# *Management of congestion in HF: Drugs and labs. Key points*

Manejo de la Congestión en IC. *Puntos clave*

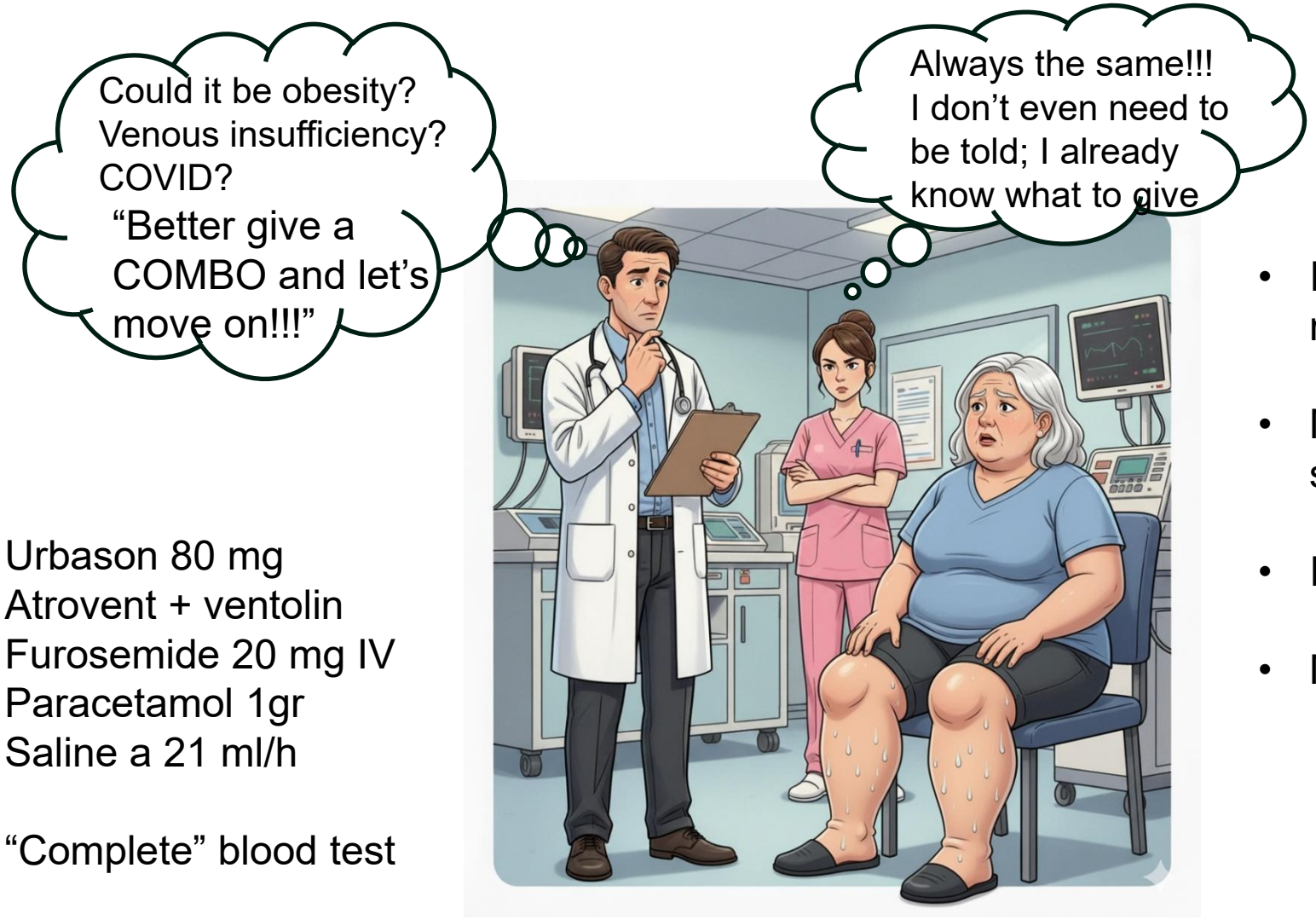
Rafael de la Espriella
Hospital Clínico Universitario de Valencia

DEPARTAMENT DE SALUT DE VALÈNCIA
CLÍNIC-LA MALVA-ROSA

INCLIVA | VLC
Instituto de Investigación Sanitaria

ciber | CV
CENTRO DE INVESTIGACIÓN BIOMÉDICA EN RED
Enfermedades Cardiovasculares

# Common scenario of uncertainty and error




Urbason 80 mg
Atrovent + ventolin
Furosemide 20 mg IV
Paracetamol 1gr
Saline a 21 ml/h

"Complete" blood test

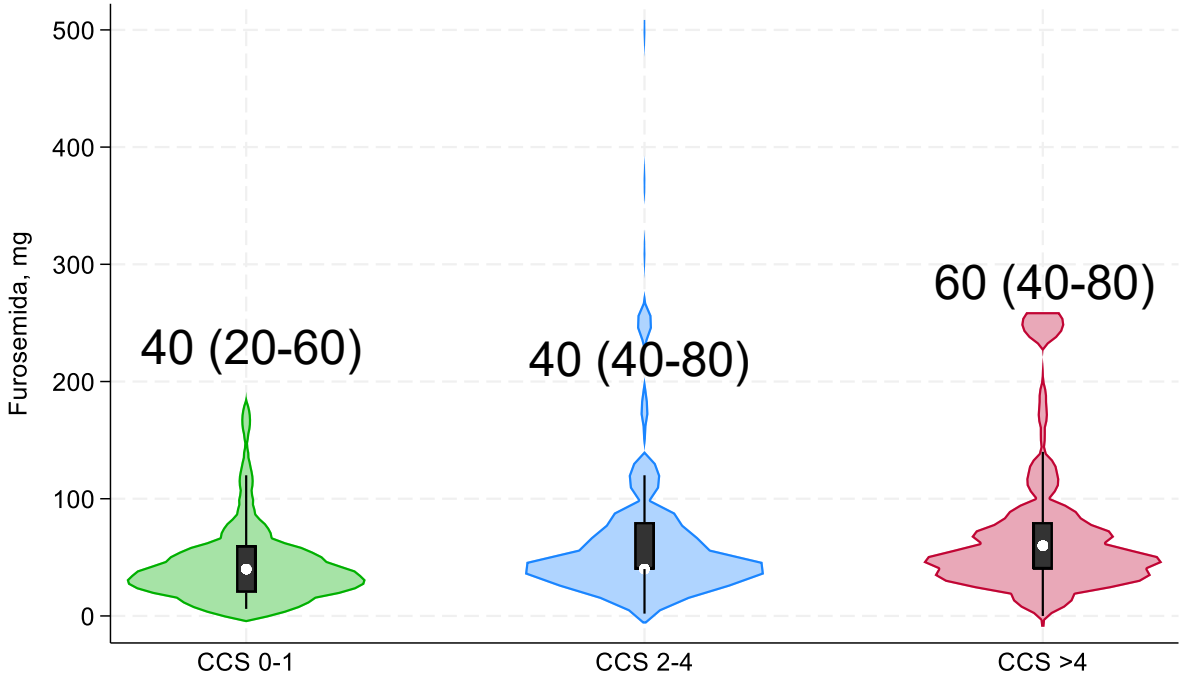
- I've been short of breath for months
- My legs swell, especially in summer when it's so hot!!!
- I think I recently caught a cold.
- My knees hurt a lot.

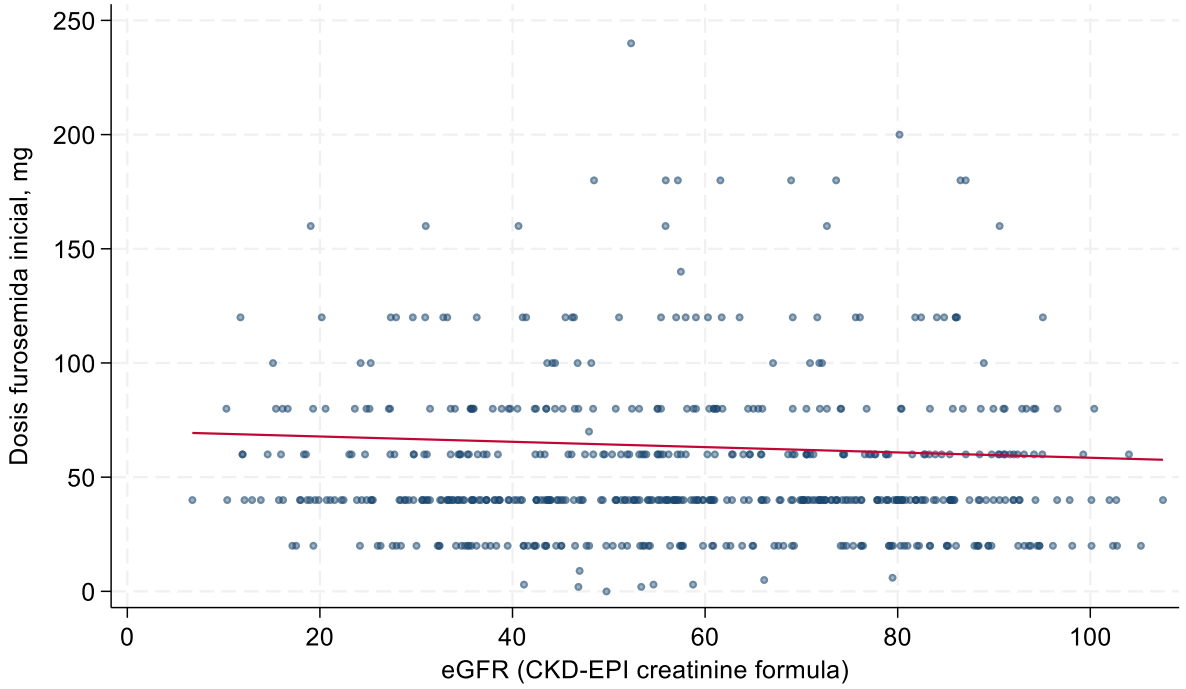
# Common scenario of uncertainty and error

