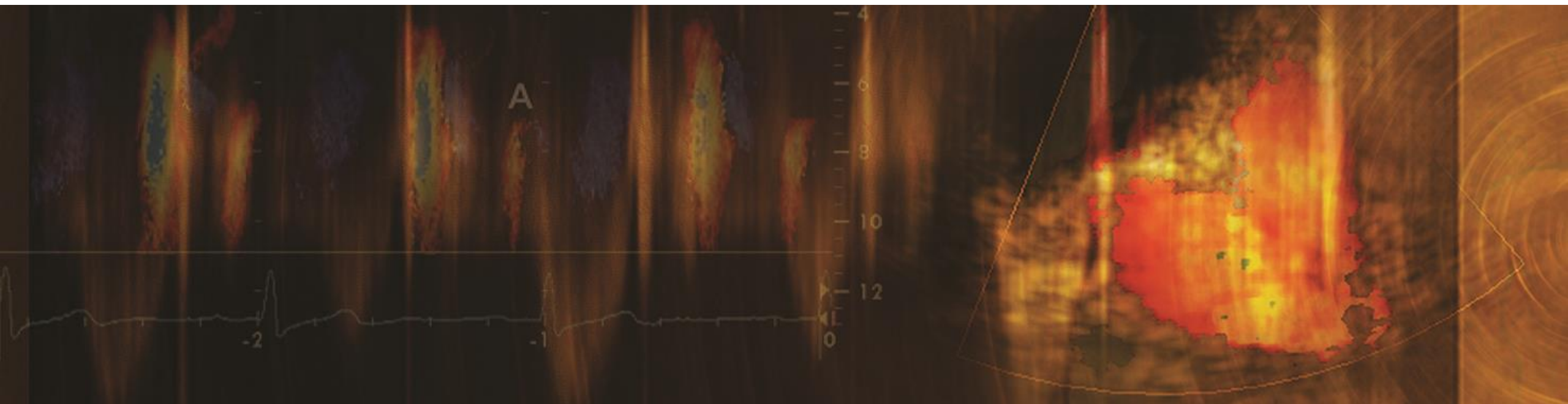




Inpatient Congestive Heart Failure Evaluation and Management



Dr. S. Allen Luis, MBBS, FRACP, FACC, FASE

Co-Director, Pericardial Diseases Clinic

Medical Director, Mayo Clinic School of Health Sciences Echocardiography Program

Medical Director, Mayo Clinic School of Health Sciences Advanced Cardiovascular Sonography Program

