Helmut Brath
Diabetes- und Fettstoffwechselambulanz
Gesundheitszentrum Favoriten, Wien

Multimorbidität
Fokus Diabetes & Niere

Linz, 15. 3. 2025

Brath: DM

Potentielle Interessenskonflikte

Vorträge, Symposien, Seminare: alle maßgebl. Diabetes- und Lipidfirmen, Ärztekammern Wien, NÖ, Bgld., Stmk, Ktn., ÖÖ

Advisory Boards: alle maßgeblichen Diabetes- und Lipidfirmen

Phase-III-Studien: GSK, Johnson&Johnson, Takeda, Sanofi, Novartis, MSD, Novo Nordisk, Eli Lilly, Grünenthal, Lexicon, AstraZeneca

Gutachter: Ethikkommission Wien, versch. Fachzeitschriften

Arbeitgeber: ÖGK

Vorstand: Initiative Ärzte geg. Raucherschäden, Österr. Cholesterinallianz, Österr. Stoffwechselakademie, Innere Medizin Online Akademie

Leitlininienkommission: Österr. Diabetes Gesellschaft

Für dieses Symposium: keine

Brath: DM

Agenda

1. Nephropathie bei Diabetes: ein Problem?
2. (Frühe) Diagnose der Nephropathie
3. Diabetes & renale Insuffizienz: die klassische Co – (Multi)morbidität
4. Allg. Nephroprotektion bei Diabetes
5. Medikamentöse nephroprotekt. (& mehr) Therapie bei Diab.
6. SGLT-2 Inhibitoren
7. GLP-1 Rezeptoragonisten
8. Brauchen wir noch mehr Nierenschutz?
9. Finerenon
10. CKD - Risikorechner
11. Synopsis & Vision

Brath: DM

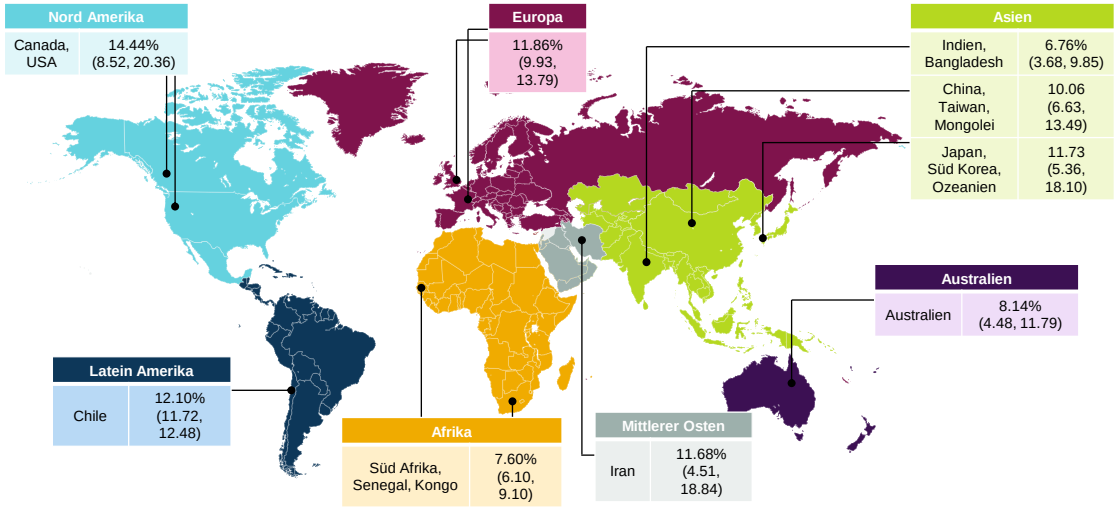
1.
Nephropathie bei Diabetes: ein Problem?

Brath: DM

CKD betrifft ~10% der Weltbevölkerung

Über **843 Millionen Patienten sind betroffen**[1]

Meta-Analyse für geschätzte Prävalenz von CKD (Stadion 3–5)[2]



CKD = chronische Niereninsuffizienz

1. Jager KJ et al. *Nephrol Dial Transplant.* 2019;34:1803–1805; 2. Hill NR et al. *PLoS One.* 2016;11:e0158765.

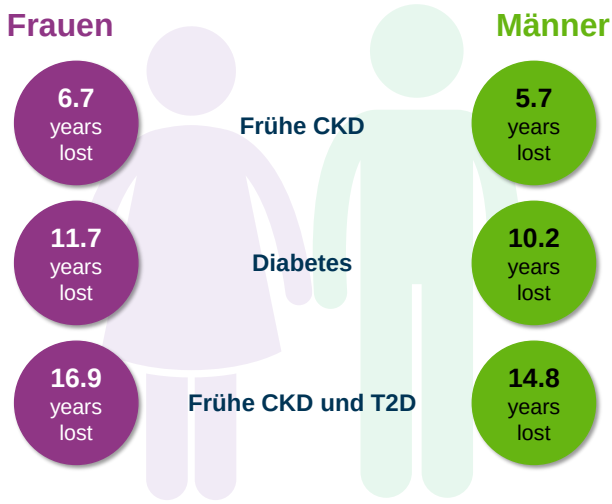
Brath: DM

Rank	Country or dependent territory	Region	Population	% of world	Date	Source (official or from the United Nations)	Notes
–	N/A	World	7,908,150,000	N/A	9 Nov 2021	UN projection[2]	N/A
1	China	Asia	1,411,778,724	17.9%	1 Nov 2020	2020 census result[3]	The census figure refers to mainland China, excluding its special administrative regions of Hong Kong and Macau, the former of which returned to Chinese sovereignty on 1 July 1997 and the latter on 20 December 1999.
2	India	Asia	1,384,128,782	17.5%	9 Nov 2021	National population clock[4]	The figure includes the population of India-administered Kashmir but not of China- or Pakistan-administered Kashmir.
3	United States	Americas	332,678,074	4.21%	9 Nov 2021	National population clock[5]	Includes the 50 states and the District of Columbia, but excludes the U.S. territories.
4	Indonesia	Asia	271,350,000	3.43%	[illegible] 2020	National annual [illegible][6]	
5	Pakistan	Asia	225,200,000	2.85%	1 Jul 2021	UN projection[2]	[illegible] four
6	Brazil	Americas	213,922,731	2.71%	9 Nov 2021	National population clock[7]	
7	Nigeria	Africa	211,401,000	2.67%	1 Jul 2021	UN projection[2]	
8	Bangladesh	Asia	171,668,756	2.17%	9 Nov 2021	National population clock[8]	
9	Russia	Europe	146,171,015	1.85%	1 Jan 2021	National annual estimate[9]	Including consider [illegible] Ukrainian government and most of the world's other states
10	Mexico	Americas	126,014,024	1.59%	2 Mar 2020	2020 census result[10]	
11	Japan	Asia	125,120,000	1.58%	1 Oct 2021	Monthly national estimate[11]	
12	Ethiopia	Africa	117,876,000	1.49%	1 Jul 2021	UN projection[2]	
13	Philippines	Asia	111,068,407	1.40%	9 Nov 2021	Official 2020 census result[12]	
14	Egypt	Africa	102,542,433	1.30%	9 Nov 2021	National population clock[13]	
15	Vietnam	Asia	97,580,000	1.23%	1 Jul 2020	National annual estimate[14]	
16	DR Congo	Africa	92,378,000	1.17%	1 Jul 2021	UN projection[2]	
17	Iran	Asia	84,929,789	1.07%	9 Nov 2021	National population clock[15]	
18	Turkey	Asia	83,614,362	1.06%	31 Dec 2020	National annual estimate[16]	
19	Germany	Europe	83,129,285	1.05%	30 Jun 2021	National quarterly estimate[17]	

Diabetes:
>> 463,000.000*
(20 – 79 a)

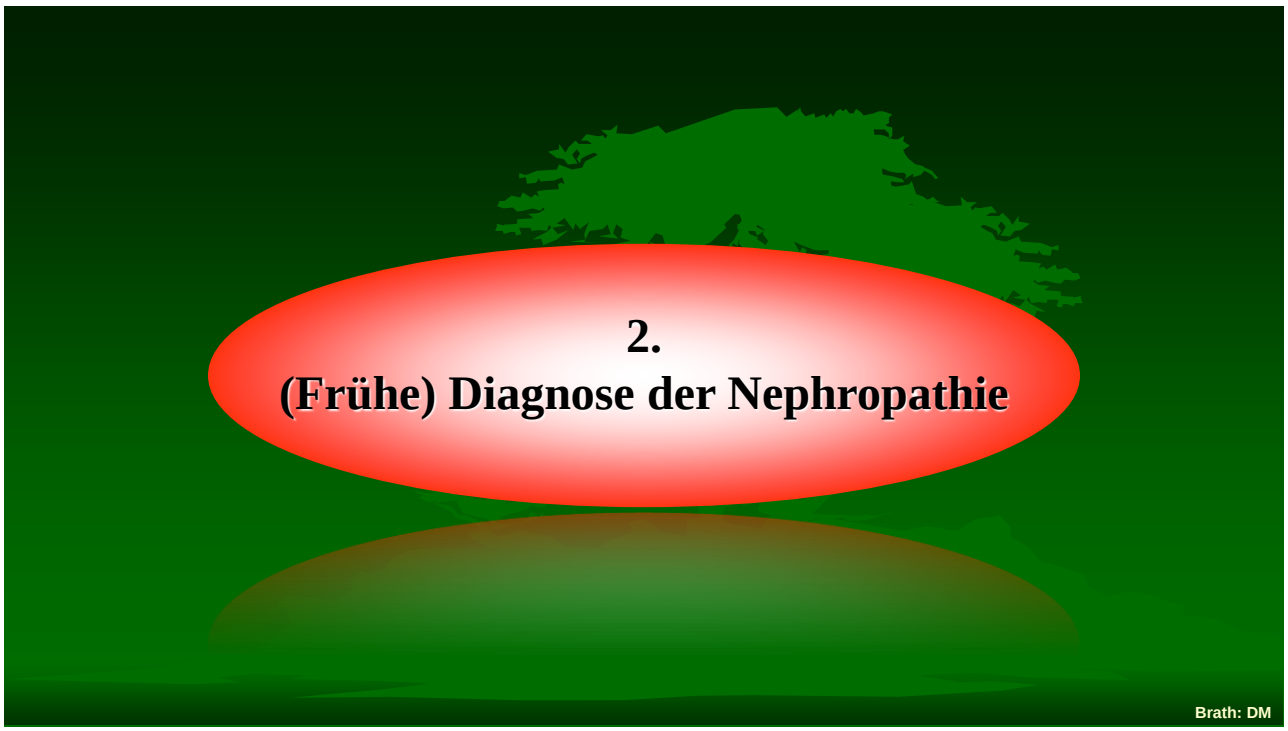
http://en.wikipedia.org/wiki/List_of_countries_and_dependencies_by_population, abgefragt 10. 11. 2021; * IFD, Diabetes Atlas 2019 **Brath: DM**

Im Vergleich zu gesunden Personen können CKD + Diabetes Lebenserwartung um ca. 16 Jahre verkürzen*



Early CKD, CKD stages 1–3
*At age 30 compared with patients without diabetes or CKD. Study population consisted of 543,412 adults who participated in a self-paying comprehensive health surveillance programme between 1994 and 2008
Wen CP, *et al*. *Kidney Int* 2017;92:388–396

Brath: DM



Chronic Kidney Disease (CKD): Definition

Table 1 | Criteria for chronic kidney disease (either of the following present for a minimum of 3 months)

Markers of kidney damage (1 or more)	Albuminuria (ACR ≥30 mg/g [≥3 mg/mmol])
	Urine sediment abnormalities
	Persistent hematuria
	Electrolyte and other abnormalities due to tubular disorders
	Abnormalities detected by histology
	Structural abnormalities detected by imaging
	History of kidney transplantation
Decreased GFR	GFR <60 ml/min per 1.73 m^2 (GFR categories G3a–G5)

ACR, albumin-to-creatinine ratio; GFR, glomerular filtration rate.

