# A patient with acute heart failure and renal impairment

## ACCA Masterclass 2017

Dr Sofie Gevaert

# Mister P. J.M., 67-years-old

- **Cardiac risk factors:** Ex-smoker, AHT, Type 2 diabetes, BMI 43, Hyperlipidaemia
- **Medical history:**
  - 2009: Hospitalisation for heart failure: HFpEF
  - 2009: Sick sinus syndrome: DDD pacemaker
  - 1/2016 NSTEMI: PCI D1
  - 2014: Paroxismal atrial fibrillation
  - COPD GOLD II
  - 11/2011
    - NSTEMI, PCI LAD: 1 month triple R/: VKA-ASA-Clopidogrel
    - Gastro-intestinal bleed with need for transfusion: stop aspirin
    - CKD stage 3B: Serum creatinin 2.09mg/dl, eGFR 30.3mL/min/1.73m$^2$
  - Echocardiography 11/2016:
    - Concentric LVH, EDD 52mm, nl systolic LVF
    - Pseudonormal relaxation pattern, E/E' 16
    - Mild TR: 41mmHg, VCI>17mm, resp variation
    - TAPSE 11mm

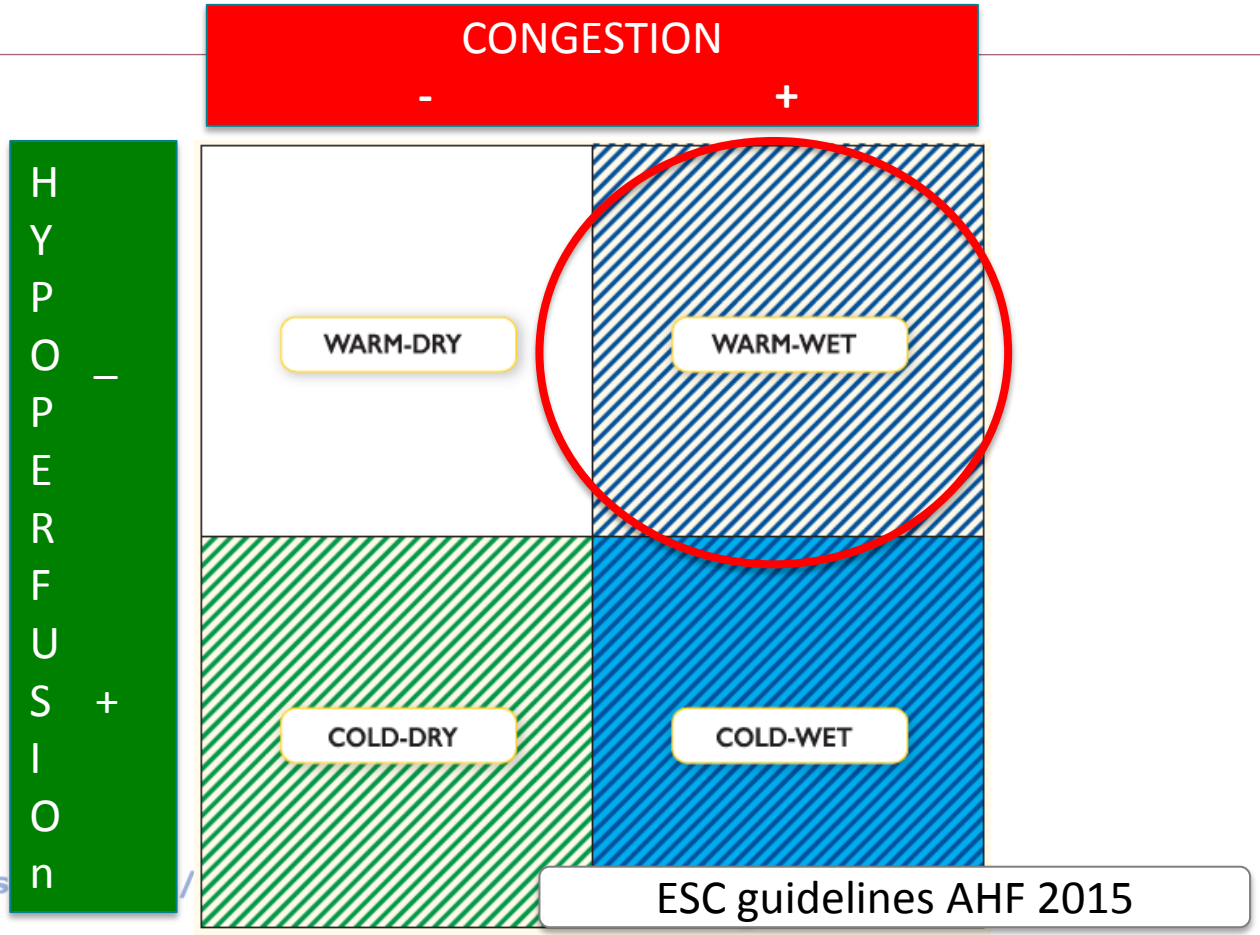
# 12/2016: hospitalization for AHF

- **Complaints:**
  Dyspnoea NYHA III, progressive over 6 days after resp infection treated with AB
  Peripheral edema
  Weight + 5kg
- **Medication:**
  - Allopurinol 100mg OD
  - Atorvastatin 80mg, OD
  - **Bisoprolol 2.5 mg daily**
  - **Bumetanide 1mg OD**
  - Clopidogrel 75mg
  - Pantoprazole 40mg
  - **Ramipril 5mg OD**
  - Warfarine ≈ INR
  - Salmeterol/fluticason inhaler

