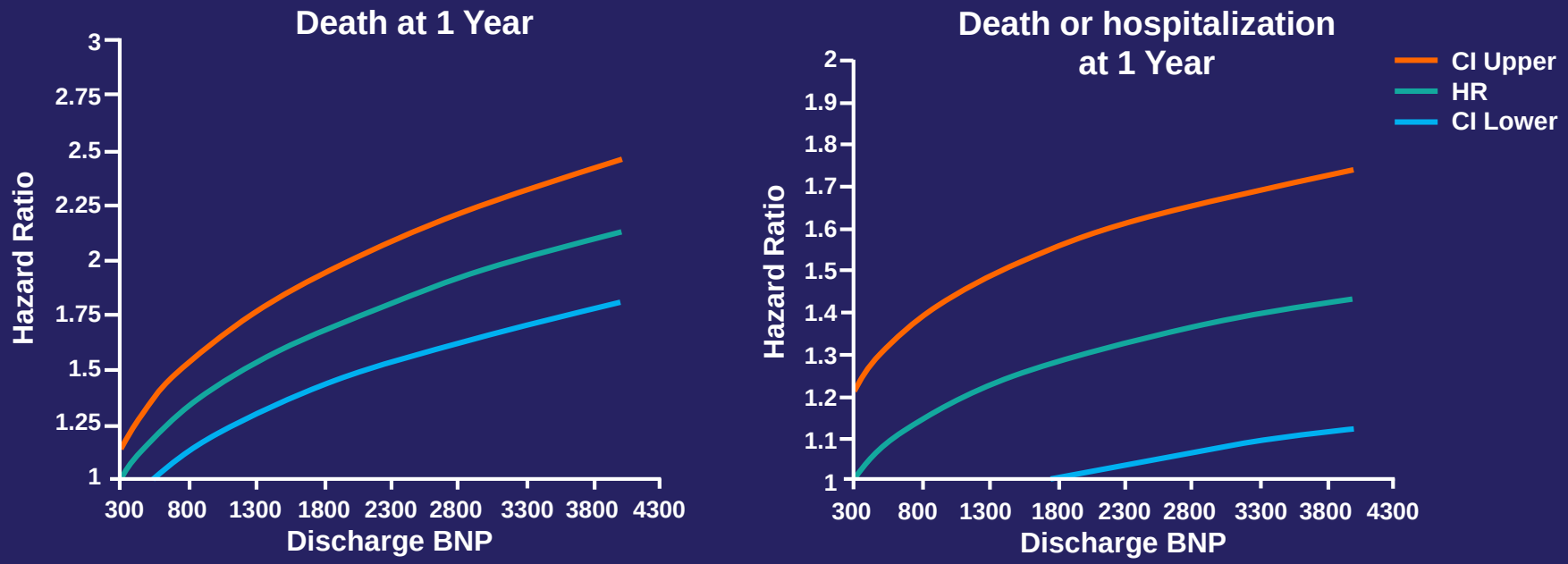
Recommendations for the Use of Biomarkers in the Evaluation of Patients with HF

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 for ADHF 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

ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239.

Association Between Discharge BNP and Clinical Outcomes

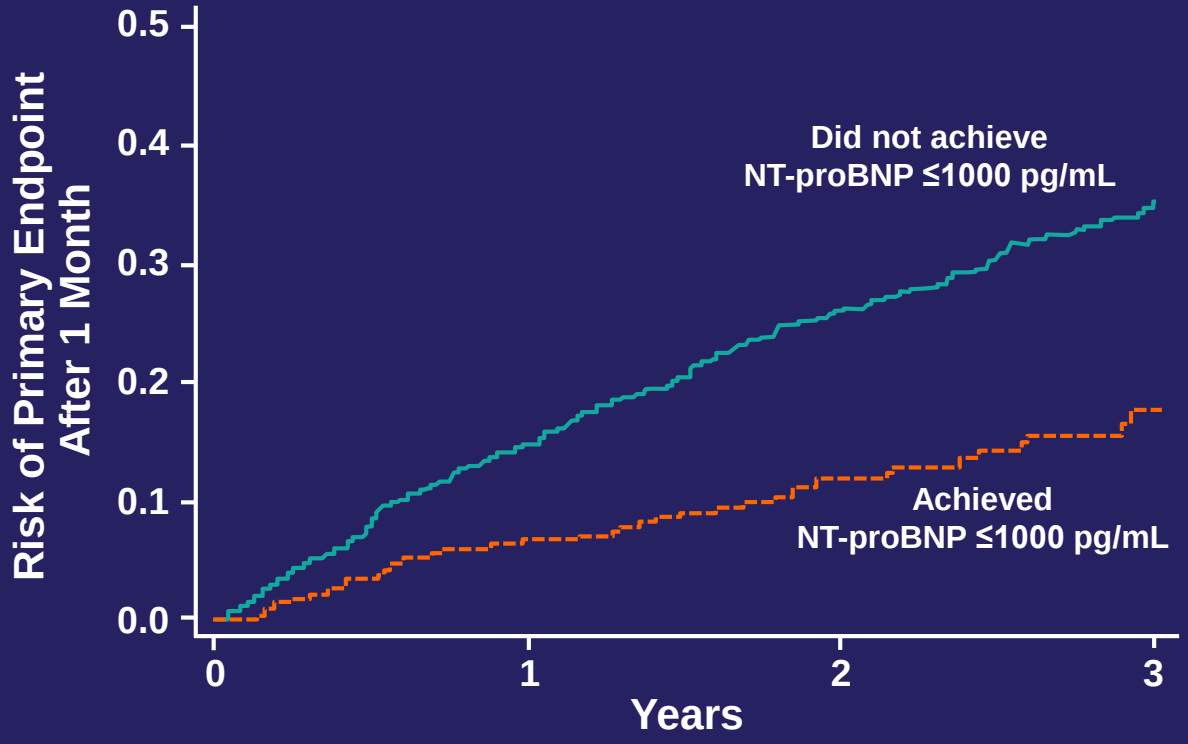
OPTIMIZE-HF



BNP, brain natriuretic peptide.

Kociol RD, et al. *Circ Heart Fail*. 2011;(4) 628-636.

NT-proBNP Reduction Lowers the Rate of CV Death or HF-related Hospitalization



NT-proBNP, N-terminal pro b-type natriuretic peptide.

Zile MR, et al. *J Am Coll Cardiol.* 2016;68:2425-36.

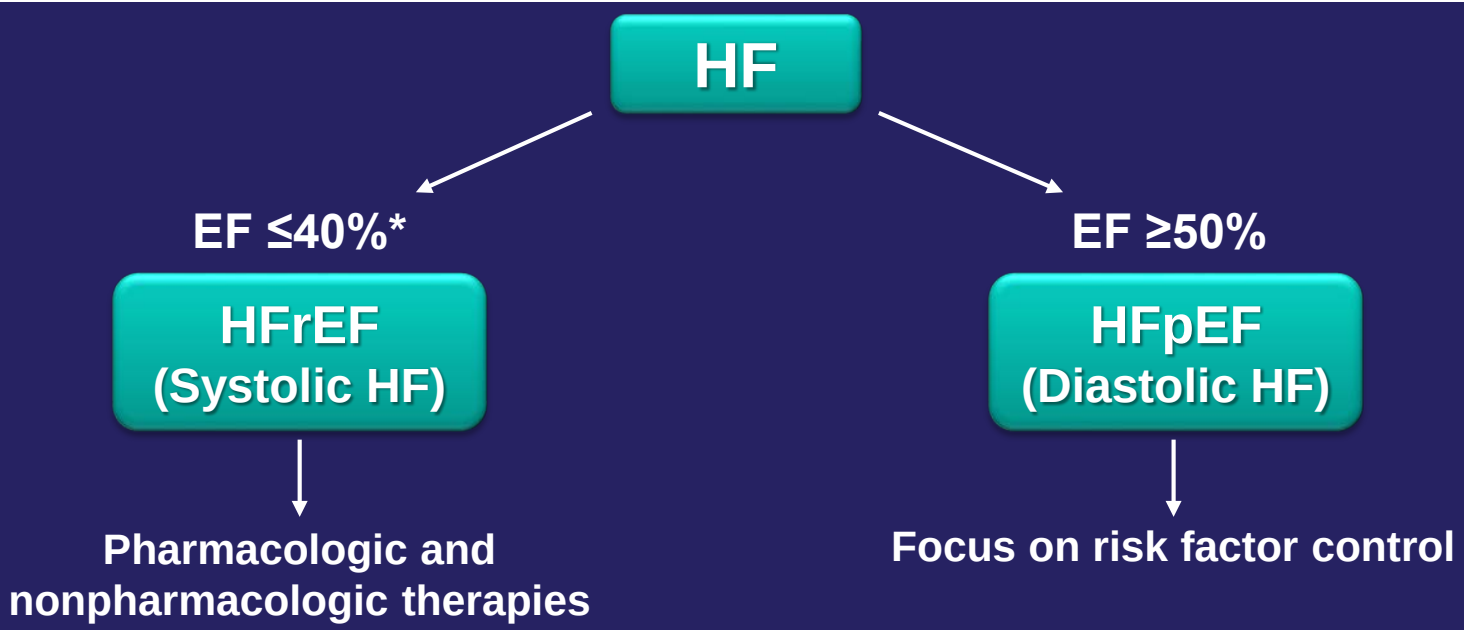
ACCF/AHA Stages and NYHA Functional Classes of HF

Stage	Characteristics	Class	Characteristics
A	▪ Significant risk factors for HF ▪ No known structural heart disease ▪ No signs or symptoms of HF	None	
B	▪ Structural heart disease ▪ No signs or symptoms of HF	I	▪ No functional limitation
C	▪ Structural heart disease ▪ Prior or current symptoms of HF	I II III IV	▪ No functional limitation ▪ Symptoms with activity beyond ADLs ▪ Symptoms with ADLs ▪ Symptoms of HF at rest
D	▪ Refractory HF requiring specialized interventions (eg, transplant, VAD, palliative care/hospice, and experimental therapies)	IV	▪ Symptoms of HF at rest

ACCF/AHA, American College of Cardiology Foundation/American Heart Association; VAD, ventricular assist device; ADLs, activities of daily living.

ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239.

HF Type by Ejection Fraction



*HFrEF has been defined across different guidelines by left ventricular ejection fraction 35%, <40%, and 40%.

EF, ejection fraction; HFpEF, heart failure with preserved ejection fraction.

ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239; Tannenbaum S, et al. *Curr Opin Cardiol*. 2015;30(3):250-258.

Treatment Options for HFrEF

Conventional Guideline-recommended Pharmacologic Treatments

Therapy	NYHA Class			
	1	2	3	4
ACE inhibitors, ARBs	✓	✓	✓	✓
Beta-blockers	(✓)	✓	✓	✓
Aldosterone antagonists		(✓)	✓	✓
Diuretics		(✓)	✓	✓
Digoxin			(✓)	(✓)
Hydralazine and isosorbide dinitrate		(✓)	(✓)	(✓)

(✓) For select patients.

ACE, angiotensin-converting enzyme; ARB, angiotensin II receptor blocker; NYHA, New York Heart Association.

ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239.

Newer Therapies for the Treatment of HF

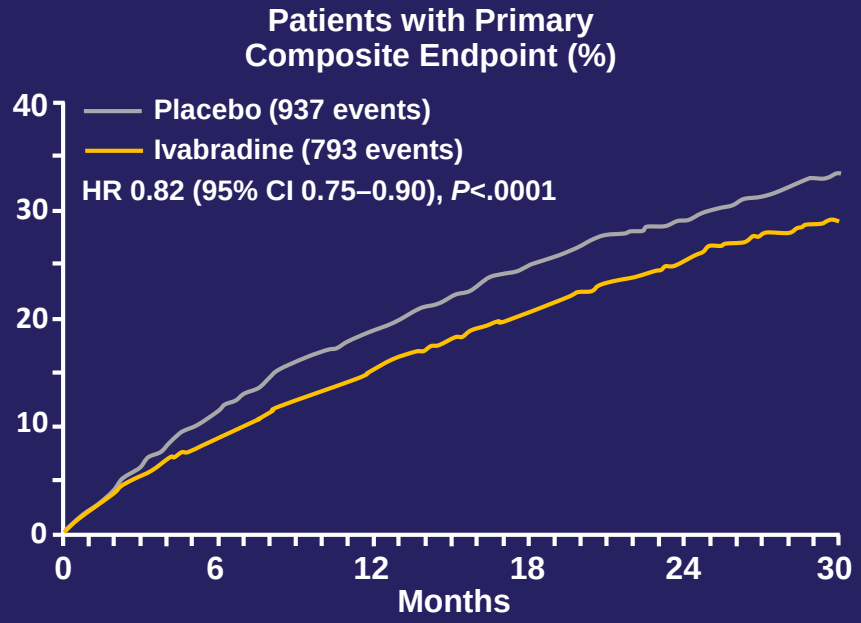
Therapy	Mechanism of Action
Ivabradine	• Selective inhibition of sinus node I_f channel (decreases HR) • Does **not** affect cardiac ionotropy and can be used with a beta blocker
Angiotensin Receptor–Neprilysin Inhibitor (ARNI)	• Angiotensin receptor blockade + inhibition of neprilysin* (inhibits RAAS and augmenting NP activity)

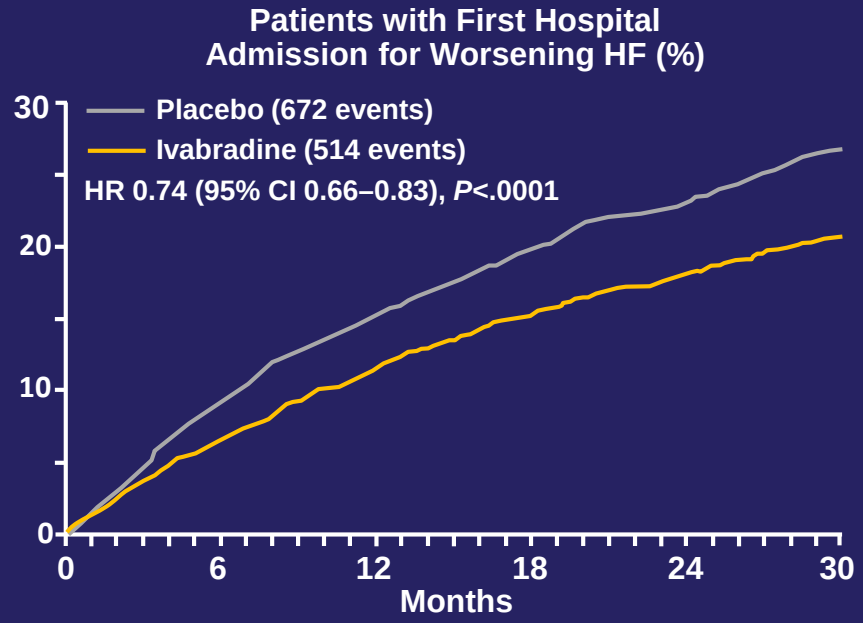
*The metallopeptidase neprilysin hydrolyzes natriuretic peptides.

RAAS, renin-angiotensin-aldosterone system; NP, natriuretic peptide.

von Lueder TG, et al. *Pharmacol Ther*. 2014;144(1):41-49; DiFrancesco D. *Circ Res*. 2010;106(3):434-446; Rosa GM, et al. *Expert Opin Drug Metab Toxicol*. 2014;10(2):279-291. Corlanor [prescribing information]. Amgen; 2015.

Impact of Ivabradine Treatment on CV Death or Hospital Admission for Worsening HF



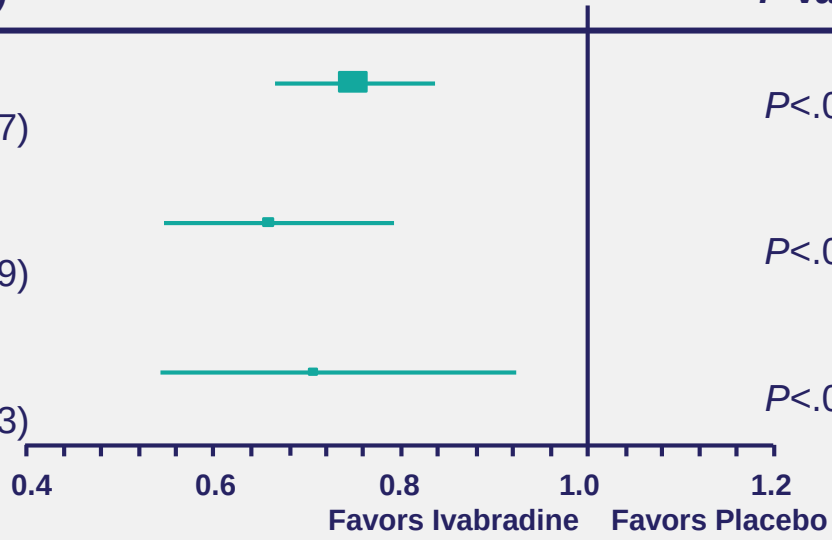


CV, cardiovascular; HR, hazard ratio; CI, confidence interval.

Swedberg K, et al. *Lancet*. 2010;376(9744):875-885.

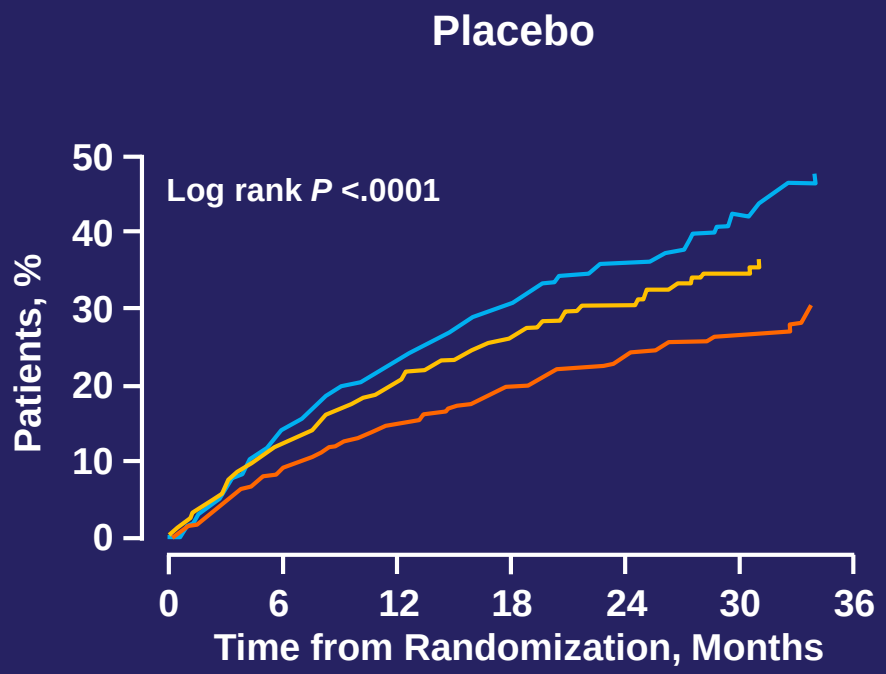
Ivabradine Added on to Standard of Care Therapy Reduces the Risk of Hospitalizations for HF