KDIGO 2024 Clinical Practice Guideline for the evaluation and management of chronic kidney disease, Kidney Int 2024

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CKD Risikoeinschätzung mit eGFR und UACR

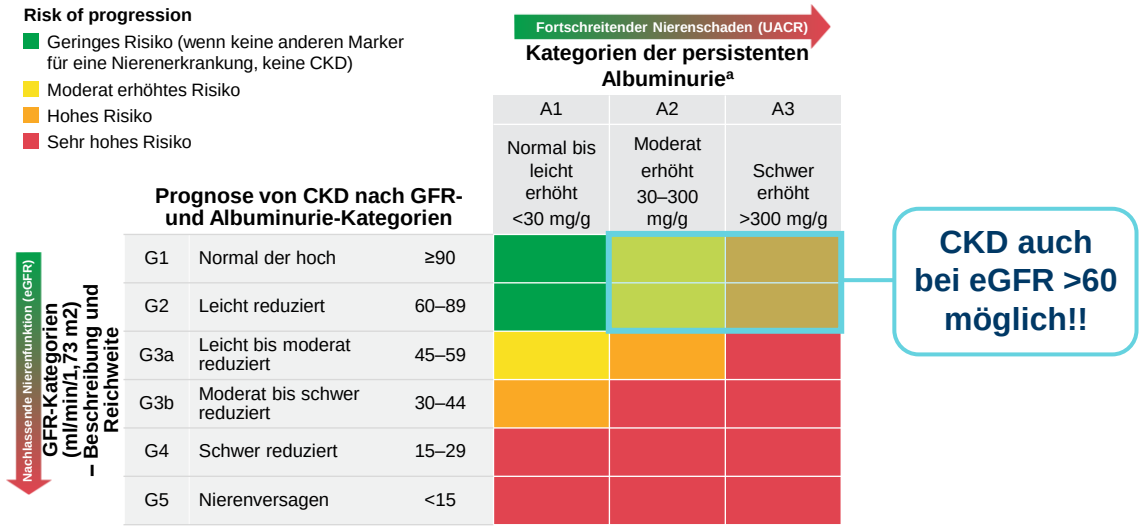
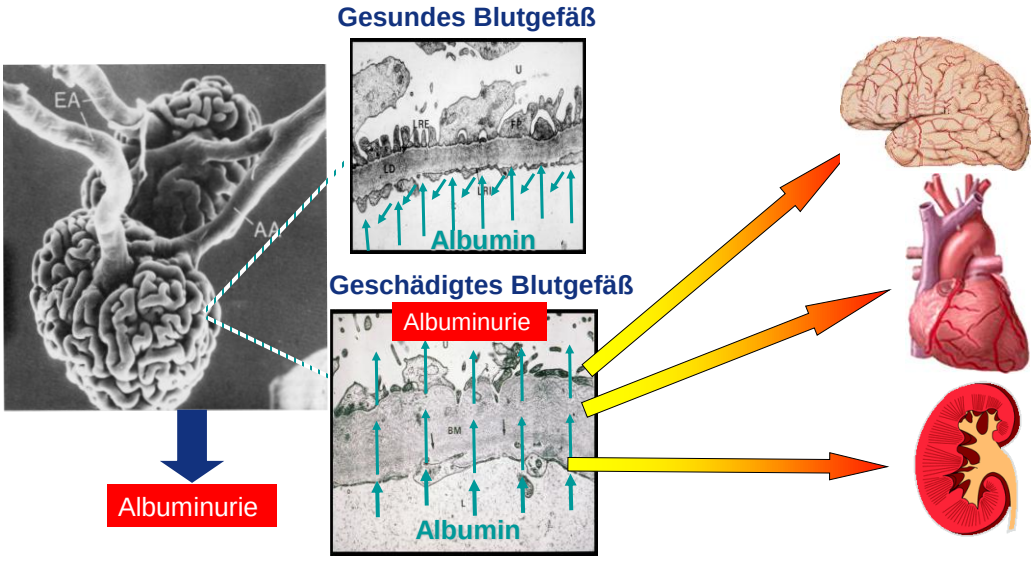


Abbildung aus KDIGO 20202; hypothetisches Patientenprofil a: Alternative Einheiten für diese drei UACR-Kategorien umfassen: <3 mg/mmol, 3–30 mg/mmol und >30 mg/mmol[2]
CKD = chronische Nierenerkrankung; GFR = glomeruläre Filtrationsrate; KDIGO = Nierenerkrankung: Verbesserung der globalen Ergebnisse; UACR = Albumin:Kreatinin-Verhältnis im Urin
Kidney Int Suppl. 2013;3:1-150.

Brath: DM

Albuminurie: Marker für Gefäßschäden in Mikrozirkulation aller Organe – nicht nur in Niere



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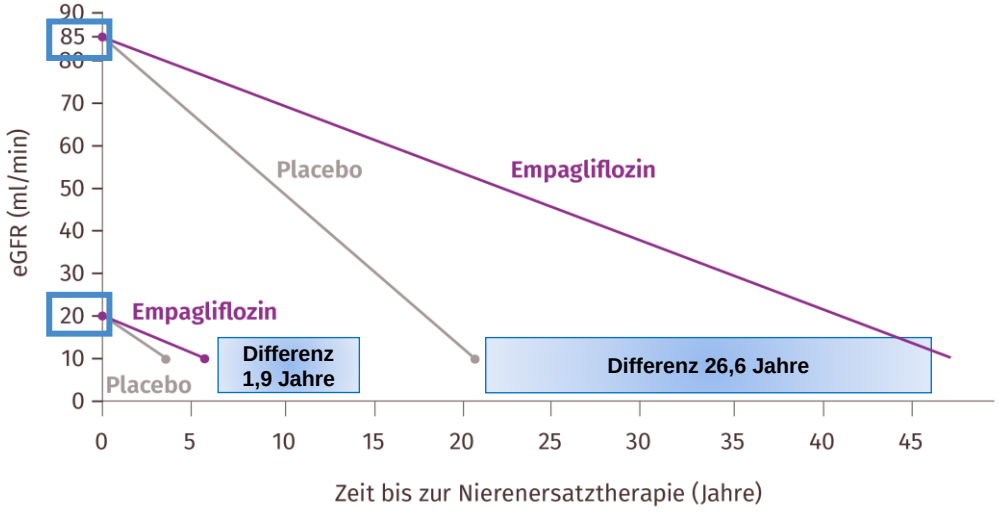
EMPA-Kidney: Empagliflozin verlangsamt die eGFR Abnahme

Ein früher Einsatz kann die Zeit bis zum Nierenversagen um bis zu 26,6 Jahre hinauszögern[1]



Hypothetische Umwandlung des chronischen eGFR-Abfalls in Zeit bis zur Notwendigkeit einer Nierenersatztherapie, definiert als eGFR 10 ml/min/1,73 m², in der EMPA-KIDNEY-Studie.

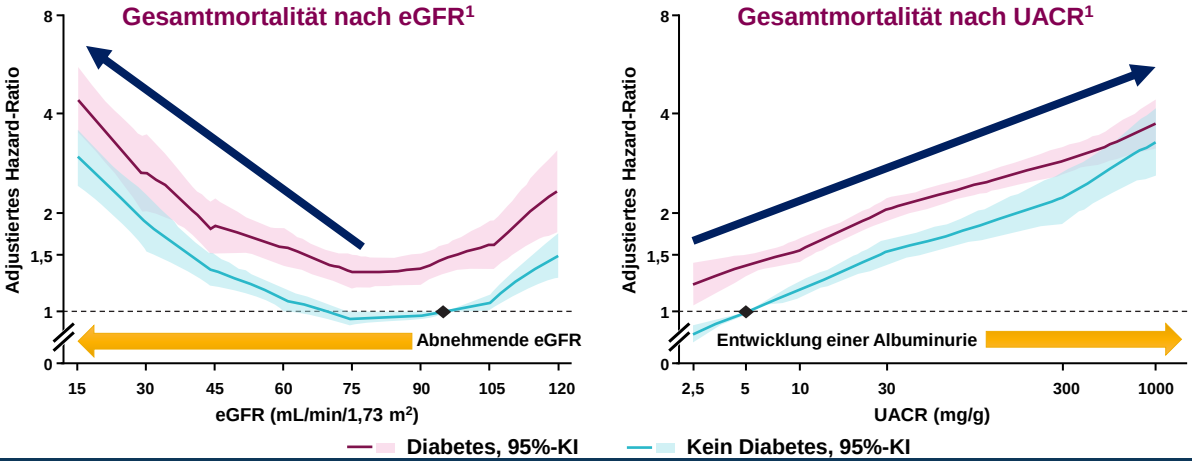
1. Fernández-Fernandez B et al. Clinical Kidney Journal, 2023, vol. 0, no. 0, 1–12, modifiziert

Brath: DM

3.
Diabetes & Niereninsuffizienz: die klassische Co-(Multi)morbidität

Brath: DM

Korrelation von Mortalität und Niereninsuffizienz bei Patienten mit und ohne Diabetes



