Iperpotassiemia nel paziente con scompenso cardiaco

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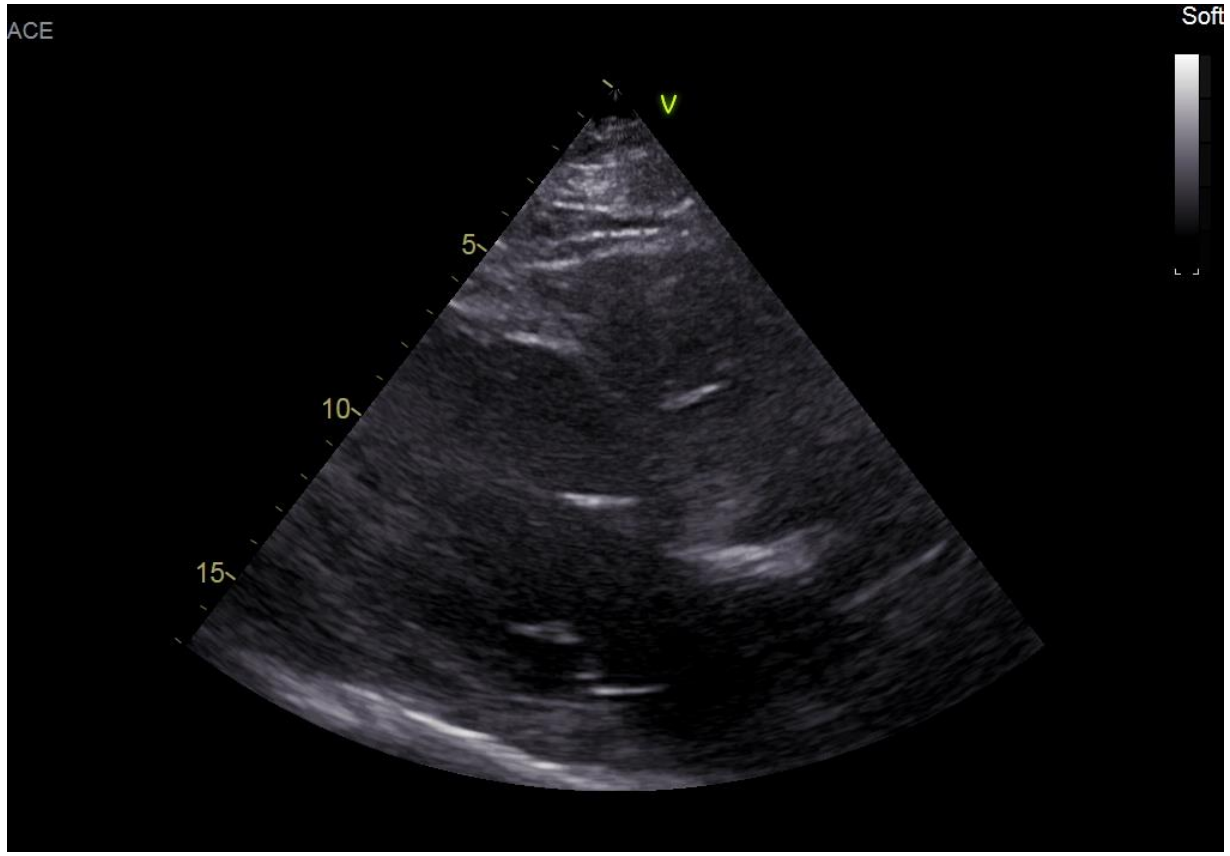
Uomo di 68 anni
FRC: ipertensione arteriosa in terapia con Ca antagonista, dislipidemia
Comorbilità: IPB, IRC stadio 2.
FA di recente riscontro.
Terapia: Amlodipina 10 mg 1 cp, Metoprololo 100 mg ½ cp x 2, Rivaroxaban 15 mg 1 cp, Tamsulosina 0,4 mg 1 cp

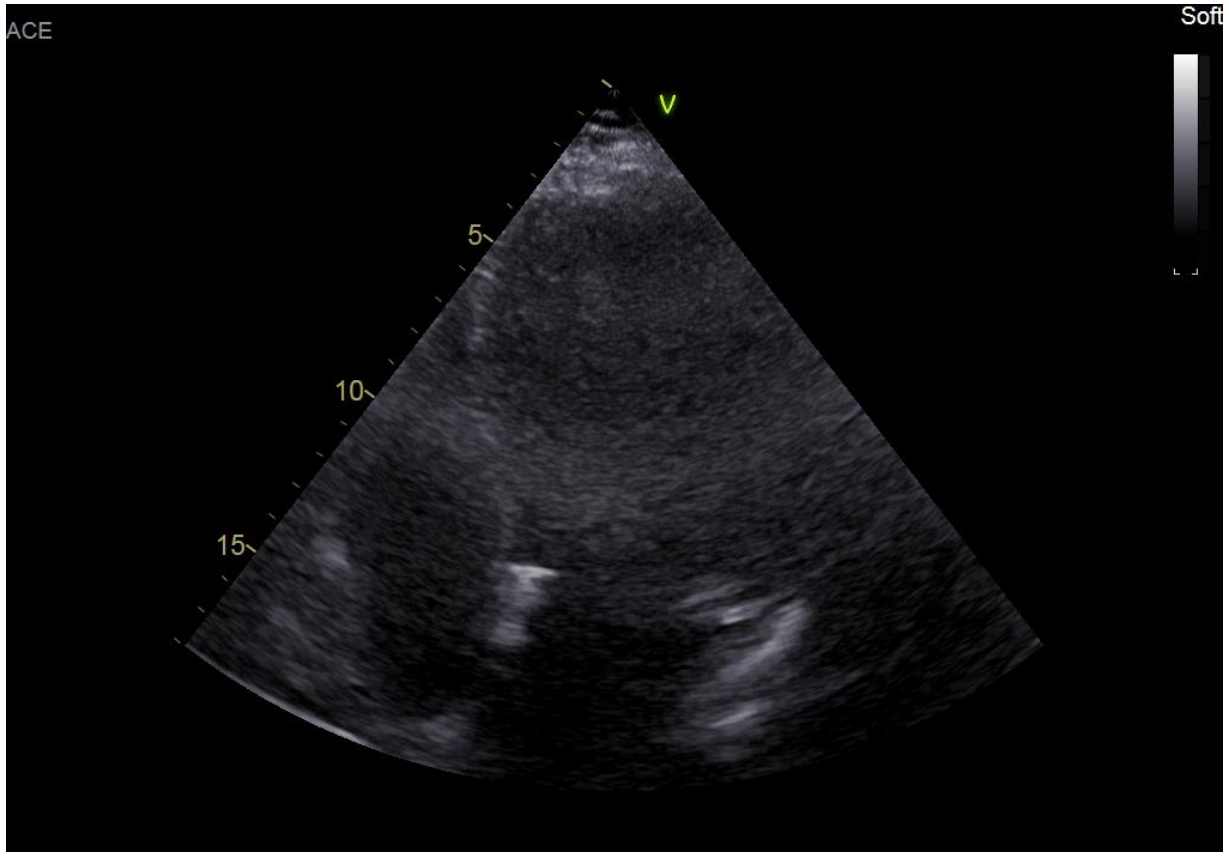
26/10/2021 accesso in DEA per insufficienza respiratoria tipo 1 in EPA iperteso.

Quadro di congestione polmonare e sistemica

Agli ematici: NTproBNP 6321 pg/mL, Crea 1,6 mg/dL, K^+ 5,1 mMol/L, Trop T 28 -> 31 ng/L.

Ecocardiogramma TT

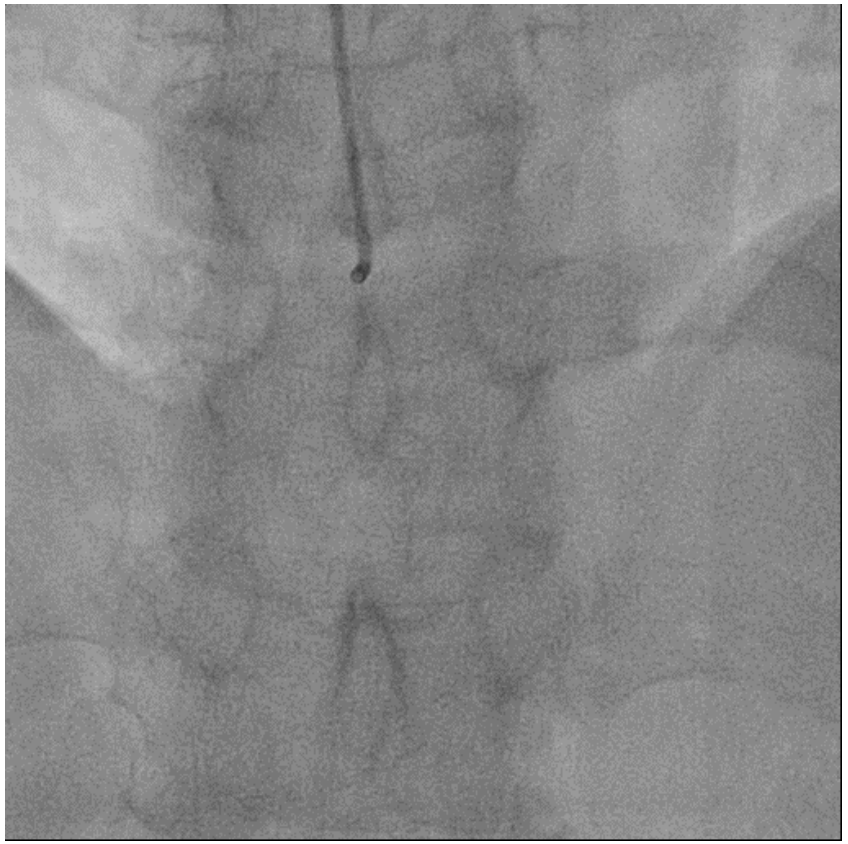
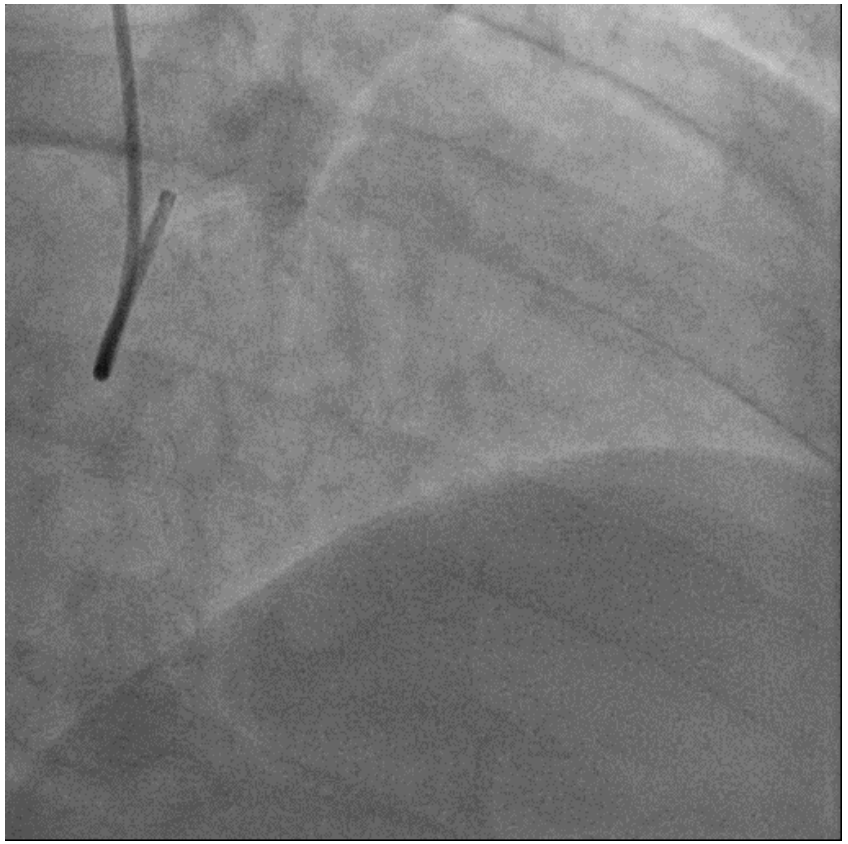
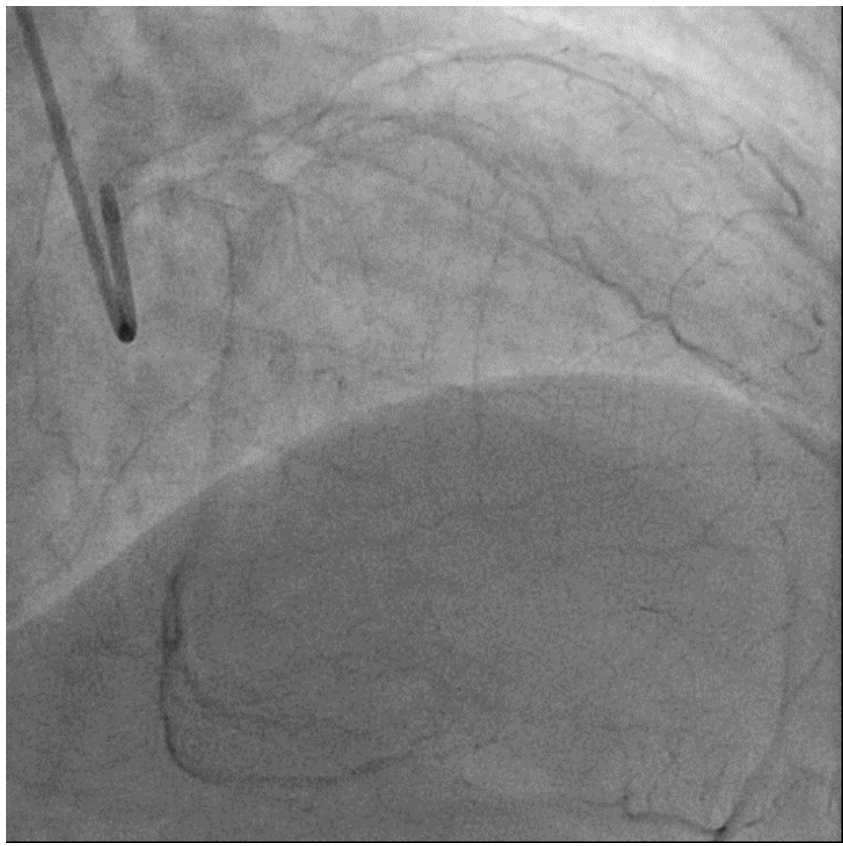