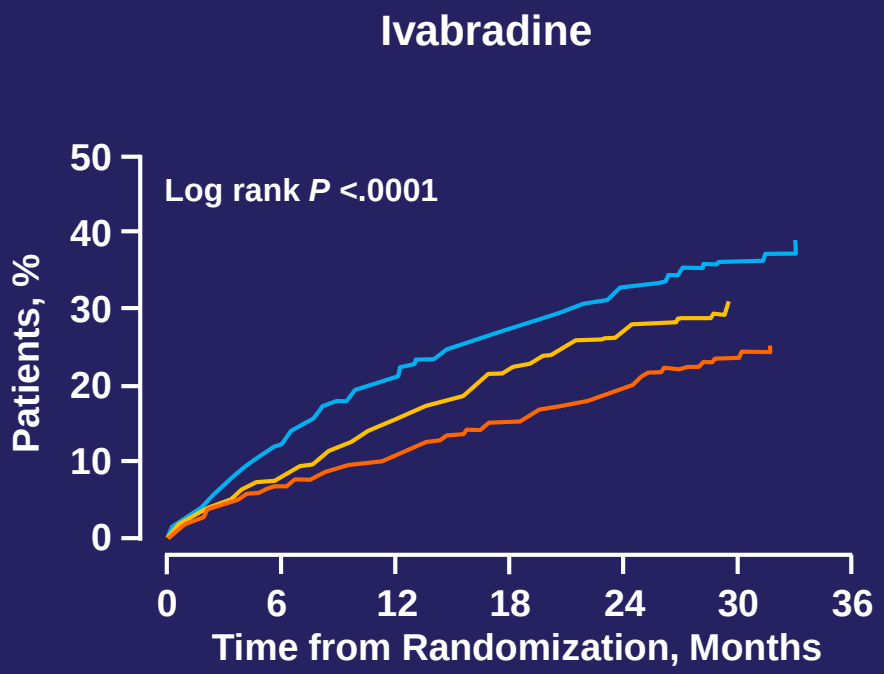
Hospitalization	Ivabradine (N=3241)	Placebo (N=3264)	HR (95% CI)	*P* value
First	514 (16%)	672 (21%)	0.75 (0.65–0.87)	*P*<.001
Second	189 (6%)	283 (9%)	0.66 (0.55–0.79)	*P*<.001
Third	90 (3%)	128 (4%)	0.71 (0.54–0.93)	*P*<.012



Borer JS, et al. *Eur Heart J*. 2012;33(22):2813-2820.

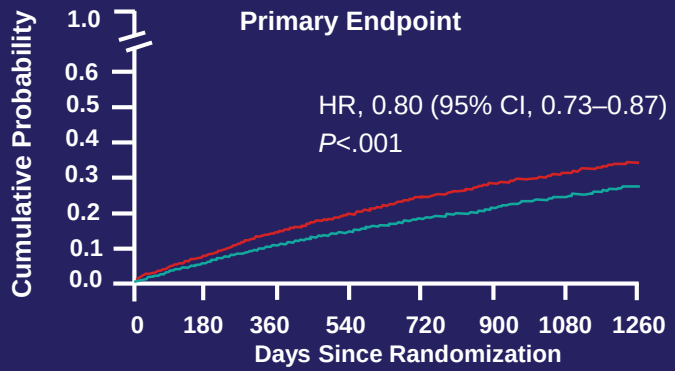
Heart Rate Reduction with Ivabradine Improves Outcomes Independently of HF Duration

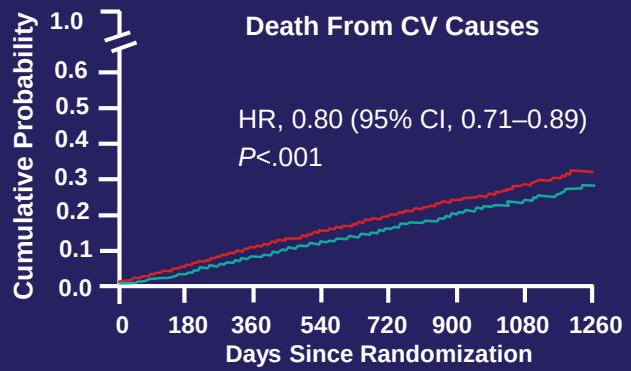


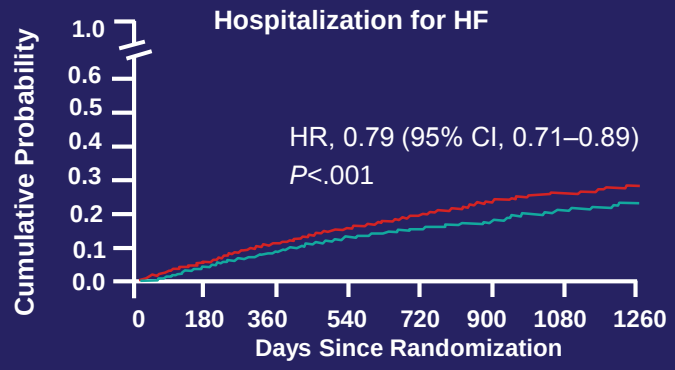


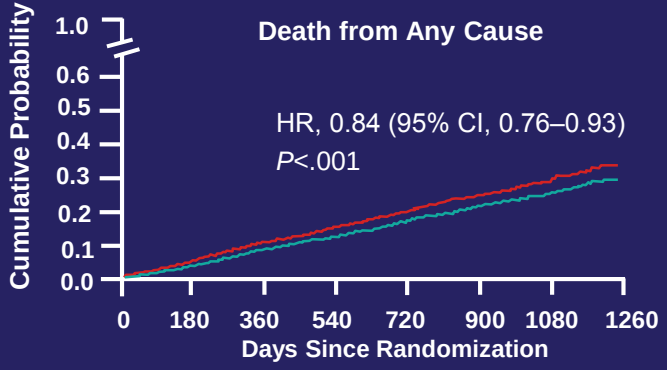
Bohm M, et al. *Eur J Heart Fail*. 2018;20:373–381.

Effect of ARNI Treatment on the Risk of Death or First-time Hospitalization for HF





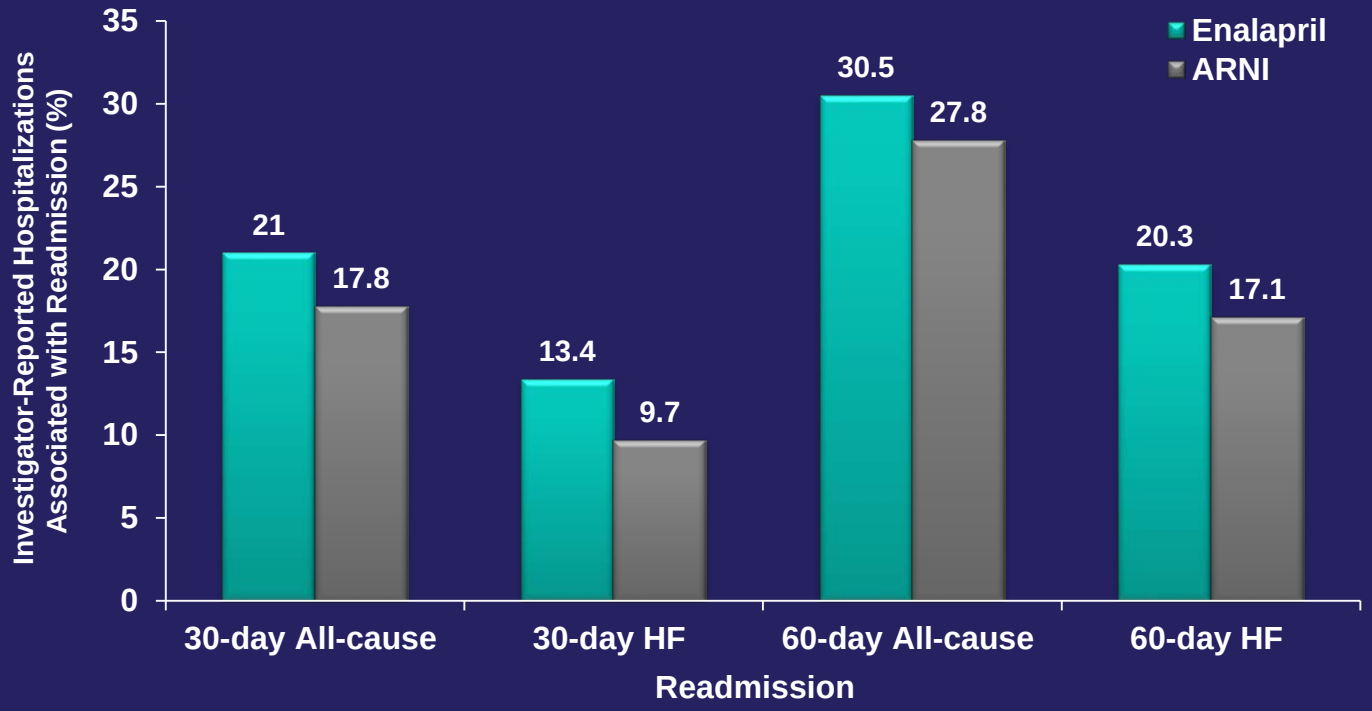




Enalapril
ARNI

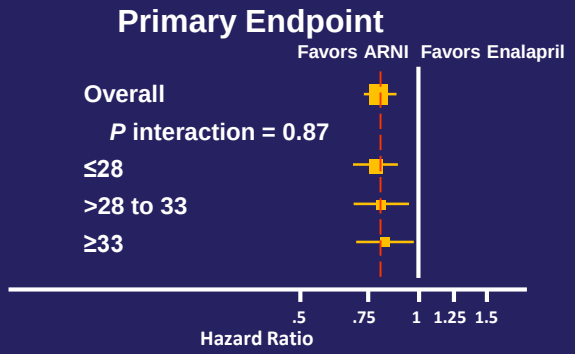
McMurray JJ, et al. *N Engl J Med*. 2014;371(11):993-1004.