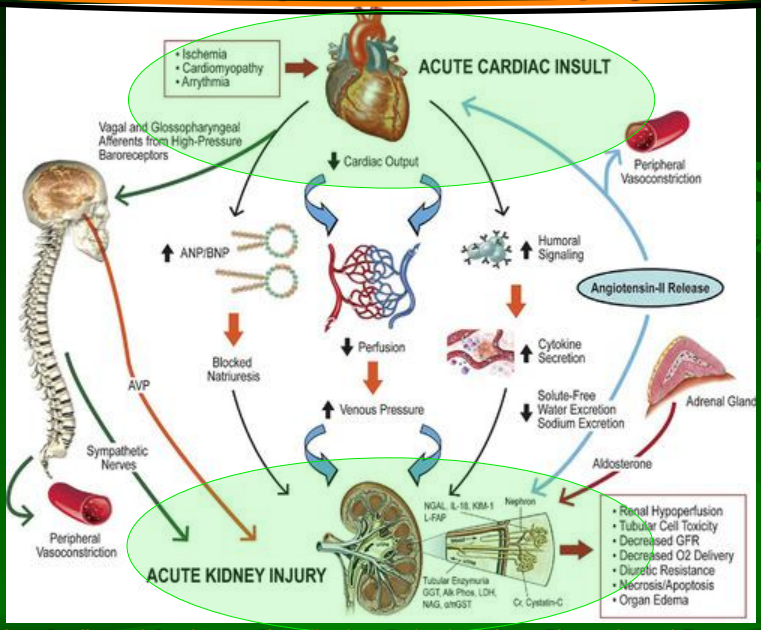
Eine niedrigere eGFR und eine stärkere Albuminurie sind unabhängige Prädiktoren der Gesamtmortalität

eGFR = geschätzte glomeruläre Filtrationsrate; KI = Konfidenzintervall; UACR = Albumin:Kreatinin-Verhältnis im Urin.

Fox C, et al. Lancet 2012;380:1662–1674.

Brath: DM

Kardiorenales Syndrom: Pathophysiologie



Janani Rangaswami. Circulation. Cardiorenal Syndrome: Classification, Pathophysiology, Diagnosis, and Treatment Strategies: A Scientific Statement From the AHA, Volume: 139, Issue: 16, Pages: e840-e878, DOI: (10.1161/CIR.0000000000000664)

Brath: DM

4.
Allgemeine Nephroprotektion bei Diabetes

Brath: DM

Ursachen der diabet. Nephropathie

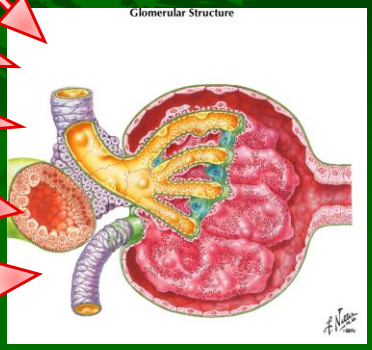
Hyperglykämie

Hypertonie

Dyslipidämie

Zigarettenrauchen

Genet. Neigung

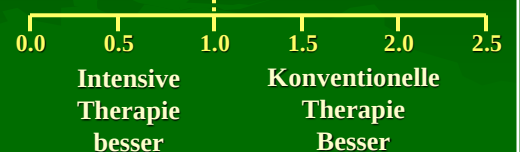


Brath: DM

Steno 2 Studie: mikrovask. Komplik.

Effekte der multifaktoriellen Intervention auf die Progression der Neu[illegible]hie und Mikroangiopathie

Variable	Relatives Risiko (95% CI)	P-Wert
Nephropathie	0.39 (0.17-0.87)	0.003
Retinopathie	0.42 (0.21-0.86)	0.02
Autonome Neuropathie	0.37 (0.18-0.79)	0.002
Periphere Neuropathie	1.09 (0.54-2.22)	0.66



Gæde et al., N Engl J Med 2003; 348: 383-93

Brath: DM

Trimethylamine N-oxide (TMAO): neuer Risikofaktor für Nephropathie?

Trimethylamine N-oxide (TMAO): gut microbiota-derived metabolite of dietary phosphatidylcholine and carnitine, primarily from red meat and choline, from a variety of animal source foods.

TMAO causes kidney injury and tubulointerstitial fibrosis in experimental models

10,564 participants from two community-based, prospective cohorts without baseline CKD (eGFR ≥ 60 mL/min/1.73 m2); incident CKD: eGFR decline ≥ 30% + eGFR < 60 mL/min/1.73 m2 Median 9.4 years, 979 incident CKD events occurred

Significant correlation between baseline TMAO and total meat intake (ρ = 0.08)

After adjustments for sociodemographic, lifestyle, diet, and CV risk factors, higher plasma TMAO associated with more than doubled CKD incidence (HR: 2.24, top vs bottom quintile).

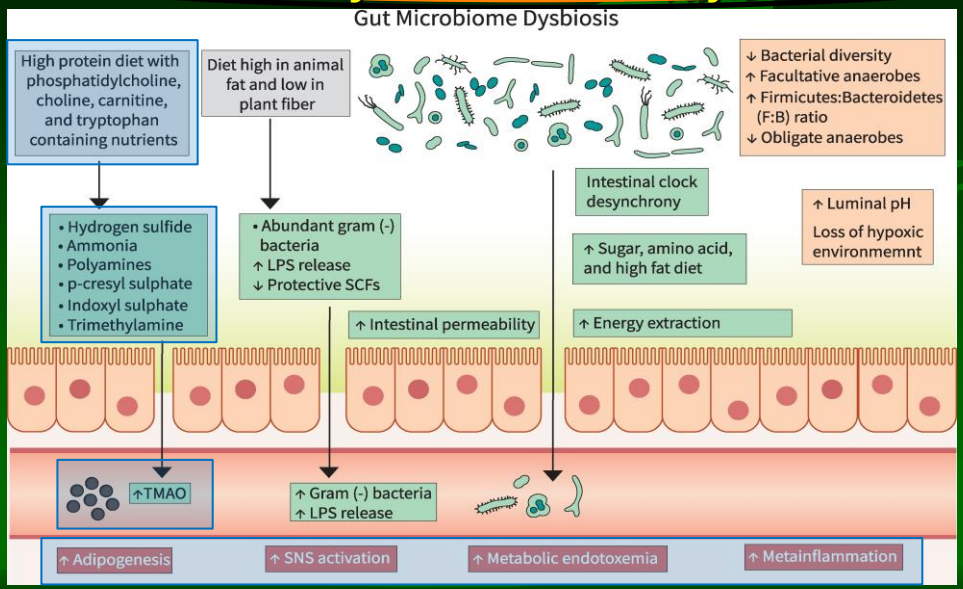
Higher TMAO levels were associated with greater annual eGFR decline (top vs bottom quintile eGFR change = −0.43 mL/min/1.73 m2 / a). This compares to 10 years of older age (−0.43), presence of diabetes (−0.51), more than increase of 10 mmHg RRsyst (−0.16).

Wang, Meng et al: The Gut Microbial Metabolite Trimethylamine N-oxide, Incident CKD, and Kidney Function Decline. Journal of the American Society of Nephrology ():10.1681/ASN.0000000000000344, April 09, 2024. | DOI: 10.1681/ASN.0000000000000344

https://www.medscape.com/viewarticle/metabolite-red-meat-increases-kidney-disease-risk-2024a10006yh?ecd=mkm_ret_240427_mscpmrk_neph_top-content_etid6471143&uac=283994DJ&implD=6471143

Brath: DM

Mechanisms linking gut microbiome dysbiosis to obesity and metabolic syndrome



GM, gut microbiota

LPS, lipopolysaccharide

SCF, short-chain fatty acid

SNS, sympathetic nervous system

TMA, trimethylamine

TMAO, trimethylamine oxide

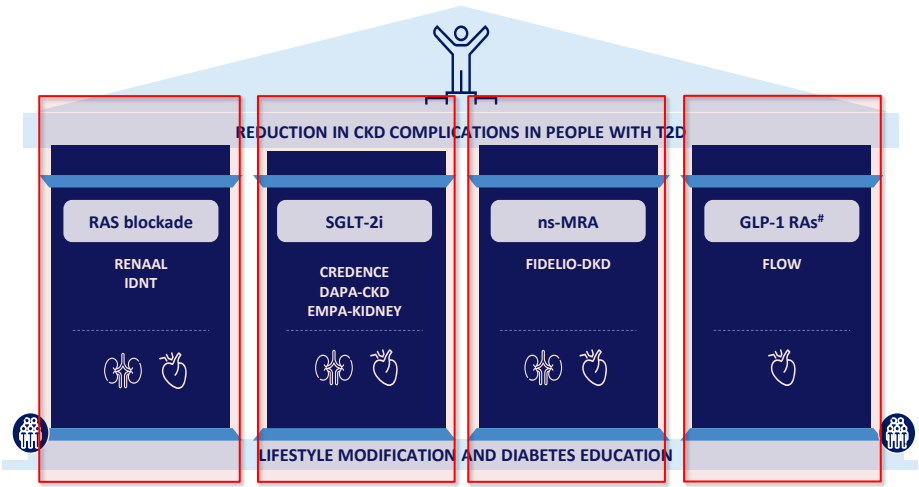
J Clin Endocrinol Metab, Volume 109, Issue 11, November 2024, Pages 2709–2719, https://doi.org/10.1210/clinem/dgae499

Brath: DM

5.
Medikamentöse nephroprotekive (& mehr) Therapie bei Diabetes

Brath: DM

Die 4 Säulen der kardiorenalen Protektion bei Personen mit diabetischer Nephropathie



Definitive place in the treatment of people with T2D and CKD remains to be established. Semaglutide is the only GLP-1RA demonstrating effects in a dedicated kidney outcomes trial. CKD, chronic kidney disease; CVOTs, cardiovascular outcomes trials; GLP-1 RAs, glucagon-like peptide-1 receptor agonists; ns-MRA, non-steroidal mineralocorticoid receptor antagonists; RAS, Renin–angiotensin system; SGLT-2i, sodium-glucose cotransporter-2 inhibitor; T2D, type 2 diabetes.