## Initial management in the Emergency Department

Valencian AHF Registry (n = 1075)

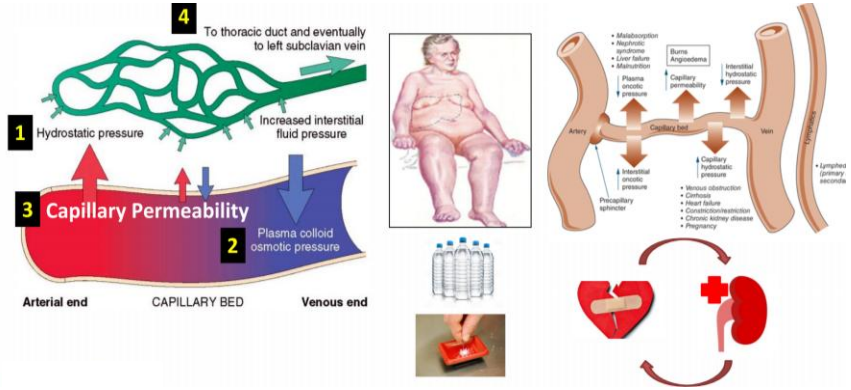
Initial furosemide bolus → 40 mg (p25–p75: 40–80)

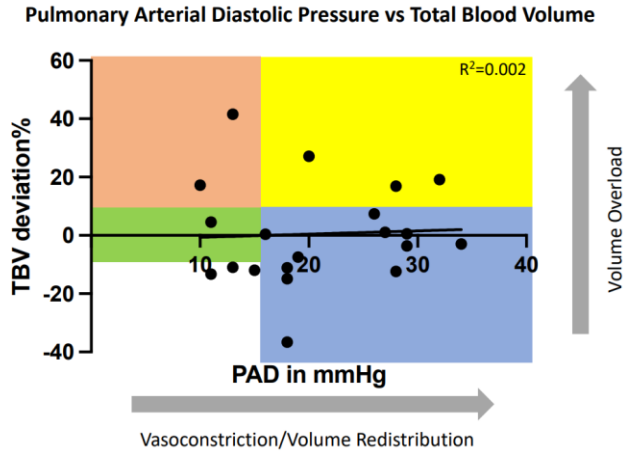


# Point 1. Make sure the patient truly needs diuretics

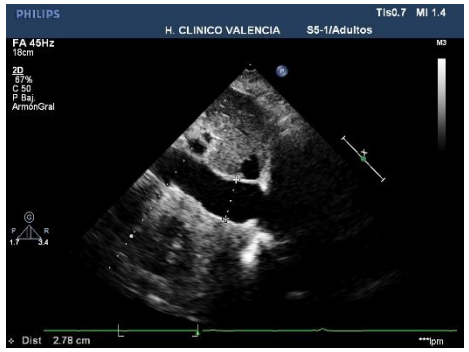
## Congestion is not just hemodynamics!!!



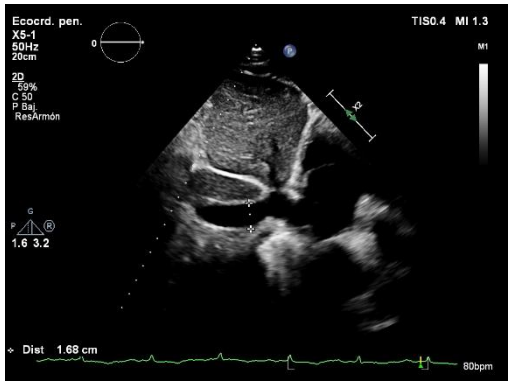

### Hemodynamic congestión

Not necessarily associated with an increase in total body water




### Tissue congestión

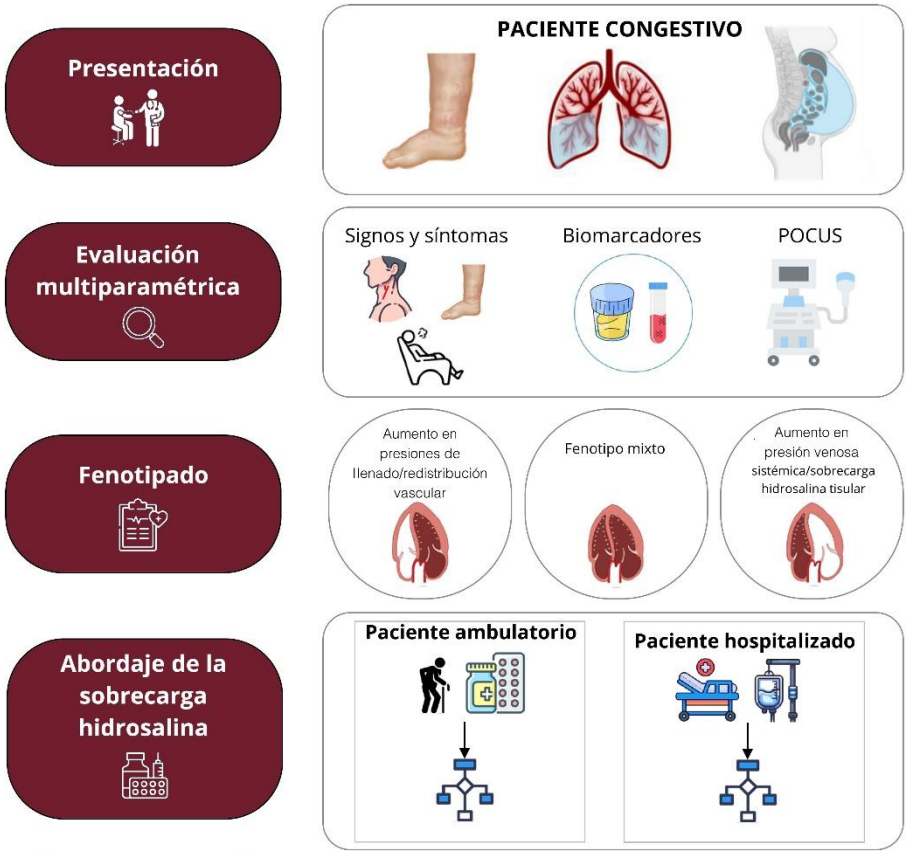
Not necessarily associated with increased venous pressure




Fudim M, et al. *J Am Coll Cardiol*. 2021;78(1):66-76.
Itkin M, et al. *J Am Coll Cardiol*. 2021;78(3):278-290.

# Point 1. Make sure the patient truly needs diuretics

## ¿Do we really need an aggressive diuretic strategy?




Grados de sobrecarga hidrosalina según un abordaje multiparamétrico

| Variables | Euvolemia | Leve | Moderada | Grave |
|---|---|---|---|---|
| *Variables clínicas* | | | | |
| Ortopnea | No | 1 almohada | 2 almohadas | Continua |
| IY, cm | <6 | 6-9 | 9-15 | >15 |
| Crepitantes | Ausente | Bases | <50% | >50% |
| Edemas | Ausentes | Tobillos | Rodillas | >Rodillas |
| Ascitis | No | Mínima, no requiere punción | Moderada, susceptible de punción | A tensión, requiere punción |
| *Biomarcadores* | | | | |
| CA125, U/ml | <20 | 20-34 | 35-99 | >100 |
| BNP/NT-proBNP, pg/ml | <100/<300 | 100-400/300-1.800 | 400-2.500/1.800-10.000 | >2.500/>10.000 |
| *Ecografía pulmonar* | | | | |
| Derrame pleural | Ausente | <1 cm | >1 cm | Atelectasia |
| Líneas B | Ausente | <3 líneas por campo | >3 líneas en menos de 2 regiones por pulmón afectadas | >3 líneas en 2 regiones por pulmón afectadas |
| VExUS | 0 | 1 | 2 | 3 |

BNP: péptido natriurético cerebral; CA125: antígeno carbohidrato 125; IY: ingurgitación yugular; NT-proBNP: fracción aminoterminal del propéptido natriurético cerebral tipo B; VExUS: ecografía de exceso venoso.

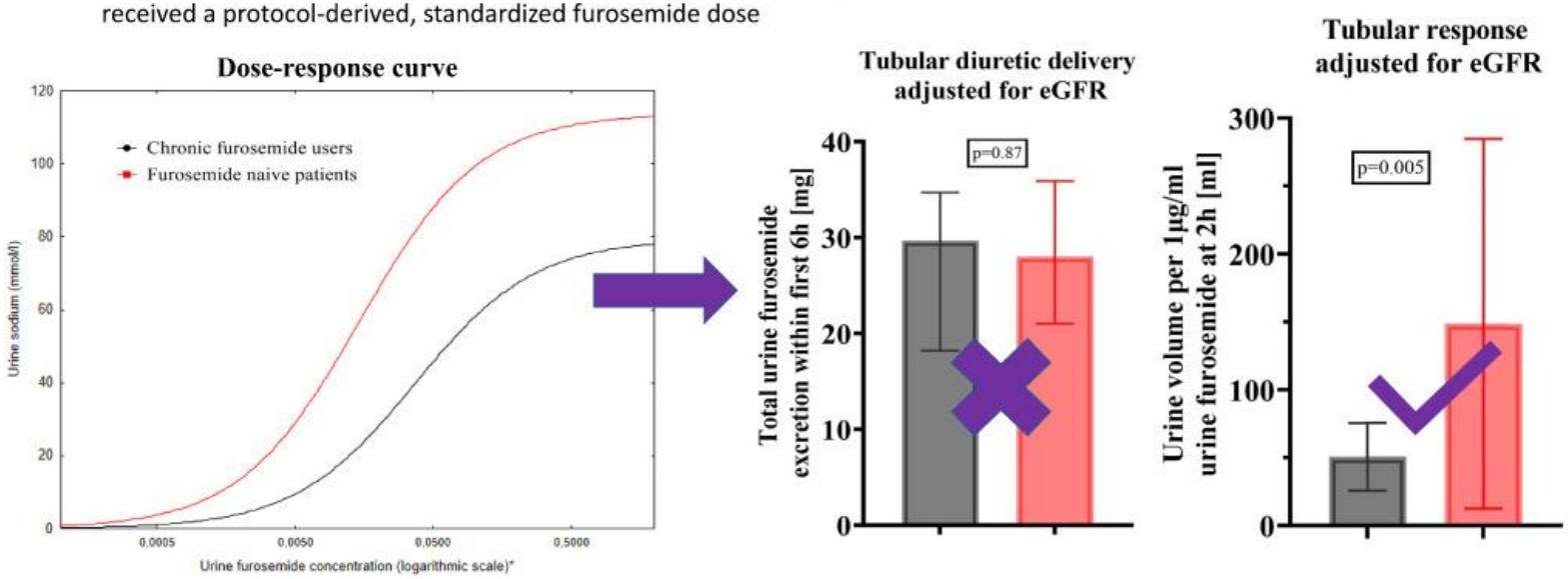
Llàcer P, de la Espriella, et al. *Rev Esp Cardiol (Engl Ed)*. 2024;77(7):556-565