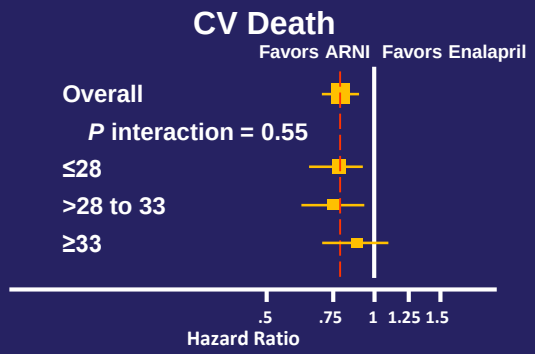
ARNI Treatment Reduces the Incidence of Hospital Readmissions

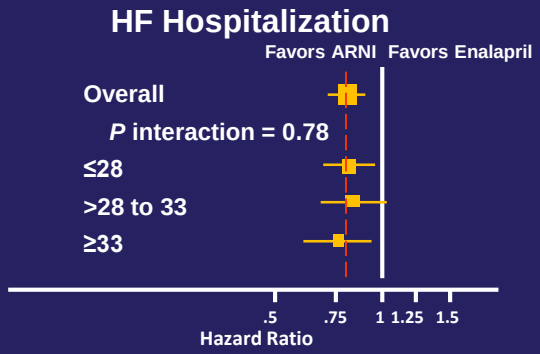


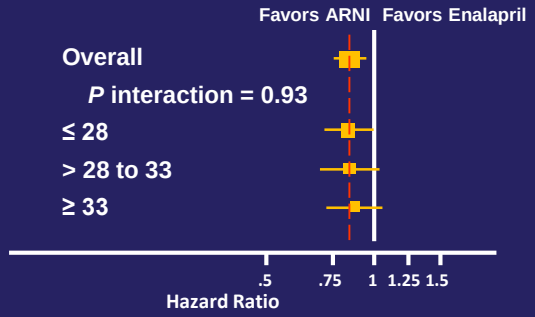
Desai AS, et al. *J Am Coll Cardiol*. 2016;68(3):241-248.

ARNI Treatment Reduces CV Death and HF Hospitalization Across the LVEF Spectrum





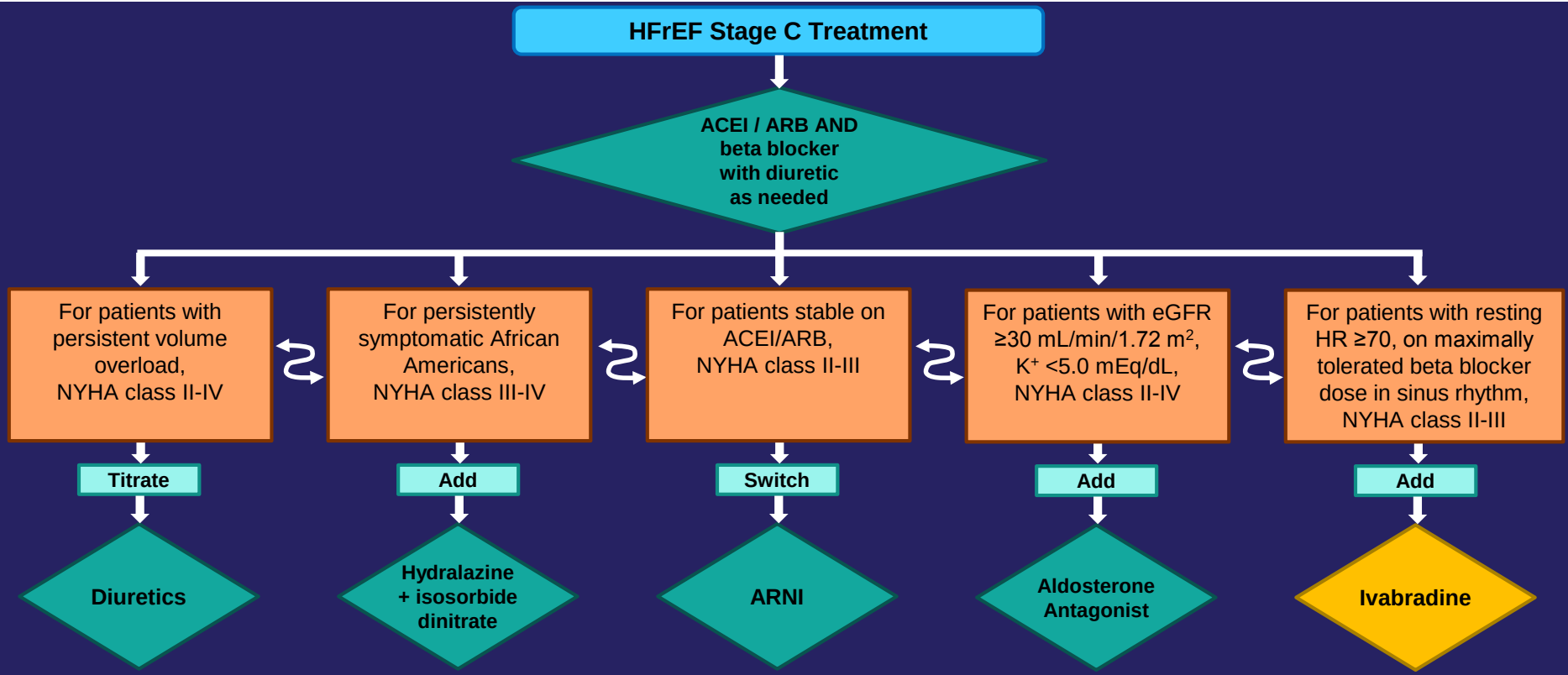




LVEF, left ventricular ejection fraction.

Solomon SD, et al. *Circ Heart Fail*. 2016;9(3):e002744.

How Should Newer Therapies Be Incorporated into GDMT?



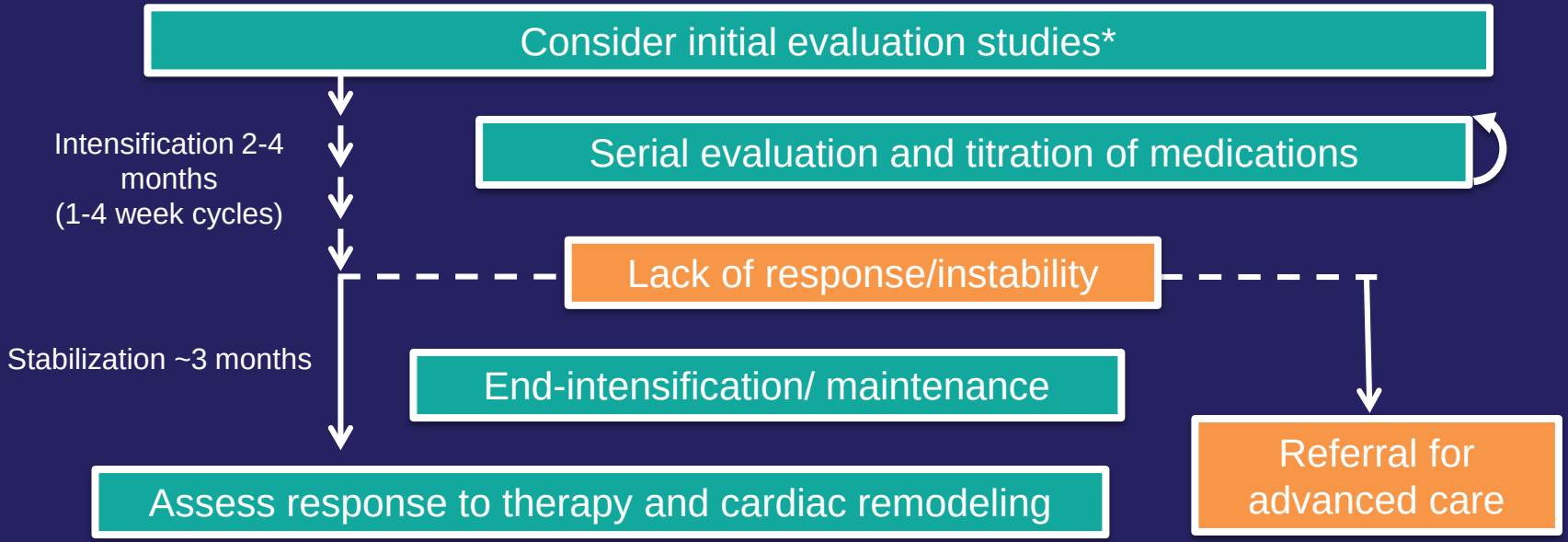
Yancey, et al. *J Am Coll Cardiol*. 2018;71(2):201-230.

PRIME-HF: When Should Therapy Be Initiated?

- Multi-center, patient-level, randomized, open-label study
- Patient population (N=~450)
  - Reduced LVEF of 35%
  - HR 70 bpm
  - Discharged following stabilization from acute HF
- Predischarge initiation of ivabradine or usual care
- Post-discharge follow-up at 7-14 days, 6 weeks, and 180 days
- HR, systolic BP, and quality of life to be assessed

Available at: https://clinicaltrials.gov/ct2/show/NCT02827500

Testing and Medication Titration for Patients with HFrEF



*BNP/NT-proBNP, complete blood count, basic metabolic panel, liver function tests, iron and thyroid studies, HbA1c, x-ray, echocardiogram, coronary angiogram, cardiac MRI, biopsy, other imaging.

Yancey et al. *J Am Coll Cardiol*. 2018;71(2):201-230.

