

# Acute Heart Failure Syndrome Best Practices: Case Study

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# Case

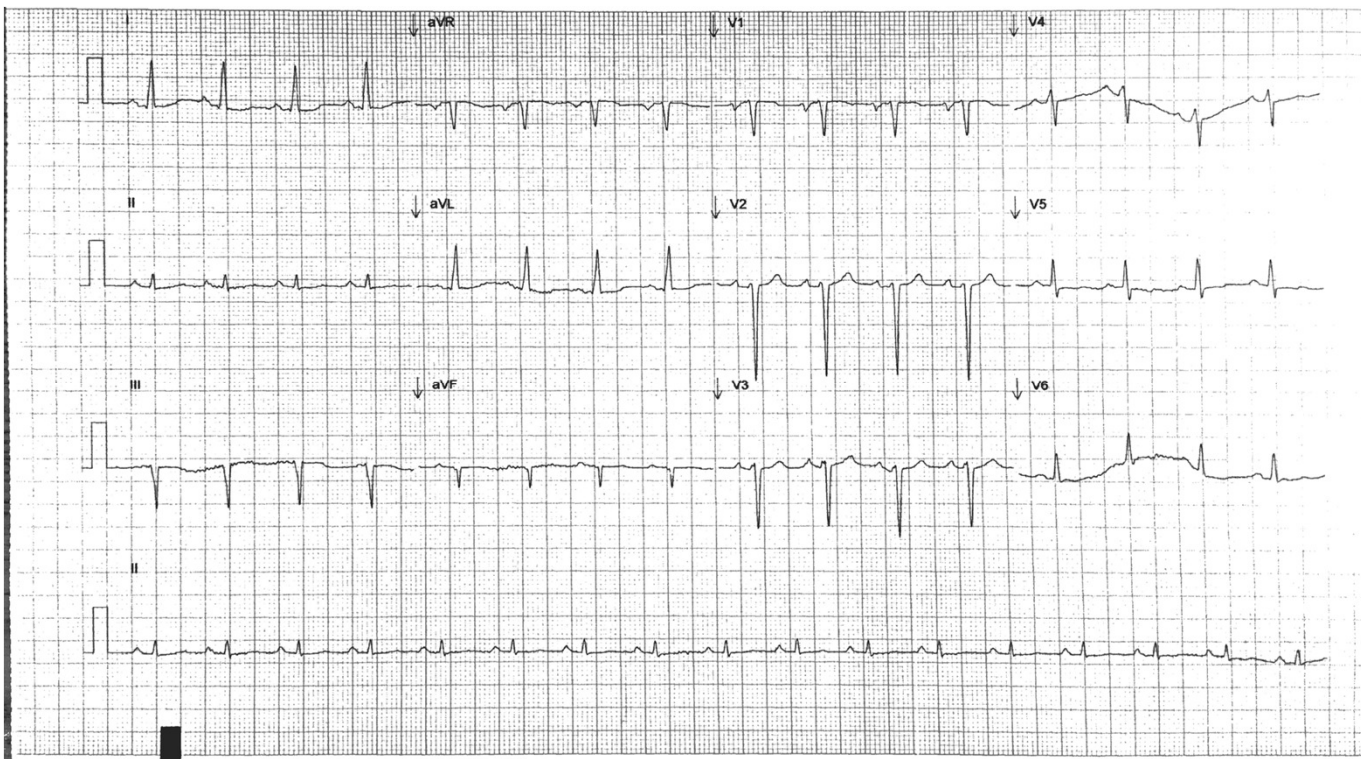
67 year old man

- PMH: Diabetes, hypertension, stage 3 CKD, hypercholesterolemia
- Previous medications: Sitagliptin 50 mg/d, basal-bolus insulin regimen, enalapril 10 mg bid, amlodipine 5 mg/d, aspirin 100 mg/d, atorvastatin 20 mg/d
- He complains of progressive dyspnea on exertion and orthopnea over the last 4 months. He has noticed lower extremity edema and increased abdominal girth in the last 2 months
- He was seen by a family doctor 4 weeks ago, who prescribed some “waterpills”, which he has been taking regularly.
- Over the last 2 weeks he has been experiencing frequent episodes of PND
- He currently complains of shortness of breath at rest. He has gained 11 Kg, since the beginning of his present illness.
- Denies chest pain