# Point 2. Choose the correct loop diuretic dose

## 1. Chronic loop diuretic use

n=50 AHF patients, **28 furosemide naïve** vs **22 chronic furosemide** users, received a protocol-derived, standardized furosemide dose

measured




**Take home message**: The blunted diuretic response in acute heart failure patients with chronic loop diuretic exposure is driven by **decreased tubular responsiveness** rather than insufficient furosemide tubular delivery.

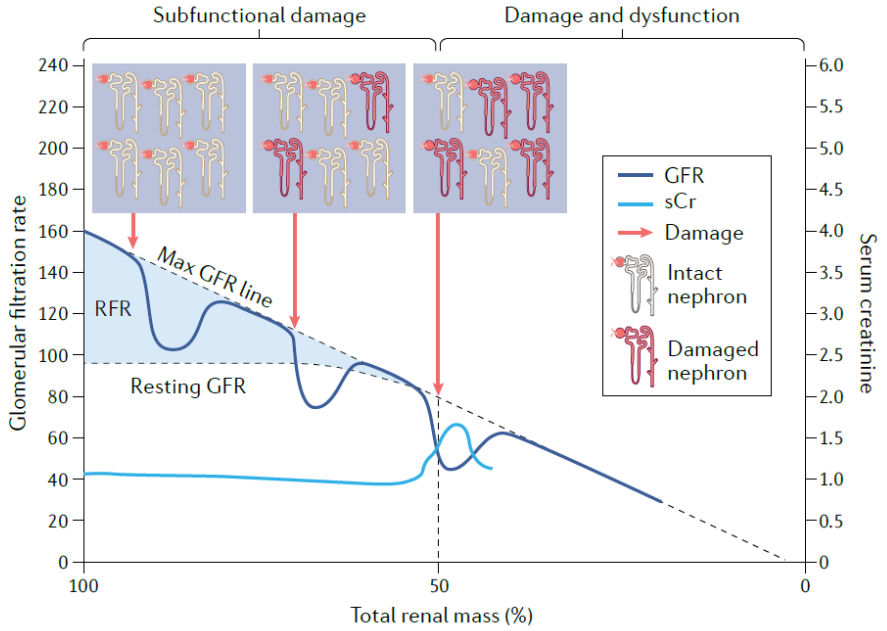
**Possible mechanisms behind this association:**

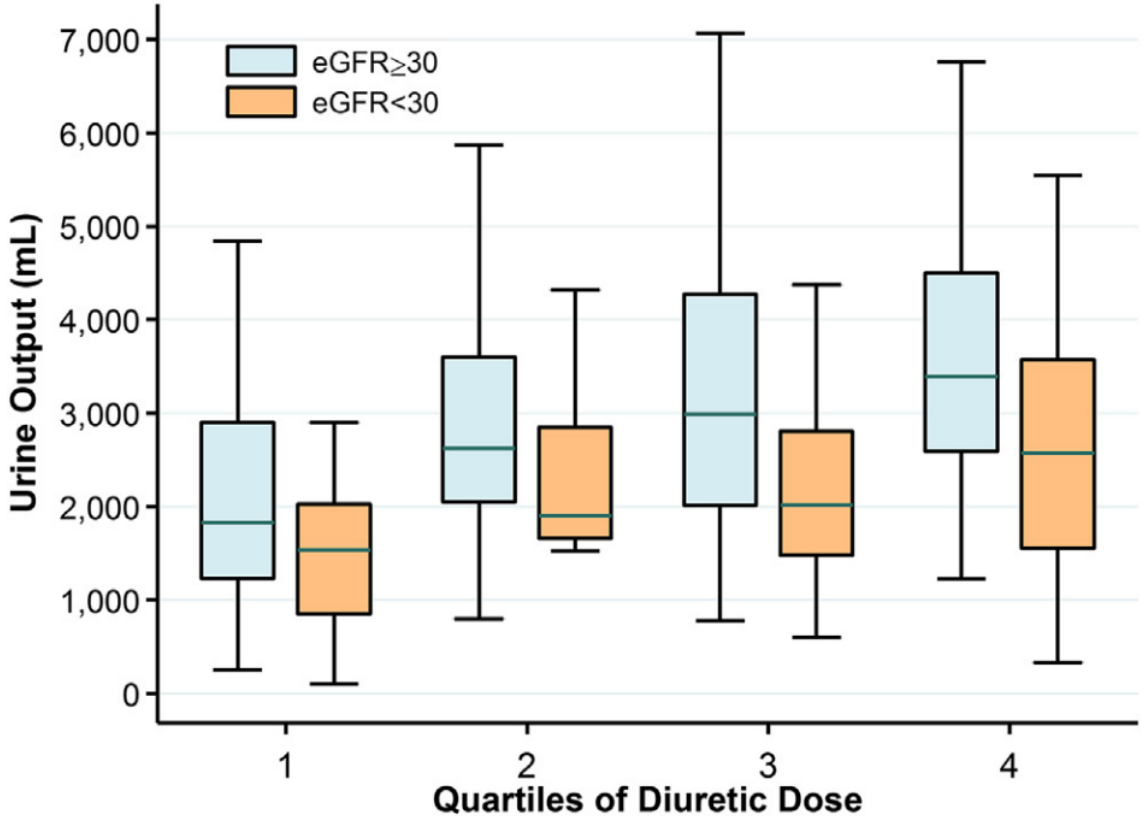
- Structural adaptation of the distal convoluted tubule to prolonged furosemide treatment
- Lower number/efficiency of the NKCC
- Higher RAAS activation (more advanced disease)

Biegus J, et al. *Eur J Heart Fail*. 2023;25(8):1323-1333

# Point 2. Choose the correct loop diuretic dose

## 2. Advanced CKD




Kellum JA, et al. Nat Rev Nephrol. 2021 Jul;17(7):493-502
Aronson D, Burger AJ. *J Card Fail*. 2016;22(3):193-200.

# Point 2. Choose the correct loop diuretic dose

## Select the initial bolus dose based on:

1. **Kidney function**
2. **Chronic loop diuretic dose**

| | Loop diuretic naive | Chronic loop diuretic use |
|---|---|---|
| eGFR ≥60 ml/min/1.73m$^2$ | Bolus of 1 mg of bumetanide | Bolus equal to total daily loop diuretic dose at home |
| eGFR <60 ml/min/1.73m$^2$ | Bolus of 2 mg of bumetanide | Bolus double the total daily loop diuretic dose at home |
| Maintenance dose is twice daily bolus dose | | |

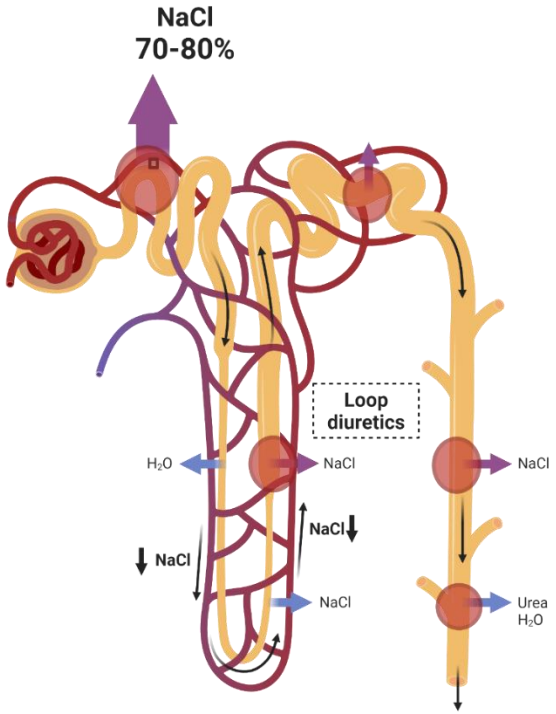
* 40 mg of furosemide is considered equal to 1 mg of bumetanide
* Maximum bolus dose is 5 mg of bumetanide