When to Refer Patients for Advanced HF Care: I-NEED-HELP

IV inotropes

NYHA IIIB/IV or persistently elevated natriuretic peptides

End-organ dysfunction

Ejection fraction ≤35%

Defibrillator shocks

Hospitalizations >1

Edema despite escalating diuretics

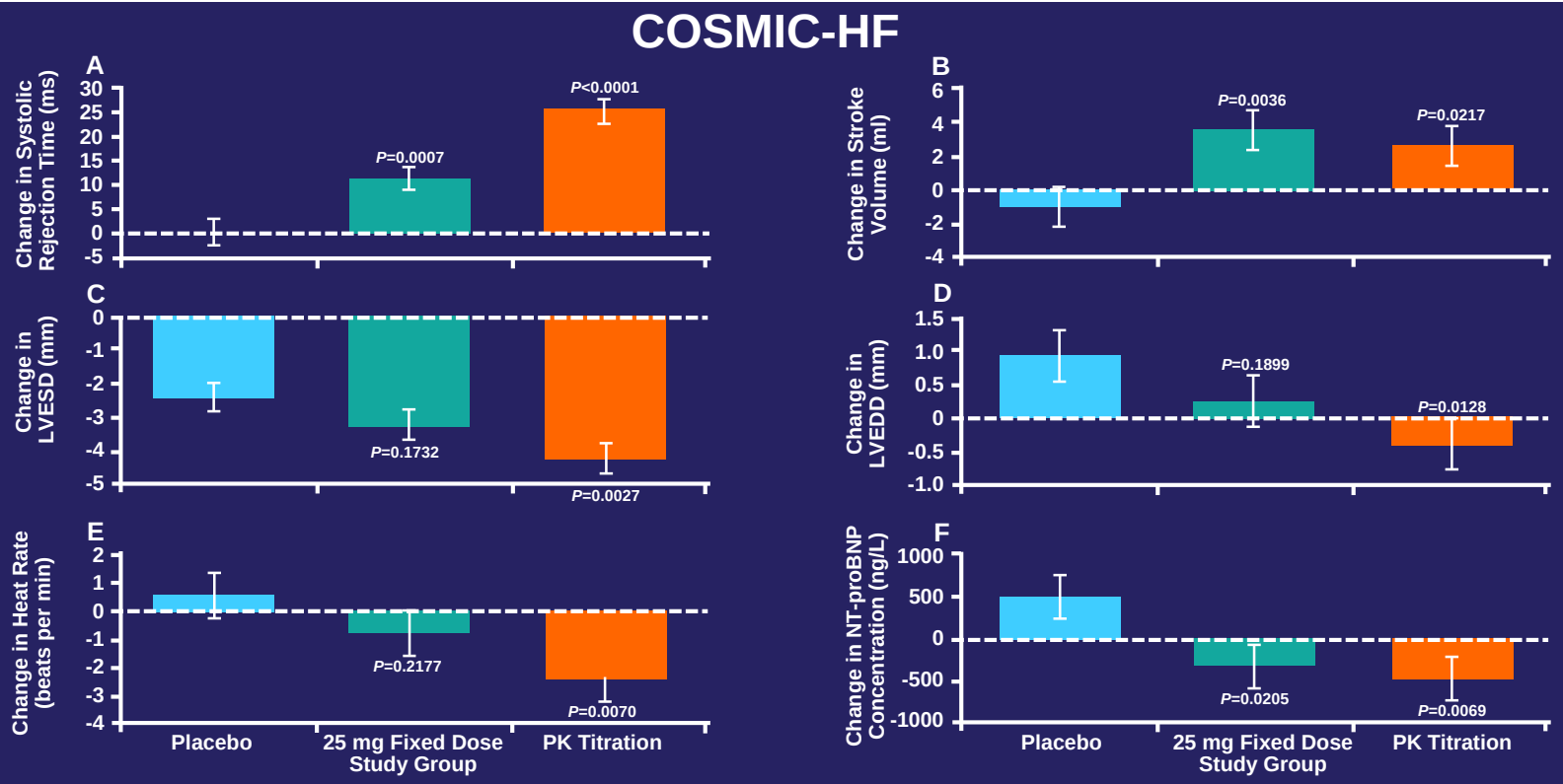
Low blood pressure, high heart rate

Prognostic medication - progressive intolerance or down-titration of GDMT

Yancey, et al. *J Am Coll Cardiol*. 2018;71(2):201-230.

Therapies for HFrEF Under Investigation

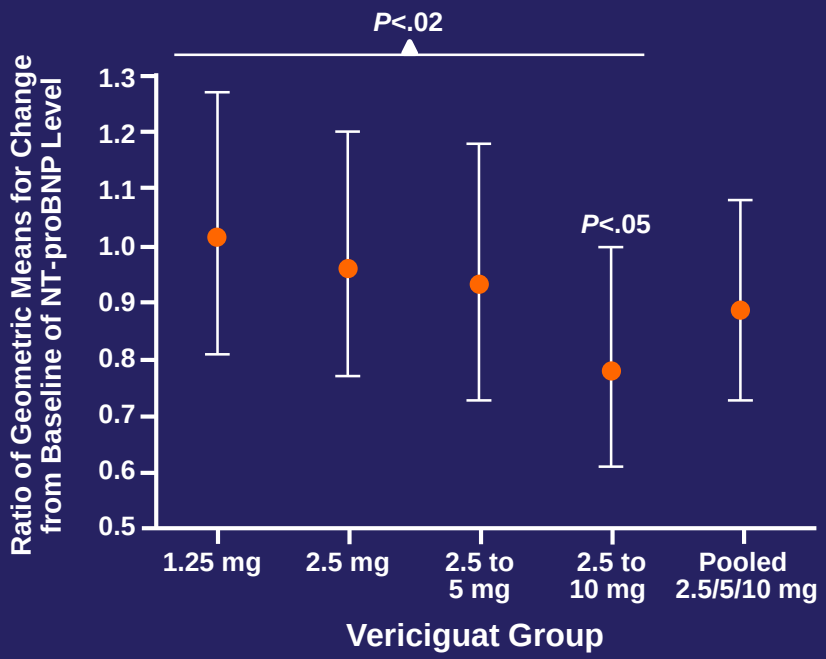
Effects of Omecamtiv Mecarbil on Cardiac Function and Structure

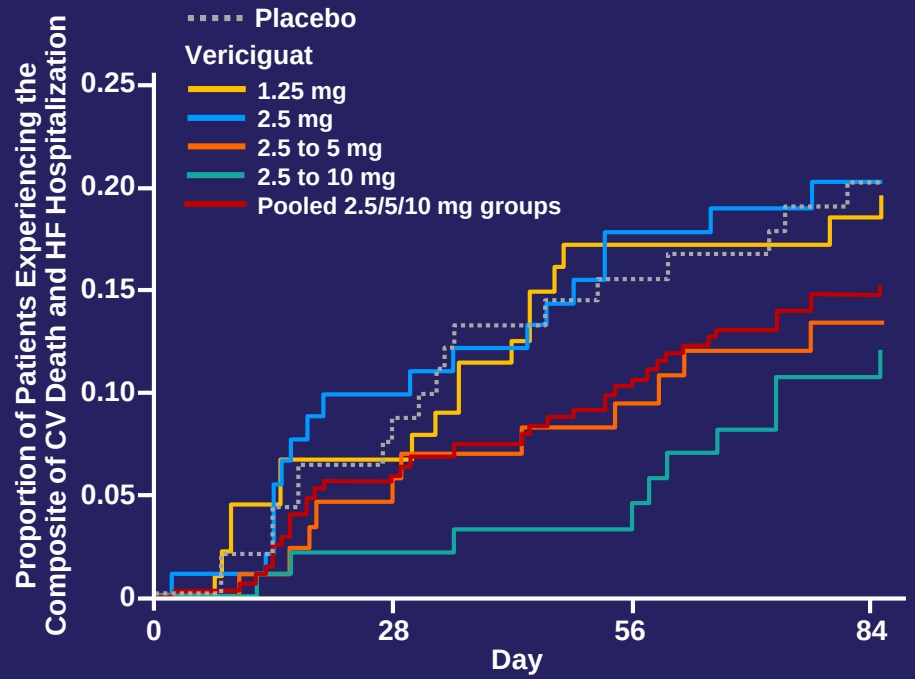


Teerlink JR, et al. *Lancet.* 2016;388:2895-903.

Effect of Vericiguat Treatment in Patients with Worsening HFrEF

SOCRATES-REDUCED





Gheorghiade M, et al. *JAMA*. 2015;314(21):2251-2262.

Treatment of HFpEF

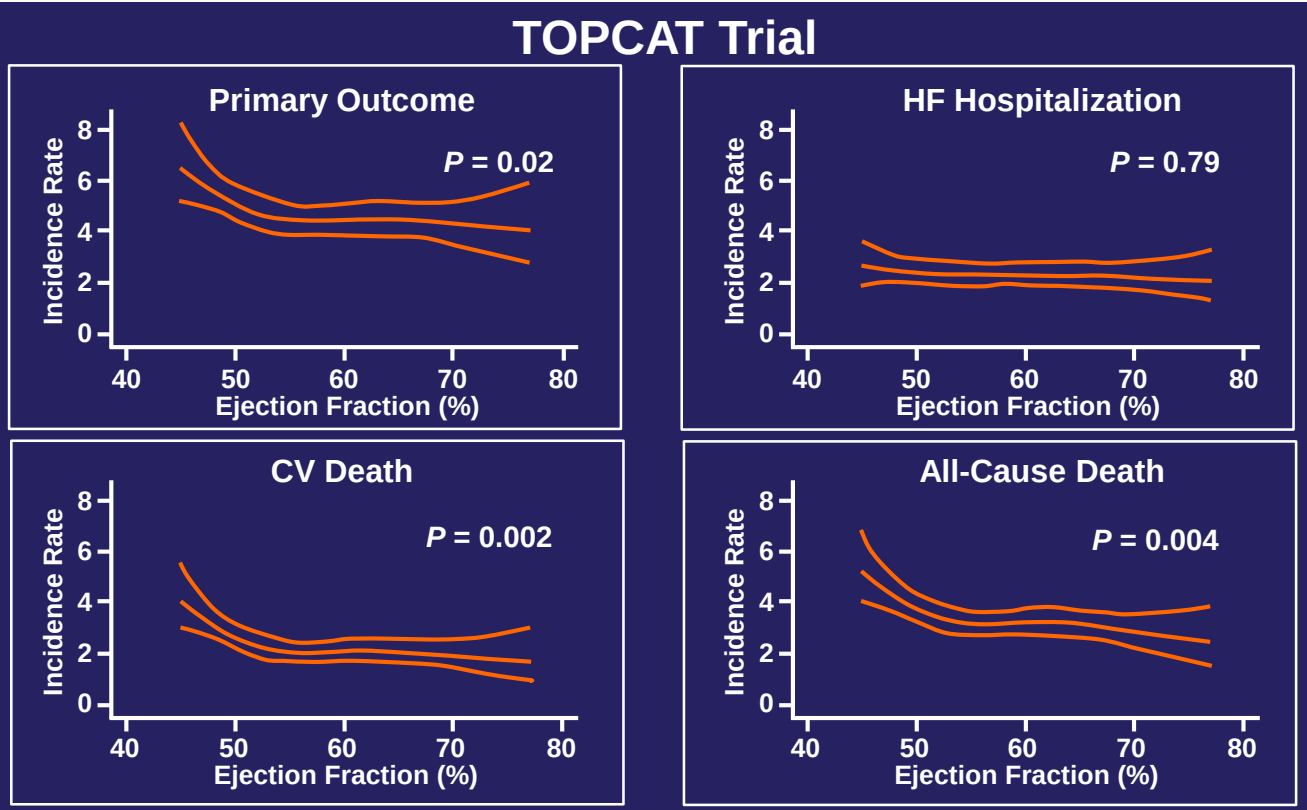
Significance of HFpEF

- Increasing incidence
- Frequent in elderly female patients
- Comorbidities include obesity, CAD, DM, AF, and hyperlipidemia
- HTN is the most important cause (60%-89% prevalence)
- **Represents a growing proportion of patients with HF requiring hospitalization**

DM, diabetes mellitus.