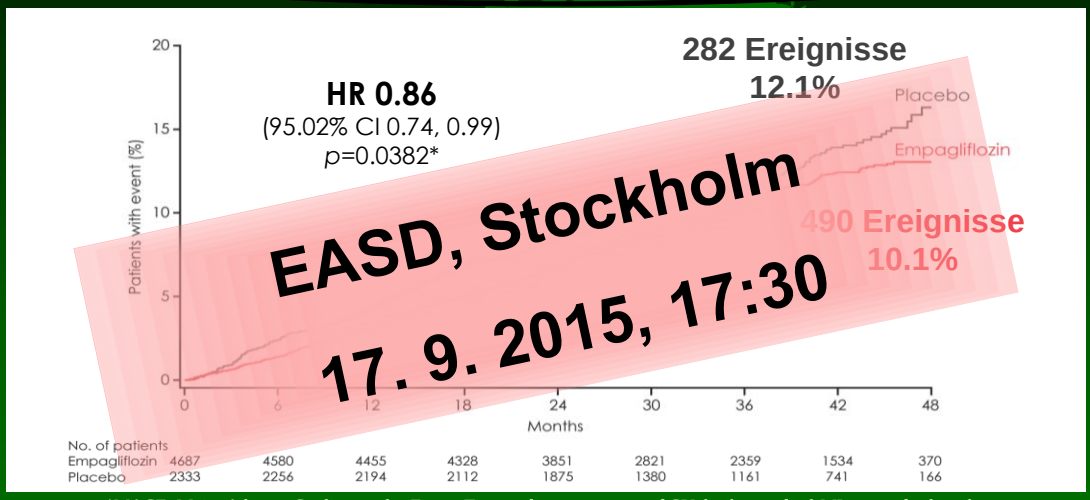
Adapted from: 2023 ADA, Standards of Medical Care in Diabetes - 2023: Diabetes Care, December 2022, Vol.46, Supplement 1;
Agarwal R et al, Nephrology Dialysis Transplantation (2023) 38: 253–257

Brath: DM

6.
SGLT-2 Inhibitor

Brath: DM

EMPA–REG OUTCOME:
Primärer Endpunkt: 3-Punkte-MACE+



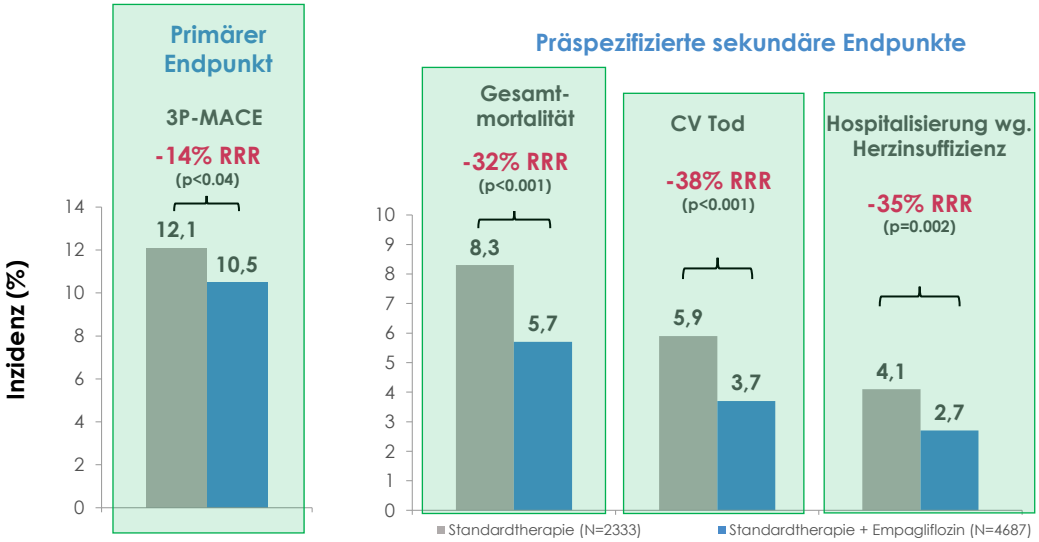
EASD, Stockholm
17. 9. 2015, 17:30

+MACE, Major Adverse Cardiovascular Event: Time to first occurrence of CV death, non-fatal MI or non-fatal stroke
Cumulative incidence function; HR, hazard ratio.
*** Two-sided tests for superiority were conducted (statistical significance was indicated if p≤0.0498)**

Zinman B et al, N Engl J Med. 2015 Sep 17. [Epub ahead of print]

Brath: DM

EMPA-REG OUTCOME: Signifikante Verbesserung relevanter Endpunkte

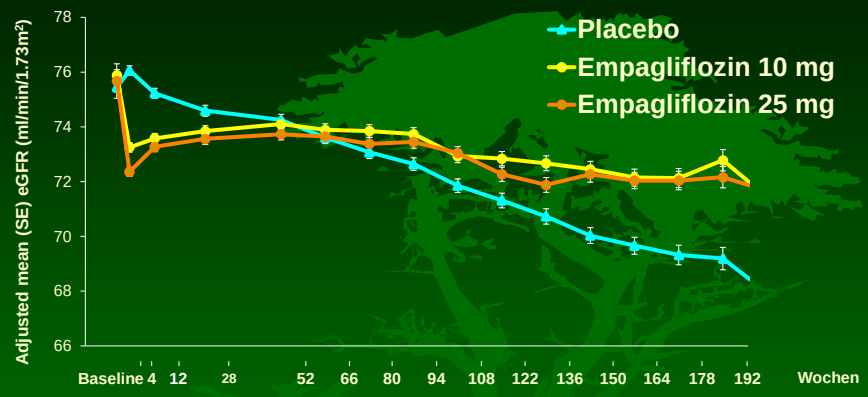


3P-MACE: kombinierter Endpunkt von CV Tod, nichttödlichem Herzinfarkt und nichttödlichem Schlaganfall; RRR: relative Risikoreduktion

Zinman et al. N Engl J Med 2015;373:2117-28

Brath: DM

eGFR (CKD-EPI-Formel) über 192 Wochen



Analysierte Patienten

Placebo	2323	2295	2267	2205	2121	2064	1927	1981	1763	1479	1262	1123	977	731	448
Empagliflozin 10 mg	2322	2290	2264	2235	2162	2114	2012	2064	1839	1540	1314	1180	1024	785	513
Empagliflozin 25 mg	2322	2288	2269	2216	2156	2111	2006	2067	1871	1563	1340	1207	1063	838	524

Patienten im follow-up für unerwünschte bzw. Endpunkt Ereignisse

Total	7020	7020	6996	6931	6864	6765	6696	6651	6068	5114	4443	3961	3488	2707	1703

Präspezifizierte mixed model repeated measures-Analyse bei allen Patienten, die ≥1 Dosis der Studienmedikation erhielten und mit einer baseline und post-baseline Messung. eGFR, geschätzte glomeruläre Filtrationsrate; CKD-EPI: Chronic Kidney Disease Epidemiology Collaboration

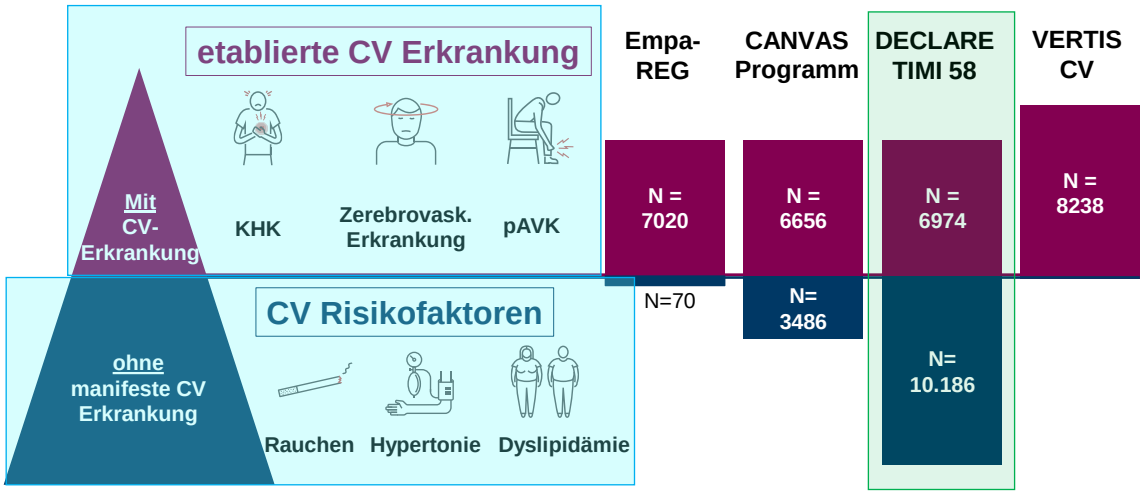
Wanner C et al. N Engl J Med 2016;375:323-334

Brath: DM

DECLARE-TIMI 58
AHA, Chicago, 10. 11. 2018, 14:30
Wirksam auch bei frühem Diabetes

Brath: DM

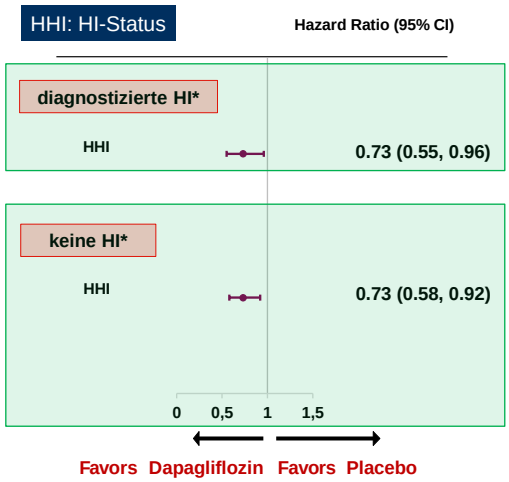
DECLARE-Studie: Zwei Patientenpopulationen abgebildet



T2D: Typ 2 Diabetes, CV: kardiovaskulär, pAVK: periphere arterielle Verschlusskrankheit
1. Zinman, B, et al.; N Engl J Med; 2015; 373; 2117-2128. 2. Neal, B, et al.; N Engl J Med; 2017; 377; 644-657; 3.Wiviott SD, et al. N Engl J Med 2019; 380:347-57 4. Cannon CP et al. N Engl J Med. DOI: 10.1056