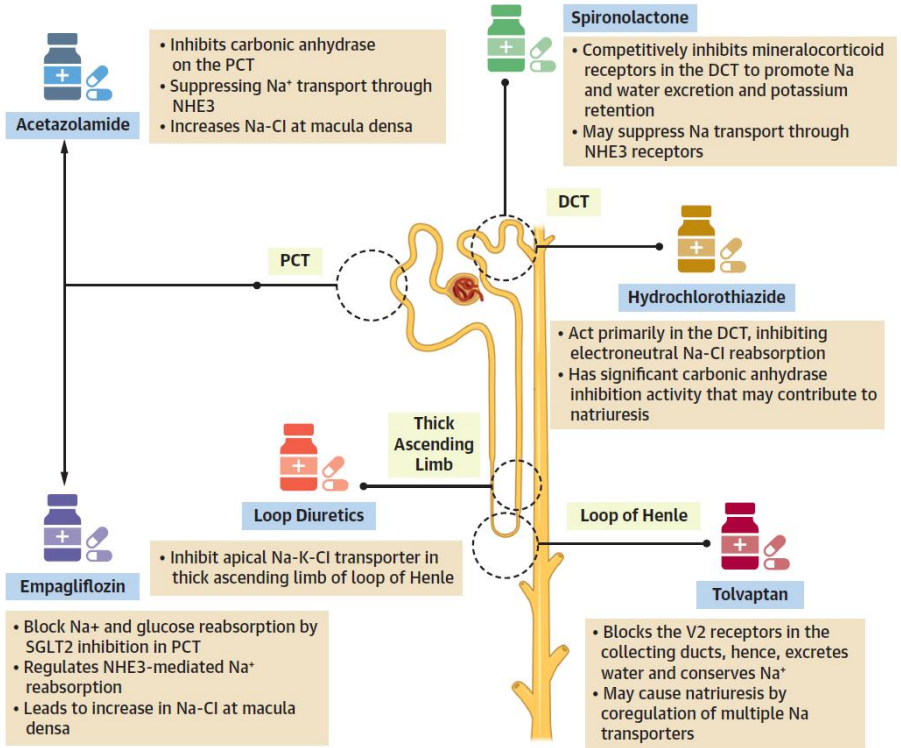
*Table legend:* eGFR: estimated Glomerular Filtration Rate

Ter Maaten JM, et al. *Nat Med*. 2023;29(10):2625-2632

# Point 3. Early combo diuretic therapy

## Combining diuretics makes pathophysiological sense




## ¿Is it really necessary for all patients??

de la Espriella R, et al. *Nefrologia (Engl Ed)*. 2022;42(2):145-162
Siddiqi TJ, et al. JACC Heart Fail. 2025;13(1):14–27.

# Point 3. Early combo diuretic therapy

**Consider upfront initiation, especially in patients at risk of resistance**

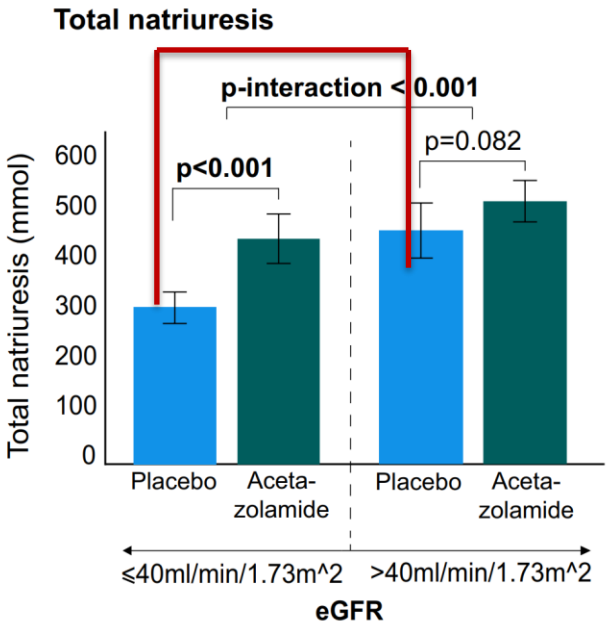
**High risk of diuretic resistance as indicated by ≥1 of:**

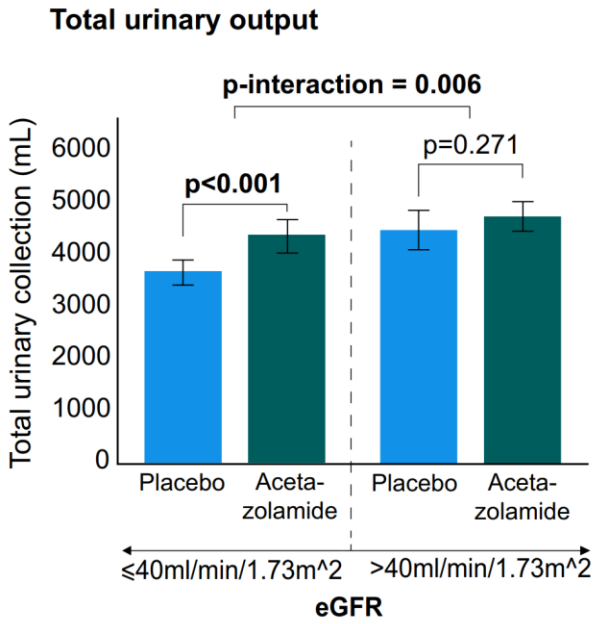
- ✓ Hypochloremia
- ✓ <1 L diuresis in 6h after first **adequate** IV furosemide bolus
- ✓ Urine sodium <100 mmol/L 1–2h after first **adequate** IV furosemide bolus

# Point 4. Which combination to choose first?

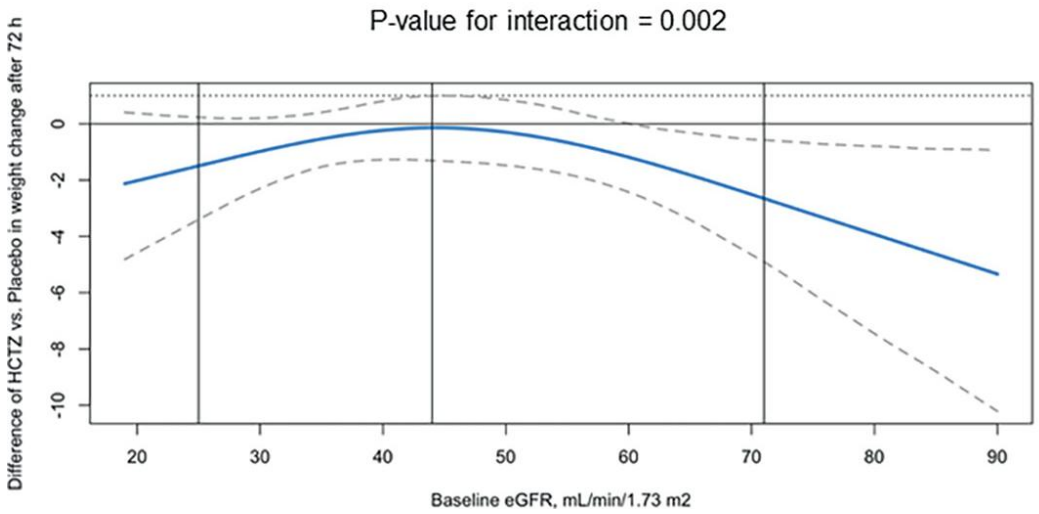
## 1. Patients with reduced eGFR

### ADVOR




### CLOROTIC



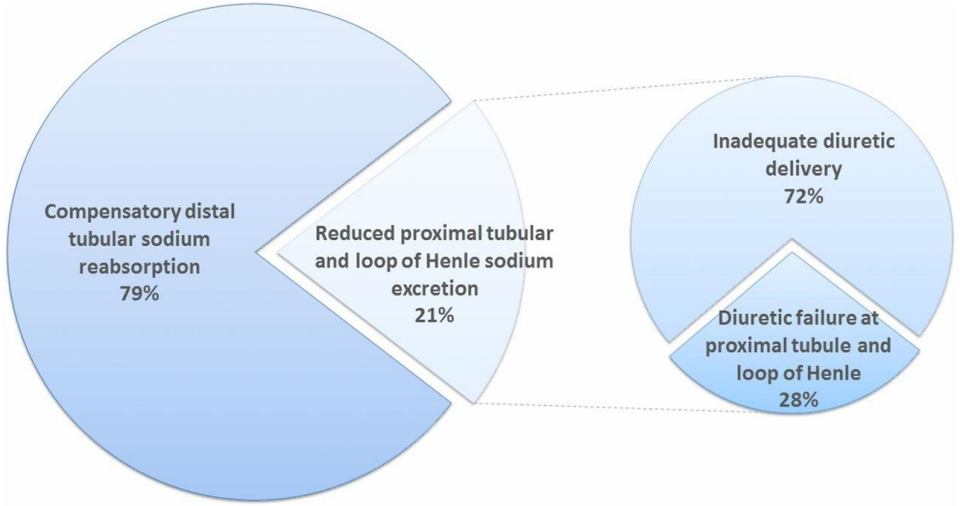


Meekers E, et al. Eur Heart J. 2023 Oct 1;44(37):3672-3682.
Trullàs JC, et al. Eur J Heart Fail. 2023 Oct;25(10):1784-1793.

