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Hyperkalemia Sequelae in Patients With Chronic Kidney Disease, Heart Failure, Neither or Both: Findings From the TRACK Study

Judith Hsia,[1] Hungta Chen,[2] Nitin Shivappa,[2] Wolfgang Winkelmayer,[3] Navdeep Tangri,[4] Anna-Karin Sundin,[5] Markus Schneider,[6] Jordi Bover Sanjuan,[7] Linda Fried,[8] Pietro Manuel Ferraro,[9] Javed Butler,[10] Meredith Bishop,[11] Ameet Bakhai,[12] Marc Bonaca[1]

[1]CPC Clinical Research and University of Colorado, Aurora, CO, USA; [2]AstraZeneca Pharmaceutical LP, Wilmington, DE, USA; [3]Baylor College of Medicine, Houston, TX, USA; [4]University of Manitoba, Winnipeg, Canada; [5]AstraZeneca, Gothenburg, Sweden; [6]University of Erlangen-Nürnberg, Erlangen, Germany; [7]Hospital Germans Trias i Pujol, Badalona, Spain; [8]Pittsburgh Healthcare System, Pittsburgh, PA, USA; [9]Università degli Studi di Verona, Verona, Italy; [10]Baylor Scott & White Research Institute, Dallas, TX and University of Mississippi, Jackson, MS, USA; [11]AstraZeneca Pharmaceutical LP, Gaithersburg, MD; [12]Royal Free NHS Hospital, London, UK

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Introduction

- TRACK is a prospective, real-world evidence study of HK management strategies, therapeutic objectives, and outcomes during 12 month follow-up of patients with HK
- We report use of CKD and HF therapies, K^+ binder use, and HK complications in patients with HF, CKD, both, or neither
- Management guidelines recommend RAASi use for CKD and HF,[1-3] supported by a large body of evidence
- ESC HF and KDIGO management guidelines[2,3] also recommend K^+ binders to achieve and maintain target RAASi dose

CKD, chronic kidney disease; ESC, European Society of Cardiology; HF, heart failure; HK, hyperkalemia; K^+, potassium; KDIGO, Kidney Disease: Improving Global Outcomes; RAASi, renin-angiotensin-aldosterone system inhibitor; TRACK, Tracking Treatment Pathways in Adult Patients with Hyperkalemia.

1. Burton JO et al. Eur J Heart Fail. 2022;24:1467–77; 2. KDIGO CKD Work Group. Kidney Int. 2024;105(4S):S117–314; 3. McDonagh TA et al. Eur Heart J. 2021;42(36):3599–726.

Methods

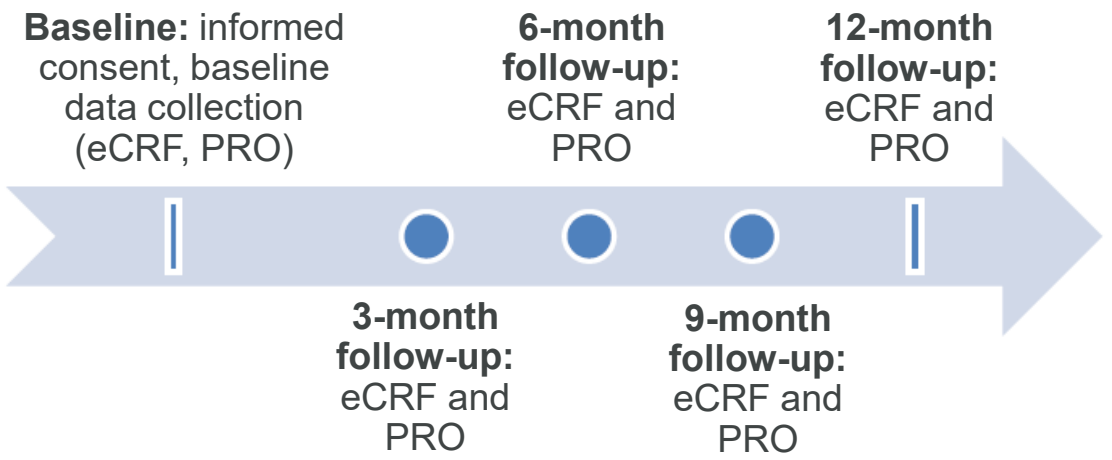
TRACK study design

Observational, prospective, longitudinal, cohort study, conducted across Germany, Italy, Spain, the UK, and the USA

