Clinical Case Discussion

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CUSOM

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A 68-year-old man with a history of HTN and hyperlipidemia presents to the emergency department with progressive shortness of breath for the last month. He woke up this morning unable to breathe. His family called EMS.

He describes worsening fatigue and has new onset swelling in his lower extremities over the last week. He denies fever. He has gained about 15 pounds in the last six weeks. He denies chest discomfort, palpitations, abdominal discomfort, changes in bowel movements or urination.

PMH:

- HTN x 20 years
- Hyperlipidemia x 20 years

Meds:

- Amlodipine 5 mg po daily
- Atorvastatin 40 mg po qhs

Social history: He is married. He is a retired banker. He has never smoked. There is no history of alcohol or drug use.

NKDA

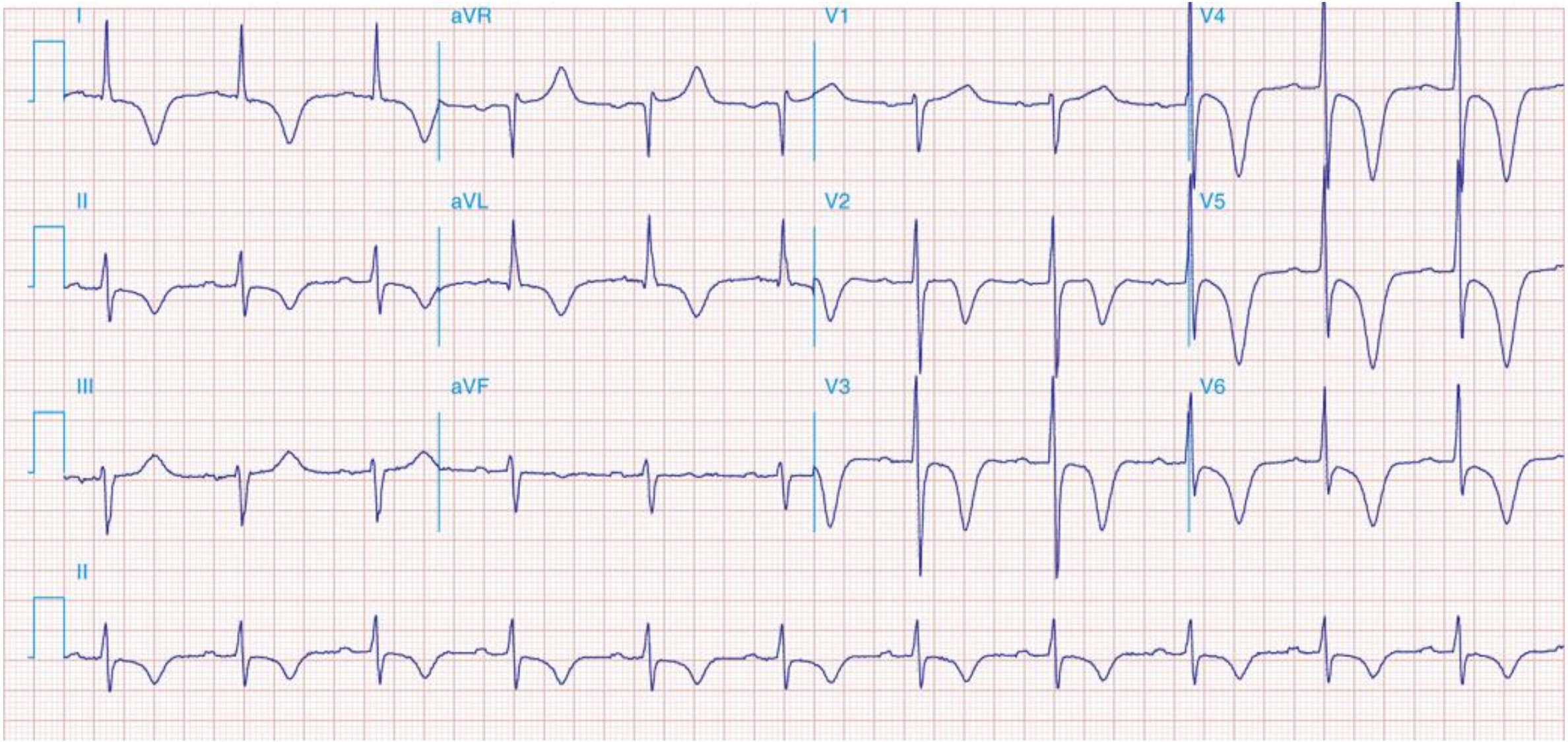
On exam, he is marked respiratory distress.
Vitals: bp 130/76 p 110 RR 30 afebrile. O2 sat 85% on room air, improved to 95% on a 50% ventimask 6’1’’ Weight 210 lbs BMI 27.7