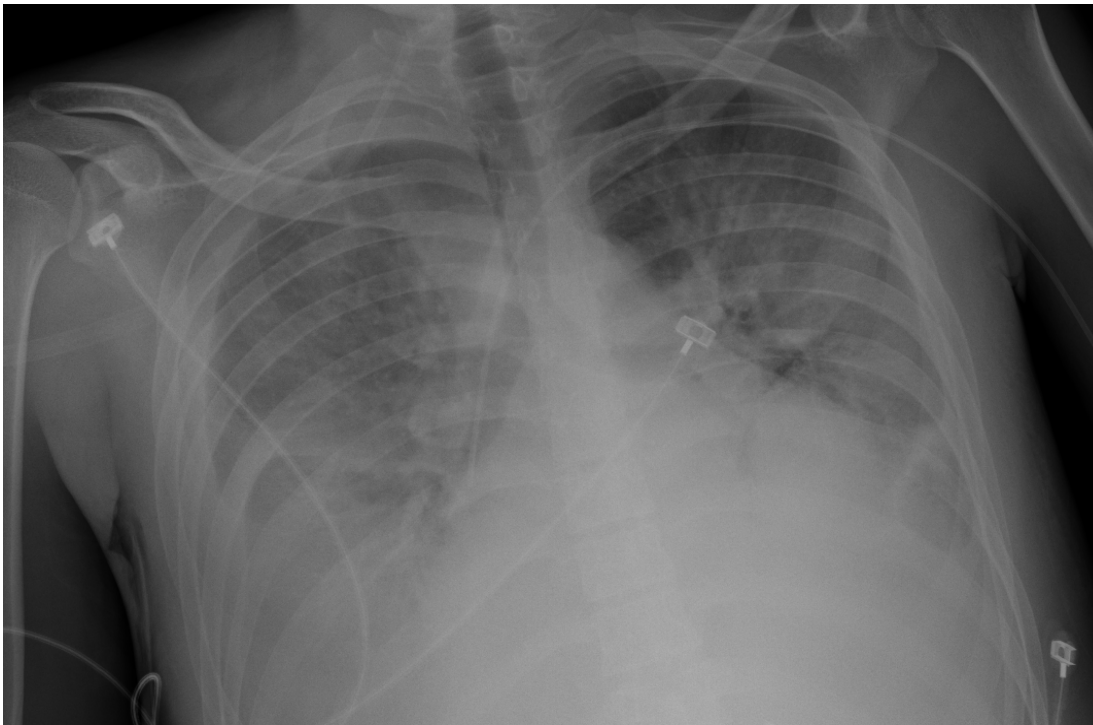
# Physical exam

- HR: 104 bpm, BP: 134/87 mmHg, RR: 26 bpm, O<sub>2</sub>Sat: 84%, T: 36.2°C, W: 97 Kg
- Awake, aware and oriented. On distress.
- JVP 10 cm, hepatojugular reflux
- Bilateral rales (2/3s from bases)
- Loud S3, grade 2/6 holosystolic murmur at the apex
- Ascites
- 3+ LE edema, warm extremities

# ECG



# Chest X-ray



## Lab tests

ABGs: pH 7.41, HCO<sub>3</sub> 16 mmHg, PCO<sub>2</sub> 24 mmHg, PaO<sub>2</sub> 49 mmHg, lactate 1.2 mmol/L