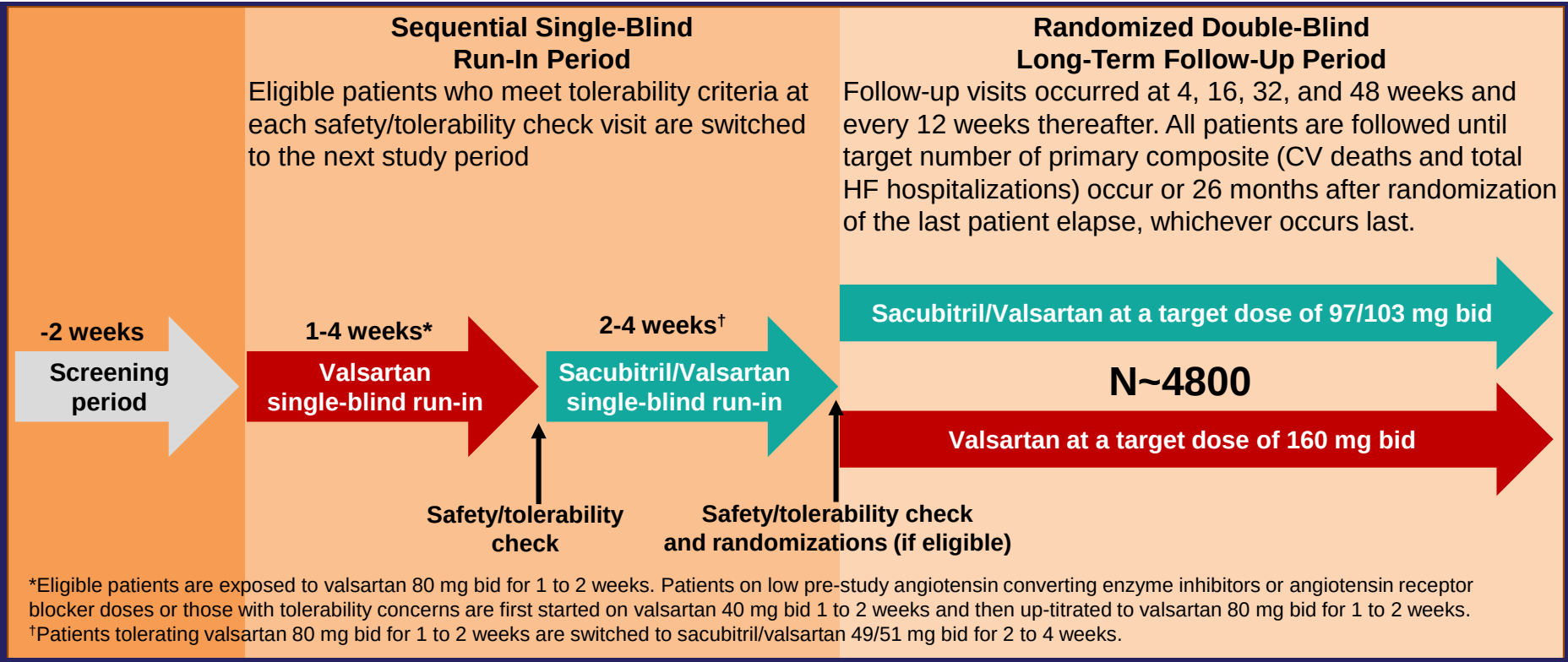
ACCF/AHA Guidelines. *J Am Coll Cardiol*. 2013;62(16):e147-e239.

Efficacy of Spironolactone Treatment of HFpEF Across the LVEF Spectrum



Solomon SD, et al. *Eur Heart J*. 2016;37:455–462.

ARNI for the Treatment of Patients with HFpEF: PARAGON-HF



*Eligible patients are exposed to valsartan 80 mg bid for 1 to 2 weeks. Patients on low pre-study angiotensin converting enzyme inhibitors or angiotensin receptor blocker doses or those with tolerability concerns are first started on valsartan 40 mg bid 1 to 2 weeks and then up-titrated to valsartan 80 mg bid for 1 to 2 weeks.
†Patients tolerating valsartan 80 mg bid for 1 to 2 weeks are switched to sacubitril/valsartan 49/51 mg bid for 2 to 4 weeks.

Solomon, et al. *JACC Heart Fail*. 2017;5(7):471-482.

Management of Comorbidities

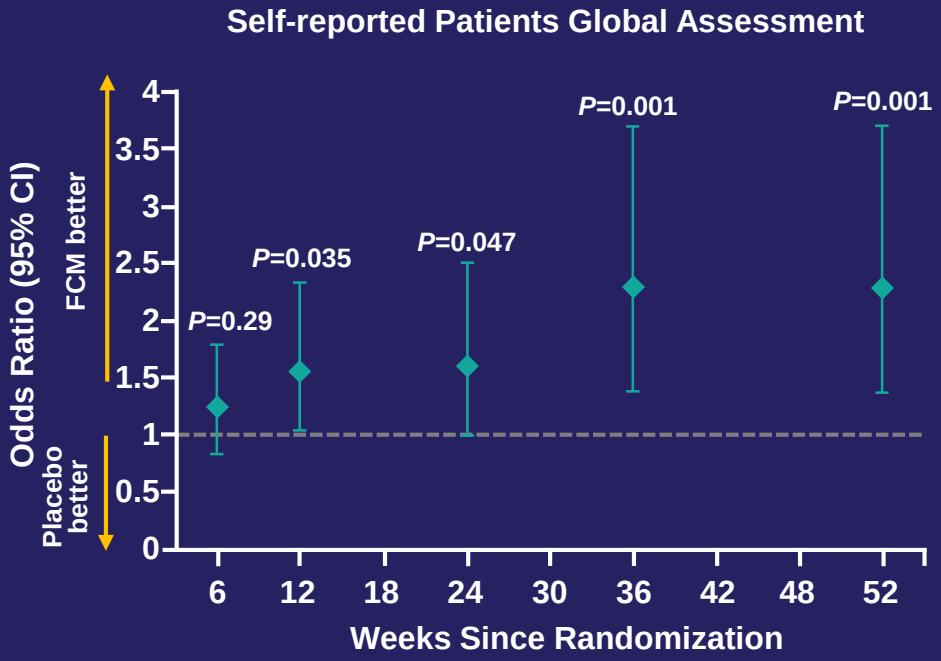
Management of Hypertension in Patients with HF

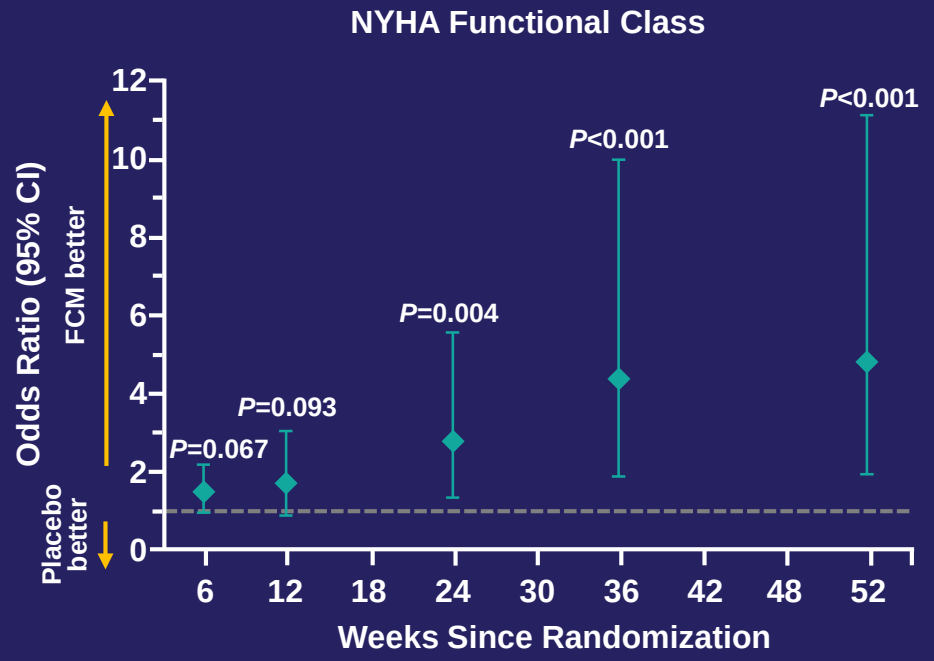
- Target an optimal BP of <130/80 mm Hg in those with HTN and at increased risk (stage A HF)
- Titration of GDMT to attain SBP <130 mm Hg in patients with HFrEF and HTN
- Titration of GDMT to attain SBP <130 mm Hg in patients with HFpEF and persistent HTN after management of volume overload

BP, blood pressure; SBP, systolic blood pressure.

Yancey CW, et al. *Circulation*. 2017;136(6):e137-e161.