HEENT:	PERRL; EOMI; OP: moist membranes
Neck:	full ROM; trachea midline. No thyromegaly. No lymphadenopathy. JVP 10 cm at 60 degrees; no carotid bruits
Car:	R/R/R with an S3 present, PMI enlarged and displaced to the L
Lungs:	coarse inspiratory rales half way up from the lung bases bilaterally
OMM:	thoracic inlet restricted on the L T3FRRSR L 8th, 9th, 10th rib with exhalation dysfunction

Abd: soft, nontender, nondistended, no organomegaly

Extr: 1+ pitting edema in both legs; dp pulses 1+ bilaterally

Neuro: Oriented to person, place and time.
CNs II through XII grossly intact
Motor: normal bulk and tone in all four extremities. Strength: wrist ext, forearm flex, hip flex, leg ext, plantar flex all 5/5 B/L
Sensory: light touch grossly intact throughout
Cerebellar: finger to nose and heel to shin testing without difficulty B/L
Reflexes: biceps, triceps, patellar all 1+ B/L, ankle jerks absent B/L; Babinski signs not present B/L.
Gait: not tested



Labs:

wbc	13.3
hgb	13.8
hct	41%
platelets	345,000

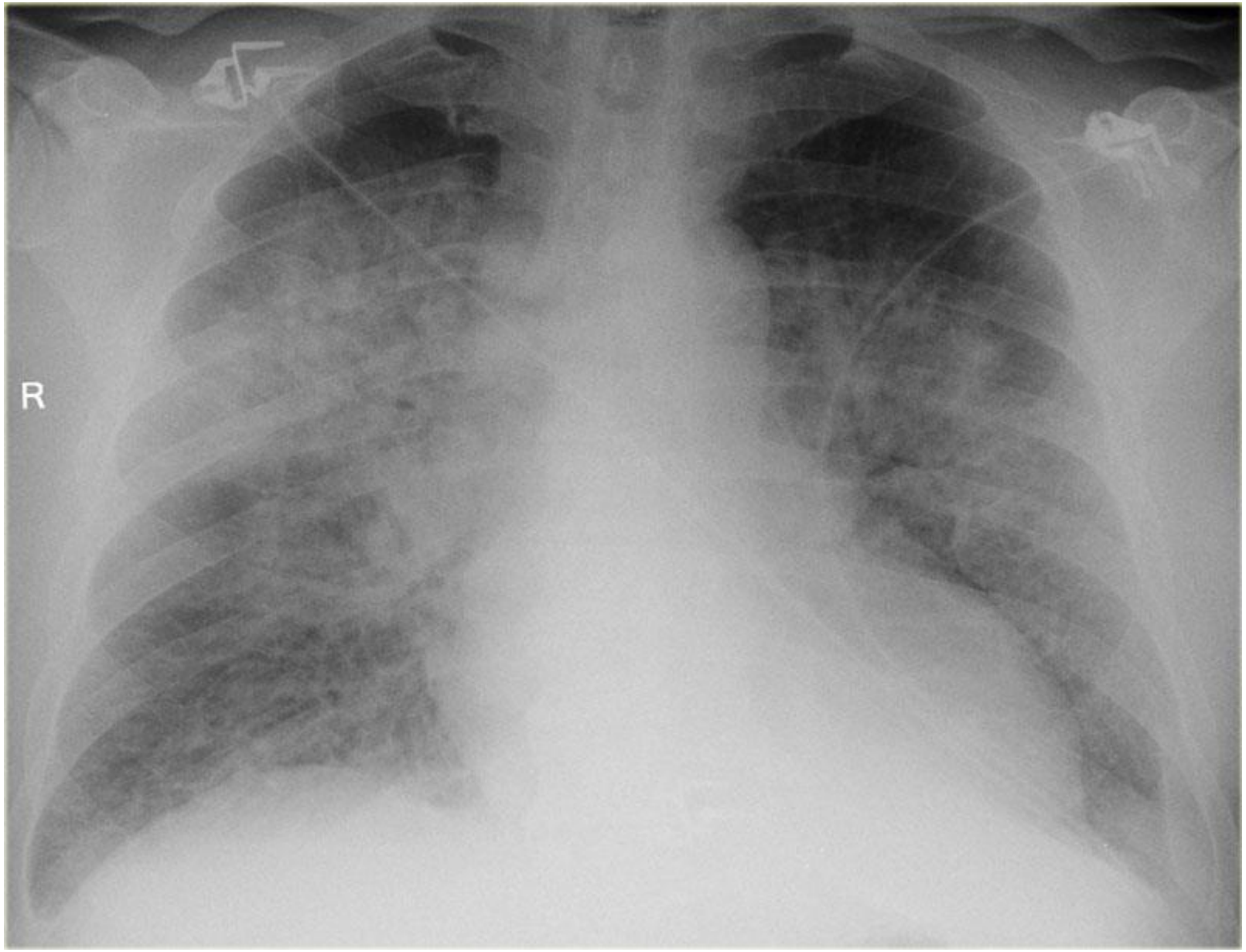
Na	139
K	4.1
CL	104
CO2	25
BUN	23
Cr	1.3
Glc	88