Ricoverato in cardiologia

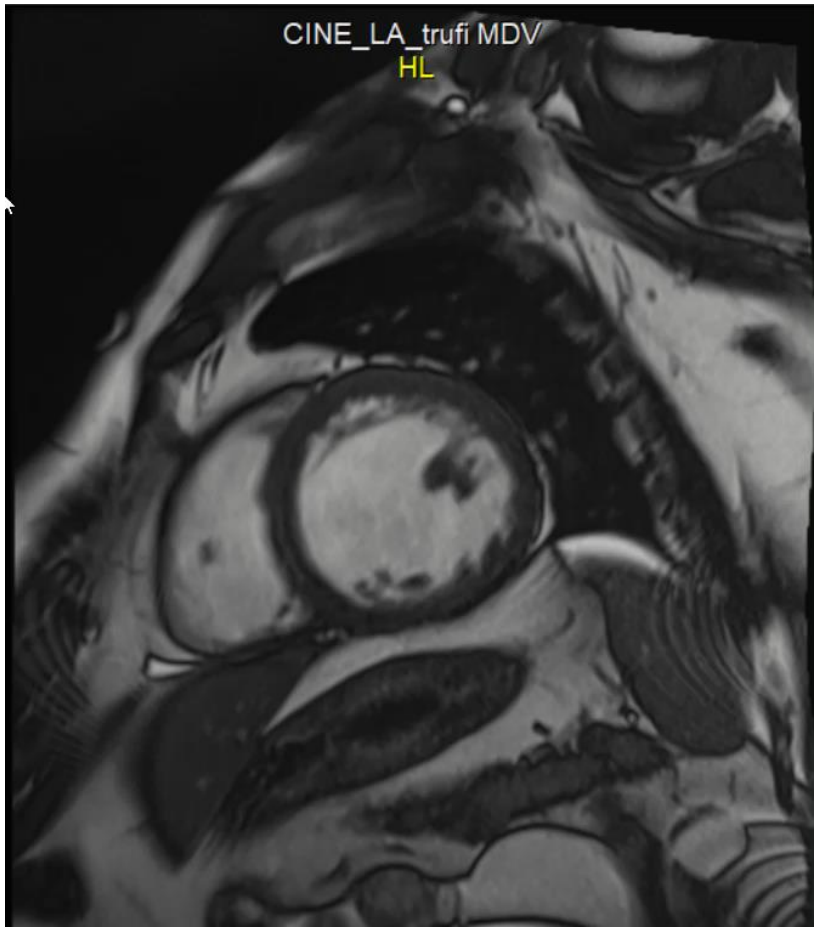
Terapia decongestionante con Vasodilatatori e diuretici con buona risposta.
Progressivamente implementata terapia prognostica.

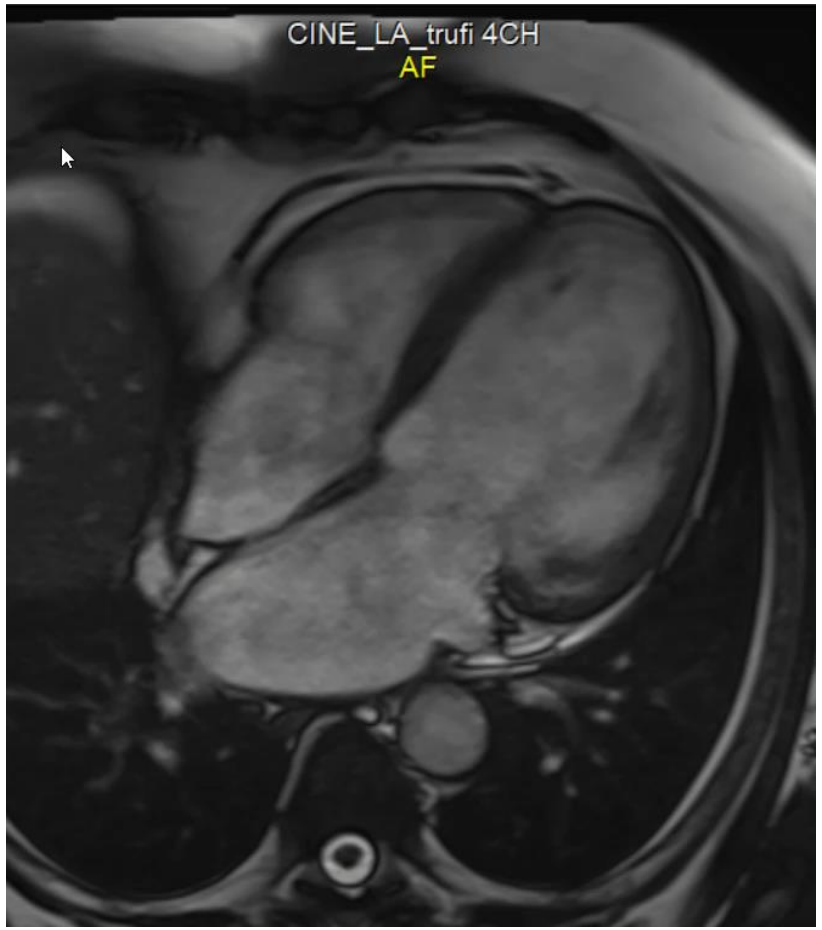
Coronarografia

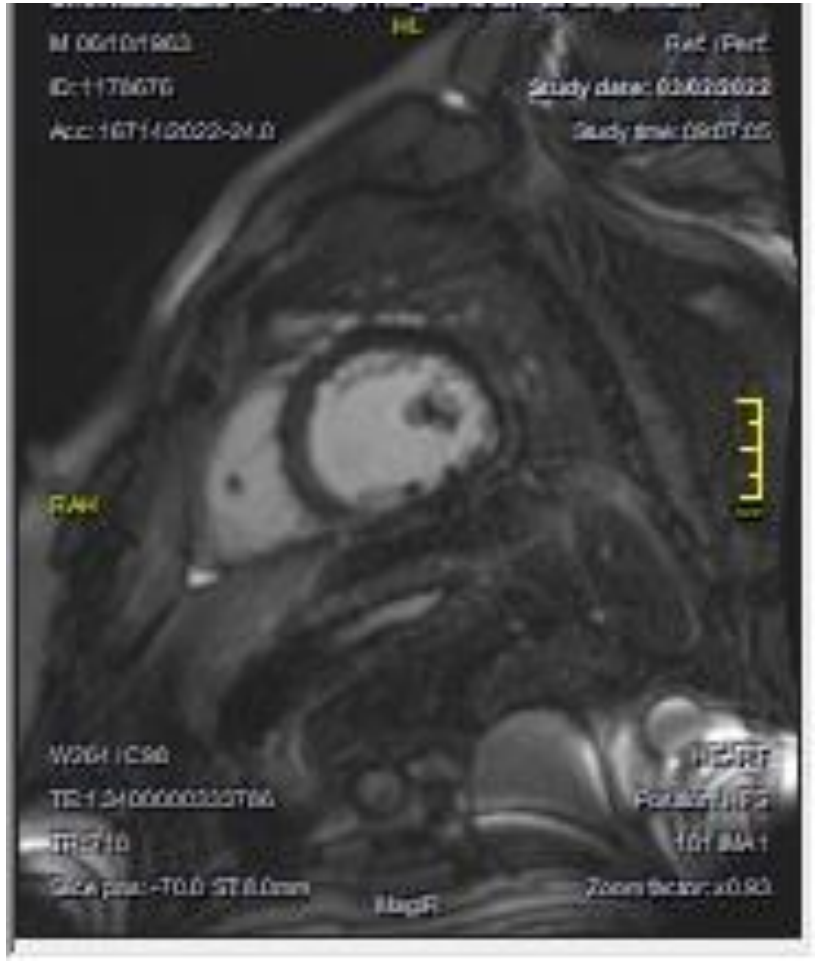




PCI + DES su IVA I

RMN cardiaca







FE 27% per ipocinesia diffusa, fibrosi intramiocardica inferiore basale e SIV.

Scompenso cardiaco in cardiomiopatia ipocinetica di primo riscontro in paziente iperteso con fibrillazione atriale parossistica e malattia monovasale di IVA prossimale sottoposta a rivascolarizzazione percutanea.