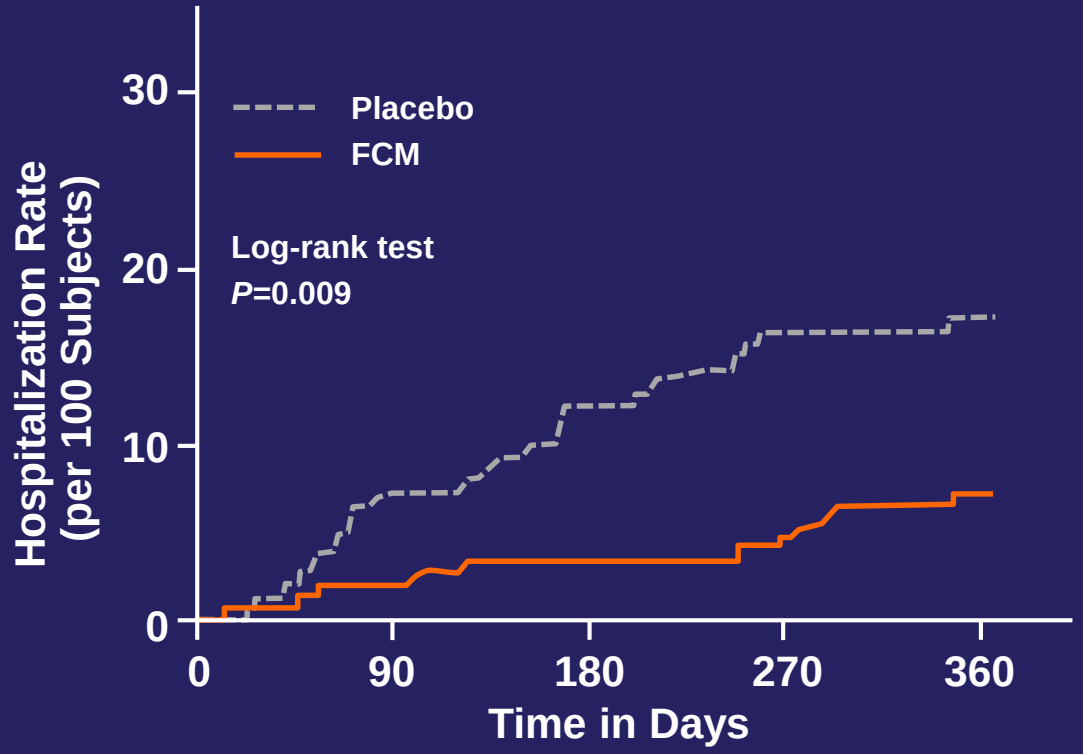
Use of Intravenous Iron for Patients with Symptomatic HF and Iron Deficiency





Ponikowski P, et al. *Eur Heart J*. 2015;36:657–668.

Impact of Intravenous Iron Therapy on Hospitalization Due to Worsening HF



Ponikowski P, et al. *Eur Heart J.* 2015;36:657–668.

Benefits of Phrenic Nerve Stimulation in the Treatment of Central Sleep Apnea

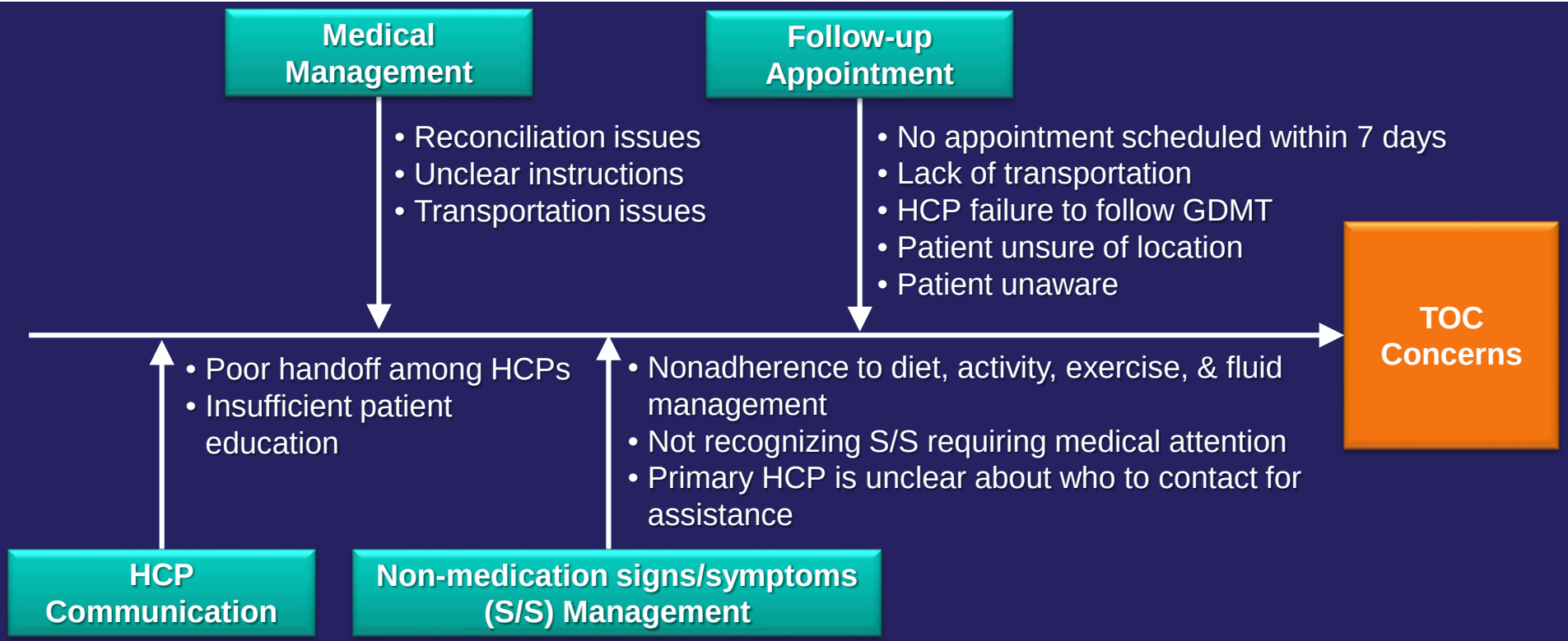
12 Months Active Subgroup	AHI Reduced ≥50% Treatment % (n/N)	Proportion (95% CI)
Age		
<65	58% (18/31)	
65 to <75	67% (10/15)	
≥75	100% (8/8)	
Sex		
Female	71% (5/7)	
Male	66% (31/47)	
Heart failure		
No	61% (14/23)	
Yes	71% (22/31)	
NYHA Class		
I	60% (3/5)	
II	71% (10/14)	
III	75% (9/12)	
Defibrillator		
No	69% (24/35)	
Yes	63% (12/19)	
AHI severity		
Moderate (15 - <30)	57% (4/7)	
Severe (≥30)	68% (32/47)	
Prior SDB therapy		
No	66% (21/32)	
Yes	68% (15/22)	
Atrial fibrillation		
No	66% (23/35)	
Yes	68% (13/19)	

Costanzo M, et al. *Am J Cardiol* 2018;121:1400–1408.

Improving Outcomes Through Effective Transitional Care

HOSPITAL MEDICINE SUMMIT

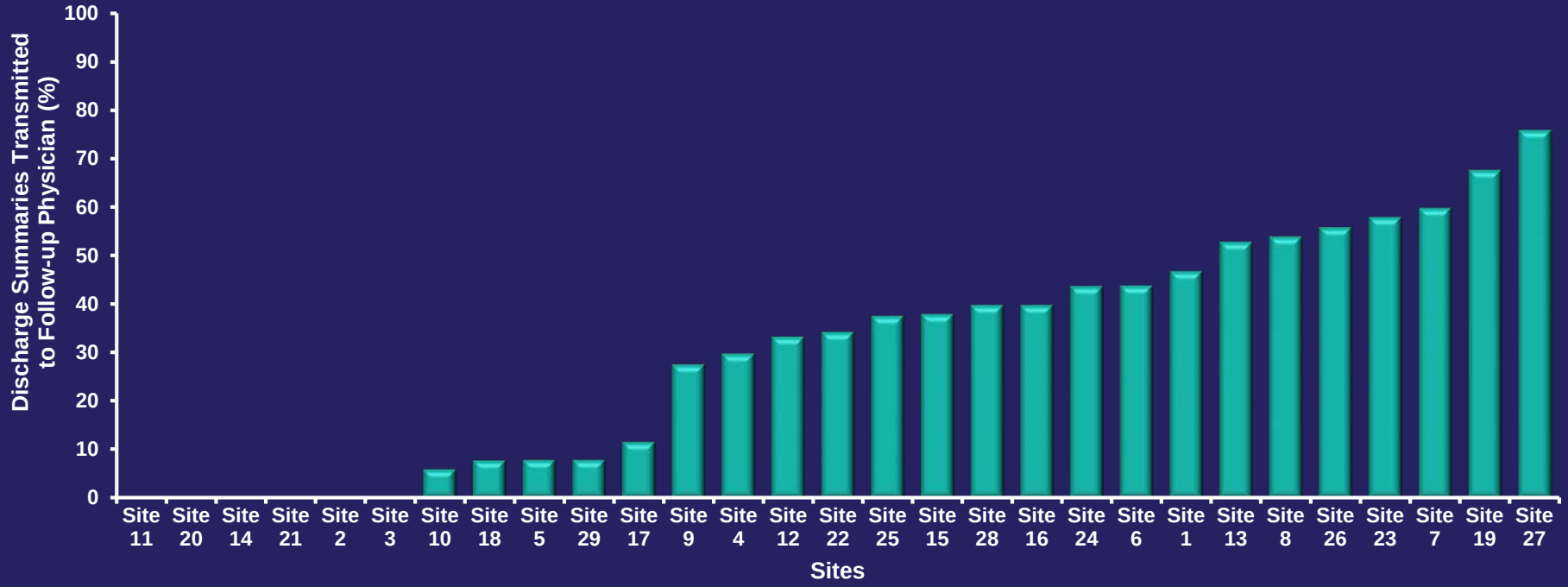
Obstacles to Effective Transitions of Care in HF



HCPs, health care providers; TOC, transitions of care.

AHA Scientific Statement. *Circ Heart Fail.* 2015;8(2):384-409.

Frequency of Discharge Summary Transmission to Follow-up Providers



Salim Al-Damluji M, et al. *Circ Cardiovasc Qual Outcomes*. 2015;8(1):77-86.