Brath: DM

DECLARE-TIMI 58 (Dapagliflozin): HHI je nach HI-Status bei Studieneinschluss



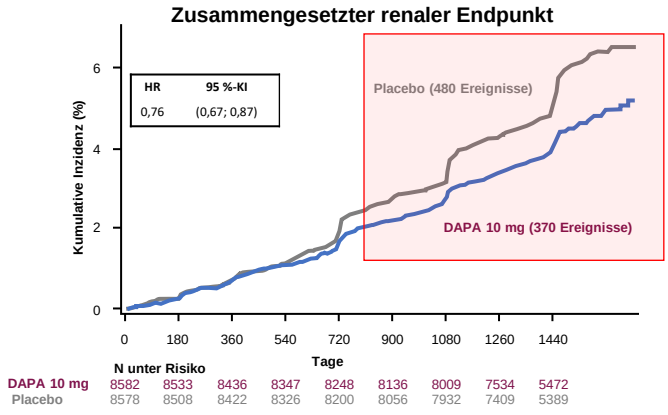
*10% der DECLARE-Patienten hatten eine diagnostizierte HF

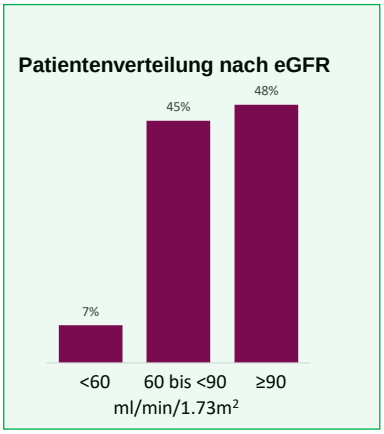
HHI, Hospitalisierung aufgrund von Herzinsuffizienz (HI)

Zinman, B, et al.; N Engl J Med; 2015; 373; 2117-2128. Neal, B, et al.; N Engl J Med; 2017; 377; 644-657. Wiviott, DS, et al.; N Engl J Med; 2018; doi 10.1056/NEJMoa1812389; [Epub ahead of print]. Zelniker, TA, et al.; The Lancet; 2018; DOI: 10.1016/s0140-6736(18)32590-x

Brath: DM

Renaler Endpunkt DECLARE-TIMI 58





Renaler Endpunkt ohne CV Tod

HR, 0.53 (95% CI 0.43,0.66)

*nominell. N unter Risiko ist die Anzahl der Patienten unter Risiko zu Beginn der Periode. Zusammengesetzter renaler Endpunkt definiert als anhaltende Reduktion der eGFR um ≥40 % auf <60 ml/min/1,73m² und/oder ESRD und/oder renal bedingter oder CV-Tod.
CV, kardiovaskulär; DAPA, Dapagliflozin; eGFR, geschätzte glomeruläre Filtrationsrate; ESRD, terminale Niereninsuffizienz; HR, Hazard-Ratio; KI, Konfidenzintervall.

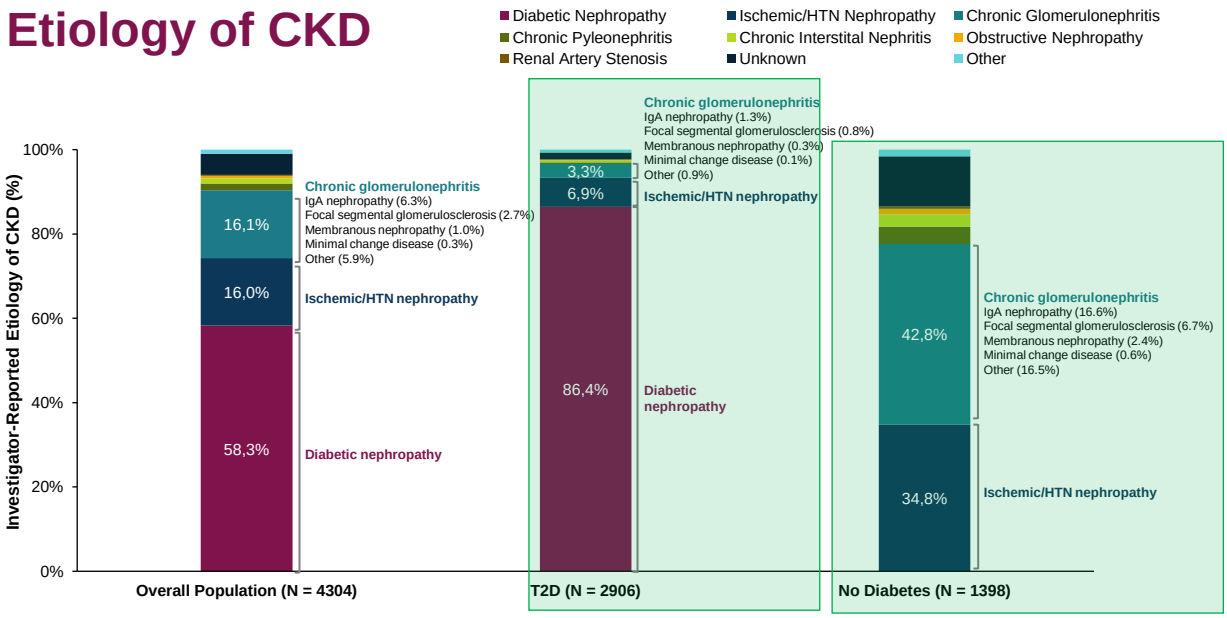
Wiviott, DS, et al.; N Engl J Med; 2018 ; doi 10.1056/NEJMoa1812389

Brath: DM

DAPA-CKD Studie
ESC, virtuell, 30. 8. 2020, 17:00
Nephropathie +/- Diabetes

Brath: DM

Etiology of CKD

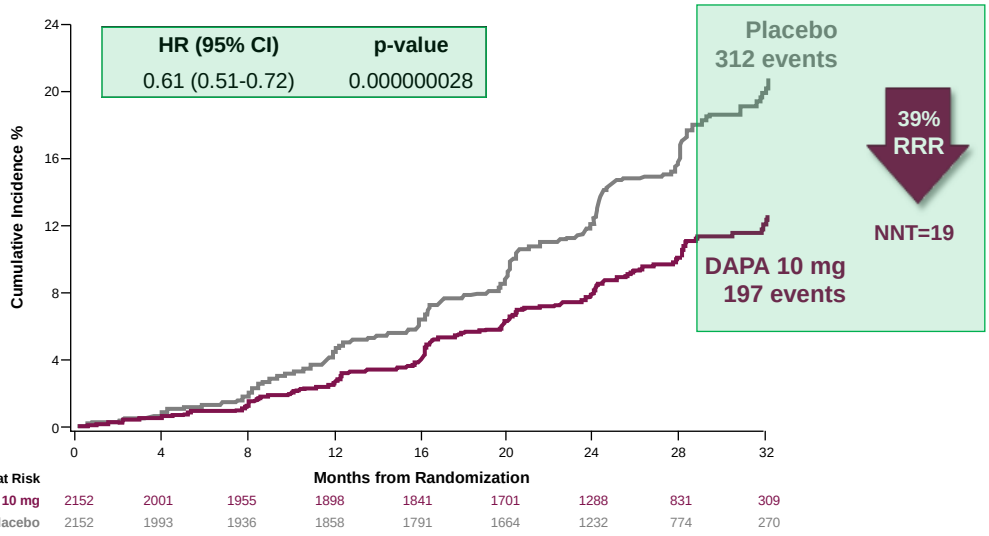


HTN = hypertensive; IgA = immunoglobulin A; T2D = type 2 diabetes

Wheeler DC et al. Online ahead of print. *Nephrol Dial Transplant*. 2020

Brath: DM

Dapa-CKD: Primärer Endpunkt: Nachhaltiger Abfall d. eGFR ≥50%, Nierenversagen, renaler od. CV Tod[a]



[a]ESKD: need for maintenance dialysis (perit. or hemodialyl. for at least 28 d and renal transplantation or sustained eGFR <15mL/min/1.73m² for at least 28 d. Renal death: death due to ESKD when dialysis treatment was deliberately withheld for any reason.[2] CV = cardiovascular; DAPA = dapagliflozin; eGFR = estimated glomerular filtration rate; ESKD = end-stage kidney disease; HR = hazard ratio; ; NNT = number needed to treat; RRR = relative risk reduction.

1. Heerspink HJL. Pres. at: ESC Congress – The Digital Experience; August 29 - Sept 1, 2020. 2. Heerspink HJL et al. *Nephrol Dial Transplant*. 2020;35:274–82

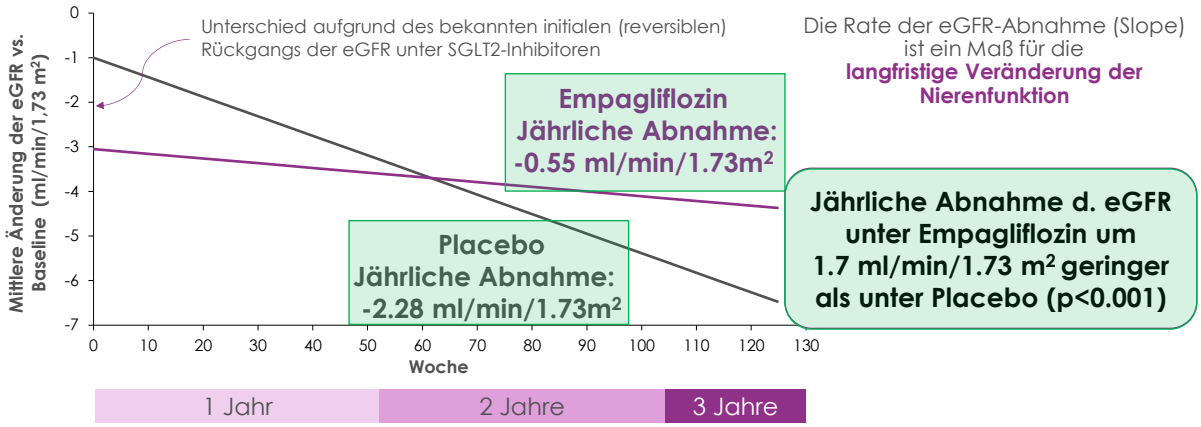
Brath: DM

Emperor-Reduced Studie
AHA, 13. – 17. 11. 2020, virtuell
Diabetesmedikament zur Therapie der Herzinsuffizienz schützt Niere