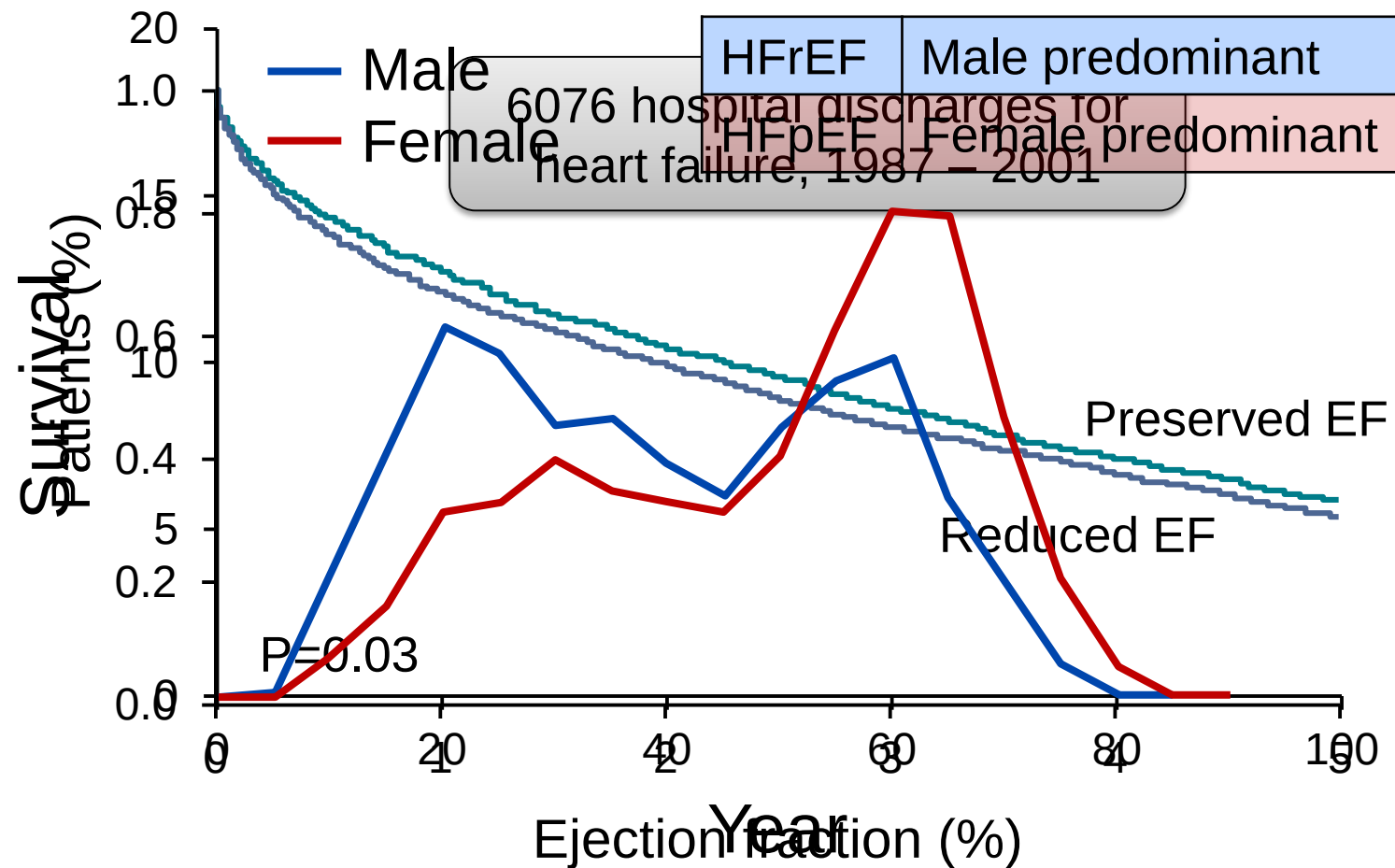
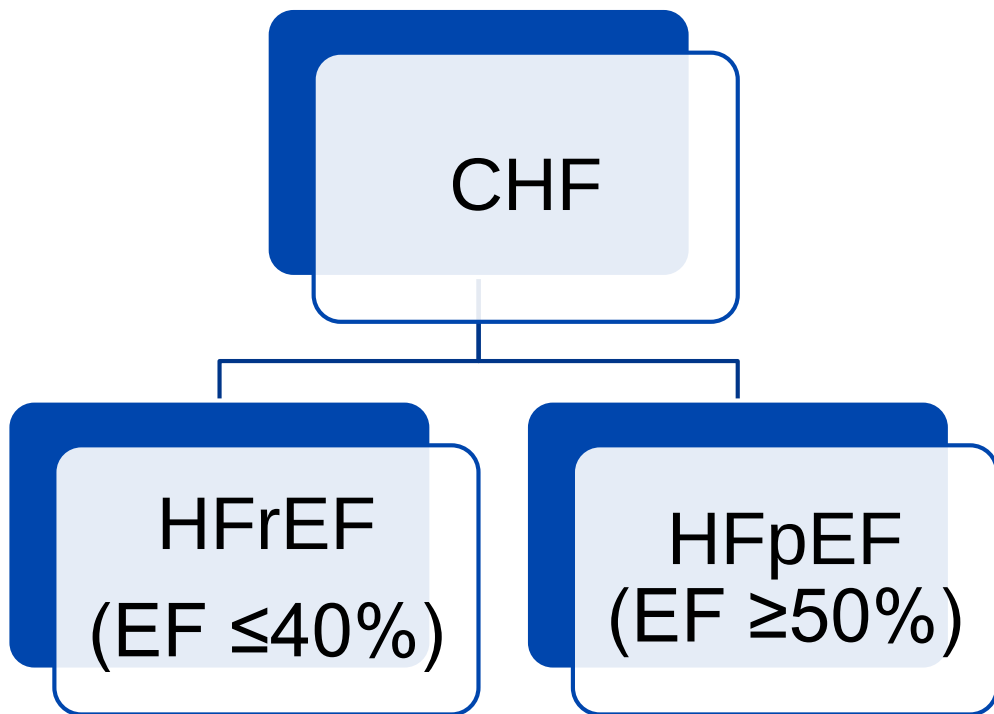
Faculty Disclosure