Systematic Review of Transitional Care Interventions

Intervention	Impact	Evidence
Home-visiting programs and multidisciplinary HF (MDS-HF) clinic interventions	⬇ All-cause 3 to 6 months readmission	High
Structured telephone support (STS) interventions	⬇ HF-specific and all-cause readmissions	High (HF-specific) Moderate (all-cause)
Home-visiting programs	⬇ HF-specific readmission and composite end point*	Moderate
Home-visiting programs, MDS-HF clinics, and STS interventions	⬇ Mortality	Moderate
High-intensity home-visiting program	⬇ All-cause 30 day readmission and composite end point* at 30 days	Low
Telemonitoring and primarily educational interventions	Did **NOT** reduce readmissions or mortality	Low

*All-cause readmission or death

Feltner C, et al. *Annals Intern Med*. 2014;160(11):774-784.

Sytematic Review of Transitional Care Interventions Cont'd

Intervention	Impact	Evidence
Home-visiting programs and multidisciplinary HF (MDS-HF) clinic interventions	⬇ All-cause 3 to 6 months readmission	High
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High-intensity home-visiting program	⬇ All-cause 30 day readmission and composite end point* at 30 days	Low
Telemonitoring and primarily educational interventions	Did **NOT** reduce readmissions or mortality	Low

AHA Recommended Strategies for Improving Transitional Care in HF

- Patient education
- Phone follow-up (48-72 hours)
- Early postdischarge follow-up visit (7-10 days)
- Early assessment after admission
- Medication reconciliation
- Caregiver inclusion
- Home visits
- Handoff communication to post-hospital providers

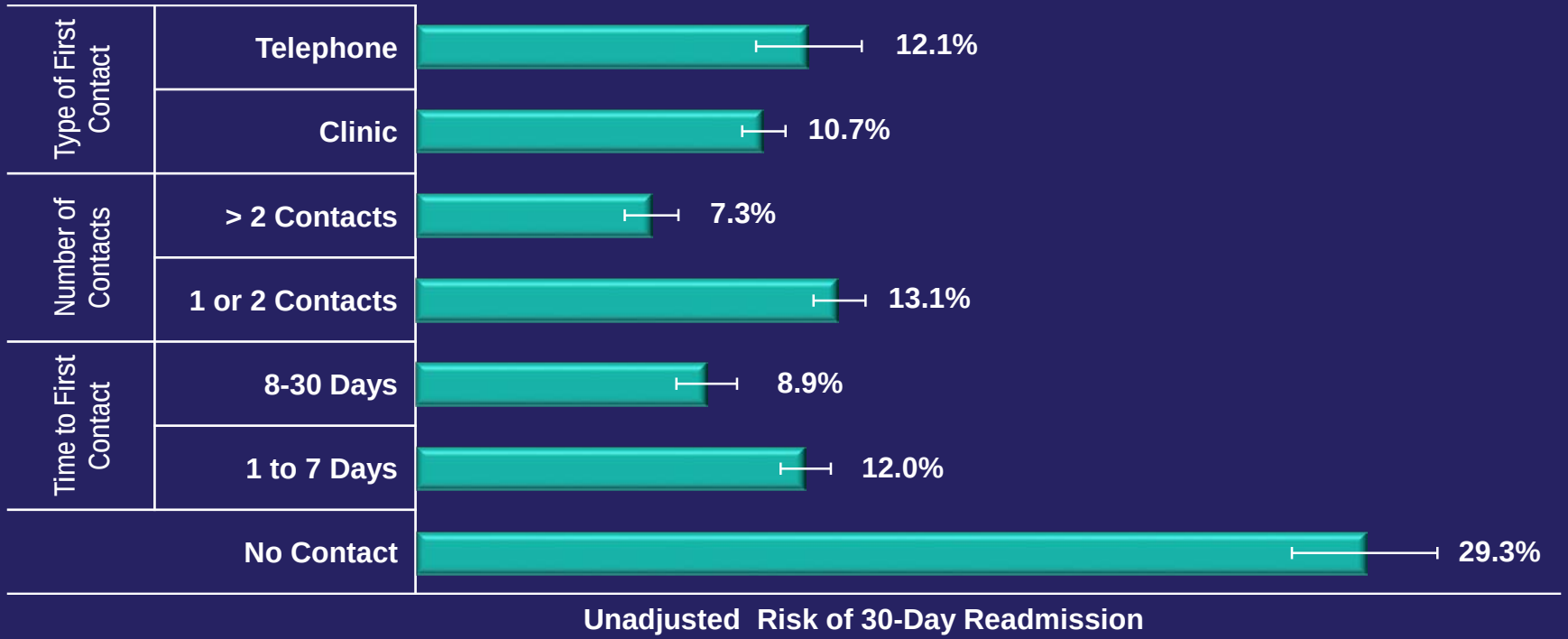
AHA Scientific Statement. *Circ Heart Fail.* 2015;8(2):384-409.

Enhanced HF Patient Education: What Domains Should Be Covered?

- Recognition of escalating symptoms/concrete plan for response
- Activity/exercise
- Indications, use, and need for medication adherence
- Daily weight monitoring
- Modification of risk factors for HF progression
- Diet
- End-of-life considerations
- Follow-up
- Discharge instructions

Available at: http://www.heart.org/idc/groups/heart-public/@private/@wcm/@hcm/@gwtg/documents/downloadable/ucm_428949.pdf

Risk of 30-Day Readmission by Postdischarge Follow-up Contact



Lee KK, et al. *Med Care.* 2016; 54(4): 365–372.

Case Evaluations

Case Evaluation #1: Patient Description

Judy is a 68-year-old woman who presents to the ED for acute distress due to breathlessness and uncontrolled coughing. She reports that over the past 4 months, she has had some difficulty climbing stairs and breathing when lying down (having to sit back up to catch her breath). Judy's medical history includes a remote history of smoking and alcohol consumption. She is dyslipidemic and moderately obese.

ED, emergency department.

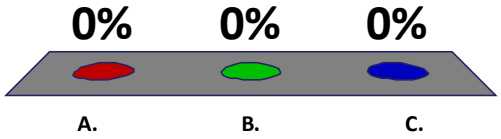
Case Evaluation #1: Question 1

Judy's physical exam confirms dyspnea on exertion and reveals significant ankle edema. Her BP = 130/86 mm Hg, HR = 90 bpm, JVD 12 cm, and she has a positive Kussmaul sign. Which of the following tests would you order to further aid in your diagnosis?

A. Blood testing for BNP/NT-proBNP

B. Invasive hemodynamic monitoring

C. Endomyocardial biopsy



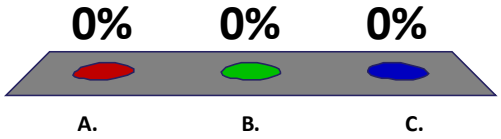
Case Evaluation #1: Question 2

Judy is diagnosed with NYHA III Stage C HFrEF. Following stabilization, she is initiated on a regimen that includes lisinopril and carvedilol. At her 3 month follow-up, clinical and laboratory assessments indicate that she is stable with her current treatment plan. Which of the following would you recommend for Judy?

A. Maintain current treatment regimen

B. Switch to ARNI

C. Switch to ivabradine



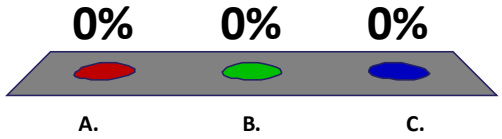
Case Evaluation #1: Question 3

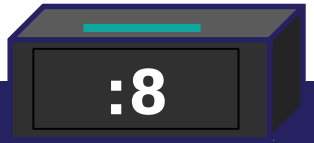
If you were to switch Judy to ARNI, how long would wait before initiating ARNI after discontinuing lisinopril?

A. 12 hours

B. 36 hours

C. 3 days





Case Evaluation #2: Patient Description

Jim is a 73-year-old man who presents with breathlessness over the past 2 days. His history includes 3 prior hospital admissions for worsening HF over 2 years. He has difficulty with ADLs. Previous echocardiograms have shown moderate LV systolic dysfunction (EF 26%, PASP 55 mm Hg, EDD 6.7 cm). Physical exam reveals BP 98/78 mm Hg, HR100 bpm, RR 25/min, S_4, and displaced point of maximal impulse. Jim's EMR reveals that he has a history of iron deficiency as well. His current medications include aspirin, furosemide, enalapril, and carvedilol.

PASP, pulmonary artery systolic pressure; S_4, fourth heart sound; EMR, electronic medical record.

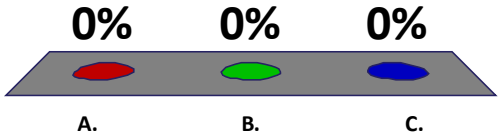
Case Evaluation #2: Question 1

Which of the following changes to Jim's therapeutic regimen would you recommend for Jim?

A. Addition of ARNI to Jim's current treatment regimen

B. Increase the dose of carvedilol

C. Switch Jim from enalapril to ivabradine



Case Evaluation #2: Question 2

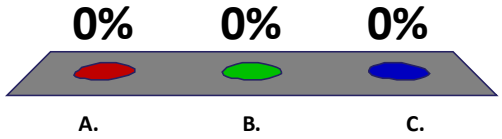
What type of intervention, if any, would you consider for the treatment of Jim's iron deficiency?

A. Dietary iron supplementation

B. Intravenous iron therapy

C. Erythropoietin therapy

D. No therapy



Summary

- Despite recent progress in the reduction of HF-related readmission rates, the health outcomes of many patients with HF remain suboptimal
- Optimal management of HF requires thorough and accurate patient evaluation along with the implementation of guideline-directed medical therapy to control symptoms and improve prognosis
- New treatment options have expanded the range of strategies to achieve therapeutic goals and demonstrated the capacity to significantly improve patient outcomes over standard therapy

Clinical Pearls

- For patients with symptoms of HF, apply a multifaceted evaluation approach to identify underlying causes and risk for disease progression
- Implement guideline-directed medical therapy for all patients with HF
- Consider treatment using a newer agent with a novel mechanism of action for any patients who remain symptomatic despite their current regimen as well as those who are stable but may benefit from a switch in therapy
- Prior to discharge, evaluate patients' clinical status, comorbid conditions, and current medication regimen, and adjust the care plan accordingly
- Schedule timely follow-up and ensure adequate communication of the care plan to the nursing home team, home healthcare team, PCP, or family caregiver

Questions and Answers

Thank You!