# Point 4. Which combination to choose first?

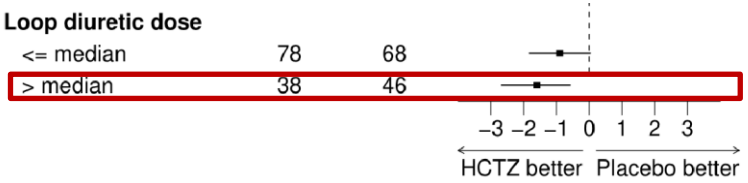
## 2. Patients with chronic loop diuretic exposure

N=128

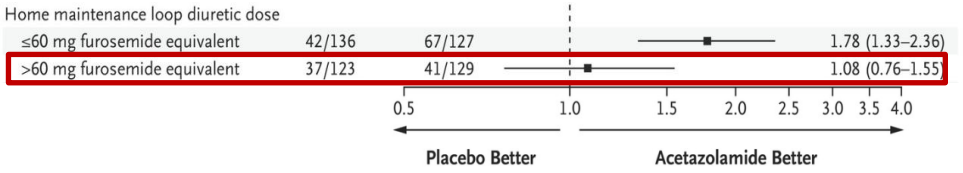



**Oral furosemide median dose → 120 mg (40-120)**

### CLOROTIC



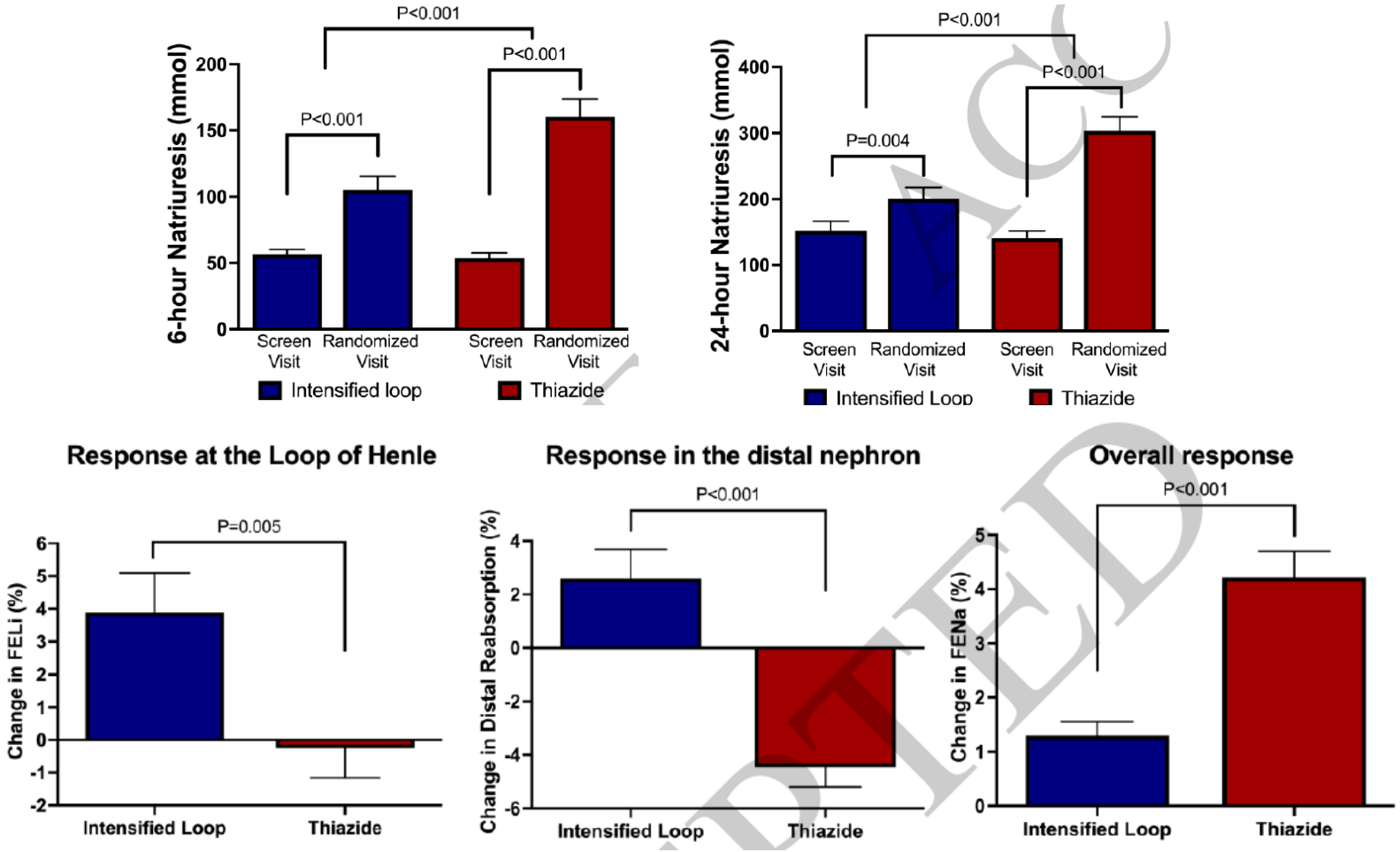

### ADVOR




1. Rao VS, et al. J Am Soc Nephrol. 2017 Nov;28(11):3414-3424; 2. Trullas JC, et al. *Eur Heart J*. 2023;44(5):411-421; 3. Mullens W, et al. N Engl J Med. 2022 Sep 29;387(13):1185-1195.

# Point 4. Which combination to choose first?

## 2. Patients with chronic loop diuretic exposure



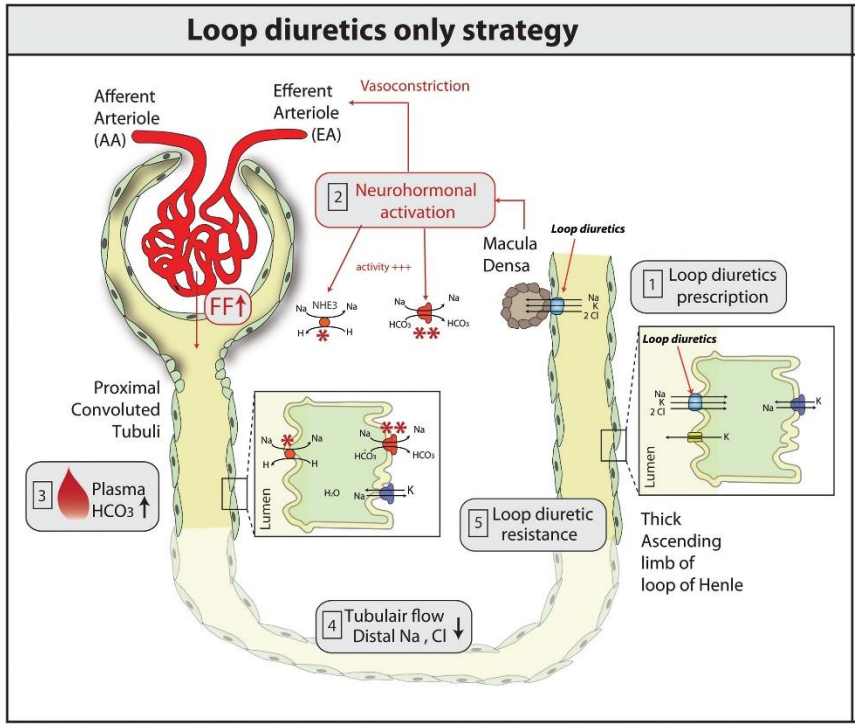



Rao VS, Testani J, et al. *J Am Soc Nephrol*. Published online September 12, 2025. doi:10.1681/ASN.0000000887

# Point 4. Which combination to choose first?

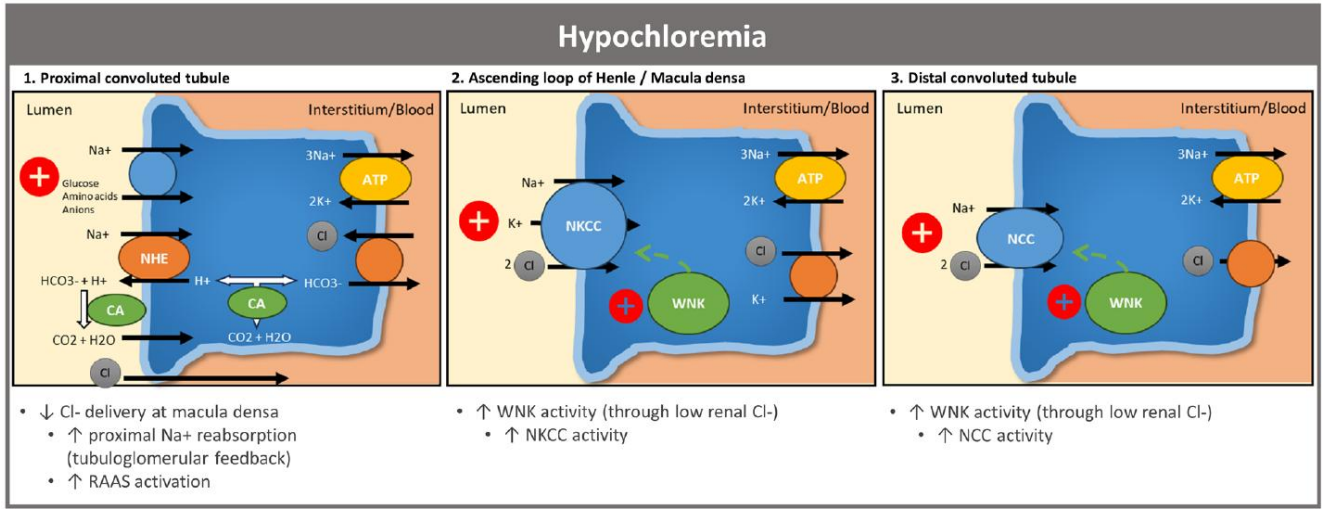
## 3. Hypochloremia / Metabolic alcalosis

### High serum HCO3




Reflective of a state of neuro-hormonal activation resulting in more proximal sodium re-absorption