Relevant financial relationship(s) with industry

None

Off Label Usage

None



Key features

History

- SOB
- Orthopnoea
- PND
- Chest pain
- Palpitations
- Toxins

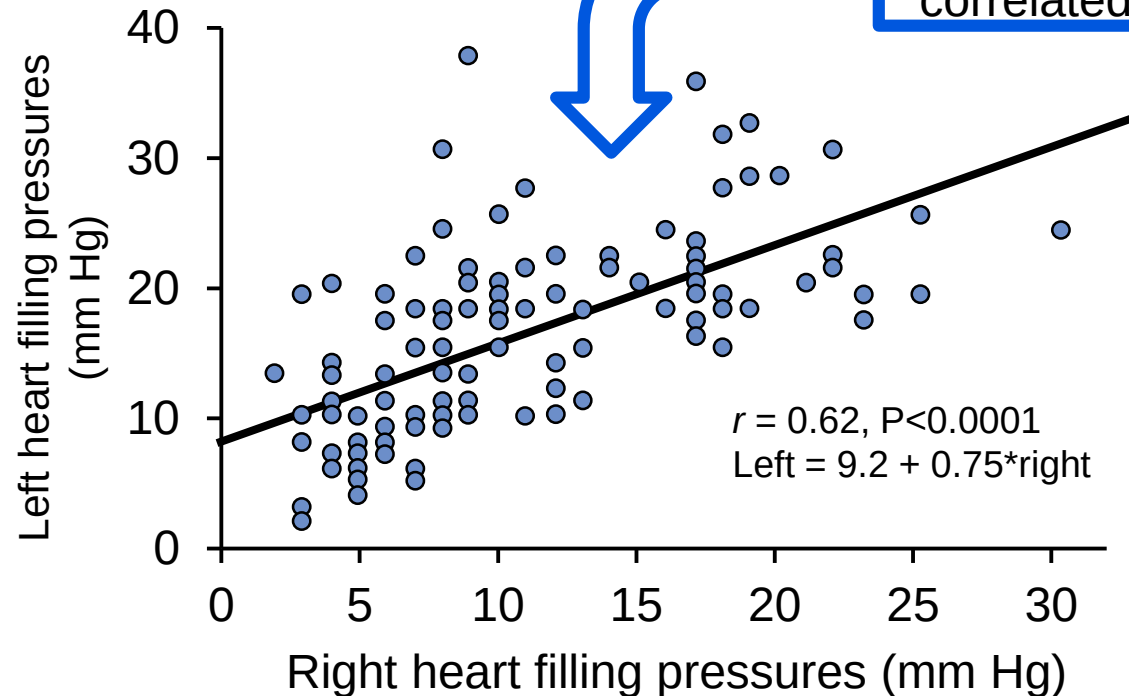
Examination

- JVP
- Crackles
- Ascities
- Peripheral edema
- Murmurs
- Rate / Rhythm

118 patients undergoing right heart cath

- Physical exam from staff cardiologist predicted right heart pressures with 82% accuracy.

- Right and left heart pressures by cath correlated in 80% of cases.



	Normal Left Heart Pressures	Abnormal Left Heart Pressures
Normal Right Heart Pressures	70* (33%)	38 (17%)
Abnormal Right Heart Pressures	6 (3%)	101* (47%)

Non-pharmacologic

- Daily weighs and monitor fluid balance
- Daily electrolytes and renal function
- Sodium restriction
 - ≤ 1.5 grams/day
- Fluid restriction
 - ≤ 1.5 to 2 liters/day
- DVT prophylaxis
- Discuss goals of care and resuscitation status



Pharmacological therapy

Drugs that ↓ mortality	Drugs that ↓ symptoms
ACE inhibitors / ARBs	Diuretics
β-blockers	Digoxin
Aldosterone antagonists	Inotropes (dobutamine, milrinone)
Hydralazine & nitrates (in African Americans)	Vasodilators (nitroglycerin, nitroprusside)