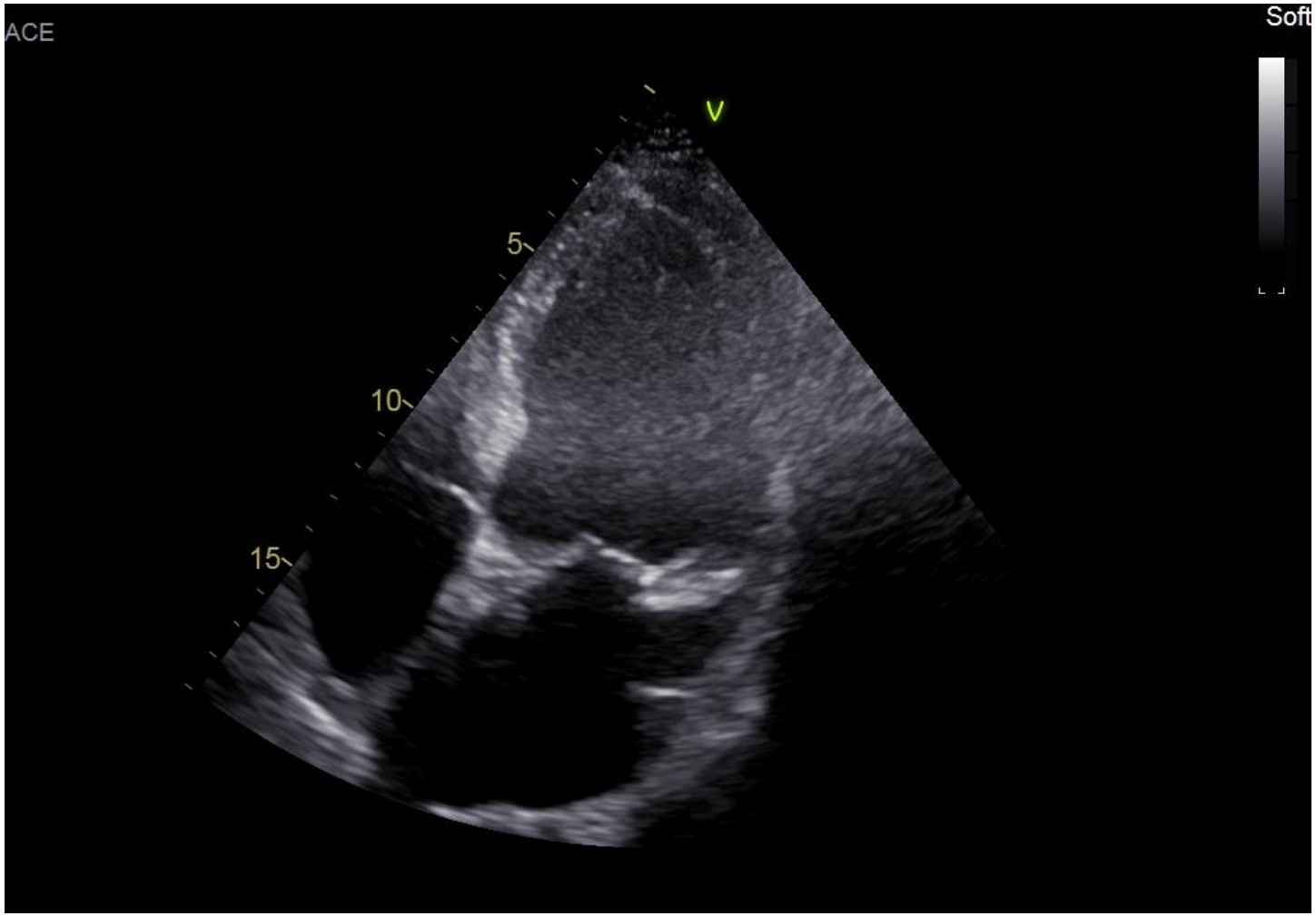
FARMACO	10/2021
Metoprololo	200 mg
Valsartan	160 mg
Furosemide	50 mg
Spironolattone	25 mg
Atorvastatina	40 mg
Cardioaspirin	100 mg
Rivaroxaban	15 mg
Clopidogrel	75 mg
Tamsulosina	0,4 mg

Alla dimissione peso 78 kg (- 9 kg dall'ingresso)
Crea 1,4 mg/dl, K^+ 4,8 mMol/L, NTproBNP 1528 pg/mL

Rivalutazione a circa un mese in ambulatorio scompenso per:

- **Avvio ARNI**
- **Avvio SGLT2i**
- **ICD ?**
- **Ablazione TC di FA?**

Follow up ambulatorio scompenso 12/2021

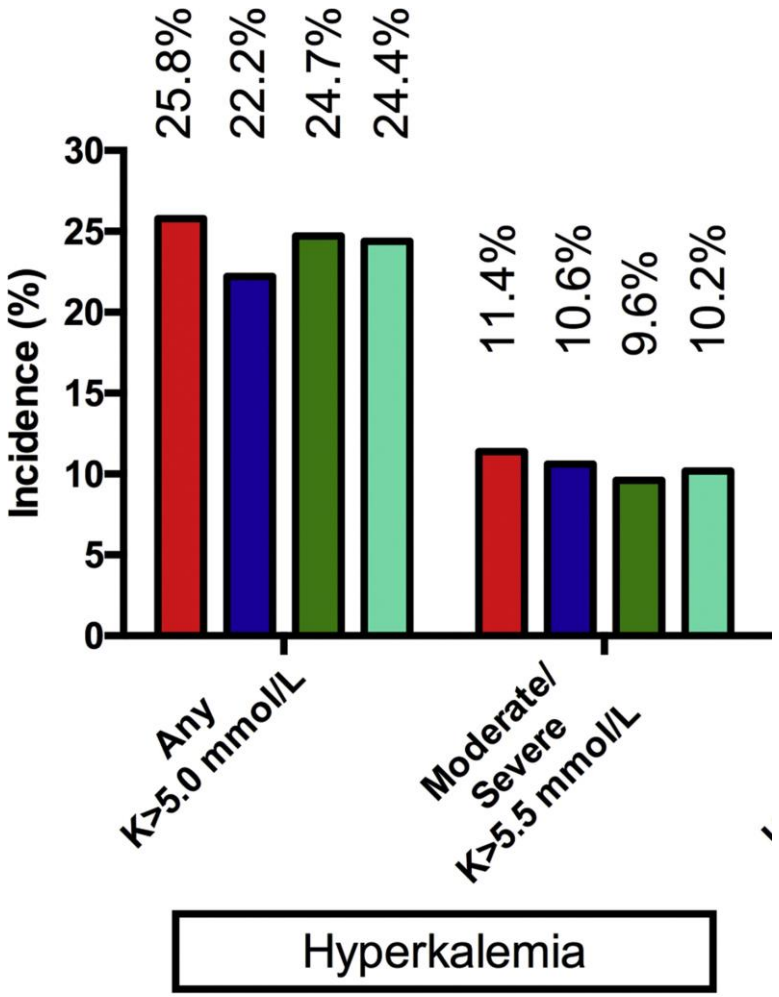


Paziente asintomatico, NYHA II. Discreto compenso emodinamico. Non edemi. Non segni di stasi polmonare

NTproBNP 1312 pg/mL

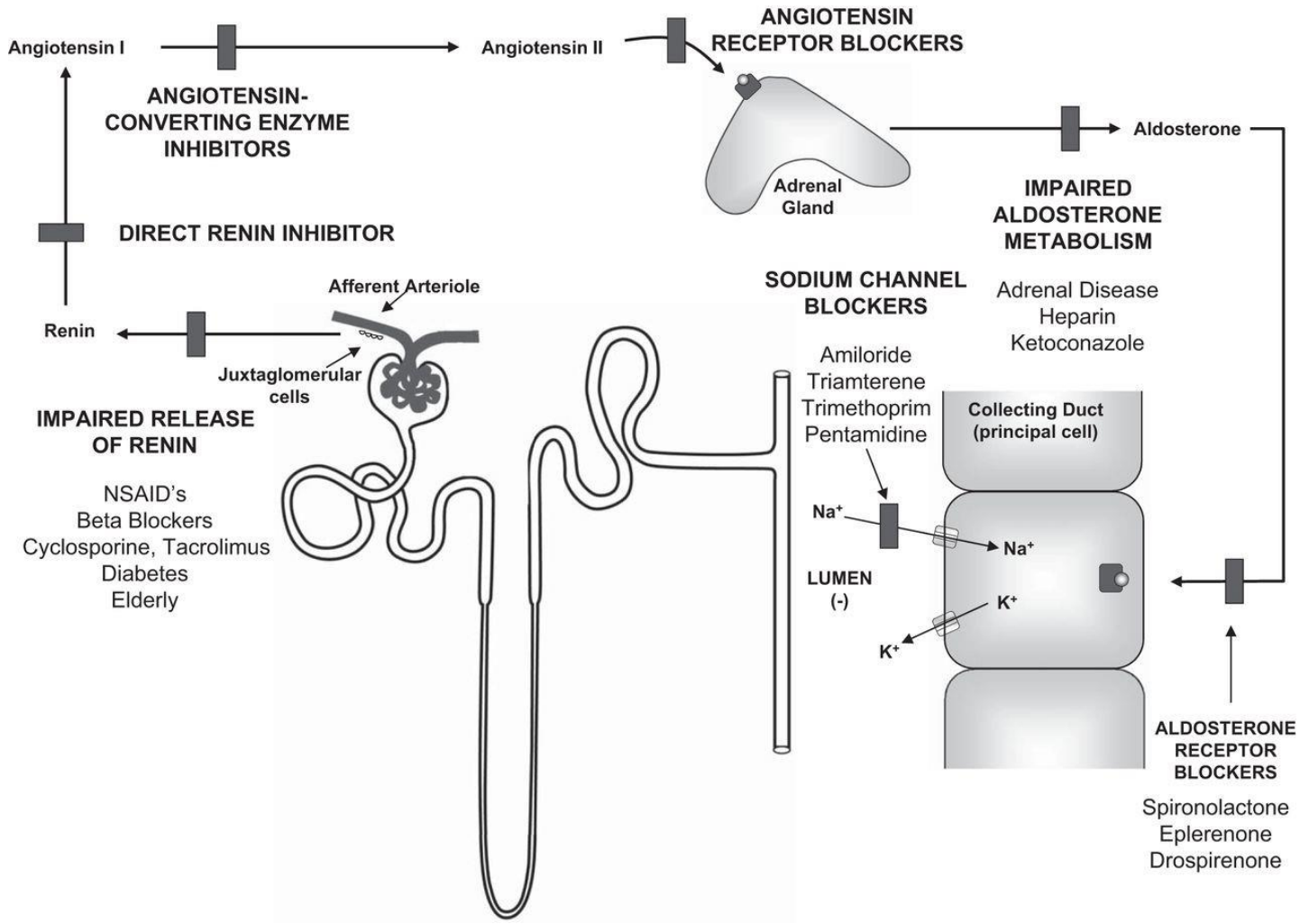
Cr 1,5 mg/dL; K^+ 5,8 mMol/L

Epidemiologia dell'iperpotassiemia nello scompenso cardiaco



Incidence, Predictors, and Outcome Associations of Dyskalemia in Heart Failure With Preserved, Mid-Range, and Reduced Ejection Fraction. Savarese G et al, J Am Coll Cardiol HF 2019;7:65–76