NT-proBNP 2500 pg/ml

Troponin < 0.01

CrCl: 60 ml/min

A CXR is done . . .



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Now what???

Airway: intact

Breathing: still in respiratory distress despite at 50% ventimask. Start BiPap 10/5 with FiO2 50%

Circulation: place two peripheral IVs

He is given Lasix 40 mg IV x 1
Nitropaste 1” topically x 1
ASA 81 mg po x 4 chewed
Consider morphine 1 mg IV x 1

He diureses over 1 liter of urine and feels better. He is admitted to the stepdown unit.

Repeat vital signs: bp 130/80 p 90 RR 24 temp 97.8 OS sat 96% on BiPap 10/5 with FiO2 50%

He is admitted to the stepdown unit. . .

Admission Orders

- **A**dmit: Stepdown Unit/Hospital Medicine Service
- **D**iagnosis: CHF
- **C**ondition: Guarded
- **V**ital signs: q 2hrs
- **A**llergies: NKDA
- **A**ctivity: Bedrest
- **N**ursing care: Place Foley catheter; strict I/Os. Daily weights
- **D**iet: NPO except meds
- **I**VF: Saline lock; maintain two peripheral IVs at all times
- Special: RT to titrate BiPap 10/5 with FiO2 50%; keep O2 sat > 92%
- Meds:
  - Lasix 40 mg IV bid
  - Nitropaste 1” topically q 6 hrs
  - ASA 325 mg po daily
  - Lovenox 40 mg SQ daily
  - Tylenol 650 mg po 6 hrs prn pain, fever
- Labs:
  - Hs-Trop now, repeat in 3 hrs
  - BMP, Mag, Phos, Lipid panel in am
- Call physician for:
  - Syst bp > 180, < 100
  - HR > 120, < 60
  - RR > 30, < 10
  - Temp > 100F
  - O2 sat < 90%, UOP < 50 ml/hr

Hospital Day Two:

He is feeling better. He is breathing more comfortably. He denies chest discomfort. Vital signs: bp 120/78 p 82 RR 22 temp 98.8F O2 sat 96% on BiPap 10/5 with FiO2 50%

I/O: 500 ml/2200 ml net – 1700 ml out. Weight – 1.2 kg

JVP 9 cm at 45 degrees
Car: r/r/r
Lungs: decreased rales with improved air movement at the bases
Abd: soft, nontender
Extr: 1+ edema; dp pulses 1+B/L; calves soft

You d/c BiPap and start 4 L O2 NC
You start a low sodium diet . . .

He rules out for an MI. A portable 2-D echo confirms LVEF 20% with global hypokinesis and no significant valvular disease.

Now what???