Participants were enrolled within 21 days of their index episode of HK

Assessments

Data gathered from medical records on HK management objectives, treatment regimens, K^+ normalization rates, continuation of RAASi and MRA therapy, and clinical outcomes



We conducted descriptive statistical analyses to identify trends between participants with CKD, HF, both, or neither

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CKD, chronic kidney disease; eCRF, electronic case report form; HF, heart failure; HK, hyperkalemia; K^+, potassium; MRA, mineralocorticoid receptor antagonist; PRO, patient-reported outcome; RAASi, renin-angiotensin-aldosterone system inhibitor; TRACK, Tracking Treatment Pathways in Adult Patients with Hyperkalemia.

Hsia J et al. Clin Kidney J. 2024;17(10):sfae295.

Baseline characteristics by CKD and HF status

	CKD	HF	CKD and HF	Neither
n (%)	741 (56)	83 (6)	385 (29)	121 (9)
Age, yrs, mean (SD)	65 (14)	71 (11)	72 (12)	67 (14)
Female, n (%)	231 (31)	24 (29)	109 (28)	52 (43)
Race, n (%), USA only				
White	104 (68)	6 (100)	33 (57)	7 (64)
Black	43 (28)	0	22 (38)	1 (9)
Asian	1 (<1)	0	1 (2)	0
American Indian/Alaskan native	0	0	0	0
Native Hawaiian/other Pacific islander	1 (<1)	0	0	0
Other	1 (<1)	0	1 (2)	1 (9)
Not reported	4 (3)	0	1 (2)	2 (18)
Ethnicity, n (%), USA only				
Latino/Hispanic	9 (6)	0	5 (9)	4 (36)
Body mass index, kg/m^2, mean (SD)	28 (6)	27 (6)	29 (6)	27 (6)
First episode of HK, %	26	50	38	65
Time from previous HK episode to enrollment, months, mean (SD)	7.5 (23.3)	8.2 (18.5)	6.3 (17.4)	5.9 (21.1)
Serum K^+, n with non-missing values	648	75	329	96
Mild HK (≤5.5 mmol/L), %	44	64	47	66
Moderate HK (>5.5 to ≤6.5 mmol/L), %	40	29	39	31
Severe HK (>6.5 mmol/L), %	16	7	14	3