Brath: DM

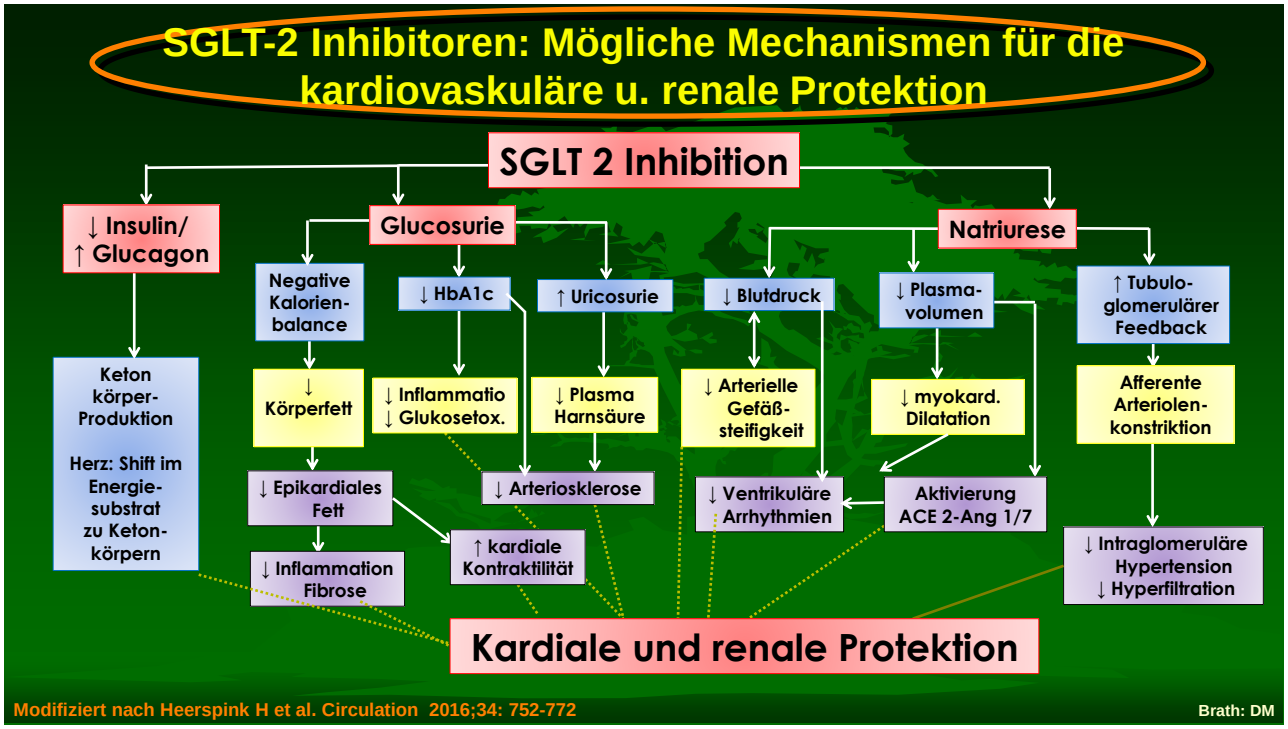
Emperor-Reduced: Konfirmatorischer sekundärer Endpunkt: Rate der Abnahme d. eGFR $(CKD\text{-}EPI)_{cr}$ gegenüber Baseline

Empagliflozin schützt die Niere durch Verlangsamung der Progression einer Nierenerkrankung



Analyse der Rate der Abnahme der eGFR erfolgte auf Basis von „On treatrment"-Daten mittels Zufallskoeffizienten-Modell; weitere Angaben, s. Foliennotizen. CKD-EPI, Chronic Kidney Disease; Epidemiology Collaboration; (CKD-EPI)cr, CKD-EPI Kreatinin-Formel; eGFR, geschätzte glomeruläre Filtrationsrate.

Packer M et al. N Engl J Med 2020;383:1413 **Brath: DM**



Modifiziert nach Heerspink H et al. Circulation 2016;34: 752-772 Brath: DM

Regeltext SGLT-2 Inhibitor seit 1. April 2024 hellgelbe Box (RE2)

Bei erwachsenen PatientInnen mit Diabetes Typ II:
- **Die Behandlung darf erst ab einem HbA1c größer 7 begonnen werden.**
- **Die Behandlung hat nur als Second-line-Therapie zu erfolgen.**
- **Regelmäßige HbA1c-Bestimmungen sind durchzuführen.**

Bei erwachsenen PatientInnen mit chronischer Herzinsuffizienz als Zusatztherapie
- **wenn die PatientInnen trotz individuell optimierter Standardtherapie mit Medikamenten aus dem Grünen Bereich noch symptomatisch sind (NYHA größer/gleich Klasse II).**
- **Therapieeinleitung nur bei etablierter Diagnose der chronischen Herzinsuffizienz.**
- **Erstverordnung und regelmäßige Kontrollen durch KardiologInnen oder InternistInnen mit gültigem Diplom in transthorakaler Echokardiographie od. durch entsprech. Fachabteilung bzw. -ambulanz.**

Bei erwachsenen PatientInnen mit chronischer Niereninsuffizienz mit einer eGFR von kleiner 90 ml bis 20 ml/min/1,73 m2 als Zusatztherapie zur individuell optimierten Standardtherapie mit einem ACE-Hemmer oder einem Angiotensin-II Rezeptorblocker.

Erstattungskodex, 1. 4. 2024

Brath: DM

SGLT-2 Inhibitoren:
Darf´s ein bisschen mehr sein?

Brath: DM

SGLT-2 Hemmer und Gicht

Patients with diabetes and gout, initiating SGLT2is vs. DPP-4i.
Propensity score–matched, general population database 1. 1. 2014 – 30. 6. 2022

After propensity score matching, the flare rate was lower among SGLT2i initiators than DPP-4i initiators (52.4 and 79.7 events per 1000 person-years, respectively), with a rate ratio (RR) of 0.66 (95% CI, 0.57 to 0.75) and a rate difference (RD) of −27.4 (CI, −36.0 to −18.7) per 1000 person-years. The corresponding RR and RD for gout-primary ED visits and hospitalizations were 0.52 (CI, 0.32 to 0.84) and −3.4 (CI, −5.8 to −0.9) per 1000 person-years,

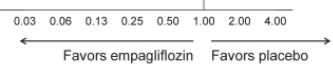
Natalie McCormick et al: Comparative Effectiveness of Sodium–Glucose Cotransporter-2 Inhibitors for Recurrent Gout Flares and Gout-Primary Emergency Department Visits and Hospitalizations. Annals of Internal Medicine 2023, https://doi.org/10.7326/M23-0724

Brath: DM

Empagliflozin reduziert Nephrolithiasis

Pooled data from 15 081 T2D ptx randomized to empagliflozin (n = 10 177) or placebo (n = 4904) from 20 phase I-IV trials, incl. EMPA-REG OUTCOME

	Empagliflozin		Placebo		Incidence rate ratio (95% CI)
	n with events/ N analyzed	Rate/ 100pt-yrs (95% CI)	n with events/ N analyzed	Rate/ 100pt-yrs (95% CI)	
Urinary tract lithiasis (all preferred terms)	104/10177	0.63 (0.51, 0.76)	79/4904	1.01 (0.80, 1.25)	0.64 (0.48, 0.86)
Nephrolithiasis	75/10177	0.45 (0.36, 0.57)	57/4904	0.72 (0.55, 0.94)	0.65 (0.46, 0.92)
Renal colic	16/10177	0.10 (0.05, 0.16)	10/4904	0.13 (0.06, 0.23)	0.77 (0.35, 1.65)
Ureterolithiasis	8/10177	0.05 (0.02, 0.09)	10/4904	0.13 (0.06, 0.23)	0.38 (0.15, 0.97)
Calculus bladder	2/10177	0.01 (0.00, 0.04)	4/4904	0.05 (0.01, 0.13)	0.23 (0.04, 1.26)
Calculus urinary	6/10177	0.04 (0.01, 0.08)	5/4904	0.06 (0.02, 0.15)	0.57 (0.17, 1.88)
Calculus urethral	1/10177	0.01 (0.00, 0.03)	0/4904		-
Nephrocalcinosis	2/10177	0.01 (0.00, 0.04)	0/4904		-



Priyadarshini Balasubramanian, Christoph Wanner, JP Ferreira, AP Ofstad, A Elsaesser, Bernard Zinman, Silvio E. Inzucchi. The Journal of Clinical Endocrinology & Metabolism, 2022, 107, e3003–e3007 https://doi.org/10.1210/clinem/dgac154

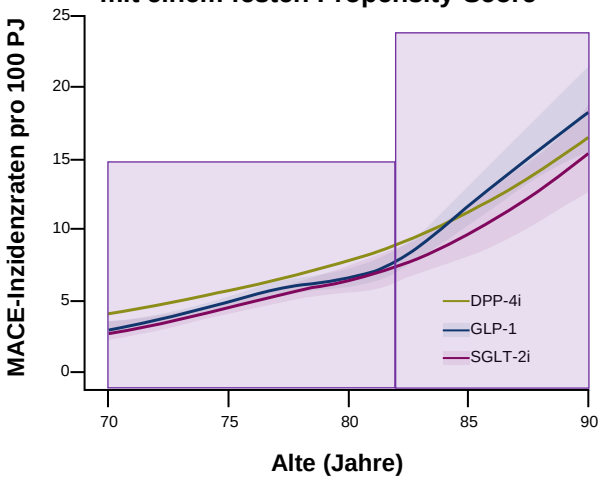
Brath: DM

GLP-1 RA und SGLT-2i bei älteren Patient:innen

Ergebnisse

	Inzidenzratenverhältnis (95%-KI)
GLP-1 RA vs DPP-4i	**0,90** (0,85; 0,95)
SGLT-2i vs DPP-4i	**0,82** (0,76; 0,88)

MACE-Inzidenzrate 2 a nach Therapiebeginn mit einem festen Propensity-Score



Modifiziert nach: Kosjerina V, et al. 59th EASD Annual Meeting – Hamburg & Virtual, 2.- 6. Oktober 2023; OP 09. [https://cattendee.abstractsonline.com/meeting/10899/presentation/435; abgerufen am: 04.10.2023].