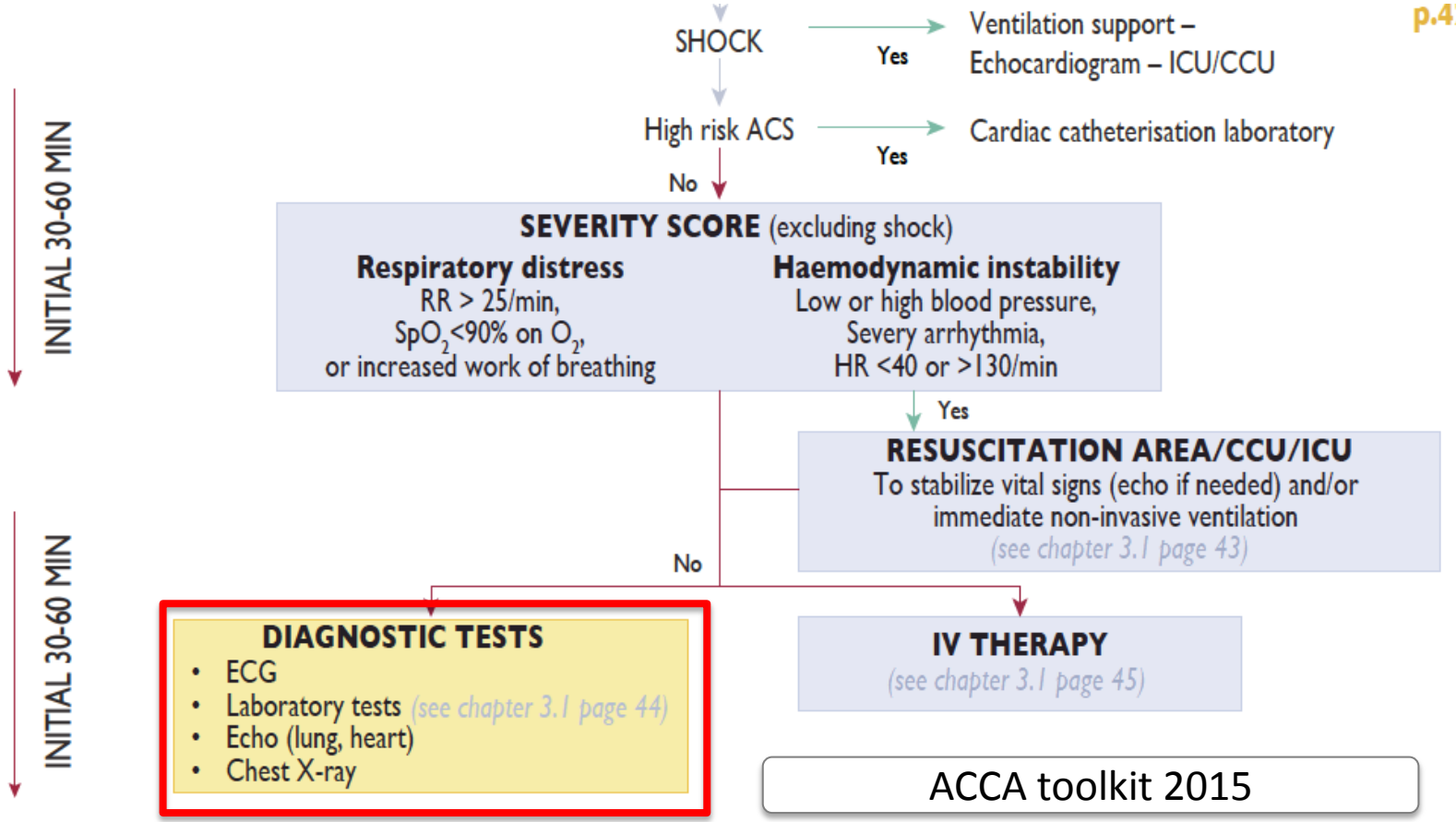
# 12/2016: hospitalization for AHF

- **Clinical exam**
  - BP 116/60 mmHG, HR 63 BPM, $SaO_2$ 92%, RR 18
  - Jugular distension ++
  - Normal heart sounds
  - Decreased breathing, rales
  - Peripheral edema ++