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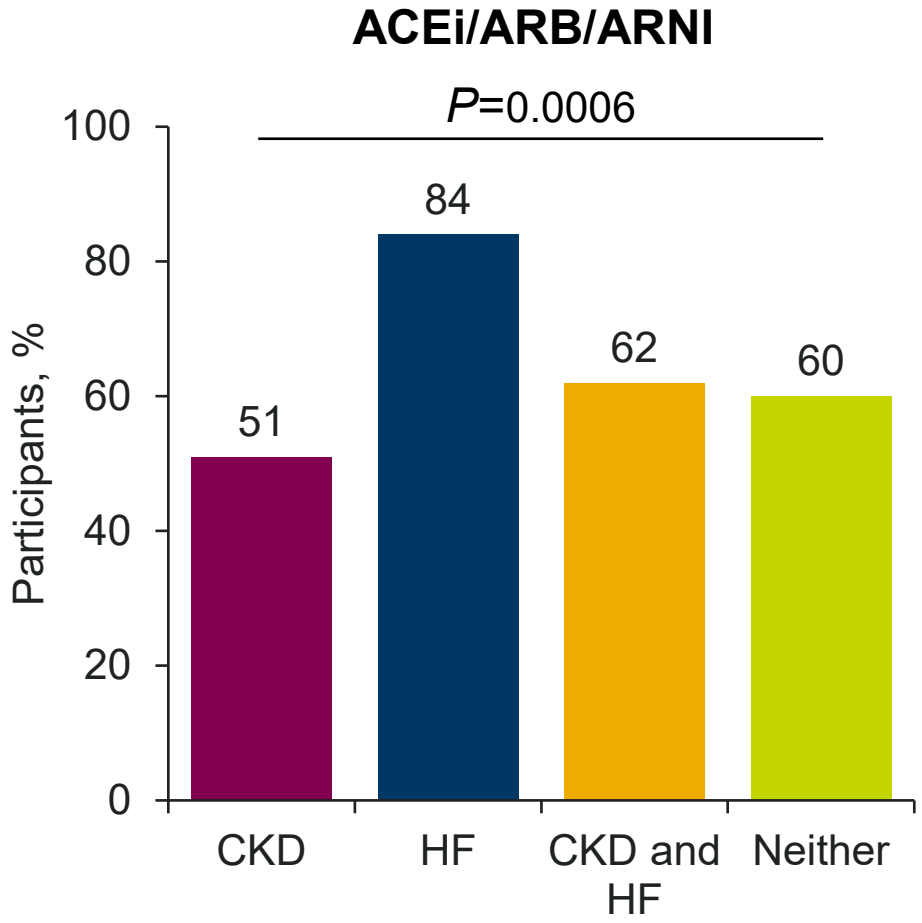
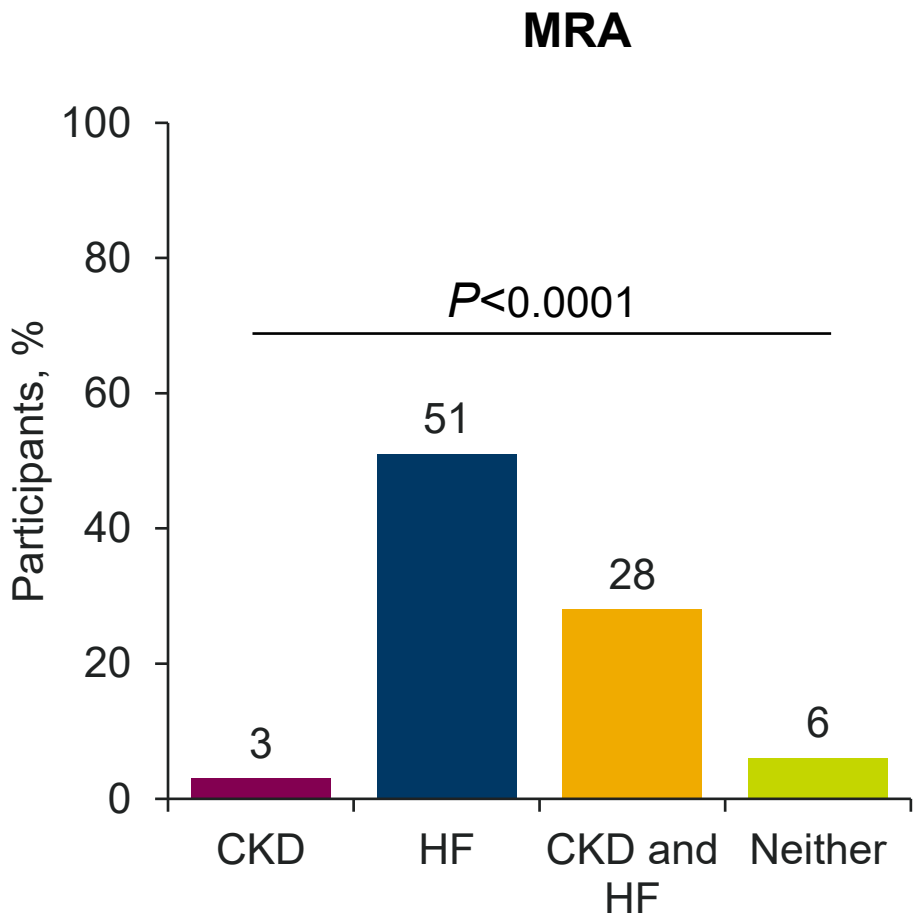
CKD, chronic kidney disease; HF, heart failure; HK, hyperkalemia; K^+, potassium; n, number; SD, standard deviation.