Farmaci e potassio



ACE inibitori e ARB diminuiscono i livelli sierici di Aldosterone

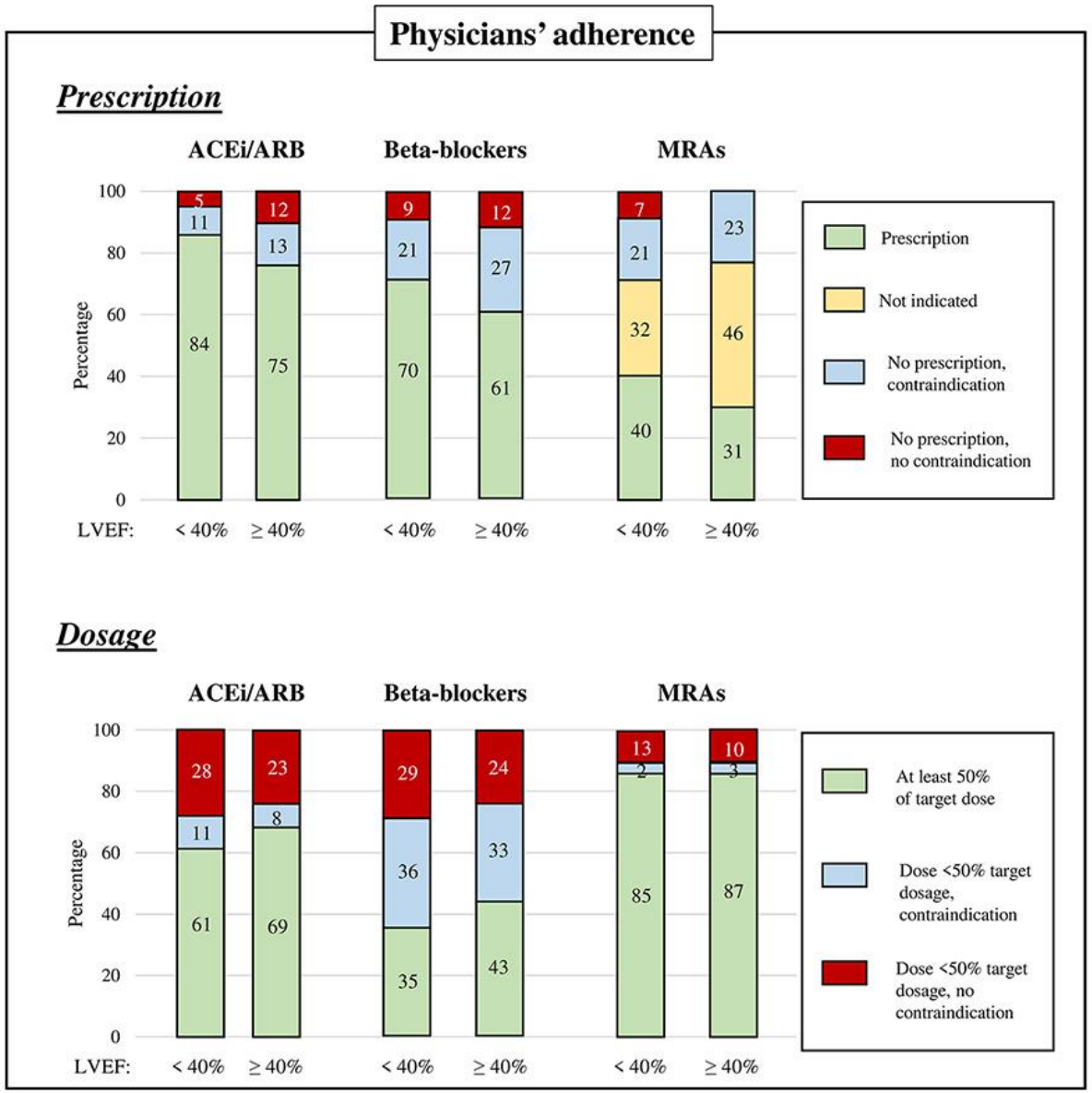
MRA antagonizzano l'azione dell'aldosterone sui recettori dei mineralcorticoidi

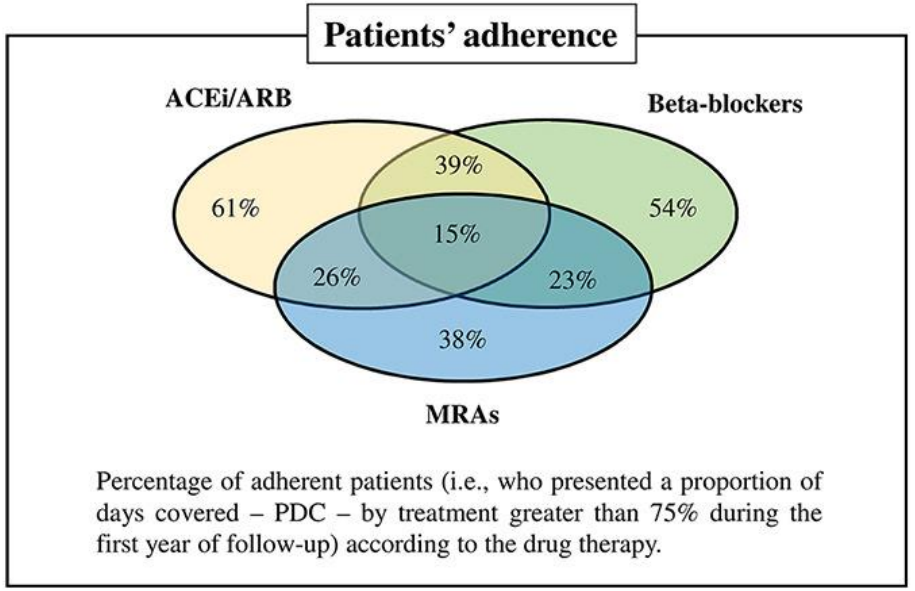
Beta bloccanti diminuisconto attività ATPasi Na/K e bloccano effetto stimolante del sistema nervoso simpatico sul rilascio di renina.

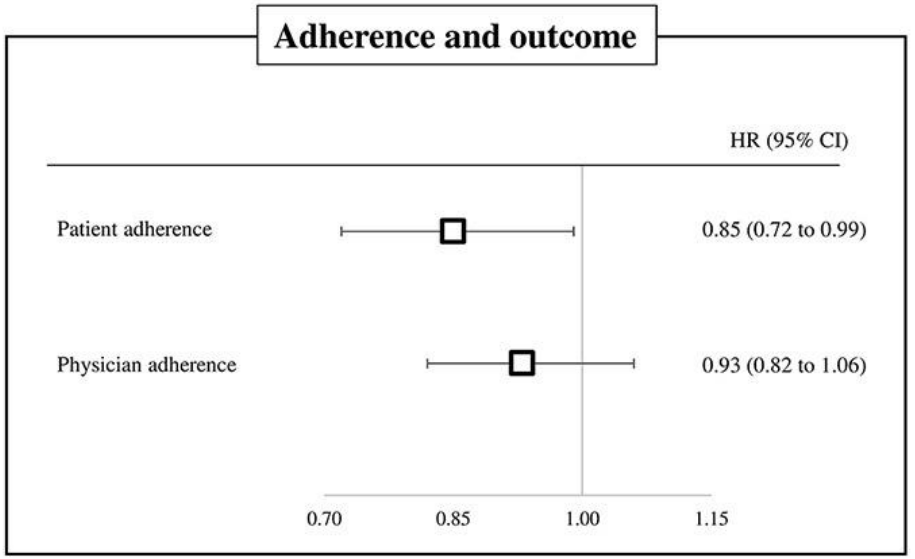
Scompenso cardiaco, diabete, insufficienza renale, RAASi possono alterare omeostasi del Potassio.

Physiology and pathophysiology of potassium homeostasis. Palmer et al *Adv Physiol Educ 2016;* 40: 480–490

Aderenza alla terapia

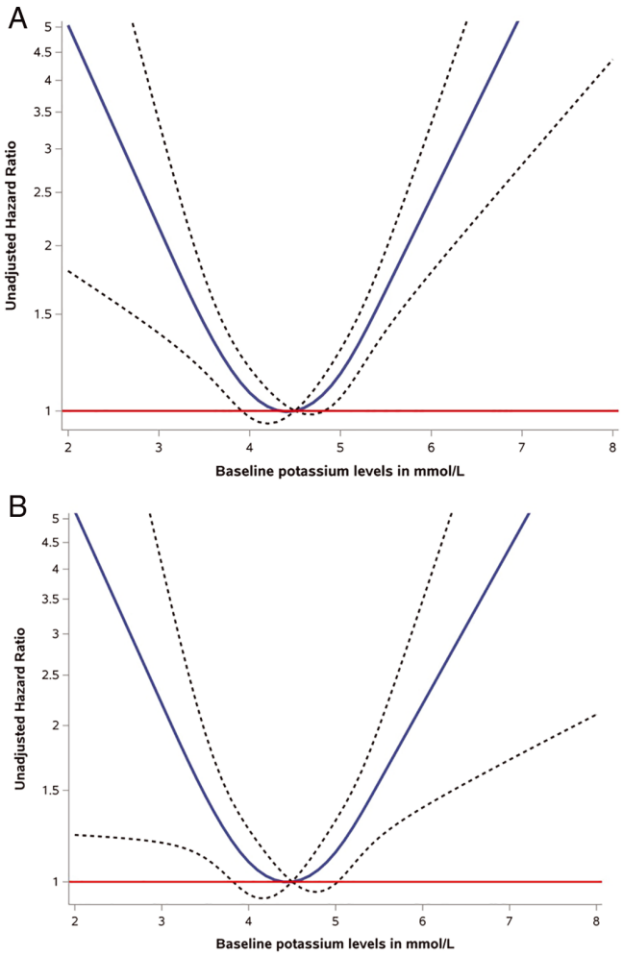


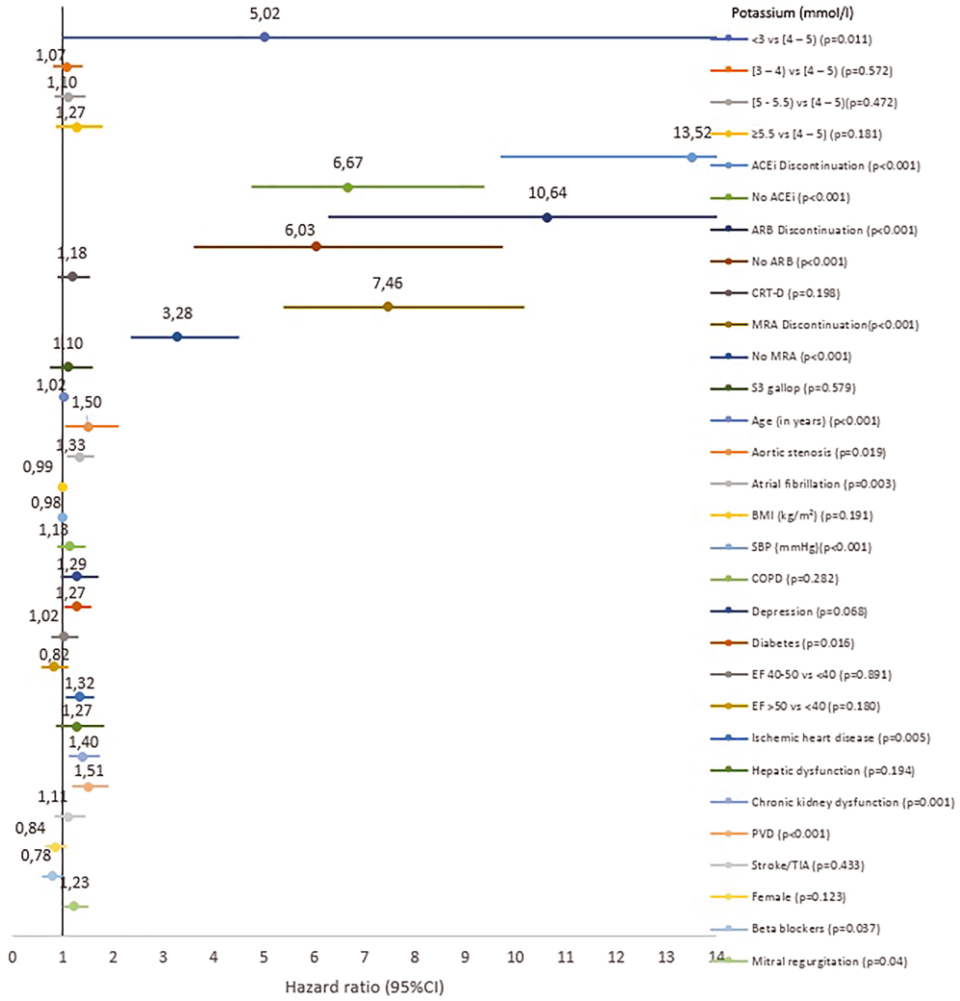




Patient adherence to drug treatment in a community based-sample of patients with chronic heart failure. Rea F et al. Int J Cardiol. 2022 15;349:144-149

Prognosi iperkaliemia in scompenso cardiaco





Unravelling the interplay between hyperkalaemia, renin–angiotensin– aldosterone inhibitor use and clinical outcomes. Data from 9222 chronic heart failure patients of the ESC-HFA-EORP Heart Failure Long-Term Registry. Rossignol P et al. European Journal of Heart Failure 2020; 22, 1378–1389

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: supplementary data

Supplementary Table 2 **Practical guidance on the use of angiotensin-converting enzyme inhibitors (or an angiotensin II receptor blocker) in patients with heart failure with reduced ejection fraction[a]**

Cautions/seek specialist advice:

1. Significant hyperkalaemia (K^+ >5.0 mmol/L).

- If K^+ rises to >5.5 mmol/L or creatinine increases by >100% or to >310 µmol/L (3.5 mg/dL)/eGFR <20 mL/min/1.73 m^2, the ACE-I (or ARB) should be stopped and specialist advice sought.