### Low serum chloride



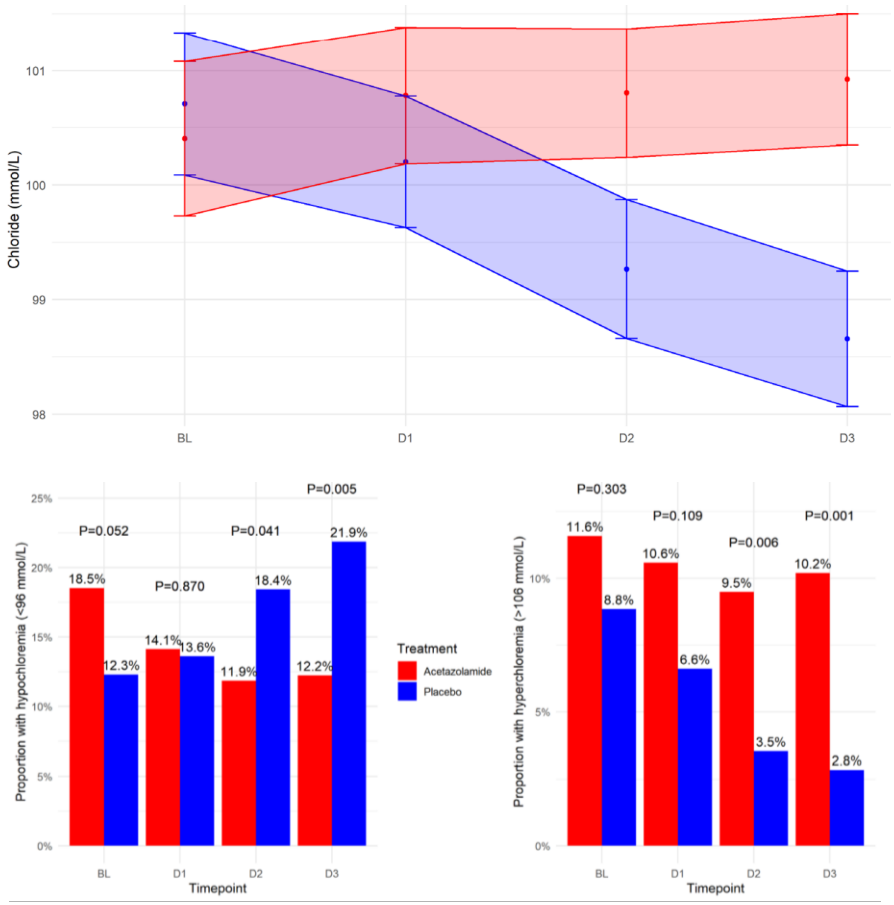

Low intracellular chloride leads to activation of WNK (with no lysine kinase), resulting in upregulation of the cation-chloride cotransporters such as NKCC in the thick ascending limb and sodium-chloride cotransporter (NCC) in the distal convoluted tubule

1. Martens P, et al. *Eur Heart J*. 2023;44(22):1995-2005; 2. Van den Eynde J, et al. Circ Heart Fail. 2024 Oct;17(10):e011749. doi: 10.1161/CIRCHEARTFAILURE.123.011749.

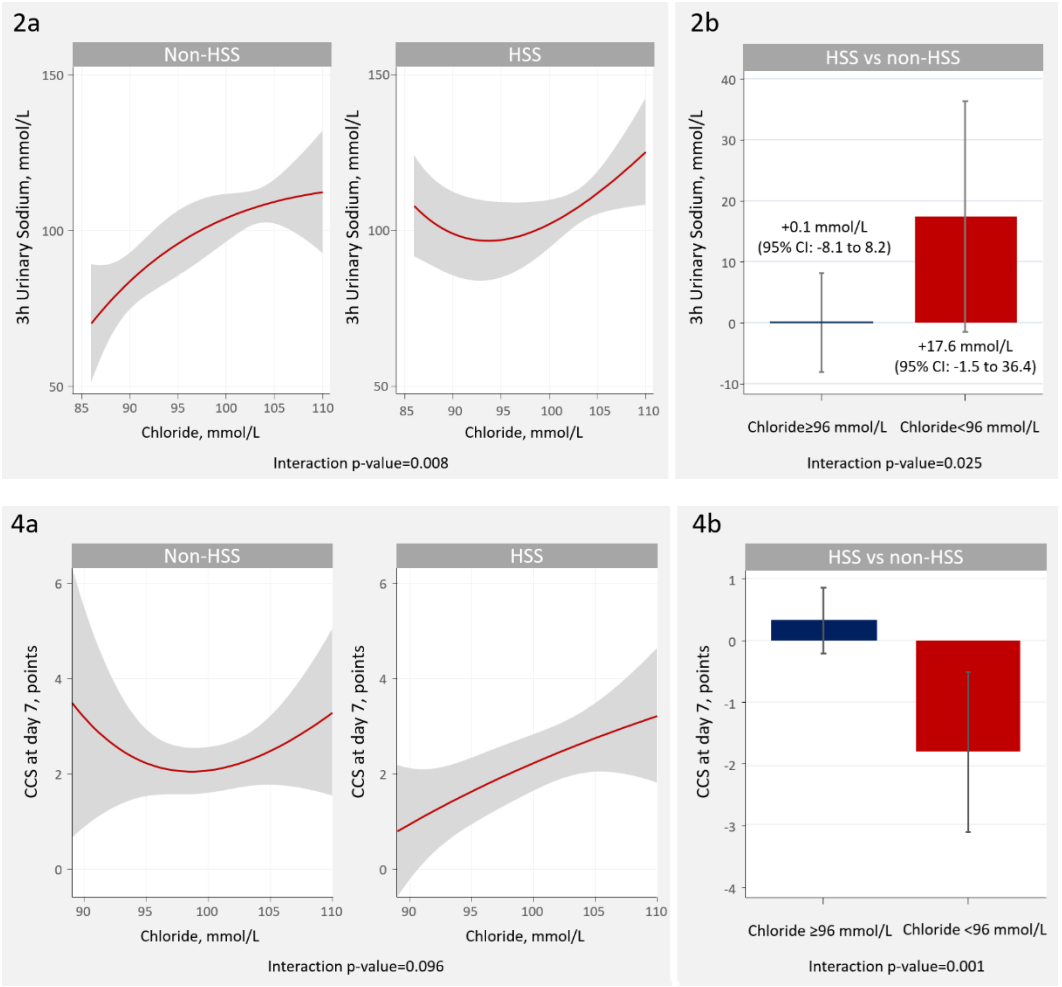
# Point 4. Which combination to choose first?

## 3. Hypochloremia / Metabolic alcalosis

### Acetazolamide



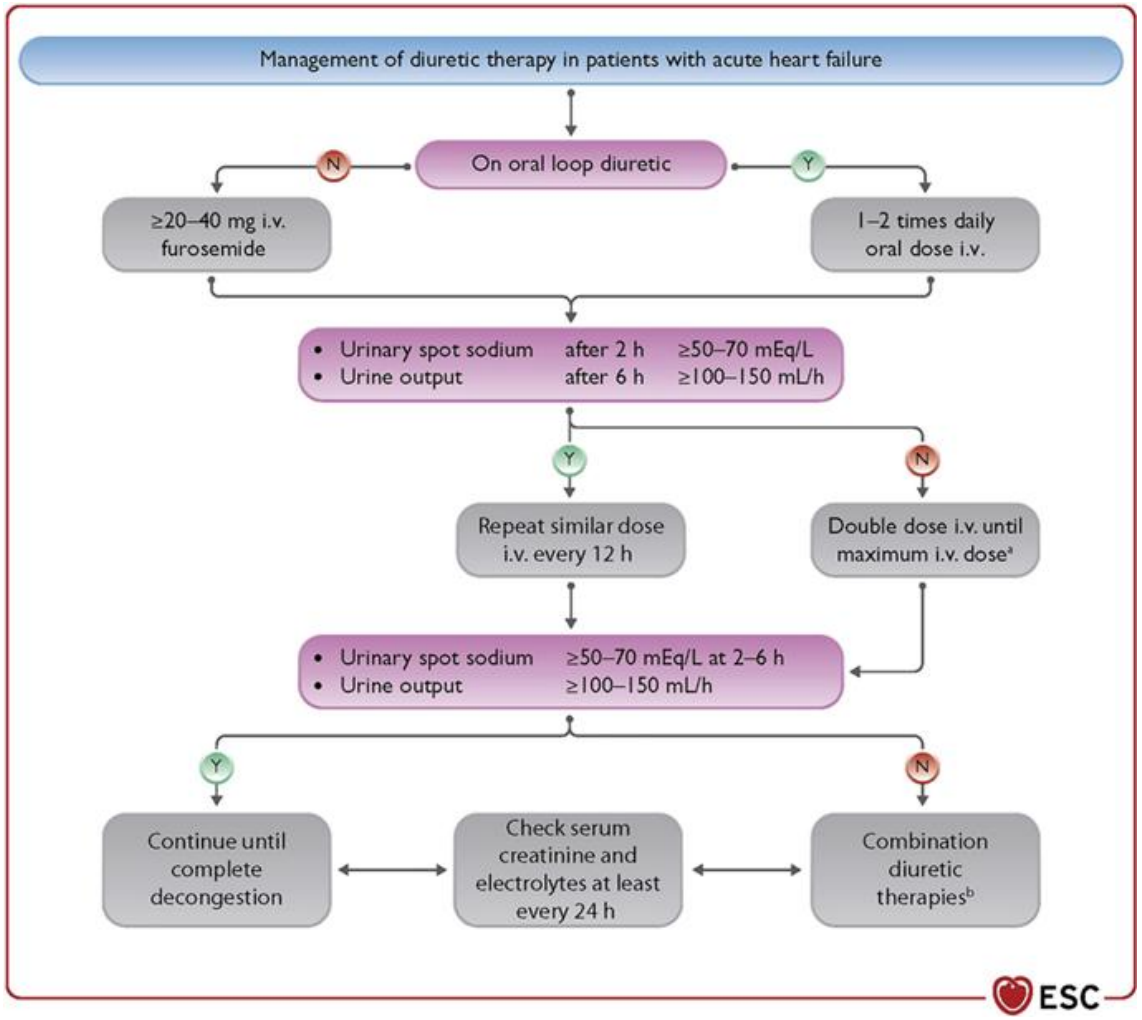

### SSH





Van den Eynde J, et al. Circ Heart Fail. 2024;17(10):e011749.
Núñez J, Miñana G, de la Espriella R, et al. *Eur J Heart Fail. 2025;27(6):960-971*