Management of Acute Heart Failure

		Congestion at rest?	
		No	Yes
Perfusion at rest?	Normal	Warm & dry	Warm & wet
	Low	Cool & dry	Cool & wet

Warm & dry	Does not need admission
Warm & wet	Diurese
Cool & dry	Inotropes, mechanical support
Cool & wet	Diurese, inotropes, vasodilate

Diuretics

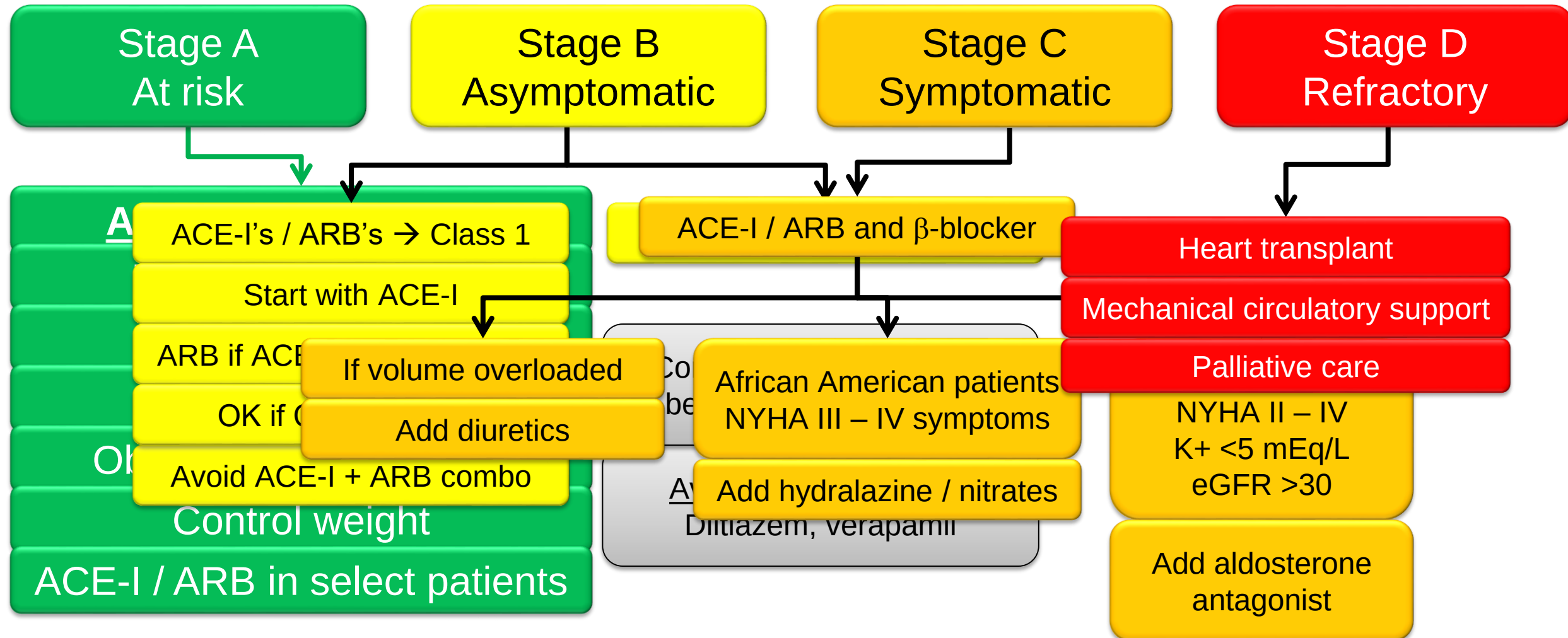
- Start IV loop-diuretic at $\geq$ usual oral dose
- Either boluses or continuous infusion
- Aim weight loss 1 kg
- If inadequate response, add another diuretic (e.g., thiazide)
- Consider adding spironolactone as K^+ sparing diuretic

Carefully assess fluid status
Creatinine improves with initial diuresis
Creatinine only gets worse with overdiuresis

- Potential roles for low-dose dobutamine and ultrafiltration

Chronic heart failure

Pharmacological therapy



Beta-blockers

	Initial dose	Goal dose
Carvedilol	3.125 mg BID	50 mg BID
Metoprolol succinate	12.5 - 25 mg daily	50 mg daily
Bisoprolol	1.25 mg daily	10 mg daily