Brath: DM

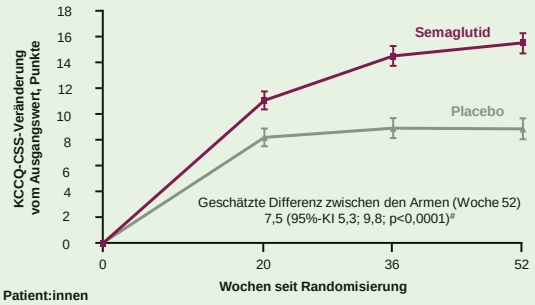
7.
GLP-1 Rezeptoragonisten

Brath: DM

STEP-HFpEF und STEP-HFpEF DM – gepoolte Analyse

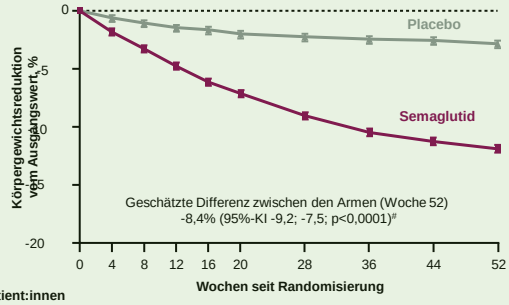
Semaglutid vs Placebo bei Patient:innen mit Adipositas-bedingter HFpEF

KCCQ-CSS*



Anzahl Patient:innen				
Semaglutid	573	538	499	524
Placebo	572	526	487	509

Prozentuale Reduktion des Körpergewichts*



Anzahl Patient:innen										
Semaglutid	573	562	551	549	536	544	522	529	522	532
Placebo	572	559	547	537	535	535	525	517	506	520

Unter Semaglutid (vs Placebo) zeigte sich bei Patient:innen mit Adipositas-bedingter HFpEF eine größere Verbesserung des KCCQ-CSS und eine größere Gewichtsreduktion

NCT04788511 und NCT04916470.
*Ausgangswert bis Woche 52. #Vergleiche zwischen den Armen in Woche 52 umfassten alle Teilnehmer:innen des vollständigen Analysesets (Semaglutid-Arm n=573, Placebo-Arm n=572); fehlende Daten wurden imputiert. KCCQ-CSS, Kansas City Cardiomyopathy Questionnaire Clinical Summary Score.

Butler J, et al. Lancet 2024; 403:1635-48

Brath: DM

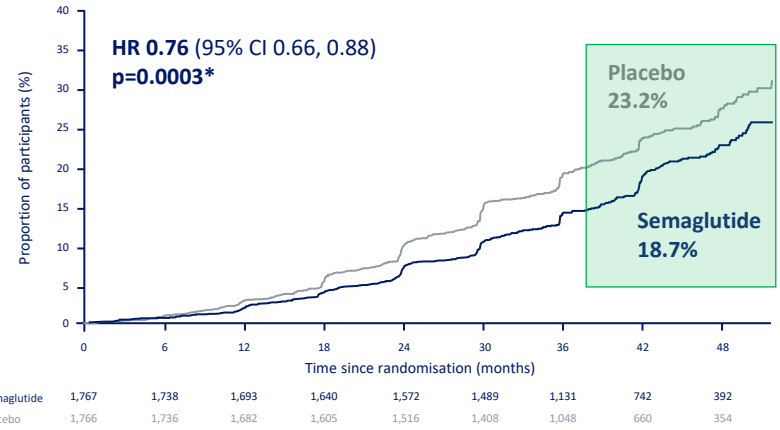
Flow-Study: OW semaglutide s.c. 1.0 mg demonstrated 24% risk reduction of Primary Endpoint

(kidney disease progression, CV and kidney death in people with CKD and T2D

Time to first occurrence of a composite endpoint consisting of:

- Onset of persistent ≥50% reduction in eGFR compared with baseline
- Onset of persistent eGFR <15 mL/min/1.73 m^2
- Initiation of chronic renal replacement therapy (dialysis or kidney transplantation)
- Renal death
- CV death

First composite kidney event: Primary outcome



*Full analysis set. Data from the in-trial period. * Superiority if p value <0.0322*
Numbers shown in the lower panels represent the number of participants at risk. CI, confidence interval; CV, cardiovascular; eGFR, estimated glomerular filtration rate; HR, hazard ratio.

Perkovic V, et al. N Engl J Med. 2024: DOI: 10.1056/NEJMoa2403347

Brath: DM

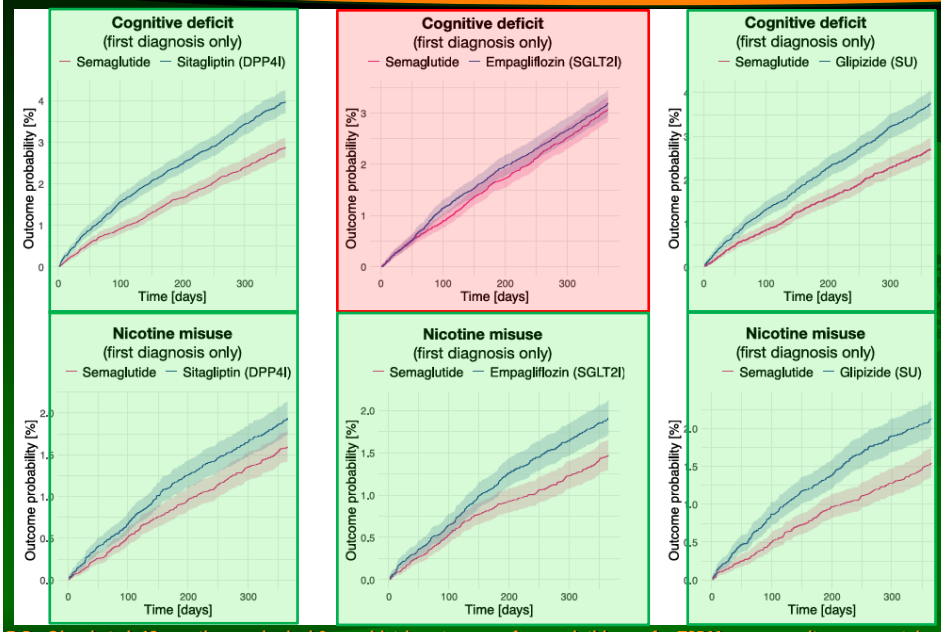
GLP-1 bzw. Polyagonisten:
Darf´s auch hier ein bisschen mehr sein?

Brath: DM

1. Klassiche GLP-1 RA

Brath: DM

Semaglutid: Neurolog. u. psychiatr. Effekte bei DM2



Retrospective cohort study; electronic health records from TriNetX US Collaborative Network; >100 million patients (USA)

R De Giorgi et al: 12-month neurological & psychiatric outcomes of semaglutide use for T2DM: a propensity-score matched cohort study. The Lancet, eClinicalMedicine, Volume 74, 102726

Brath: DM

GLP-1 RA & verschiedene Dependenzen

Zusammenfassung (Exzerpt aus Abstract)

21.35% of comments reported a compulsive shopping interruption, whilst the sexual drive/libido elements reportedly increased in several users.

Arillotta, D. et al: Exploring the Potential Impact of GLP-1 Receptor Agonists on Substance Use, Compulsive Behavior, and Libido: Insights from Social Media Using a Mixed-Methods Approach. Brain Sci. 2024, 14, 617. https://doi.org/10.3390/brainsci14060617JR

Brath: DM

evoke and evoke+: Two large, global, phase 3a trials

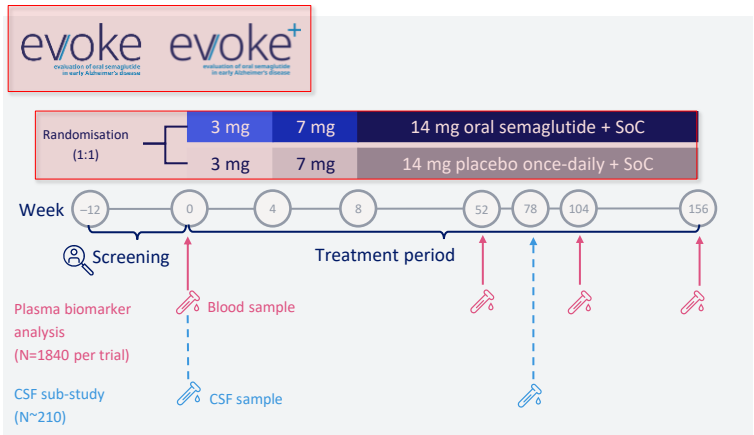
Trial design

1840 patients in each trial

Age: 55–85 years (both inclusive)

MCI or mild dementia both of the Alzheimer's type
- 80% MCI and 20% mild dementia
- Amyloid-positive (PET or lumbar puncture)

800+ sites in **40** countries



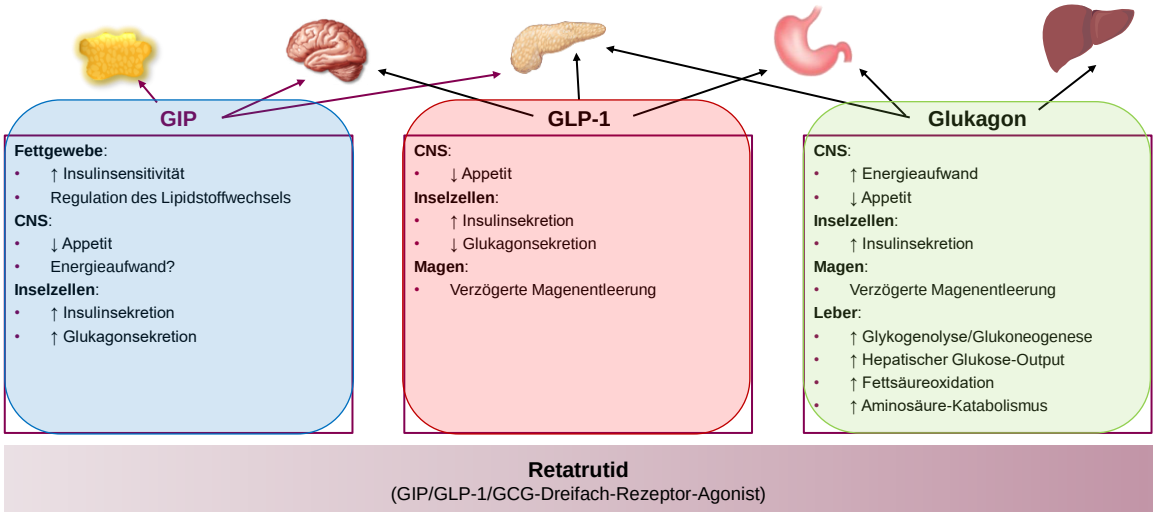
CSF, cerebrospinal fluid; MCI, mild cognitive impairment; PET, positron emission tomography; SoC, standard of care
1. ClinicalTrials.gov. Available at: https://clinicaltrials.gov/ct2/show/NCT04777396 (accessed August 2021); 2. ClinicalTrials.gov. Available at: https://clinicaltrials.gov/ct2/show/NCT04777409 (accessed August 2021)

Brath: DM

2. Polyagonisten

Brath: DM

Heranziehen d. Inkretin- u. Glukagonphysiologie zur Entwicklung einer Pharmakotherapie f. Stoffwechselkrankheiten