Supplementary Table 4 **Practical guidance on the use of mineralocorticoid receptor antagonists in patients with heart failure with reduced ejection fraction[a]**

Cautions/seek specialist advice:

1. Significant hyperkalaemia (K^+ >5.0 mmol/L)[b].

- If K^+ rises above 5.5 mmol/L or creatinine rises to 221 µmol/L (2.5 mg/dL)/eGFR <30 mL/min/1.73 m^2, halve a dose and monitor blood chemistry closely.
- If K^+ rises to >6.0 mmol/L or creatinine to >310 µmol/L (3.5 mg/dL) eGFR <20 mL/min/1.73 m^2, stop MRA immediately and seek specialist advice.

Follow up ambulatorio scompenso 12/2021

FARMACO	10/2021	12/2021
Metoprololo	200 mg	200 mg
Valsartan	160 mg	STOP
Furosemide	50 mg	50 mg
Spironolattone	25 mg	STOP
Atorvastatina	40 mg	40 mg
Cardioaspirin	100 mg	STOP
Rivaroxaban	15 mg	15 mg
Clopidogrel	75 mg	75 mg
Tamsulosina	0,4 mg	0,4 mg
Amlodipina		5 mg

Stop Valsartan
Stop Spironolattone
Avvia Amlodipina

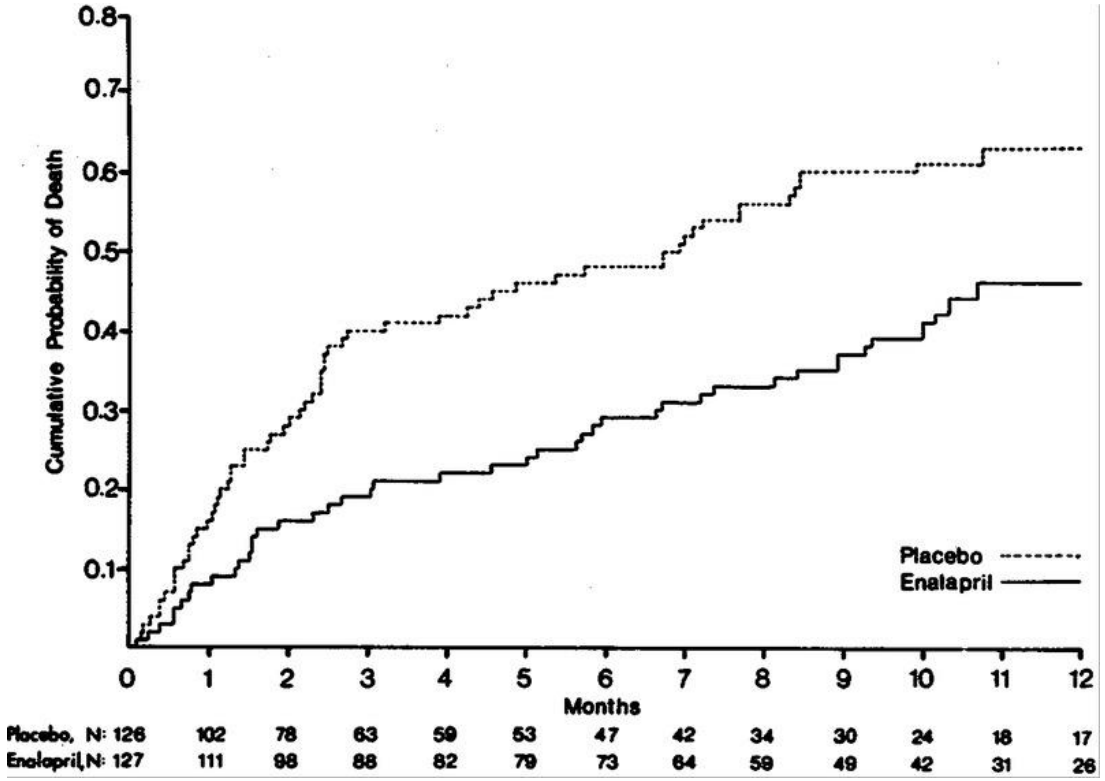
The New England
Journal of Medicine

Volume 316 JUNE 4, 1987 Number 23

EFFECTS OF ENALAPRIL ON MORTALITY IN SEVERE CONGESTIVE HEART FAILURE

Results of the Cooperative North Scandinavian Enalapril Survival Study (CONSENSUS)

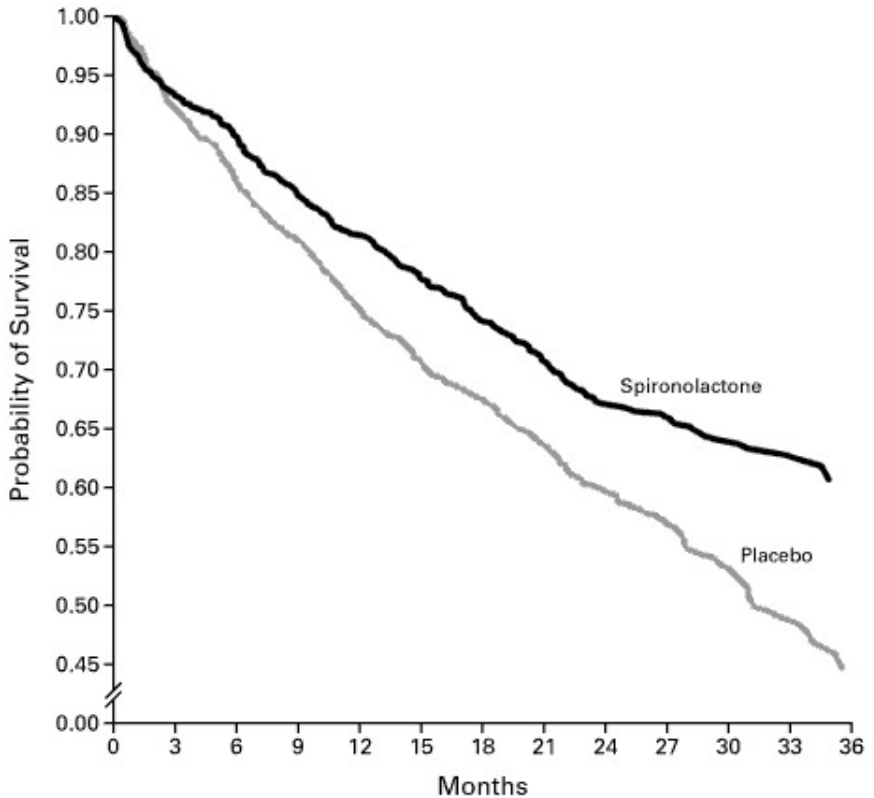
THE CONSENSUS TRIAL STUDY GROUP*



Major inclusion criteria	Mean follow-up (years)	Impact of treatment on primary endpoint
Congested HF, NYHA IV, cardiomegaly on chest X-ray	0.5	All-cause mortality reduced by 40% at 6 months (26% vs. 44%, *P* = 0.002) and by 31% at 12 months (52% vs. 36%, *P* = 0.001)

THE EFFECT OF SPIRONOLACTONE ON MORBIDITY AND MORTALITY IN PATIENTS WITH SEVERE HEART FAILURE

BERTRAM PITT, M.D., FAIEZ ZANNAD, M.D., WILLEM J. REMME, M.D., ROBERT CODY, M.D., ALAIN CASTAIGNE, M.D., ALFONSO PEREZ, M.D., JOLIE PALENSKY, M.S., AND JANET WITTES, PH.D., FOR THE RANDOMIZED ALDACTONE EVALUATION STUDY INVESTIGATORS*