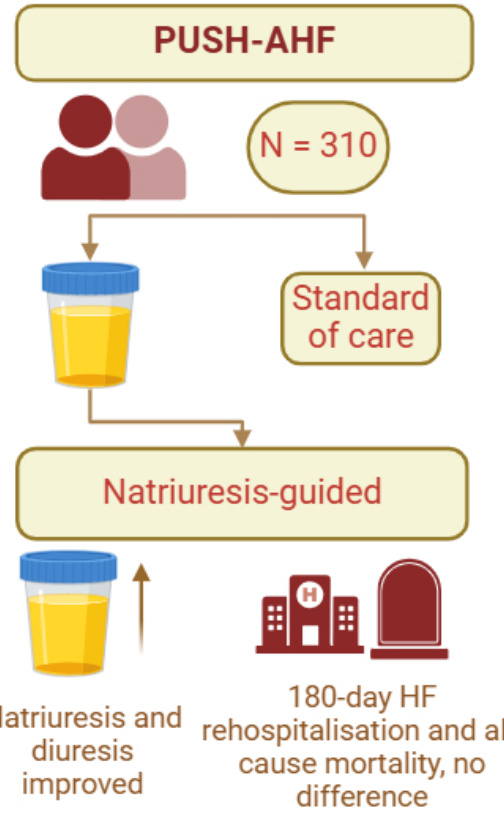
# Point 5. Monitor diuretic response & adapt diuretic strategy



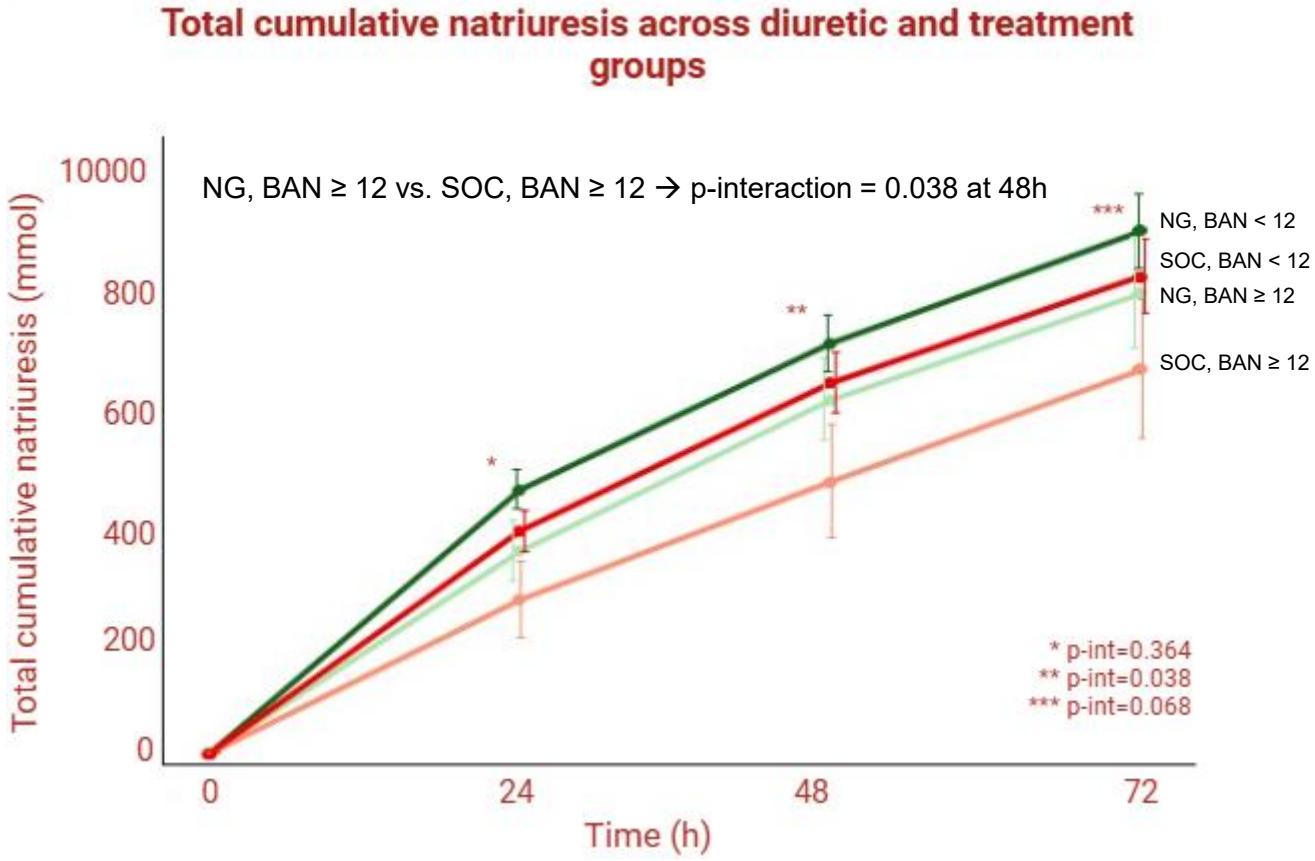

LEEC Zonneveld et al. Abstract presented at ESC Congress 2025. Optimal management of acute heart failure session

# Point 5. Monitor diuretic response & adapt diuretic strategy

## BAN-ADHF score in the PUSH-AHF trial




| | BAN-ADHF score <12 | BAN-ADHF score ≥12 |
|---|---|---|
| SOC | 115 (38%) | 31 (10%) |
| Natriuresis-guided | 126 (41%) | 34 (11%) |

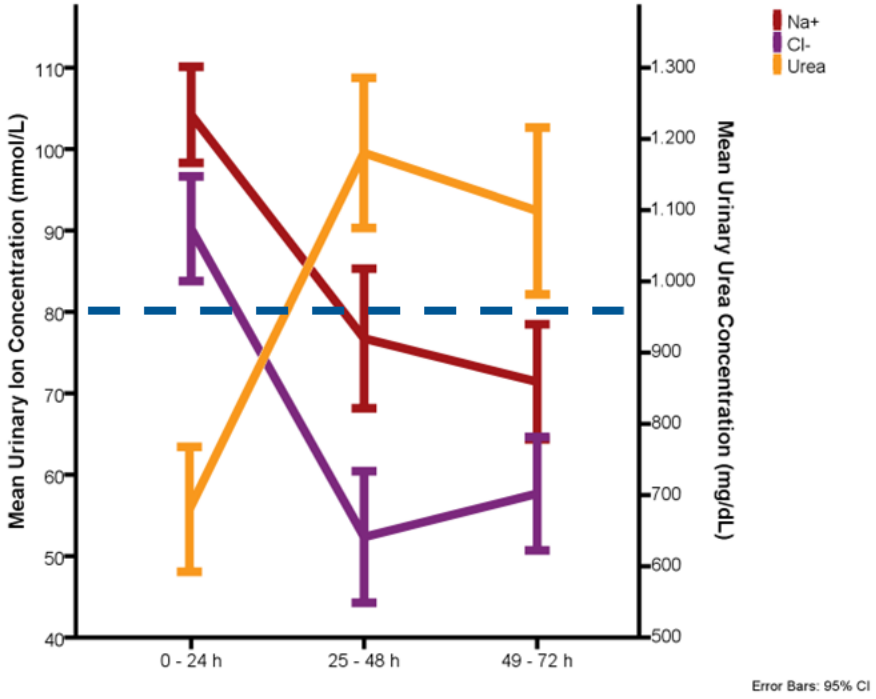



NG therapy might be more effective in diuretic-resistant vs. nondiuretic-resistant patients in improving decongestive response

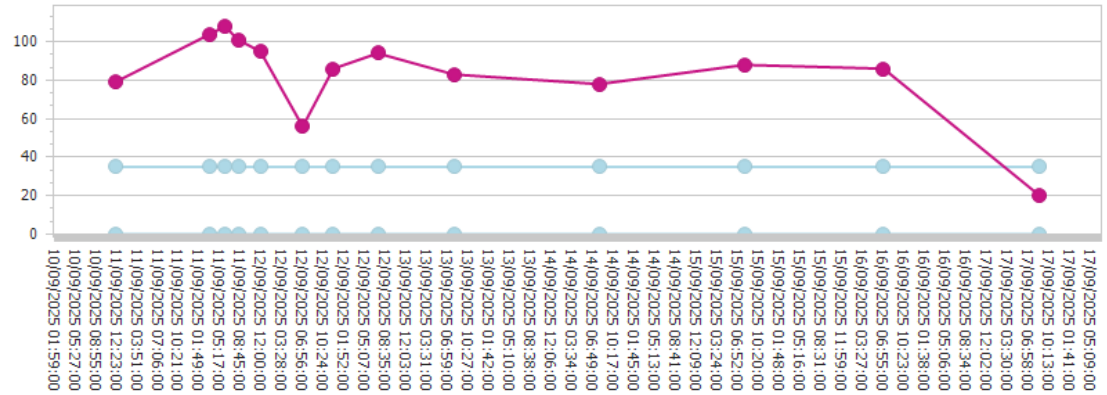
LEEC Zonneveld et al. Abstract presented at ESC Congress 2025. Optimal management of acute heart failure session