RAASi use at baseline was more frequent among participants with HF; MRA use was suboptimal





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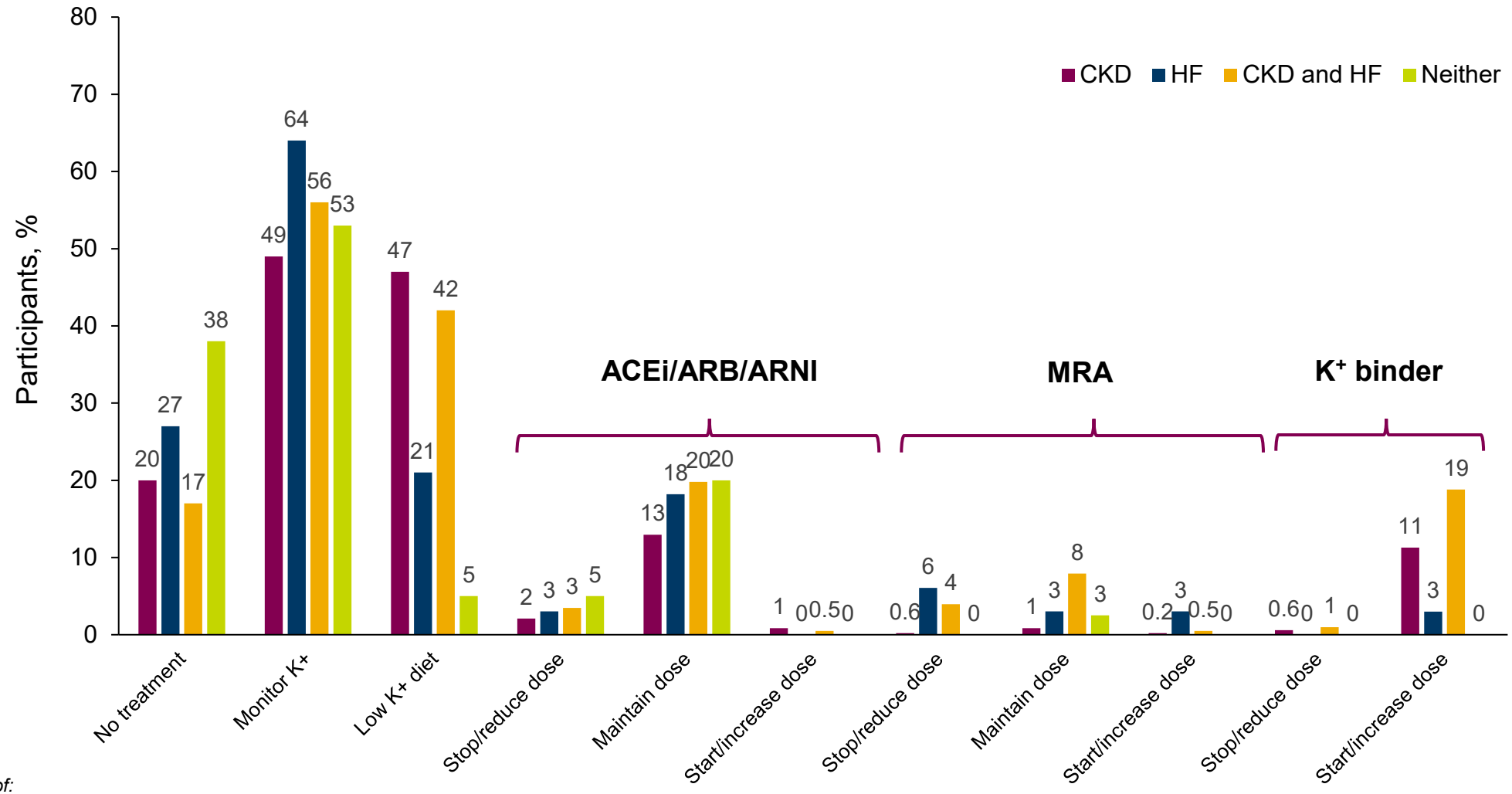
P-value denotes comparison across the four groups.
ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor/neprilysin inhibitor; CKD, chronic kidney disease; HF, heart failure; MRA, mineralocorticoid receptor antagonist; RAASi, renin-angiotensin-aldosterone system inhibitor.