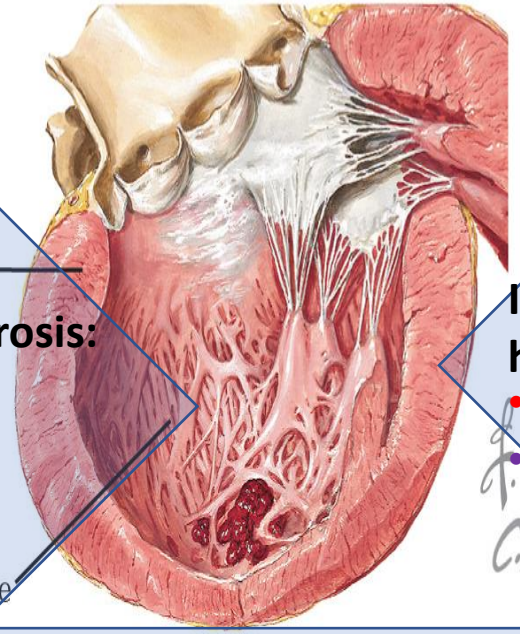
Your team discusses your patient with the cardiology team. The cardiologist recommends a left heart catherization during this admission. But first, we need to optimize the patient's heart failure. . .

Congestive Heart Failure with reduced ejection fraction (HFrEF) Pathophysiology, standard medical treatment and OMM

PATHOLOGIC PROCESSES

STANDARD MEDICAL TREAMENT

OSTEOPATHIC TREATMENT



Aldosterone-induced myocardial fibrosis: ventricular dilatation

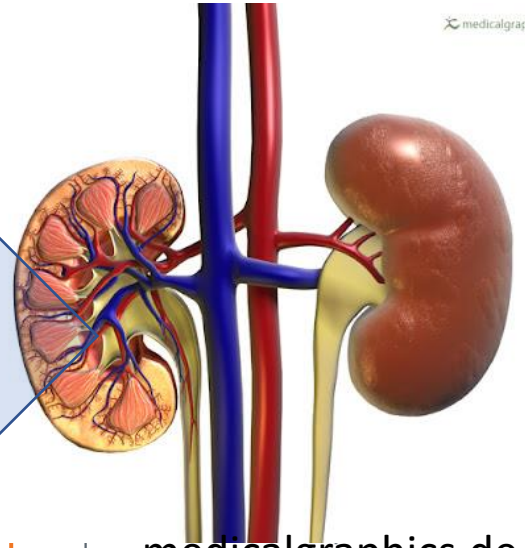
- **spironolactone**

Increased sympathetic activity: Uncontrolled hypertension, Ventricular hypertrophy

- **Beta blocker**
- **Non pharmacologic reduction of sympathetic activity**

Activation of renin-angiotensin-aldosterone system: Water and sodium retention, Vasoconstriction

- **Neprilysin-inhibitor/ARB or ACE-I or ARB**
- **Diuretic**
- **SGLT-2 inhibitor**
- **Improve laminar blood flow to the kidneys to enhance diuresis**



Management of Chronic Heart Failure Download PDF
Hannah Bensimhon and Carla A. Sueta
Netter's Cardiology, Third Edition 29, 190-196

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You start sacubitril/valsartan 24mg/26mg po bid, continue Lasix 40 mg IV bid.

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Angiotensin-Neprilysin Inhibition in Acute Heart Failure

Outcome (%)	Sacubitril/valsartan (N= 440)	Enalapril (N=441)	RR (95% CI)
Death	2.3	3.4	0.66 (0.30 to 1.48)
Rehospitalization for CHF	8.0	13.8	0.56 (0.37 to 0.84)
Composite of all serious clinical events	9.3	16.8	0.54 (0.37 to 0.79)

New Engl J Med 2019; 380(6):539-548.

Hospital Day Three:

The next day, he is feeling better.
Vitals: bp 120/76 p 84 RR 18 temp 98.7F O2 sat 93% on 3 L NC

I/O 1000 ml/2500 ml; net - 1500 ml weight – 2.4 kg since admission

On exam, his JVP 8 cm at 45 degrees, he has a regular rhythm, his lungs are now clear and his edema is improved.

You add metoprolol XL 25 mg po daily to his regimen.

Metoprolol in Congestive Heart Failure: Total mortality or hospitalization for worsening heart failure

Metoprolol **N= 1990**	**Placebo** **N= 2001**	**RR** **EER/CER**
15.6%	21.9%	0.71 (p< 0.01)

JAMA 2000; 283: 1295-1302.

Hospital Day Four:

The next day, he continues to feel better. He no longer needs supplemental oxygen and is out of bed to chair. Vitals: bp 115/72 p 80 RR 18 temp 98.7F O2 sat 94% on RA

I/O 1050 ml/2300 ml; net – 1250 ml weight – 3.5 kg since admission

On exam, his JVP 8 cm at 45 degrees, he has a regular rhythm, his lungs are now clear and his edema is improved.