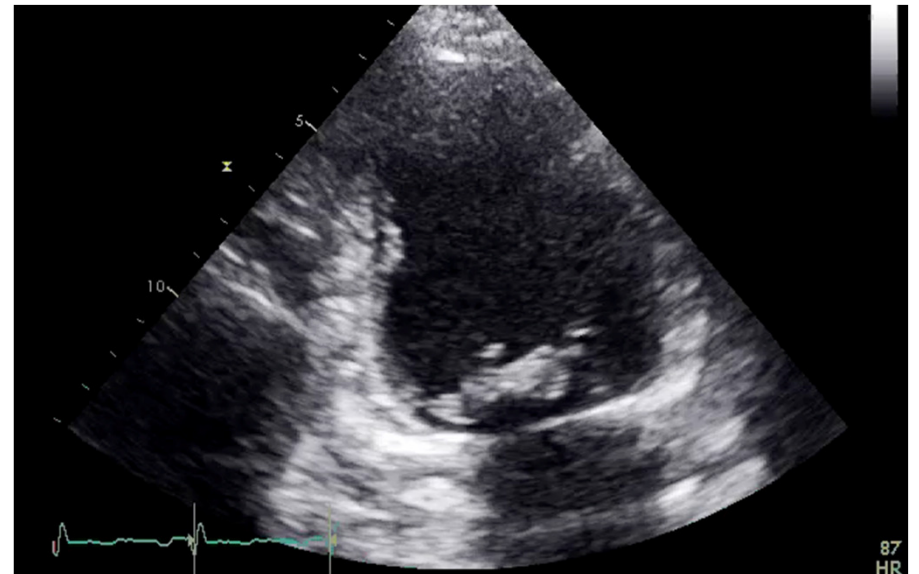
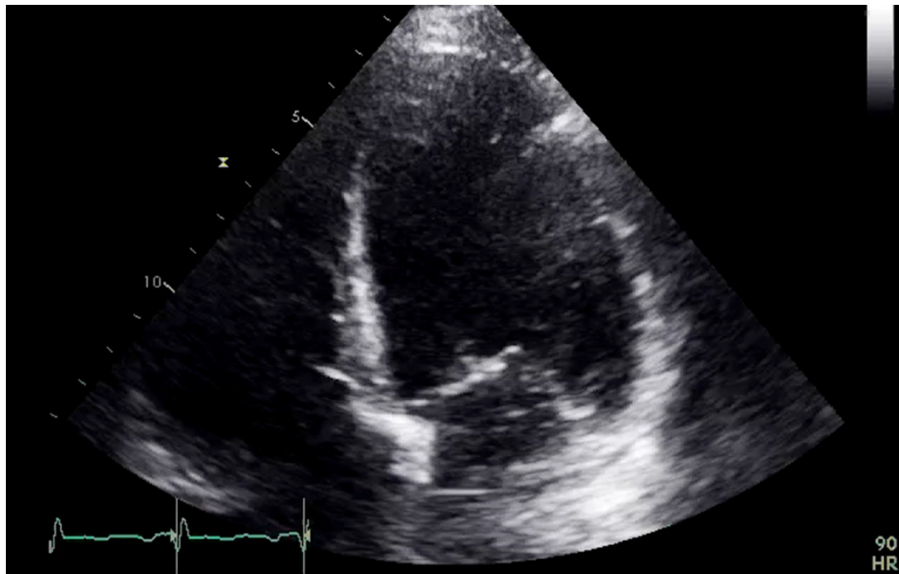
Blood count: Hb 11.2 g/dl, Hct 34%, Pl 161, leu 9  
Cr 2.1 mg/dl (prev. 1.6), BUN 63 mg/dL, glucose 190 mg/dl, Na 127 mmol/L, K 4.9 mmol/L, Cl 101 mmol/L

Cardiac biomarkers: TnI 0.04 ng/ml (no 6 h $\Delta$ ), NT-Pro BNP 24,124 pg/ml

# Initial treatment

- Admitted to CCU
- IV and central line (initial CVP 18 mmHg) , cardiac monitoring
- NIPPV (CPAP 7 cm H<sub>2</sub>O)
- Lasix: 40 mg IV bolus
- NTG 20 mcg/min
- DVT prophylaxis

# Echocardiogram





## 2-hour reassessment

- HR: 91 bpm, BP: 121/82 mmHg, RR: 18 bpm, O<sub>2</sub>Sat: 91%, CVP 18 mmHG
- Urine output: 190 ml (0.9 ml/kg/hr)
- Still congested
- NTG up-titrated as tolerated (40 mcg/min)
- 80 mg IV Lasix bolus → additional boluses as needed

# Day 2

## ASSESSMENT

- HR: 87 bpm, BP: 100/61 mmHg, RR: 17 bpm, O<sub>2</sub>Sat: 93%, CVP 16 mmHg
- Rales 1/2 lung fields
- Lasix daily dose 240 mg (day 1)