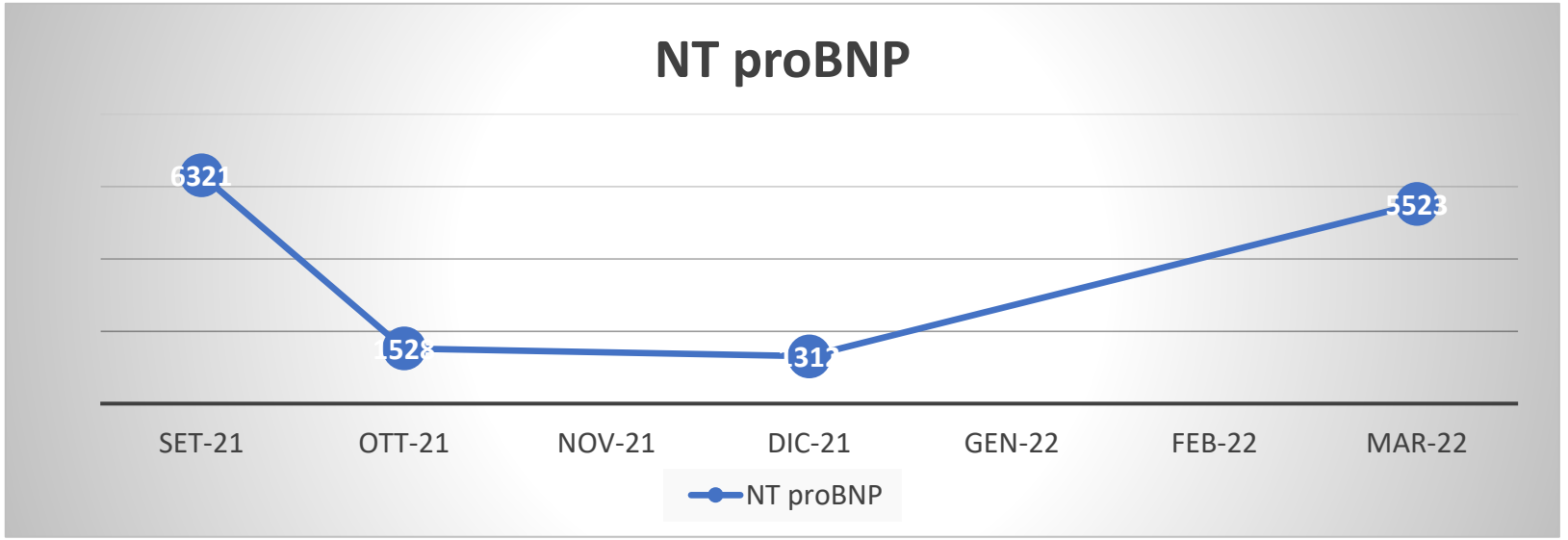


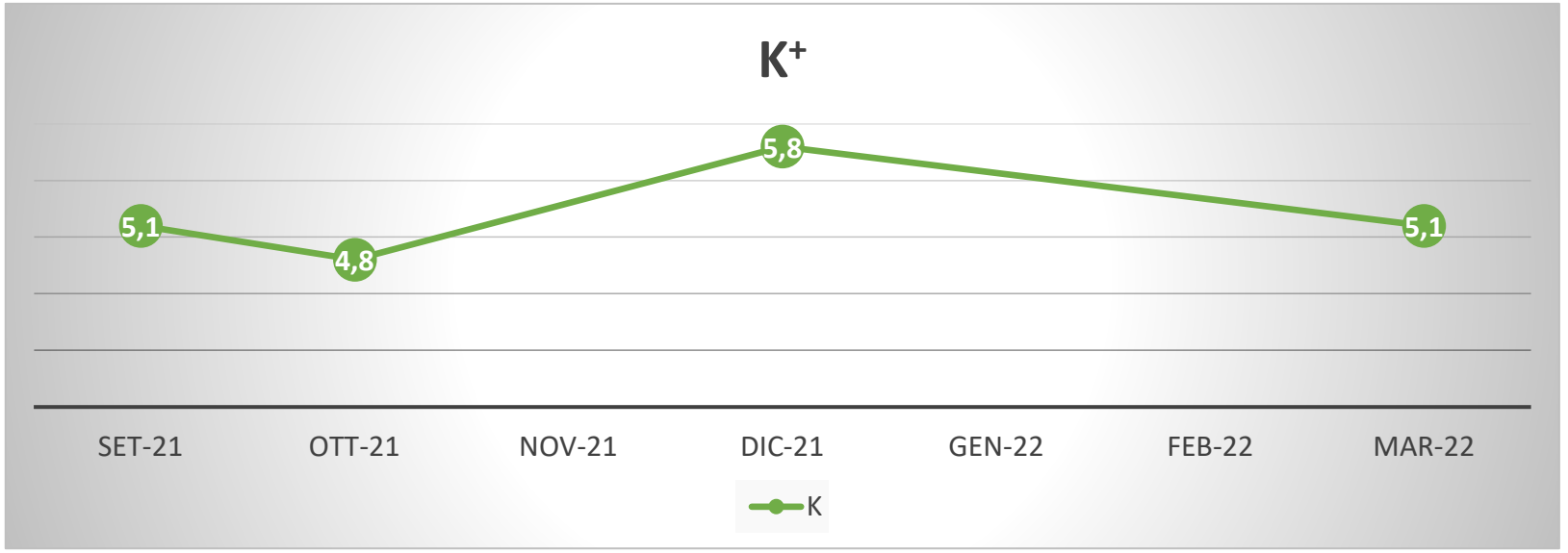
Drug	Major inclusion criteria	Mean follow-up (years)
Spironolactone (n = 822) vs. placebo (n = 841)	LVEF ≤35%, NYHA III–IV, and HF for >6 weeks	2.0

Impact of treatment on primary endpoint	Other results
All-cause mortality reduced by 30% (35% vs. 46%) (P <0.001)	Reduction in cardiac hospitalization rate by 35% (P<0.001)

N Engl J Med 1999; 341:709-717

Follow-up ambulatorio scompenso 3/2022





NYHA III. Aumento ponderale di 5 kg. Comparsa di succulenza perimalleolare, somiortopnea.

Ematici:

- **NTproBNP 5523 pg/mL**
- **Cr 1,4 mg/dL K^+ 5,1 mMol/L**

Supplementary Table 24 Management of chronic hyperkalaemia

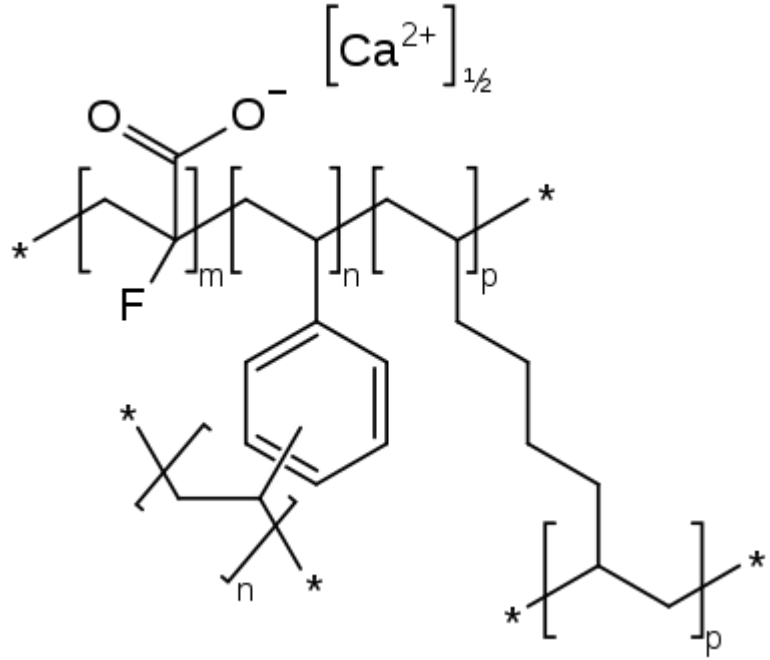
- In patients with chronic or recurrent hyperkalaemia on RAAS inhibitors therapy an approved K^+-lowering agent may be initiated as soon as K^+ levels are confirmed as >5.0 mEq/L. Closely monitor K^+ levels. Maintain treatment unless alternative treatable aetiology is identified.
- In patients with chronic or recurrent hyperkalaemia not on maximal tolerated guideline-recommended target dose of RAAS inhibitors, an approved K^+-lowering agent may be initiated as soon as confirmed K^+ levels are >5.0 mEq/L. Closely monitor K^+ levels. Maintain treatment unless alternative treatable aetiology is identified. RAAS inhibitors should be optimized when K^+ levels are <5.0 mEq/L.
- In patients with K^+ levels of 4.5–5.0 mEq/L not on maximal tolerated, guideline-recommended target dose of RAAS inhibitor therapy, RAAS inhibitor therapy can be initiated/uptitrated with a close monitoring of K^+ levels. If K^+ levels rise above 5.0 mEq/L, initiate an approved K^+-lowering agent.
- In patients with K^+ levels of >5.0–≤6.5 mEq/L not on maximal tolerated, guideline-recommended target dose of RAAS inhibitor therapy, an approved K^+-lowering agent should be initiated. If levels <5.0 mEq/L are detected, uptitrate RAAS inhibitor; K^+ level should be closely monitored and K^+-lowering treatment should be maintained unless another aetiology for hyperkalaemia is identified.
- In patients with K^+ levels of >5.0–≤6.5 mEq/L on maximal tolerated, guideline-recommended target dose of RAAS inhibitor therapy, treatment with a K^+-lowering agent may be initiated. K^+ level should be closely monitored and K^+-lowering treatment should be maintained unless alternative treatable aetiology for hyperkalaemia is identified.
- In patients with K^+ levels of >6.5 mEq/L on either maximal or sub-maximal tolerated, guideline-recommended target dose of RAAS inhibitor therapy, it is recommended to discontinue/reduce RAAS inhibitor. Treatment with a K^+-lowering agent may be initiated as soon as K^+ levels >5.0 mEq/L. K^+ level should be closely monitored.

Patiromer Calcio Sorbitolo

- Struttura polimerica in grado di chelare il potassio in cambio di calcio nel lume gastrointestinale ed incrementarne l'escrezione con le feci in modo dose-dipendente.

- Effetti collaterali: Stipsi (6%), Diarrea (3%), Ipomagnesemia (5%), Ipopotassiemia (4,7%).

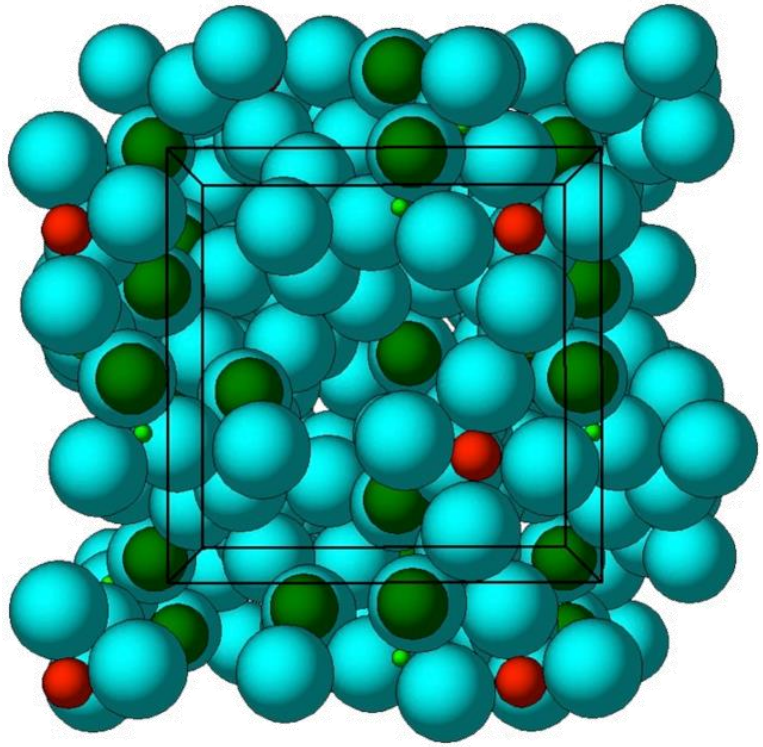
- Per meccanismo d'azione porta ad aumento Calcemia, che va monitorata.



Sodio Zirconio Ciclosilicato (ZS-9)

- Composto insolubile che permette di chelare selettivamente il potassio in cambio di Sodio ed idrogeno nel lume intestinale.

- Effetto collaterale: edema, ipopotassemia



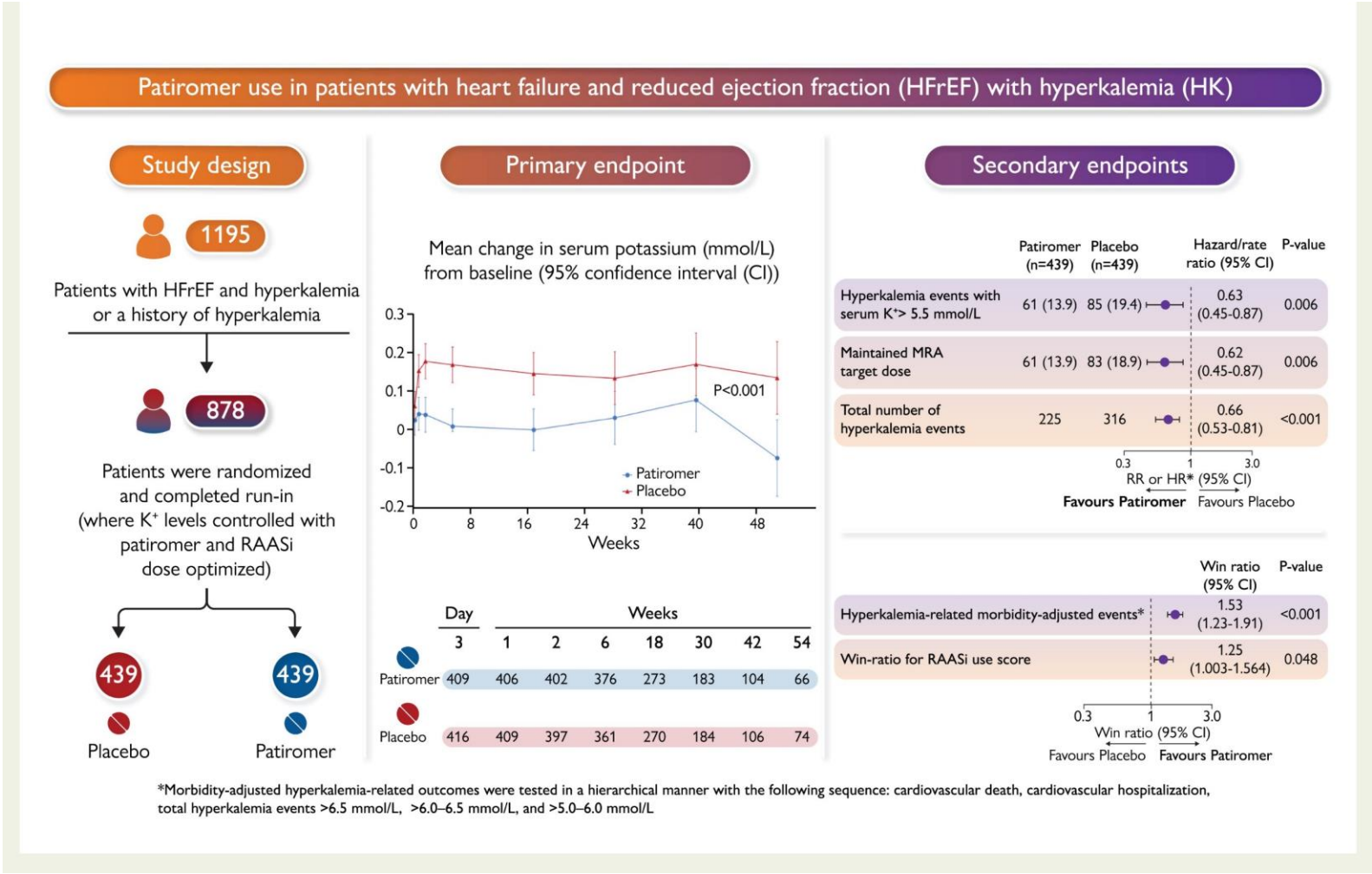
Proprietà farmacodinamiche e farmacocinetiche di Patiromer e Ciclosilicato di Sodio e Zirconio (SZC)

Tabella 1. Proprietà farmacodinamiche e farmacocinetiche di patiromer e ciclosilicato di sodio e zirconio (SZC)[10,11].