You add spironolactone 25 mg po daily to his regimen . . .

Spironolactone in HFrEF: All-cause mortality

Spironolactone (N=822)	**Placebo (N=841)**	**RR EER/CER**
34.5%	45.9%	0.75 (p<0.001)

N Engl J Med 1999; 341: 709-17.

Hospital Day Five:

He is up and ambulatory with no complaints.
Vitals: bp 110/68 p 68 RR 14 temp 98.6F O2 sat 94% on RA

I/O 1200 ml/2200 ml; net – 1000 ml weight – 4.8 kg since admission

On exam, his JVP 7 cm at 45 degrees, he has a regular rhythm, his lungs are clear and his edema is resolved

Follow up labs:

Na	139
K	3.4
CL	102
CO2	25
BUN	23
Cr	1.4
Glc	102

You transition him to Furosemide 40 mg po daily

You add Dapagliflozin 10 mg po daily . . .

Dapagliflozin in HFrEF: Primary Outcome—Worsening Heart Failure or Cardiovascular Death

Dapagliflozin N=2373	**Placebo N=2371**	**RR (relative risk) (95% CI)**
	(CER)	**(EER/CER)**
16.3%	21.2%	0.77 (p<0.001)

N Engl J Med 2019;381(21): 1995-2008

Our patient's current inpatient medication regimen is:

- Sacubitril/valsartan 24 mg/26 mg 1 po bid
- Metoprolol XR 25 mg po daily
- Spironolactone 25 mg po daily
- Dapagliflozin 10 mg po daily
- Furosemide 40 mg po daily
- ASA 81 mg po daily
- Atorvastatin 40 mg po daily

Adjunctive OMM . . .

Adjunctive OMM . . .

OMM: thoracic inlet restricted on the L
T3FRRSR
L 8th, 9th, 10th rib with exhalation dysfunction

Example of OMT Sequence for CHF in our patient

OMT Technique	**Treatment Goals**
FPR T3	Treat somatic dysfunction T3FRRSR
Muscle energy with respiratory assist	Treat exhalation dysfunction in L 8^{th}, 9^{th} and 10^{th}

Example of OMT Sequence for CHF in our patient

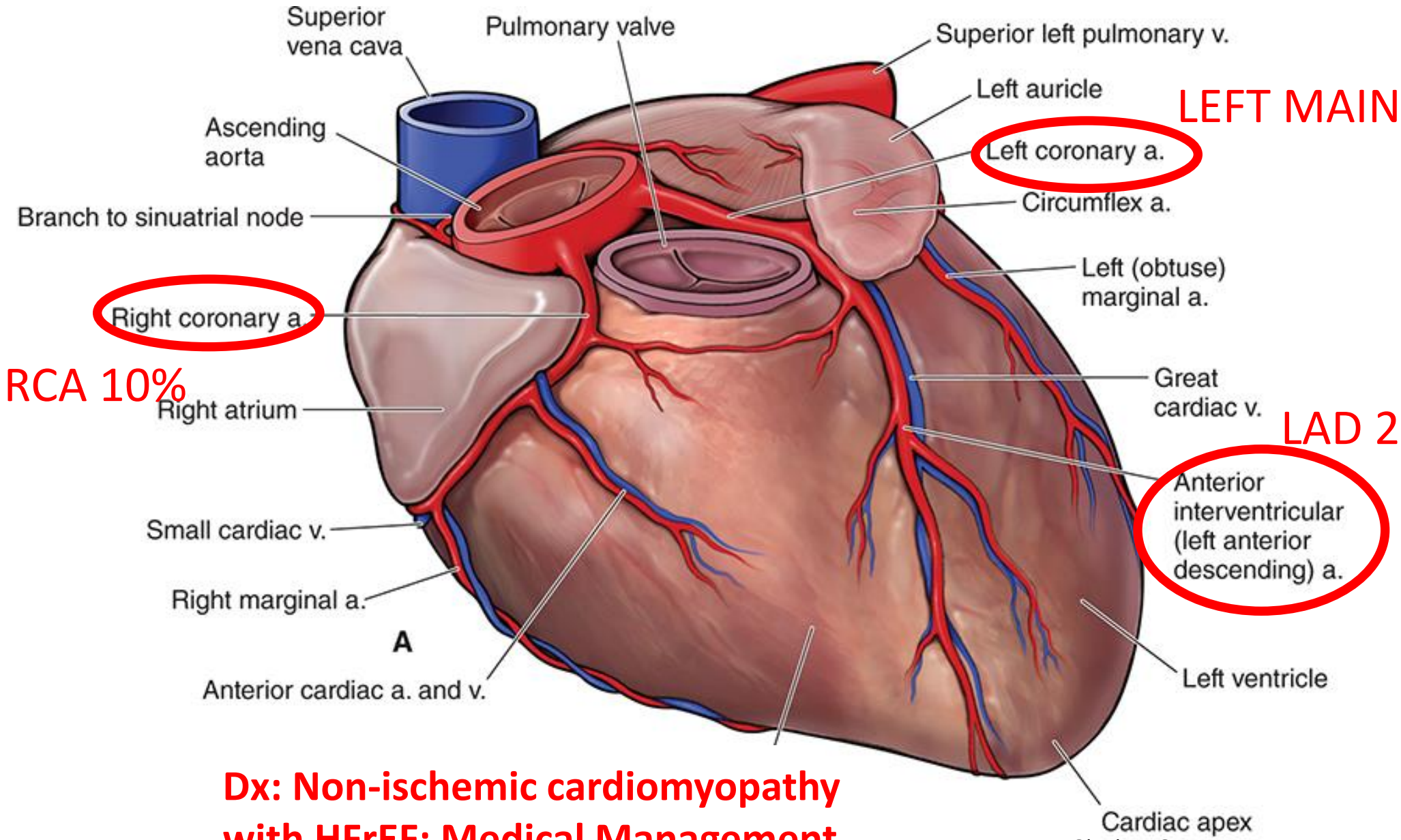
OMT Technique	**Treatment Goals**
Rib Raising T10 to L2	Increase blood flow to the kidneys; optimize diuresis
Rib Raising T1 to T4	Decrease tension on thoracic sympathetic chain which supplies the heart
Suboccipital release	Decrease tension on the vagus nerve