# Clinical Profile?

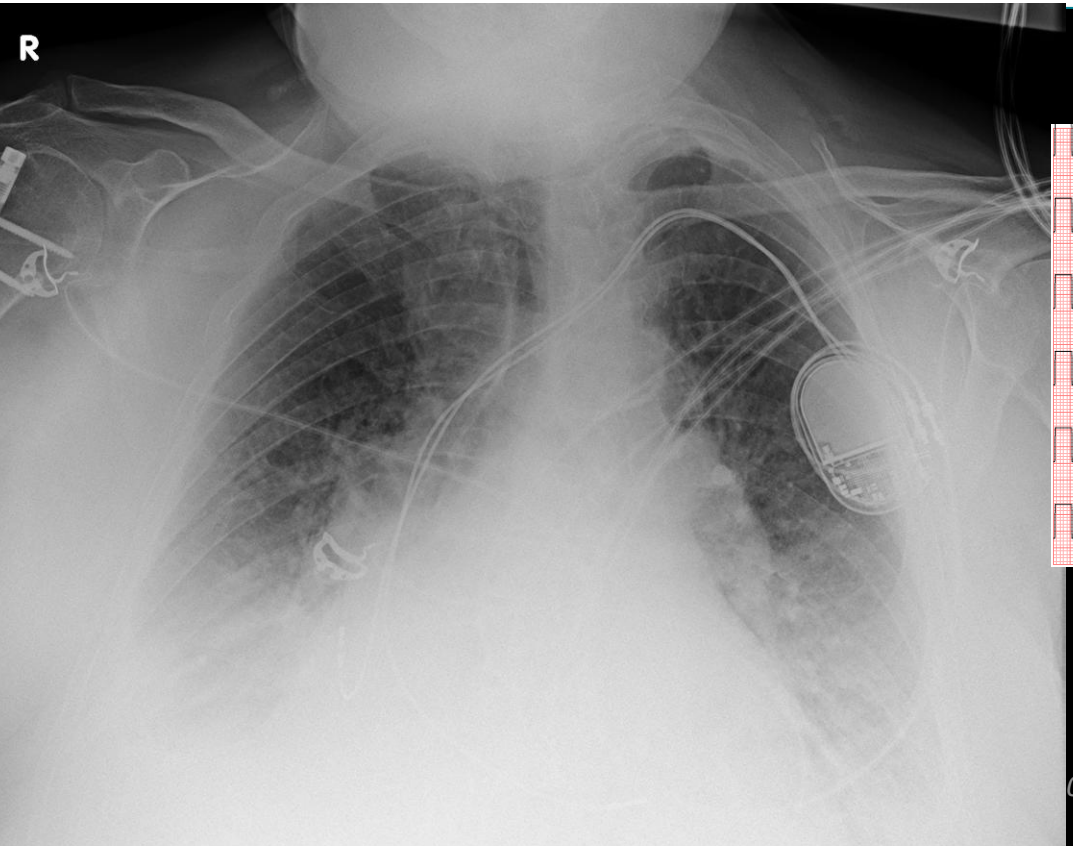


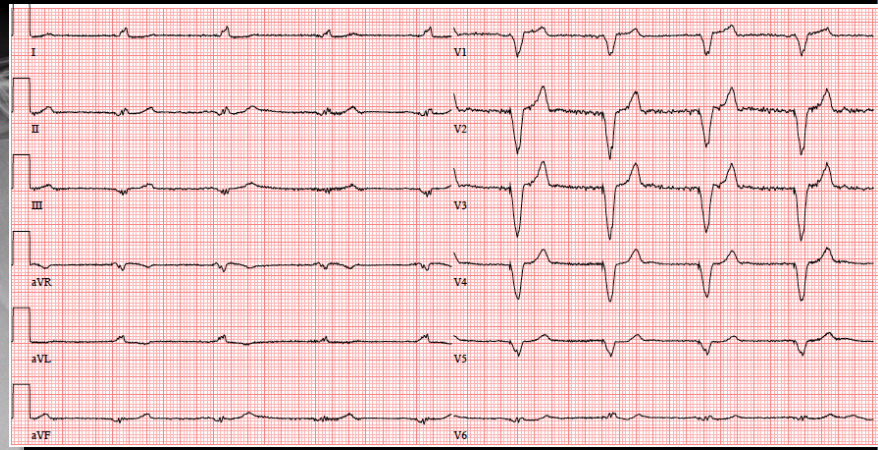

ESC guidelines AHF 2015




ACCA toolkit 2015

# Chest X-ray-ECG



- **Lab results**
  - Hct 36.3% (39-49)
  - $K^+$ 5.5 mmol/L
  - Serum Creatinin **2.85 mg/dL** (0.72-1.17), eGFR: 22 mL/min/1.73 $m^2$
  - proBNP: 2,400 pg/mL (≤125)
  - PH 7.37, $pO_2$ **55**, $pCO_2$ 33.4

# Timing echocardiography?

- **Immediately**
- **<48 hours of admis**
- **Before discharge**
- **Not necessary, rece**

Immediate echocardiography is mandatory only in patients with haemodynamic instability (particularly in cardiogenic shock) and in patients suspected of acute life-threatening structural or functional cardiac abnormalities (mechanical complications, acute valvular regurgitation, aortic dissection). Early echocardiography should be considered in all patients with *de novo* AHF and in those with unknown cardiac function; however, the optimal timing is unknown (preferably within 48 h from admission, if the expertise is available). Pocket-size echocardiography may be used as an extension of the clinical examination in the first instance where available. Repeated echocardiography is usually not needed unless there is relevant deterioration in clinical status.