	SZC	Patiromer
Meccanismo d'azione	Aumenta l'escrezione fecale di K^+ Agisce legando il K^+ già nel primo tratto gastrointestinale	Aumenta l'escrezione fecale di K^+ Agisce legando il K^+ nel tratto gastrointestinale, principalmente nel colon
Assorbimento	Nessuno	Nessuno
Eliminazione	Fecale	Fecale
Forma	Polvere per sospensione orale solubile da miscelare con acqua: 5 g/bustina 10 g/bustina	Polvere per sospensione orale: 8.4 g/bustina 16.8 g/ bustina 25.2 g/bustina
Dose	Iniziale: 10 g tid per os per 48 h Mantenimento: 5 o 10 g/die per os La dose giornaliera può essere aggiustata con incrementi o decrementi di 5 g, con una dose minima di 5 g/die e una dose massima di 10 g/die La dose di mantenimento raccomandata è di 5-15 g/die, massimo 15 g/die solo per i pazienti dializzati	Iniziale: 8.4 g/die per os Mantenimento: aumentare o ridurre la dose se necessario ma non superare 25.2 g/die La dose giornaliera può essere aggiustata ad intervalli di 1 settimana o di durata maggiore, con incrementi di 8.4 g Dosaggi superiori a 50.4 g/die non sono stati testati; dosaggi eccessivi possono provocare ipopotassiemia, nel qual caso devono essere ripristinati normali livelli sierici di K^+
Effetti avversi	Edema (5.7%)* Ipopotassiemia (4.1%)	Stitichezza (7.2%) Ipomagnesiemia (5.3%) Diarrea (4.8%) Ipopotassiemia (4.7%) Nausea (2.3%) Dolori addominali (2%) Flatulenza (2%)

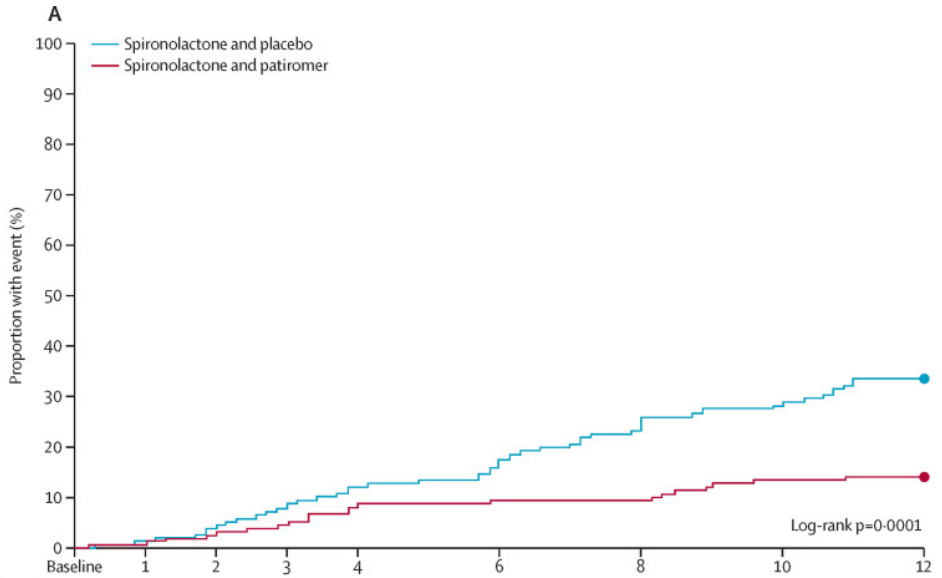
Strategie farmacologiche per il trattamento dell'iperpotassiemia. Rosano MC, G Ital Cardiol 2021;22(12 Suppl 1):e8-e12

Patiromer for the management of hyperkalemia in heart failure with reduced ejection fraction: the DIAMOND trial

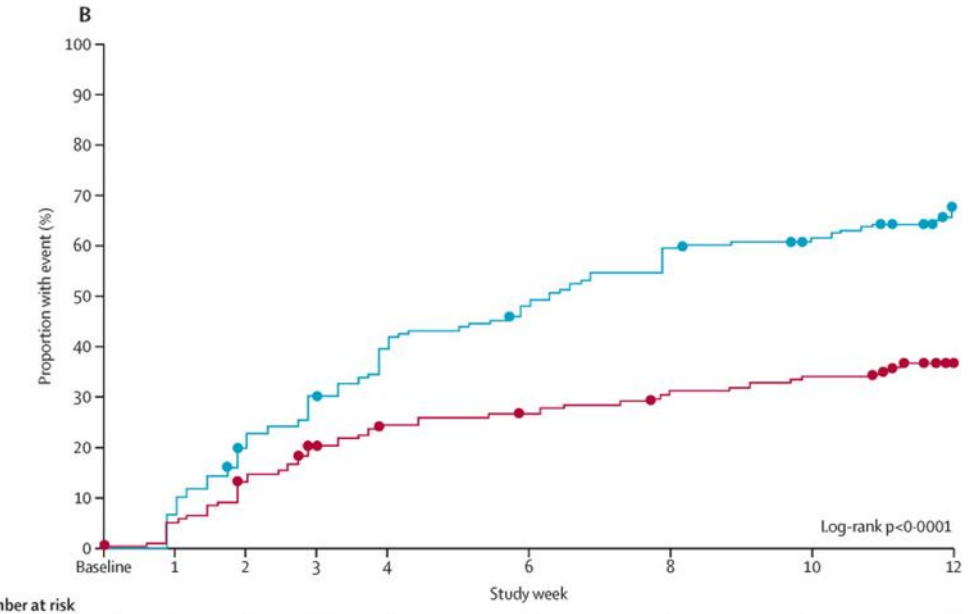


Butler J et al. European Heart Journal 2022 00, 1–12

Patiromer versus placebo to enable spironolactone use in patients with resistant hypertension and chronic kidney disease (AMBER): a phase 2, randomised, double-blind, placebo-controlled trial



	Baseline	1	2	3	4	6	8	10	12
Discontinued because of hyperkalaemia									
Spironolactone and placebo	0	1	4	8	12	14	24	29	34
Spironolactone and patiromer	0	0	2	3	4	5	5	9	10
Discontinued because of other reasons									
Spironolactone and placebo	0	1	1	3	5	8	11	13	16
Spironolactone and patiromer	0	1	2	6	8	9	9	10	11
Number at risk									
Spironolactone and placebo	148	146	142	136	130	124	113	106	98
Spironolactone and patiromer	147	146	143	140	135	133	133	127	126



	Baseline	1	2	3	4	6	8	10	12
Number at risk									
Spironolactone and placebo	148	136	115	100	86	73	57	51	18
Spironolactone and patiromer	147	138	124	112	104	100	94	89	31