For management of index HK, RAASi dose reduction was infrequent and K⁺ binder initiation/up-titration was limited



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ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor/neprilysin inhibitor; CKD, chronic kidney disease; HF, heart failure; HK, hyperkalemia; K⁺, potassium; MRA, mineralocorticoid receptor antagonist; RAASi, renin-angiotensin-aldosterone system inhibitor.

K^+ binder management during 12 months' follow-up

	CKD	HF	CKD and HF	Neither
n	741	83	385	121
K^+ binder at baseline, n (%)	220 (30)	13 (16)	119 (31)	3 (3)
Change through 12 months, n				
Stop/reduce	59	3	22	3
Start/increase	102	5	43	1

- Baseline K^+ binder use:
  - Sodium zirconium cyclosilicate: n=174
  - Calcium polystyrene sulfonate: n=72
  - Patiromer: n=39
  - Sodium polystyrene sulfonate: n=33
  - Not reported: n=39

During follow-up, participants' K^+ binder dose could be adjusted more than once

CKD, chronic kidney disease; HF, heart failure; K^+, potassium; n, number.

Metabolic acidosis and death were the most common sequelae during the 12 months' follow-up

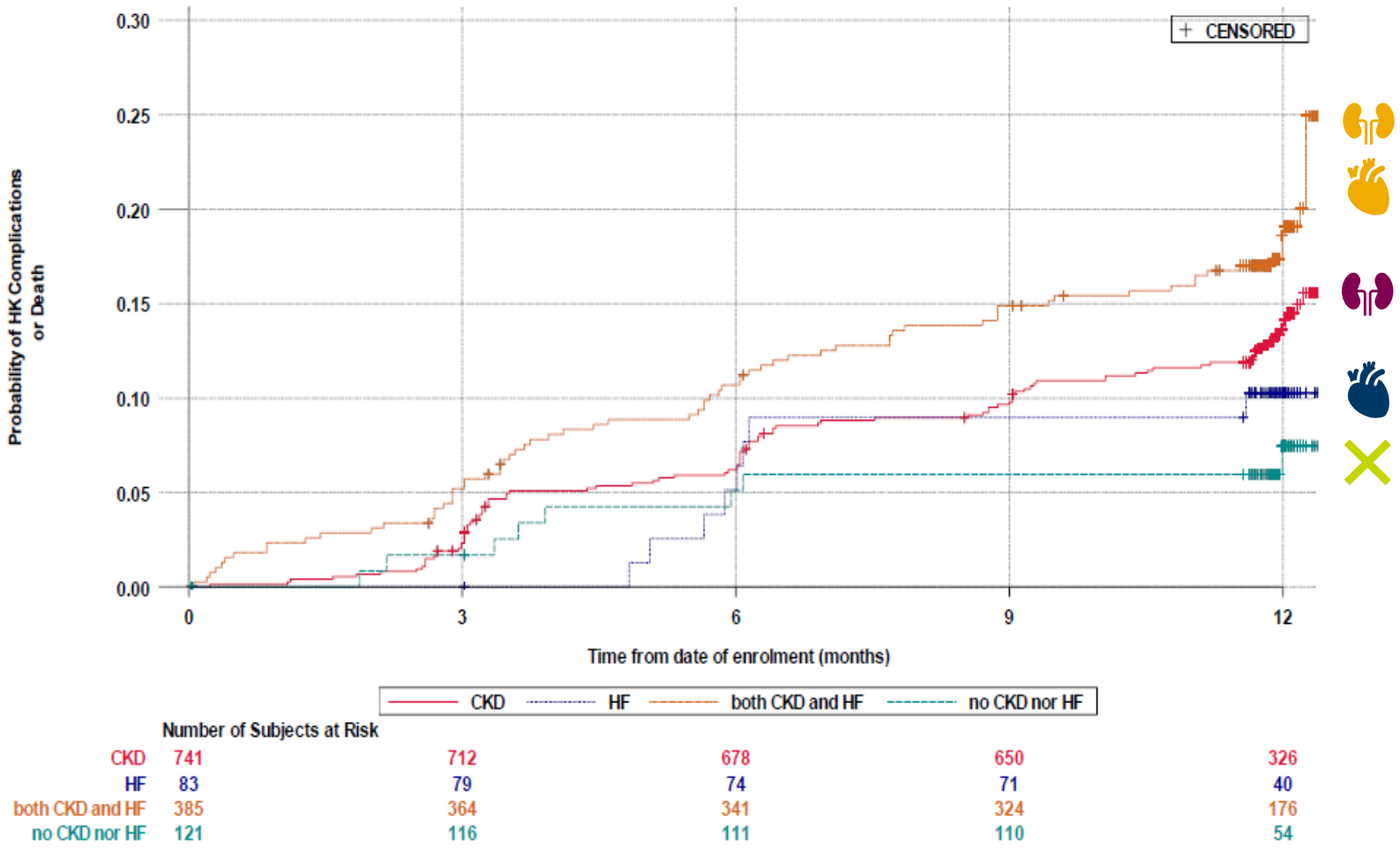
	CKD	HF	CKD and HF	Neither
Enrolled, n	741	83	385	121
Participants with 12 months' follow-up data, n	684	76	330	116
Arrhythmia, n (%)		0	2 (<1)	0
Palpitations, n (%)	(<1)	(<1)	0	(<1)
Muscle weakness, n (%)	5 (<1)	0	5 (2)	0
Metabolic acidosis, n (%)	19 (3)	0	5 (2)	0
Death, n (%)	34 (5)	5 (7)	52 (16)	4 (3)