ESC guidelines AHF 2015

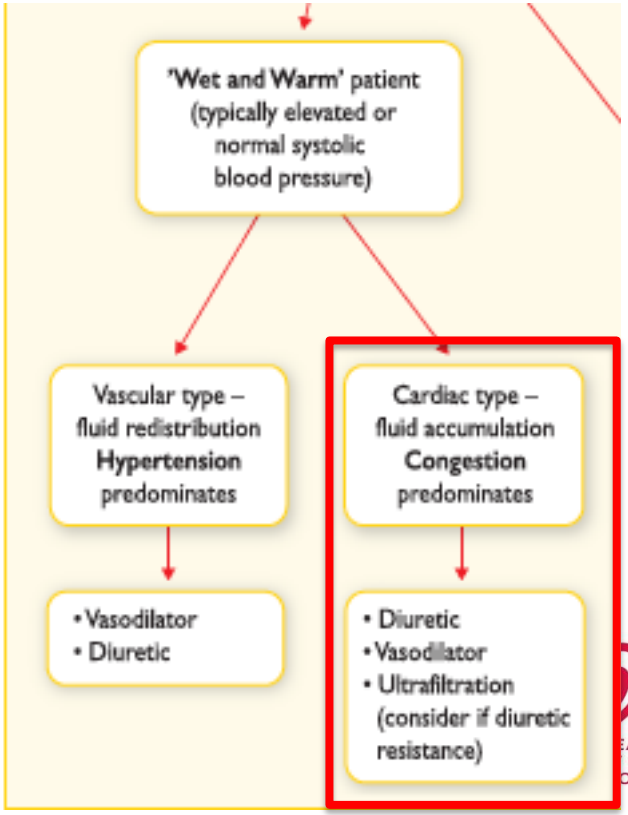
# Echocardiogaphy

- Moderate views
- Restrictive relaxation pattern, E/E' med 26
- TR grade 2+: 54mmHg, VCI>17mm no resp. variation
- TAPSE 11mm

→ ADHF triggered by respiratory infection

# Initial treatment?

- IV diuretics
- IV diuretics and vasodilators
- Ultrafiltration




ESC guidelines AHF 2015

# Diuretics-Ultrafiltration

| Diuretics | | |
|---|---|---|
| Intravenous loop diuretics are recommended for all patients with AHF admitted with signs/symptoms of fluid overload to improve symptoms. It is recommended to regularly monitor symptoms, urine output, renal function and electrolytes during use of i.v. diuretics. | I | C |
| In patients with new-onset AHF or those with chronic, decompensated HF not receiving oral diuretics the initial recommended dose should be 20–40 mg i.v. furosemide (or equivalent); for those on chronic diuretic therapy, initial i.v. dose should be at least equivalent to oral dose. | I | B |
| It is recommended to give diuretics either as intermittent boluses or as a continuous infusion, and the dose and duration should be adjusted according to patients' symptoms and clinical status. | I | B |
| Combination of loop diuretic with either thiazide-type diuretic or spironolactone may be considered in patients with resistant oedema or insufficient symptomatic response. | IIb | C |
| Ultrafiltration may be considered for patients with refractory congestion, who failed to respond to diuretic-based strategies. | IIb | B |
| Renal replacement therapy should be considered in patients with refractory volume overload and acute kidney injury. | IIa | C |

ESC guidelines AHF 2015

# Referral CCU: IV diuretics and vasodilators

- Continuous infusion bumetanide 0.5mg/h for 24h
- Continuous infusion isosorbide dinitrate 2mg/h
- Negative fluid balance -3L 1st 24h→ oral diuretics at increased dose

→

- Improvement kidney function: **2.0 mg/dl (eGFR 34mL/min)** at discharge
- Discharge after 72h:
  - Weight -5 kg
  - Oral dose Bumetanide increased to 2mg
  - Daily weight, salt restriction
  - Follow-up 4 weeks