- Carvedilol
 - More vasodilatory
 - Preferred if blood pressure not a limitation to titration

- Metoprolol succinate
 - Use in patients with tendency toward hypotension
 - Less likely to provoke bronchospasm

COPD is not a contraindication to β -blockade

Beta-blockers

- Continue at usual home dose
- Only discontinue in hemodynamic compromise or if required inotropes.
- Initiate

- **Do not give β -blockers in acute pulm edema**
- **Initiate β -blockers slowly and gently up-titrate**
- **Sinus tachycardia is compensatory to maintain stroke volume – do not aggressively β -block for HR control**

required inotropes

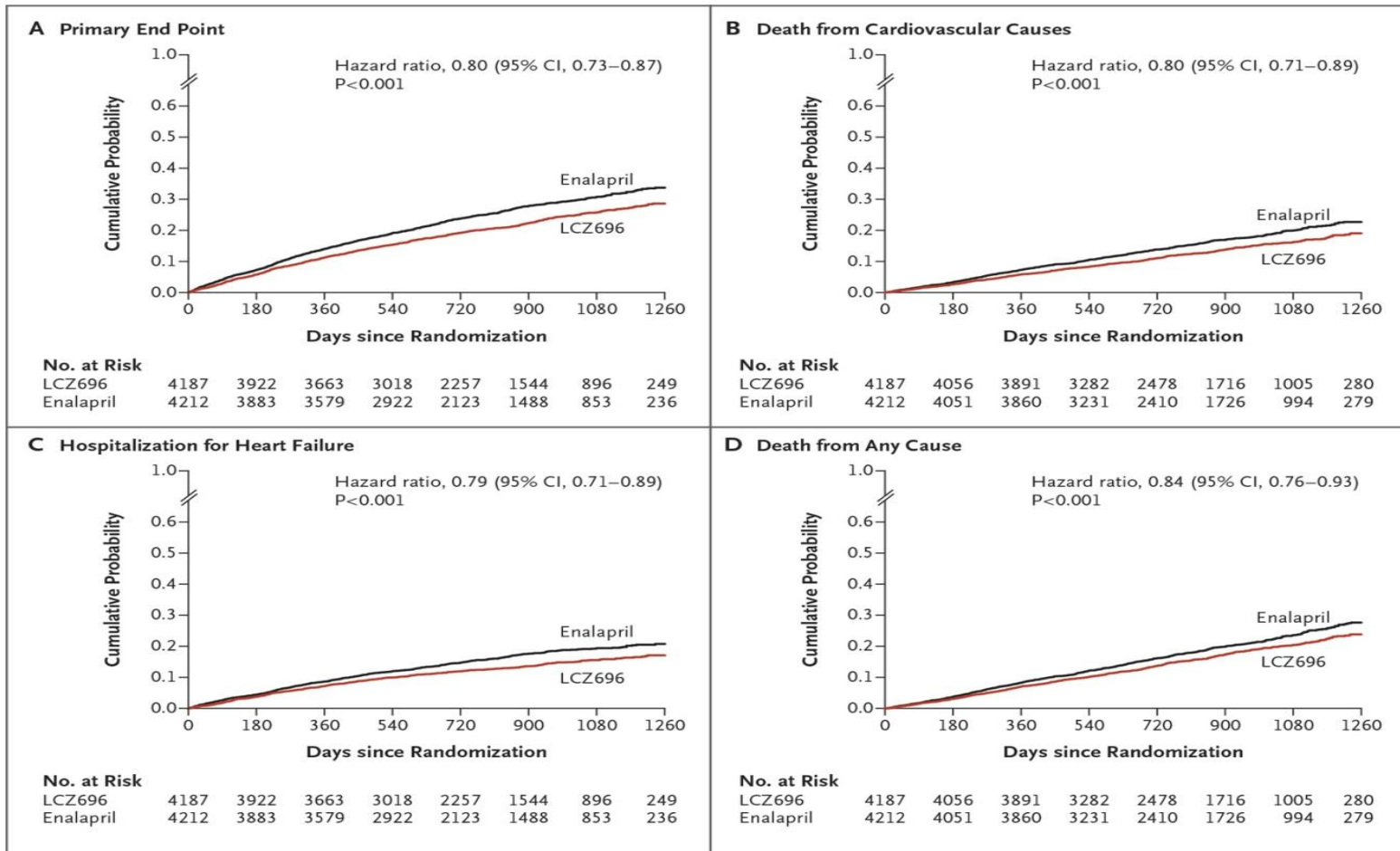
ACE Inhibitors and ARBs

- Ideally continue home doses at admission
- Consider temporary dose reduction or discontinuation if worsening of renal function until improves.
- Aim to uptitrate during admission as tolerated
- Recheck potassium and creatinine 2 weeks after dose uptitration