Causes of death included renal, cardiac, and multisystem failure, infection, and cancer

CKD, chronic kidney disease; HF, heart failure.

Occurrence of any HK complications or death

Time to HK complications or death by CKD/HF status at baseline



Number of Subjects at Risk

CKD	741	712	678	650	326
HF	83	79	74	71	40
both CKD and HF	385	364	341	324	176
no CKD nor HF	121	116	111	110	54

Event rate at 12 months (95% CI)

18.6 (14.6, 22.6)

13.6 (11.1, 16.2)

10.3 (3.5, 17.0)

7.5 (2.3, 12.6)

Both vs CKD alone: ***P*=0.0871**

Both vs HF alone: ***P*=0.0842**

Both vs neither: ***P*=0.0123**

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CI, confidence interval; CKD, chronic kidney disease; HF, heart failure; HK, hyperkalemia.

Conclusions

- In a cohort of patients with hyperkalemia, ~60% were taking ACE/ARB/ARNI. Adoption of MRA was much lower among those with CKD
- Despite guidelines recommending K^+ binder therapy,[1–4] K^+ binder initiation/dose increase was infrequent over the 12 months' follow-up
- Risk of HK complications or death was highest for patients with both CKD and HF over the 12 months' follow-up
- More consistent guideline-directed HK management including K^+ binder use is needed to optimize practice of potentially life-saving CKD and HF therapies and to prevent HK sequelae

CKD, chronic kidney disease; HF, heart failure; HK, hyperkalemia; K^+, potassium; MRA, mineralocorticoid receptor antagonist; RAASi, renin-angiotensin-aldosterone system inhibitor.

1. KDIGO CKD Work Group. Kidney Int. 2024;105(4S):S117–314; 2. McDonagh TA et al. Eur Heart J. 2021;42(36):3599–726; 3. Rosano GMC et al. Eur Heart J Cardiovasc Pharmacother. 2018;4(3):180–8; 4. UK Kidney Association. UK Kidney Association Clinical Practice Guidelines Treatment of Acute Hyperkalaemia in Adults. Available at https://www.ukkidney.org/sites/default/files/FINAL%20VERSION%20-%20UKKA%20CLINICAL%20PRACTICE%20GUIDELINE%20-%20MANAGEMENT%20OF%20HYPERKALAEMIA%20IN%20ADULTS%20-%20191223_0.pdf.