# Readmission 1 week later

- **Complaints:**

  Dyspnoea NYHA III, progressive 3 days, peripheral edema, weight +4 kilo

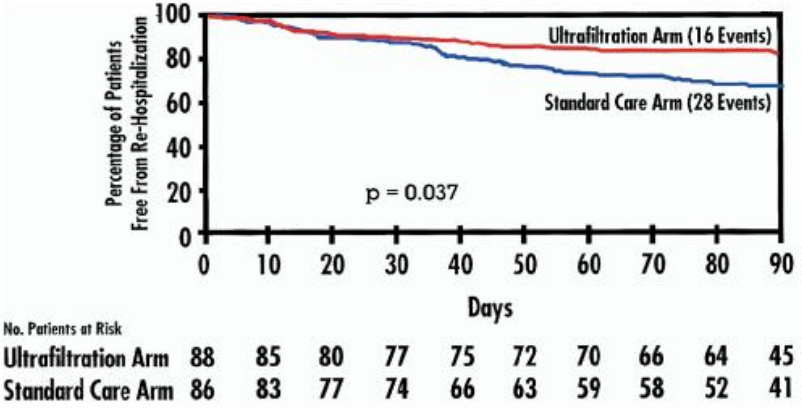
- **Medication:**
  - Allopurinol 100mg OD
  - Atorvastatine 80mg, OD
  - Bisoprolol 2.5 mg daily
  - **Bumetanide 2mg OD**
  - Clopidogrel 75mg
  - Pantoprazole 40mg
  - Ramipril 5mg OD
  - Warfarine ≈ INR

- **Clinical exam**
  - BP 128/55 mmHG, HR 56 BPM, $SaO_2$ 94%
  - Jugular distension
  - Normal heart sounds
  - Rales basal
  - Moderate peripheral edema
- **Lab results**
  - Serum creatinin:2.3 mg/dL (+0.3mg/dL, GFR 28mL/min)

# Could UF have prevented rehospitalization?

ADHF

Adjustable UF (up to 500mL/h)
vs.
diuretic R/ at discretion physician




UNLOAD trial,
Costanzo et al, JACC 2007

# Compliance problem? Diuretic resistance? Decongestion treatment?

- IV diuretics
- Increase oral dose
- Add thiazide or other
- Ultrafiltration

# Referral to ward for IV diuretics

| day | Bumetanide | Diuresis (mL) | Serum creatinine |
|---|---|---|---|
| 1 | 20.00h: 0.48mg/h | 1.950 | 2.30 |
| 2 | 0.48mg/h IV | 2.700 | 2.20 |
| 3 SAT | Stop IV 23.00h | 260 (complete?) | **2.51** |

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| 4 SUN | 1 mg PO | 700 | - |
| 5 | 1mg PO | 610 | **3.91** |

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| 3 SAT | Stop IV 23.00h | 260 (complete?) | **2.51** |
| 4 SUN | 1 mg PO | 700 | - |
| 5 | - | 610 | **3.91** |
| 6 | - | 1.150 | 3.4 |
| 7 | - | 1.500 | 2.45 |
| 8 | - | 1.450 | 1.89 |
| 9 | 1mg PO | 1.500 | 1.83 |

# Too rapid decongestion→ AKI

| KDIGO definition of AKI | |
|---|---|
| Increase in Scr level of ≥ 0.3 mg/dL (26.5 µmol/L) | <48h |
| Increase in Scr level of ≥ 1.5 times baseline | <7 d |
| Urine output <0.5mL/Kg/h | >6h |

# KDIGO staging of AKI

| Stage | Scr increase | Urine output |
|---|---|---|
| 1 | ≥1.5-1.9 times baseline<br>or<br>≥ 0.3mg/dL | <0.5mL/kg/h for 6-12h |
| 2 | | <0.5mL/kg/h for ≥ 12h |
| 3 | ≥3times baseline<br>or<br>≥ 4mg/dL<br>or<br>RRT | <0.3mL/kg/h for ≥ 24h<br>or<br>Anuria for ≥ 12h |

**CRS type 1**: **acute** cardiorenal

# Could UF have prevented AKI ?

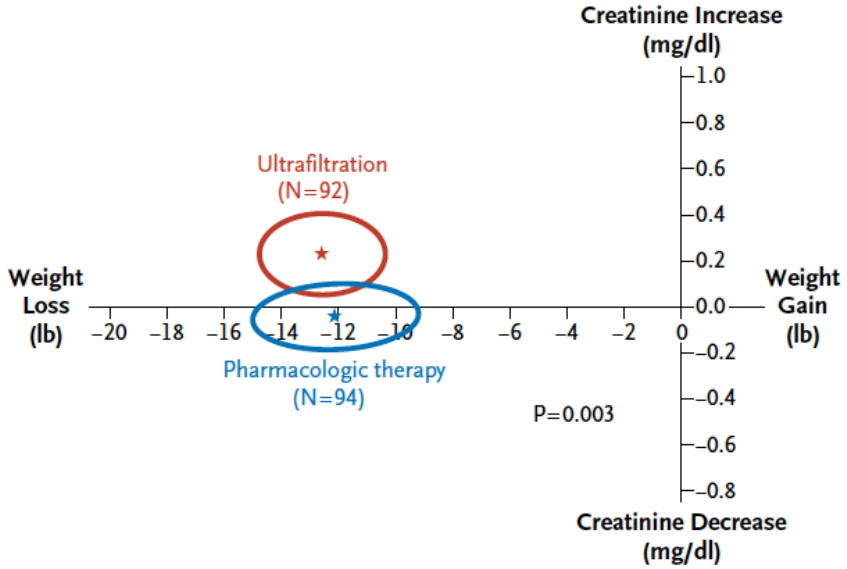



**Figure 1. Changes in Serum Creatinine and Weight at 96 Hours (Bivariate Response).**

CARESS trial,
Bart et al, NEJM 2012

ADHF+WRF:

Fixed UF rate (200mL/h)
vs.
defined stepped pharmacological R/

**OBJECTIVES** The AVOID-HF (Aquapheresis versus Intravenous Diuretics and Hospitalization for Heart Failure) trial tested the hypothesis that patients hospitalized for HF treated wit
first HF event within 90 days after hospital discharge than t

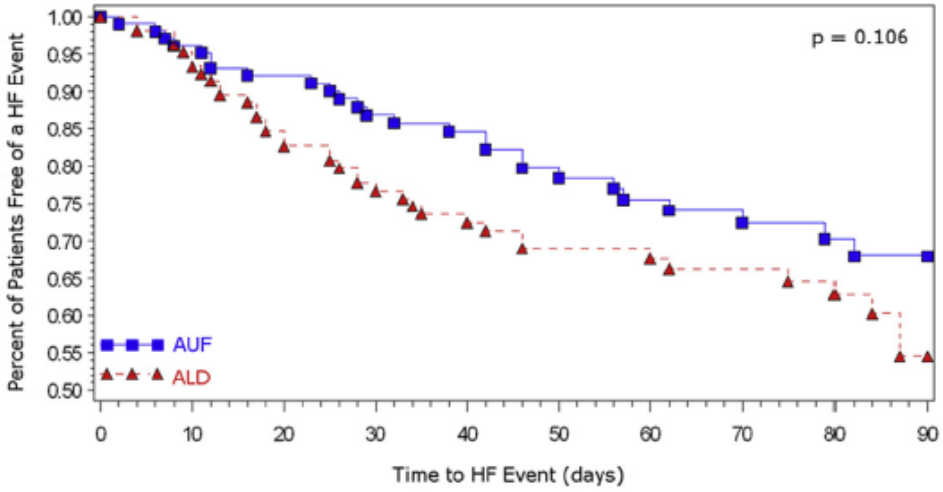
**BACKGROUND** Congestion in hospitalized heart failure (

**METHODS** The AVOID-HF trial, designed as a multicenter,
terminated unilaterally and prematurely by the sponsor (Ba
patients (27.5%). Aquadex FlexFlow System (Baxter Health
to the randomized treatment, adjudicated whether 90-day

**RESULTS** A total of 110 patients were randomized to AUF
mated days to first HF event for the AUF and ALD group wer
with the ALD group, the AUF group had fewer HF and cardi
AUF patients experienced an adverse effect of special inter
event ($p = 0.026$). The 90-day mortality was similar.

**CONCLUSIONS** Compared with the ALD group, the AUF
90 days and fewer HF and cardiovascular events. More pati
product-related adverse event. Due to the trial's untimely
(J Am Coll Cardiol HF 2016;4:95–105) © 2016 by the Ame

**FIGURE 2** Primary Endpoint: Time to Heart Failure Event after Discharge




| | Baseline | 30 Days | 60 Days | 90 Days |
|---|---|---|---|---|
| AUF | 105 | 80 | 52 | 19 |
| ALD | 108 | 74 | 49 | 15 |

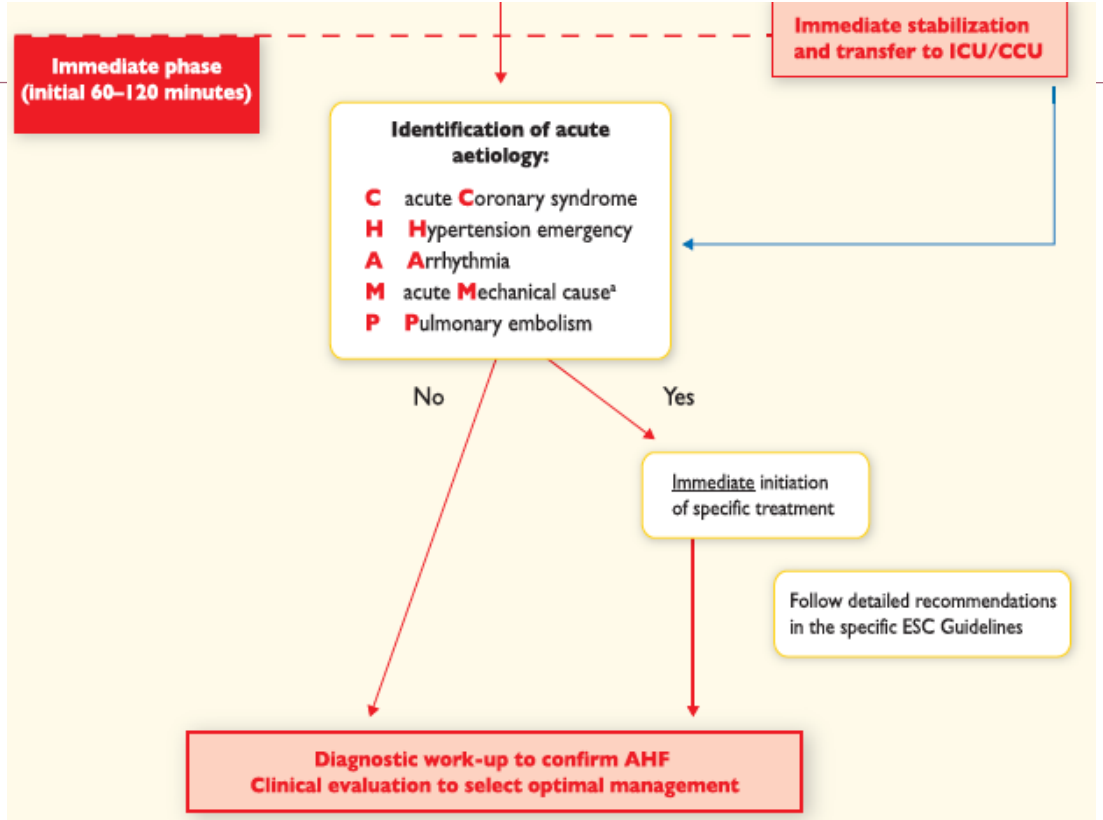
No difference in changes kidney function