# Point 6. When should we stop?

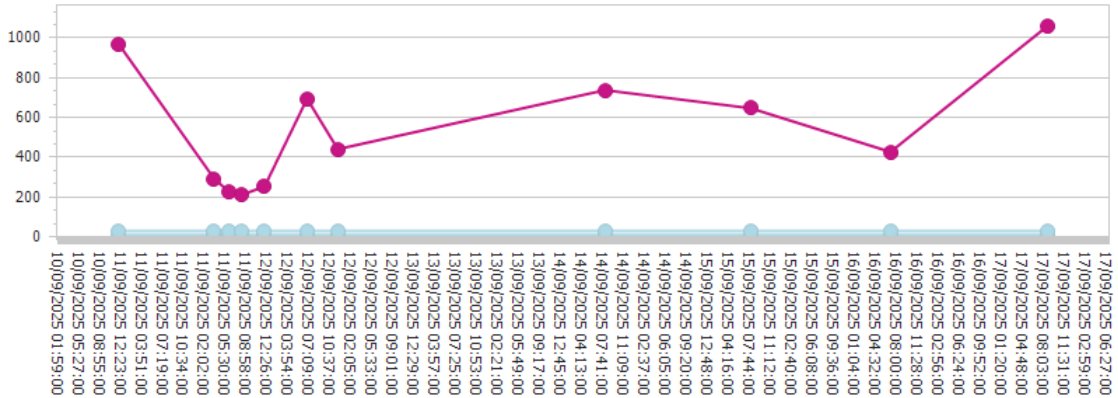
## 1. Check urine composition during decongestion




Urinary sodium during admission



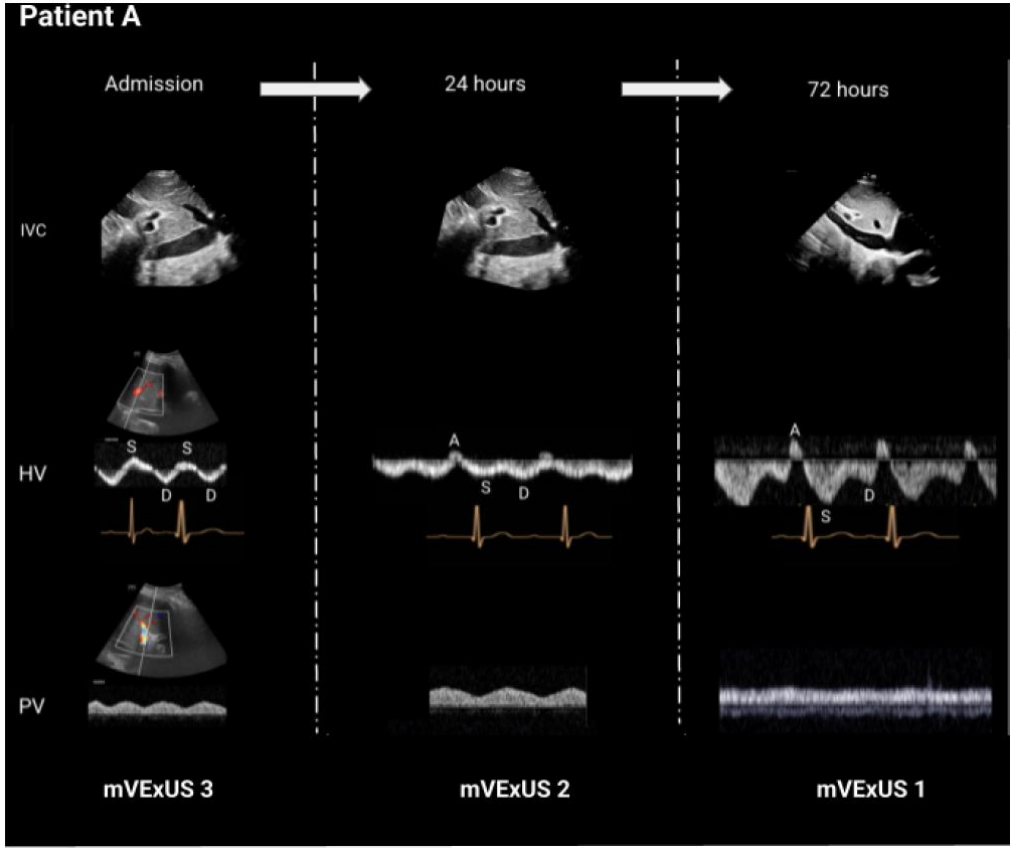

Urinary urea during admission

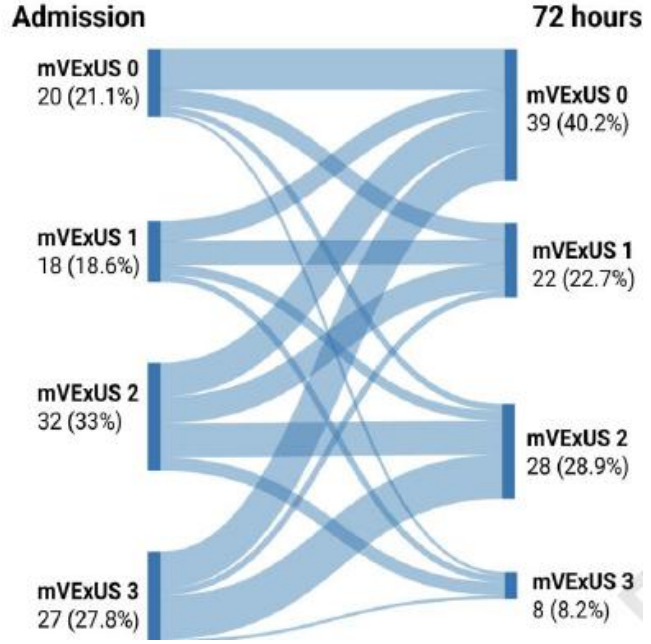


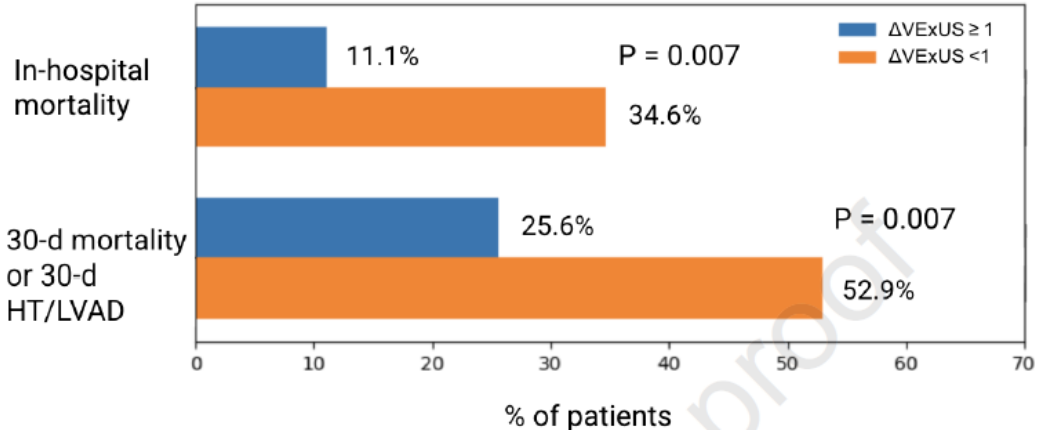

Verbrugge FH, et al. *Circ Heart Fail*. 2014;7(5):766-772.

# Point 6. When should we stop?

## 2. Dynamic, multiparametric response assessment



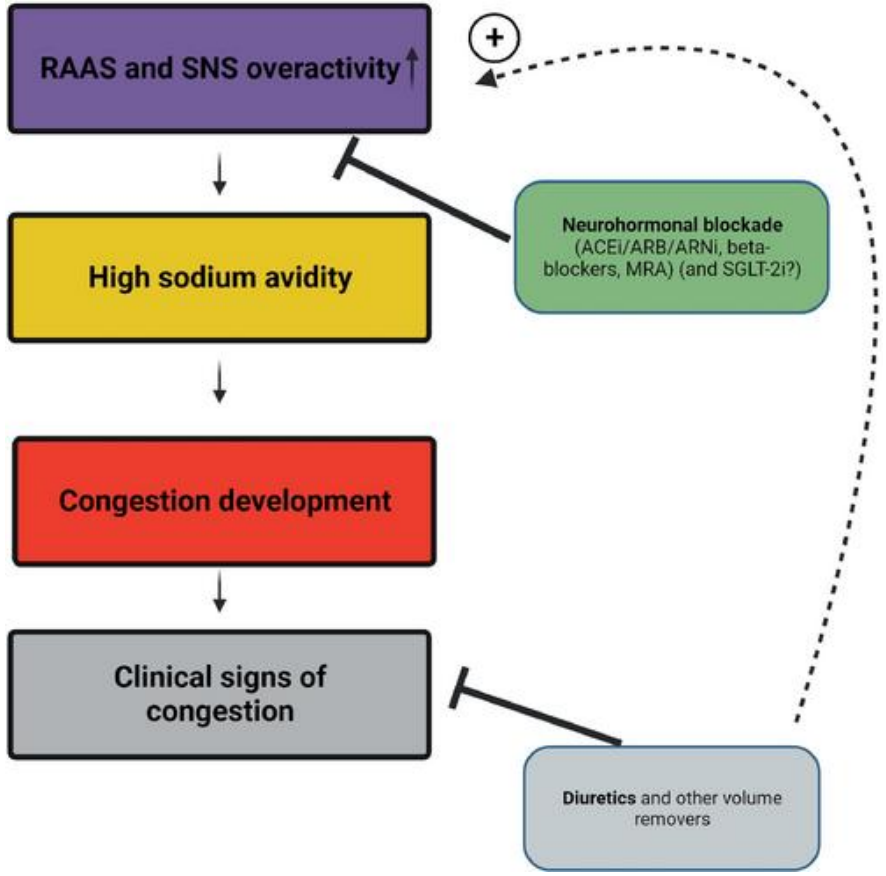




Saadi MP, et al. *J Am Soc Echocardiogr*. Published online August 22, 2025. doi:10.1016/j.echo.2025.08.011

# Point 7. Start/up-titrate prognostic drugs


We need to stop just mopping the floor




Biegus J, et al. *Eur J Heart Fail*. 2024;26(10):2094-2106.
Biegus J, et al. *J Am Coll Cardiol*. 2024;84(4):323-336.