Digoxin

- Persistent symptoms despite medical therapy
- Decreases HF hospitalisations
- Goal level → 0.5 – 0.9 mg/dL
- Additional rate control in AF

Valsartan / Sacubitril (Entresto)

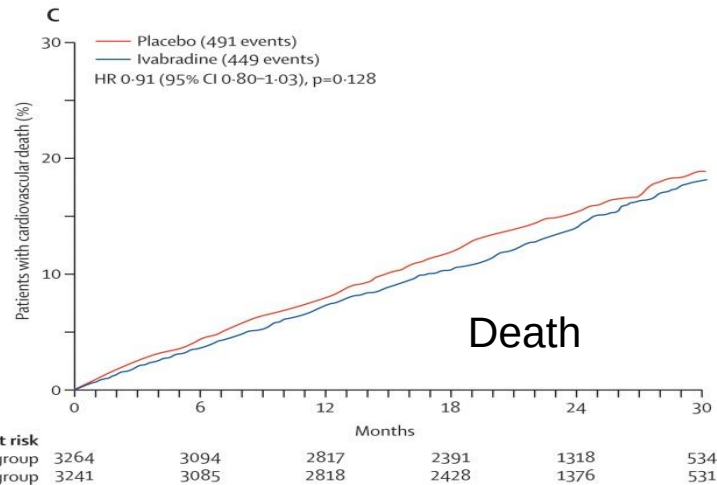
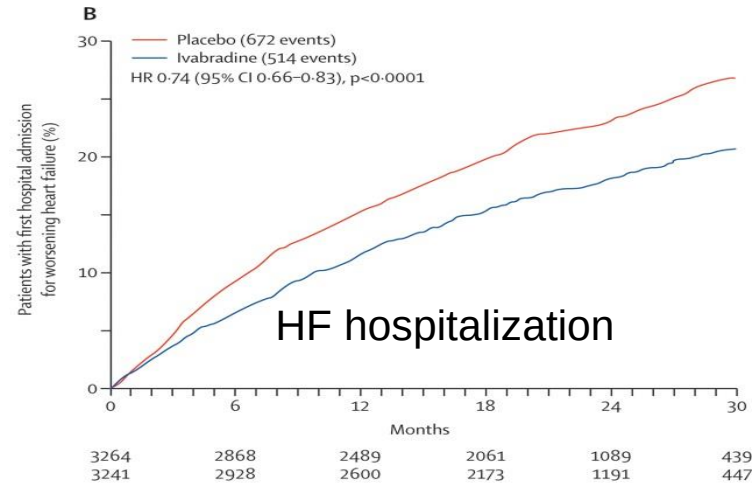
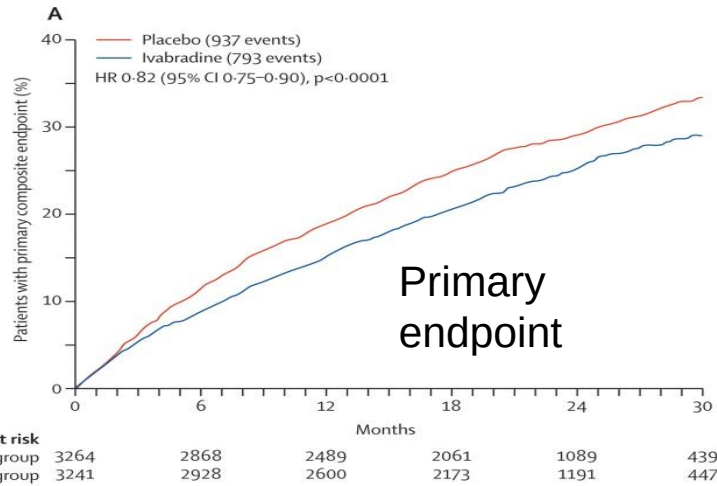