## INTERVENTIONS

- Switched to Lasix drip (up-titrated to 20 mg/hr)
- Intermittent NIPPV → nasal prongs
- NTG =

Total weight Δ	Daily Urine output	Total Fluid balance	Creatinine	Hct	Sodium	Potassium
-1 kg (0.17/40 mg furosemide)	1783 mL (0.77 ml/kg/hr)	- 1.4 L	2.7 mg/dL ↑	34% →	129 mmol/L ↑	4.1 mmol/L ↓

# Day 3

## ASSESSMENT

- HR: 91 bpm, BP: 97/59 mmHg, RR: 16 bpm, O<sub>2</sub>Sat: 94%, CVP 14 mmHg
- Lasix daily dose 360 mg (day 2)
- Rales 1/3 lung fields

## INTERVENTIONS

- IV Lasix → tapered to 5 mg/hr
- NTG → tapered → hydralazine + isosorbide dinitrate
- K<sup>+</sup> and Mg<sup>+</sup> replaced

Total weight Δ	Daily Urine output	Total Fluid balance	Creatinine	Hct	Sodium	Potassium
-4 kg (0.26/40 mg furosemide)	3,234 mL (1.44ml/kg/hr)	- 4.3 L	3.1 mg/dL ↑	36% ↑	132 mmol/L ↑	3.3 mmol/L. ↓

# Day 4

## ASSESSMENT

- HR: 88 bpm, BP: 110/83 mmHg, RR: 16 bpm, O<sub>2</sub>Sat: 94%, CVP 14 mmHg
- Lasix daily dose 200 mg (day 3)
- Rales 1/3 lung fields

## INTERVENTIONS

- Lasix drip → switched back to 80 mg IV BID and as needed boluses.
- K<sup>+</sup> and Mg<sup>+</sup> replaced

Total weight Δ	Daily Urine output	Total Fluid balance	Creatinine	Hct	Sodium	Potassium
-7kg (0.35/40 mg furosemide)	2,871 mL (1.32 ml/kg/hr)	- 6.8 L	3.4 mg/dL ↑	38% ↑	134 mmol/L ↑	3.9 mmol/L ↑

# Day 5

## ASSESSMENT

- HR: 93 bpm, BP: 120/79 mmHg, RR: 15 bpm, O<sub>2</sub>Sat: 95%, CVP 12 mmHg
- Lasix daily dose 160 mg (day 4)
- Rales 1/3 lung fields

## INTERVENTIONS

- IV Lasix → switched to oral Lasix

Total weight Δ	Daily Urine output	Total Fluid balance	Creatinine	Hct	Sodium	Potassium
-8.5kg (0.35/40 mg furosemide)	1,954 mL (0.9 ml/kg/hr)	- 7.9 L	2.9 mg/dL ↓	39% ↑	134 mmol/L →	4.1 mmol/L ↑

## Day 6

- HR: 94 bpm, BP: 124/81 mmHg, RR: 14 bpm, O<sub>2</sub>Sat: 96%, CVP 11 mmHg
- Lasix daily dose 160 mg (oral)
- Rales < 1/3 lung fields

- Started on carvedilol 3.125 mg BID
- K<sup>+</sup> and Mg<sup>+</sup> replaced

Total weight Δ	Daily Urine output	Total Fluid balance	Creatinine	Hct	Sodium	Potassium
-9.9kg (0.38 kg/ 40 mg furosemide)	1,733 mL (0.8 ml/kg/hr)	- 8.7 L	2.2 mg/dl ↓	39% →	136 mmol/L ↑	3.7 mmol/L ↓

## Day 9

- Cr 1.8 mg/dl
- Coronary angiography → non-obstructive coronary artery disease

## Day 12

- HR: 69 bpm, BP: 102/59 mmHg, RR: 14 bpm, O<sub>2</sub>Sat: 96 %
- Clear lung fields, JVP 4 cm
- Cr stable (1.7 mg/dL), NT-ProBNP 2,361 pg/ml
- Discharged on:
  - Carvedilol 3.125 mg/d
  - Enalapril 2.5 mg/d
  - Spironolactone 25 mg/d
  - Lasix 60 mg BID



## Pending Assessments/Interventions:

- LVEF and ICD assessment
- BB and ACEI up-titration
  - Consider replacing ACEI with ARNI