AVOID trial,
Costanzo, Bart et al, JACC HF 2016

# 3 weeks later, third admission

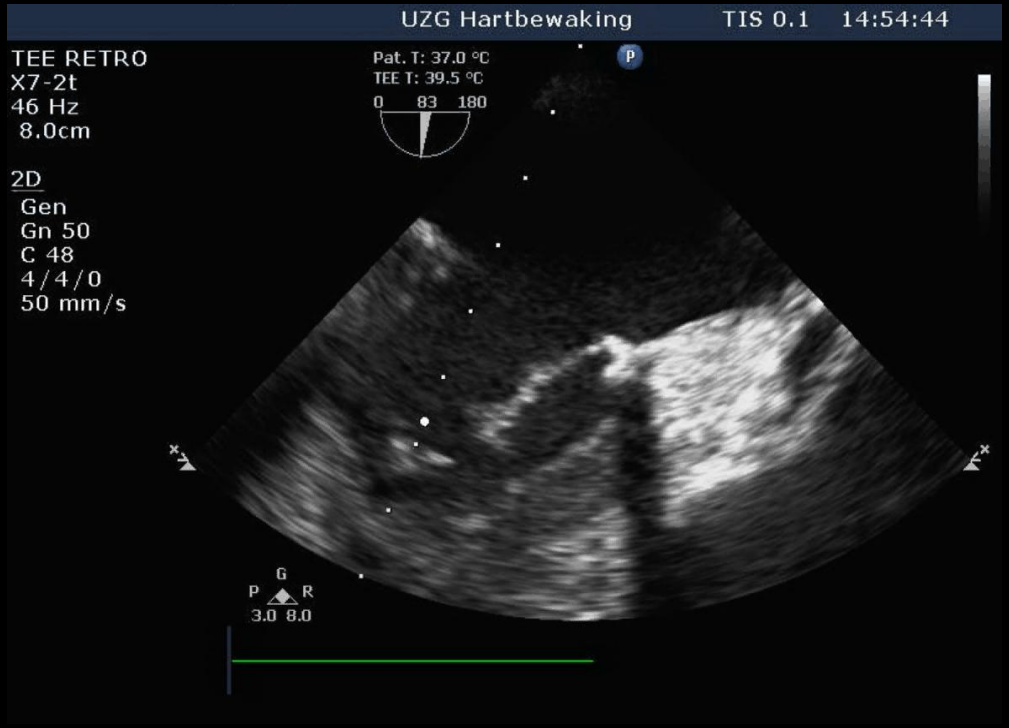
- **Complaints:**
  Dyspnoea NYHA IV, progressive since discharge, peripheral edema, weight +4 kg
- **Medication:**
  - Allopurinol 100mg OD
  - Amlodipine 5 mg OD
  - Atorvastatine 80mg, OD
  - Bisoprolol 2.5 mg daily
  - **Bumetanide 2-3mg OD, depending on weight**
  - Clopidogrel 75mg
  - Pantoprazole 40mg
  - Ramipril 5mg OD
  - Warfarine ≈ INR

- **Clinical exam**
  - BP 116/60 mmHG, HR 63 BPM, $SaO_2$ 88%
  - Jugular distension
  - New systolic murmur?
  - Decreased breathing, rales
  - Peripheral edema
- **Lab results**
  - Serum creatinin 2.2mg/dL