- 8442 patients
- NYHA class II - IV
- LVEF $\leq 40\%$
- Enalapril versus ARB + neprilysin inhibitor
- ↓ composite endpoint of CV death or HF hospitalization by 20%

Valsartan / Sacubitril (Entresto)

- HFrEF patients with NYHA class II-III symptoms who tolerate ACEI / ARB
- Do not use in those with history of angioedema
- Neprilysin inhibitors cause angioedema when used with ACEI
- Wait 36 hours from last dose of ACEI prior to commencing

Ivabradine



- Selective sinus node blocker
- ↓ HF admissions in HFrEF with NYHA class II-III symptoms
- Sinus rhythm with resting HR > 70 BPM on max tolerated beta-blocker dose

HFpEF

I-PRESERVE¹⁶

CHARM-Alternative^{s16}

CHARM-Preserved¹⁵

PEP-CHF¹⁷

SOLVD^{s17}

DIG-Pre

DIG²⁸

OPTIMIZE

OPTIMIZE

OPTIMIZE-ACE⁹

OPTIMIZE-ACE⁹

OPTIMIZE-BB²⁰

OPTIMIZE-BB²⁰

Lots of negative trials!
Paucity of good data in HFpEF!

0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3

Hazard ratio for death or HF hospitalization

— HFrEF

— HFpEF

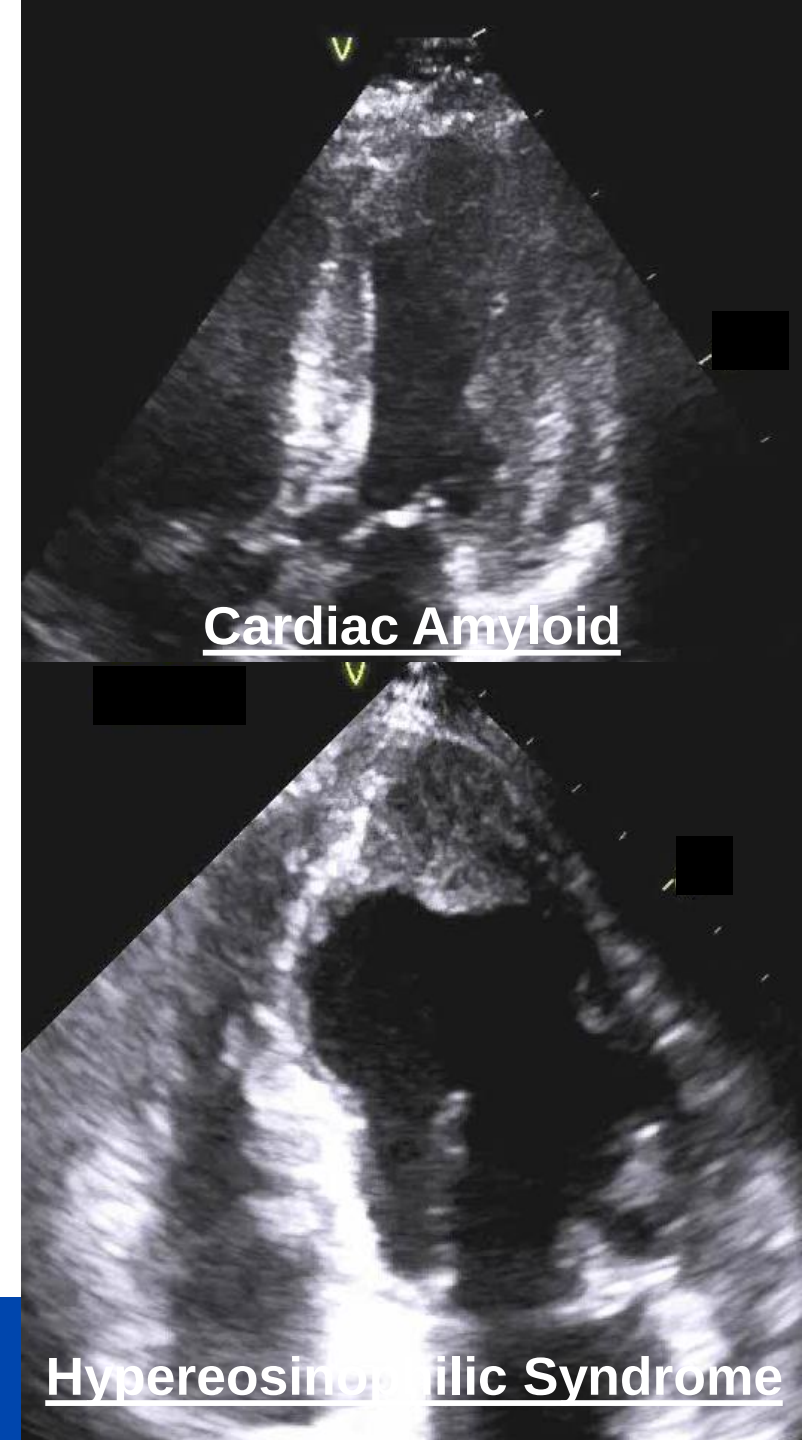


HFpEF Management

- Treat Hypertension
 - ACE-I / ARB and / or β -blockers
 - Consider aldosterone antagonist
- Use diuretics to achieve euvolemia
- Exclude coronary artery disease
- Control atrial fibrillation
- Manage lifestyle
 - Diet & exercise

Restrictive Cardiomyopathies

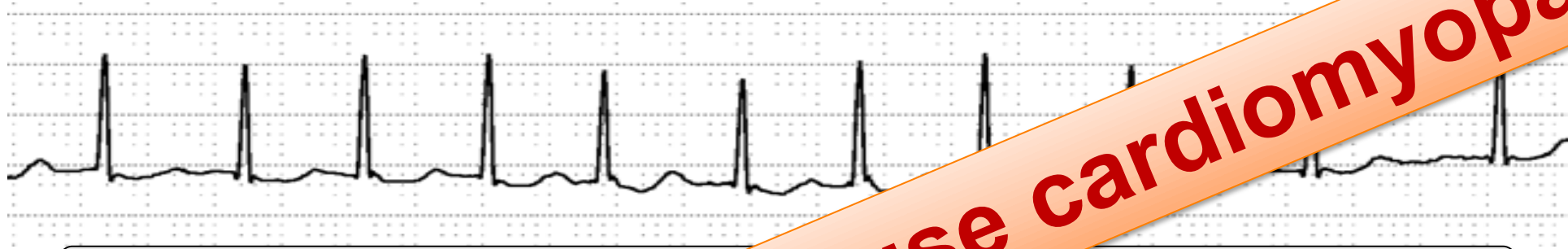
- Slow diuresis
- Cautious β -blockers