Example of OMT Sequence for CHF in our patient

OMT Technique	**Treatment Goals**
Myofascial release of the thoracic outlet	Optimize lymphatic drainage from the whole body
Pedal Pump	Optimize lymphatic drainage from the whole body

Hospital Day Six:

He undergoes a L heart catheterization with results as follows:



LEFT MAIN 10%

RCA 10%

LAD 20%

Dx: Non-ischemic cardiomyopathy with HFrEF: Medical Management Recommended

Citation: CHAPTER 4 Heart, Morton DA, Foreman K, Albertine KH. *The Big Picture: Gross Anatomy, 2e;* 2019.

He is discharged the next day . . .

He returns to his primary physician's office in one week and over the next four weeks, his sacubitril/valsartan is titrated up to a target dose of 97 mg /103 mg po bid. His bp is now 110/65 with pulse 70.

Over the subsequent four weeks, his metoprolol XL is titrated up to a target dose of 100 mg po daily. His bp is now 105/60 with pulse 62

He is referred for outpatient cardiac rehabilitation with the following medical regimen:

- Sacubitril/valsartan 97 mg/103 mg po bid
- Metoprolol XL 100 mg po daily
- Spironolactone 25 mg po daily
- Dapagliflozin 10 mg po daily
- Furosemide 40 mg po daily
- ASA 81 mg po daily
- Atorvastatin 40 mg po qhs

What is the impact of current medical therapy on mortality from HFrEF?

Baseline annual mortality from HFrEF at least 30%		Sacubitril/valsartan		Metoprolol XL		Spironolactone		Dapagliflozin
0.30	X	0.66	X	0.71	X	0.75	X	0.77

= 0.0811 = 8.1% Annual mortality

Key points in the management of CHF

- Evaluate and treat concurrent acute coronary syndrome
- Initial management in most patients: oxygen, furosemide, nitrates, morphine, ASA.
- Assess LVEF and valvular heart disease with 2-D echo
- Start goal-directed medical therapy (GDMT) in the hospital

Key points in the management of CHF

- Treat underlying CAD and assess the need for revascularization
- One week follow up post discharge
- Titrate medications to target doses in the outpatient setting, usually every two weeks.
- Patient education: low sodium diet, smoking cessation, medication compliance, daily weights

Questions?

Thank you!

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