ESC guidelines AHF 2015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50 mm/s
Pat. T: 37.0 °C
TEE T: 39.5 °C
0 83 180
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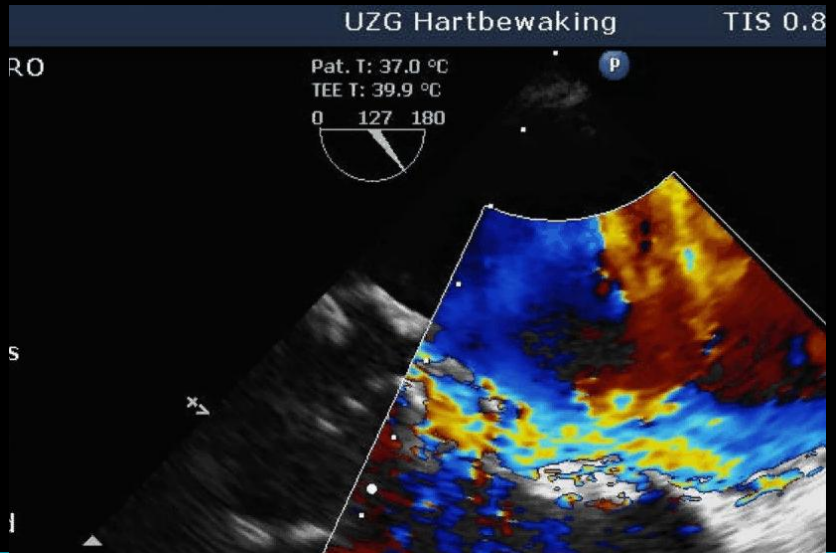
3.0 8.0

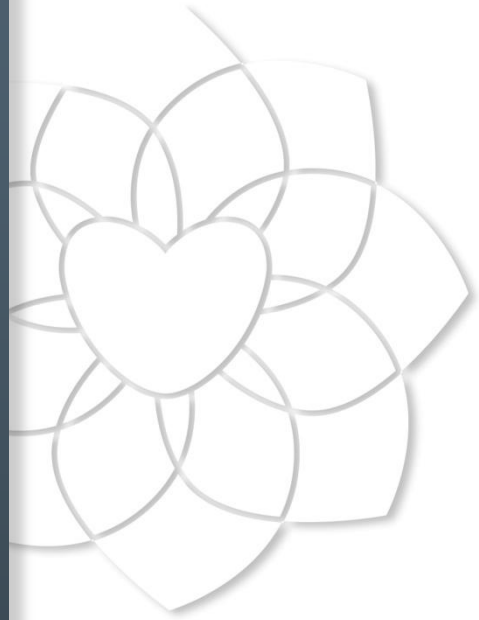

UZG Hartbewaking TIS 0.8
RO
Pat. T: 37.0 °C
TEE T: 39.9 °C
0 127 180

# RUPTURED CHORDA of ant. LEAFLET MV

- Cardiac surgery
- Repair not succesful→ bioprosthesis CE Magna Ease
- Postoperative:

AKI, anuria → Dialysis

# Thank you



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Acute Cardiovascular Care Association ACCA
A Registered Branch of the ESC

EUROPEAN SOCIETY OF CARDIOLOGY®

# How to avoid too rapid/much decongestion?

**Decongestion goal**
**CLOSE monitoring of ?**

- BP
- weight
- Δ renal function/urine output
- Monitoring of intravascular volume
  - Hct as surrogate marker?
- Monitoring of CO?
  - $CVO_2$ as surrogate marker of CO?
- …?

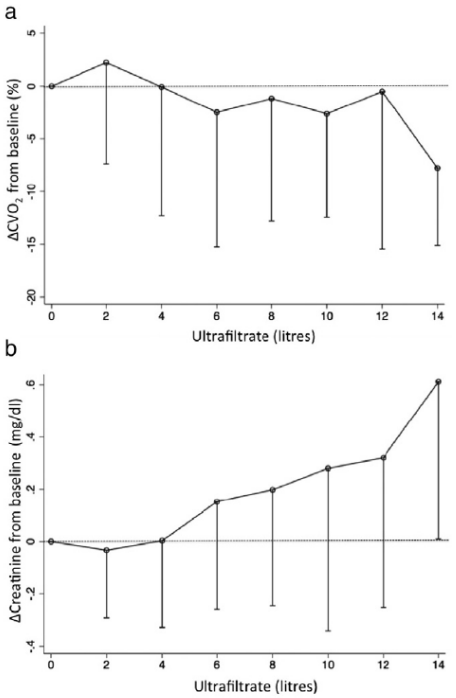


**Fig. 1.** Title: Mean and standard deviation of a) changes in central venous oxygen level ($\Delta CVO_2$) and b) changes in creatinine (Δcreatinine) from baseline values for every 2 l of ultrafiltrate removed. This figure demonstrates that as the initial 2 l of fluid was removed, there was a rise in mean $\Delta CVO_2$ corresponding to a fall in mean Δcreatinine. Subsequently with further fluid removal beyond 4 l, there was a fall in mean $\Delta CVO_2$ which corresponded to a rise in mean Δcreatinine.

Vazir et al, Int J card 2016