- Avoid digoxin
- Treat underlying cause
- Consider transplantation



Chemotherapy-induced Cardiomyopathy

Anthracyclines (doxorubicin)	Dose dependent (≥ 300 mg/m ²)
	Irreversible
Trastuzumab	Not dose dependent
	Reversible
5-fluorouracil	Vasospasm
	Ischemia, arrhythmias
Management	Optimize medical therapy
	Control other risk factors

Tachycardia-induced Cardiomyopathy



Weeks-to-months of tachycardia

Atrial fibrillation

and tachycardia

PVC's ($\geq 20,000/\text{day}$)

Check a TSH

Sinus tach does NOT cause cardiomyopathy



Treat arrhythmia

Optimize meds

Re-assess LV function

Look for other causes



Essentials at hospital discharge

- Diuretics
 - Ideally ensure stable weight on oral Rx for 24 hrs prior
 - Consider using Torsemide or Bumetanide in RHF
 - Lasix 40mg po = Torsemide 20mg = Bumetanide 1mg
- Daily weighs
 - Needs diuretic dose adjustment if weight $\uparrow$ or $\downarrow$ by > 2 kg
- Low salt diet ($\text{Na}^+ \leq 1.5$ g/day)
- Fluid restrict (≤ 1.5 L per day)
- PCP follow up and HF titration plan

Conclusions

- Daily clinical assessment of volume status essential
- Diuresis improves renal function in volume overload
- Consider Torsemide or Bumetanide in RHF at discharge
- Use admission time to uptitrate HF therapy
- HF medication titration and diuretic plan essential to prevent re-admissions



Questions & Discussion

luis.s@mayo.edu