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, $O_2$ 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, HCO3 16 mmHg, PCO2 24 mmHg, PaO2 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 hΔ), 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 H₂O)
- 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, O₂ 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, $O_2$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 =

<table>
<thead>
<tr>
<th>Total weight $\Delta$</th>
<th>Daily Urine output</th>
<th>Total Fluid balance</th>
<th>Creatinine</th>
<th>Hct</th>
<th>Sodium</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 kg (0.17/40 mg furosemide)</td>
<td>1783 mL (0.77 ml/kg/hr)</td>
<td>- 1.4 L</td>
<td>2.7 mg/dL $\uparrow$</td>
<td>34% $\rightarrow$</td>
<td>129 mmol/L $\uparrow$</td>
<td>4.1 mmol/L $\downarrow$</td>
</tr>
</tbody>
</table>
Day 3

**ASSESSMENT**

- HR: 91 bpm, BP: 97/59 mmHg, RR: 16 bpm, \( O_2 \)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+ and Mg+ replaced

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<tr>
<td>-4 kg (0.26/40 mg furosemide)</td>
<td>3,234 mL (1.44ml/kg/hr)</td>
<td>- 4.3 L</td>
<td>3.1 mg/dL ↑</td>
<td>36% ↑</td>
<td>132 mmol/L ↑</td>
<td>3.3 mmol/L. ↓</td>
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</tbody>
</table>
Day 4

ASSESSMENT

- HR: 88 bpm, BP: 110/83 mmHg, RR: 16 bpm, $O_2$ 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+ and Mg+ replaced

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<tr>
<td>-7kg (0.35/40 mg furosemide)</td>
<td>2,871 mL (1.32 ml/kg/hr)</td>
<td>- 6.8 L</td>
<td>3.4 mg/dL ↑</td>
<td>38% ↑</td>
<td>134 mmol/L ↑</td>
<td>3.9 mmol/L ↑</td>
</tr>
</tbody>
</table>
**Day 5**

**ASSESSMENT**

- HR: 93 bpm, BP: 120/79 mmHg, RR: 15 bpm, O₂Sat: 95%, CVP 12 mmHg
- Lasix daily dose 160 mg (day 4)
- Rales 1/3 lung fields

**INTERVENTIONS**

- IV Lasix → switched to oral Lasix

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<tr>
<td>-8.5kg (0.35/40 mg furosemide)</td>
<td>1,954 mL (0.9 ml/kg/hr)</td>
<td>- 7.9 L</td>
<td>2.9 mg/dL ↓</td>
<td>39% ↑</td>
<td>134 mmol/L →</td>
<td>4.1 mmol/L ↑</td>
</tr>
</tbody>
</table>
Day 6

• HR: 94 bpm, BP: 124/81 mmHg, RR: 14 bpm, $O_2$Sat: 96%, CVP 11 mmHg
• Lasix daily dose 160 mg (oral)
• Rales < 1/3 lung fields

• Started on carvedilol 3.125 mg BID
• K+ and Mg+ replaced

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<tr>
<td>-9.9kg (0.38 kg/ 40 mg furosemide)</td>
<td>1,733 mL (0.8 ml/kg/hr)</td>
<td>- 8.7 L</td>
<td>2.2 mg/dl ↓</td>
<td>39% →</td>
<td>136 mmol/L ↑</td>
<td>3.7 mmol/L ↓</td>
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</table>
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, O₂Sat: 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-titratio
  - Consider replacing ACEI with ARNI