Lancet 2019; 394: 1540–50

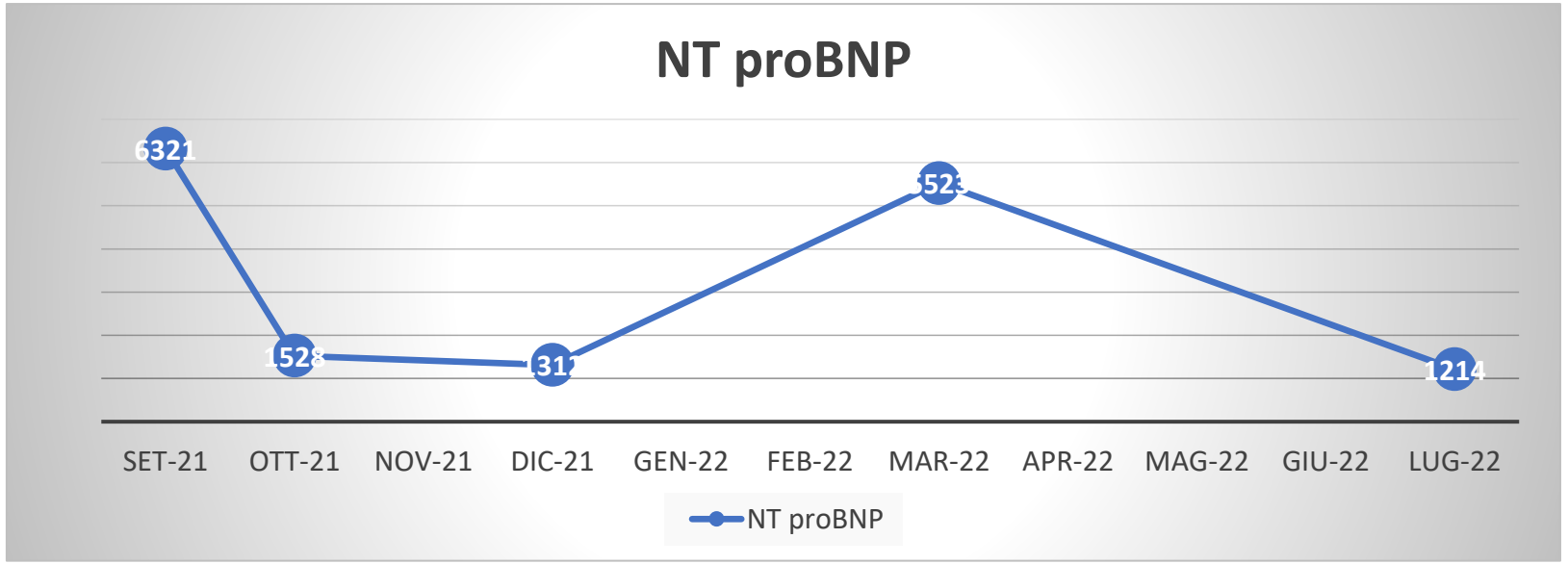
Follow-up ambulatorio scompenso 3/2022

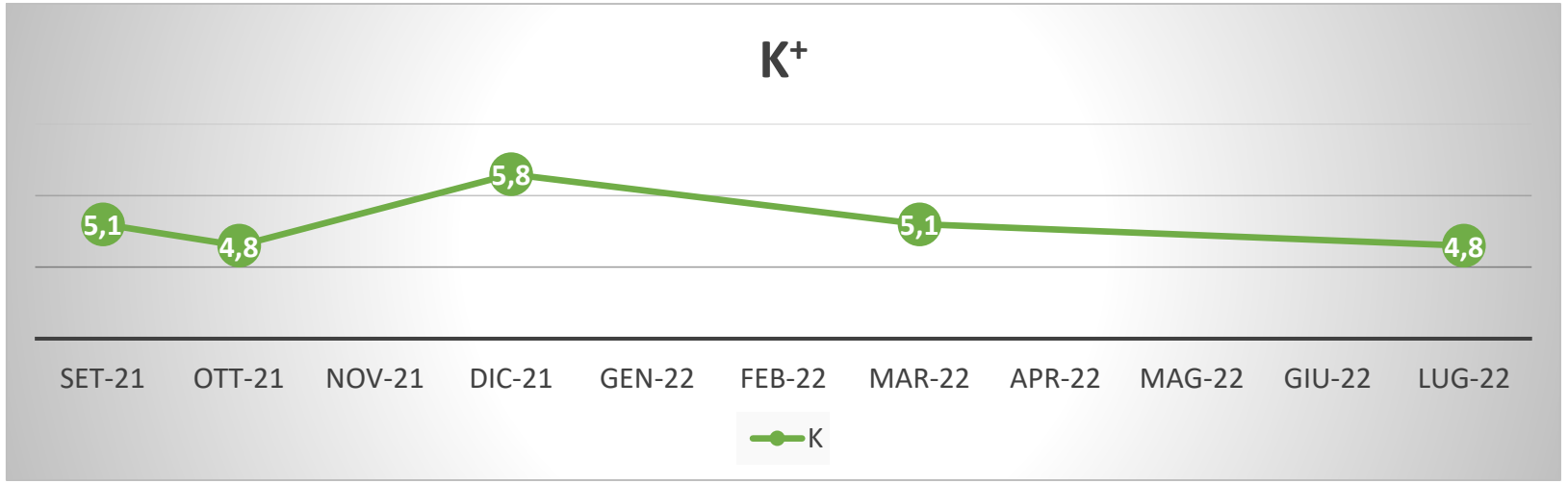
FARMACO	10/2021	12/2021	3/2022
Metoprololo	200 mg	200 mg	200 mg
Valsartan	160 mg	STOP	
Furosemide	50 mg	25 mg	50 mg
Spironolattone	25 mg	STOP	25 mg
Atorvastatina	40 mg	40 mg	40 mg
Cardioaspirin	100 mg	STOP	
Rivaroxaban	15 mg	15 mg	15 mg
Clopidogrel	75 mg	75 mg	75 mg
Lanoxin	0,125 mcg	STOP	STOP
Tamsulosina	0,4 mg	0,4 mg	0,4 mg
Amlodipina		5 mg	STOP
Sacubitril/Valsartan			49/51 x 2
Dapaglifozin			10 mg
Patiromer			8,4 g

Avvia Patiromer
Avvia Spironolattone
Avvia Sacubitril/Valsartan
Avvia Dapaglifozin
Aumenta dosaggio Lasix
Sospende Amlodipina

Visita 7/2022

- Buon compenso emodinamico. NYHA I. Peso – 6 kg. RS



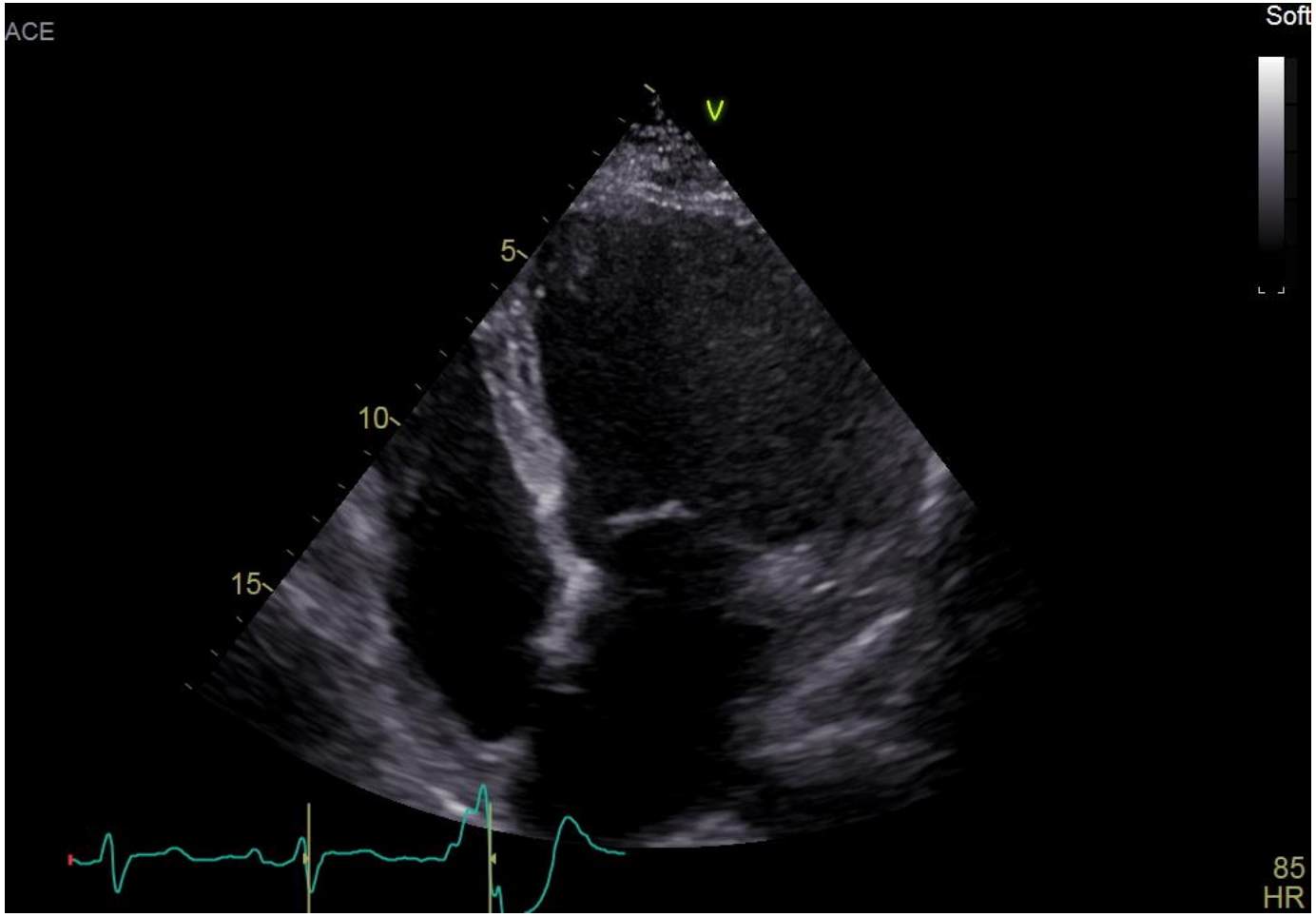


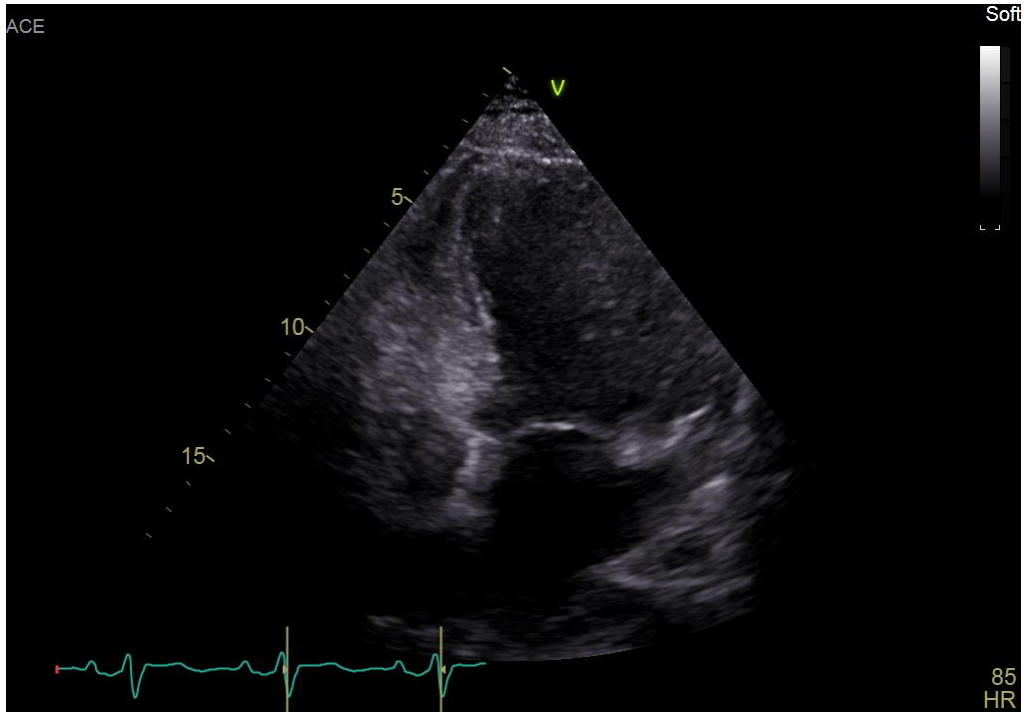
NTproBNP 1214 pg/mL

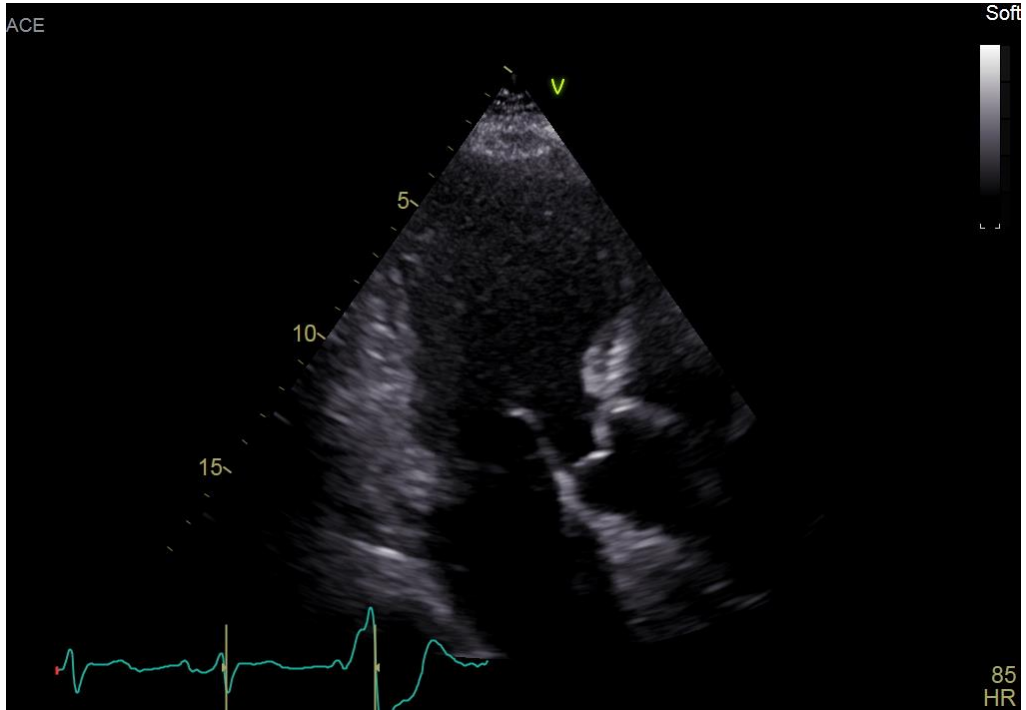
K^+ 4,8 mMol/L

Cr 1,4 mg/dL.

Visita 7/2022







In conclusione:

- L’Iperpotassiemia è un frequente riscontro nel paziente con scompenso cardiaco
- L’iperpotassiemia peggiora la prognosi
- Patiromer e Ciclosilicato di Sodio e Zirconio possono normalizzare la potassiemia aumentando l’escrezione fecale di Potassio e consentendo il proseguimento della terapia con RAASi.

Grazie per l’attenzione