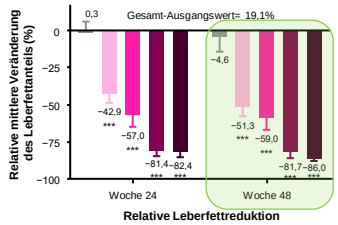


Frias, JP et al. Präsentiert auf den American Diabetes Association 83rd Scientific Sessions – San Diego and Virtual, June 23-26, 2023; Corporate Symposium - Managing NAFLD/NASH in People with T2 Diabetes: Disease Burden · Diagnosis · Current/Emerging Armamentarium Brath: DM

Retatrutid (LY3437943) – NAFLD-Substudie

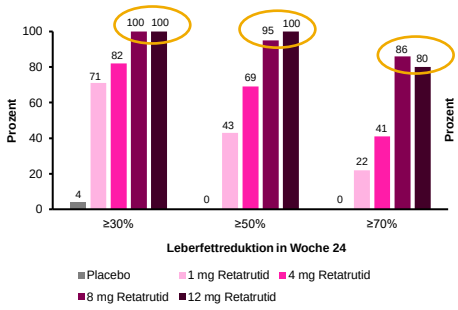
Ergebnisse – primäre und wichtige sekundäre Endpunkte

Relative Leberfettreduktion nach 24 und 48 Wochen

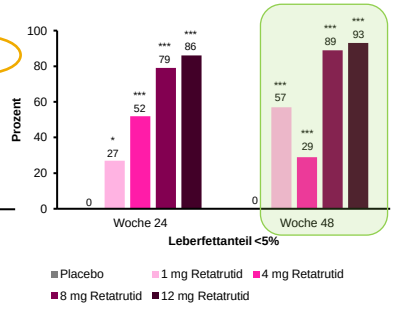


- Die relative Veränderung des Leberfetts war bei allen Retatrutid-Dosen größer als bei Placebo
- Die mittlere, relative Leberfettreduktion lag bei >80% mit Retatrutid 8 mg (n=17) und 12 mg (n=15)

Teilnehmer:innen mit NAFLD mit einer relativen Leberfettreduktion von ≥30%, ≥50% und ≥70% nach 24 Wochen



Anteil der Teilnehmer:innen, die einen Leberfettanteil von <5% erreichten



Bei der Behandlung mit Retatrutid 8 mg und 12 mg bildete sich die Lebersteatose bei >85% der Teilnehmer:innen in Woche 48 zurück

*p<0,05 vs Placebo; ***p<0,001 vs Placebo

Eine geringere Anzahl der Studienteilnehmer:innen hatte während Woche 48 MRT-Scans (n=8 [Placebo], n=9 [1 mg Retatrutid], n=9 [4 mg Retatrutid], n=8 [8 mg Retatrutid], n=9 [12 mg Retatrutid] im Vergleich zu Woche 24 (n=14 [Placebo], n=16 [1 mg Retatrutid], n=15 [4 mg Retatrutid], n=17 [8 mg Retatrutid], n=15 [12 mg Retatrutid]).

Sanyal, AJ et al. Präsentiert auf den American Diabetes Association 83rd Scientific Sessions – San Diego and Virtual, June 23-26, 2023; Symposium - Retatrutid (LY3437943), a Novel GIP/GLP-1/Glucagon Receptor Triagonist—Obesity, NAFLD, and T2D Phase 2 Trial Results.

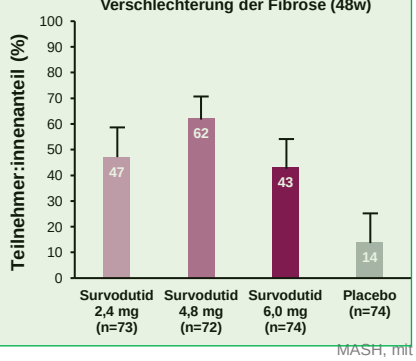
Brath: DM

Duale Agonisten bei Lebererkrankungen

Aktuelle Phase-II-Studien bei MASH

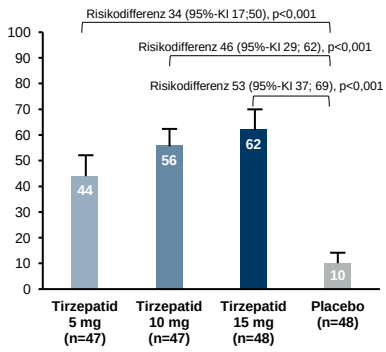
Survodutid (Glukagon/GLP-1 RA) bei MASH und Fibrose[1]

Verbesserung der Steatohepatitis ohne Verschlechterung der Fibrose (48w)

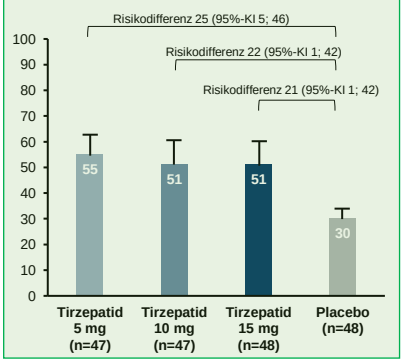


Tirzepatid (GIP/GLP-1 RA) bei MASH mit Leberfibrose[2]

Resolution der MASH und keine Verschlechterung der Fibrose



Rückgang um ≥1 Fibrosestadium und keine Verschlechterung der MASH



MASH, mit metabolischer Dysfunktion assoziierter Steatohepatitis.

1. Sanyal AJ, et al. N Engl J Med 2024; doi 10.1056/NEJMoa2401755; [Epub ahead of print]; 2. Loomba R, et al. N Engl J Med 2024; doi 10.1056/NEJMoa2401943; [Epub ahead of print]. Roden M, et al. Präsentiert auf den American Diabetes Association 84th Scientific Sessions – Orlando/Hybrid, 21.-24. Juni 2024; CT-SY35-1 Symposium - Liver Health in Diabetes.

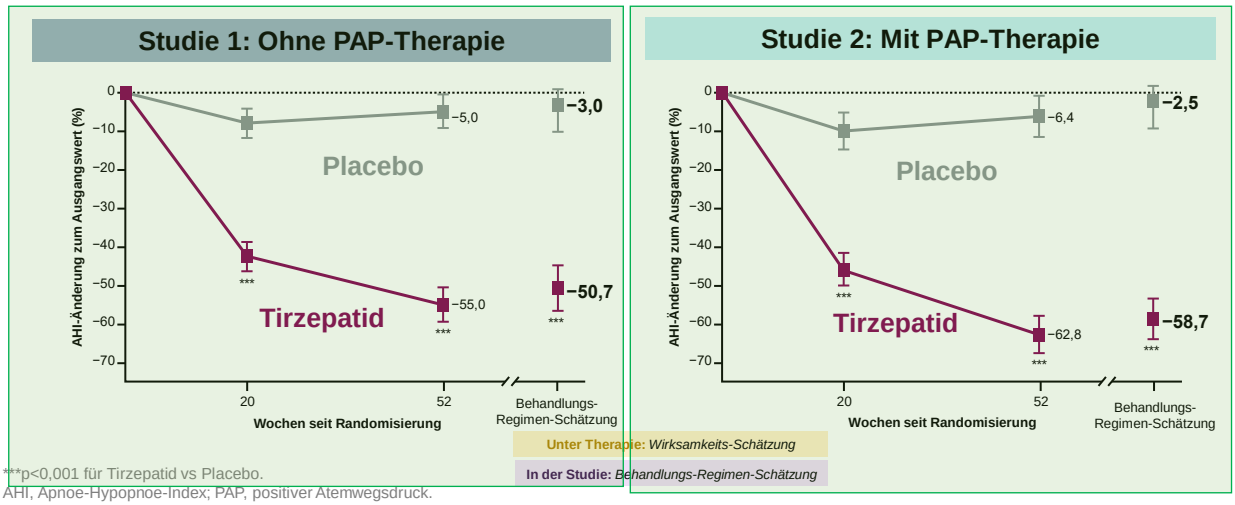
Brath: DM

3.
Neue Wege der Therapie der Schlafapnoe

Brath: DM

SURMOUNT-OSA

Prozentuale Veränderung des AHI im Vergleich zum Ausgangswert über 52 Wo.



***p<0,001 für Tirzepatid vs Placebo.
AHI, Apnoe-Hypopnoe-Index; PAP, positiver Atemwegsdruck.

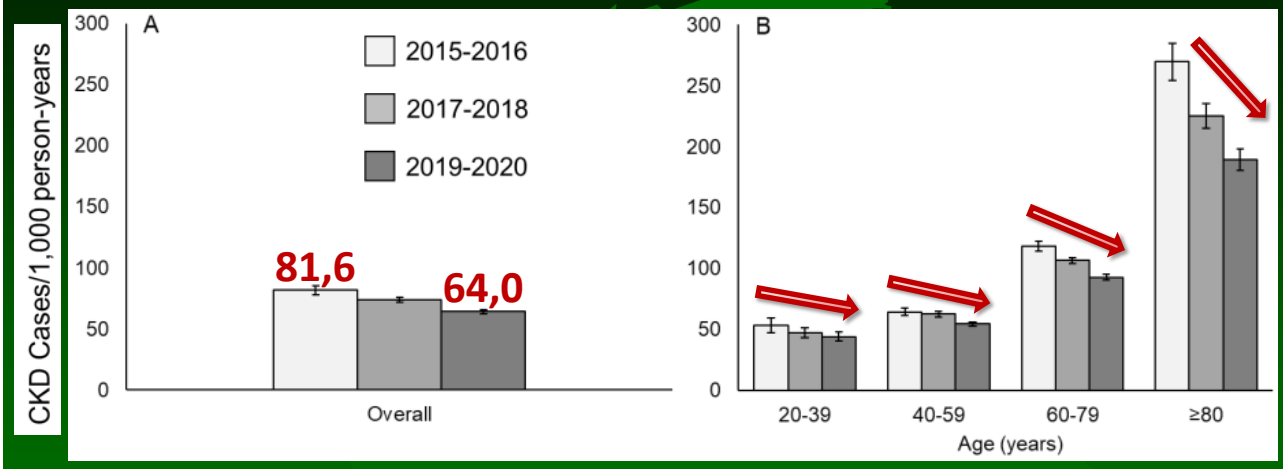
Malhotra A, et al. Präsentiert auf den American Diabetes Association 84th Scientific Sessions – Orlando/Hybrid, 21.-24. Juni 2024; CT-SY49-1.5. SURMOUNT-OSA Trial Results and Potential Role of Tirzepatide in Treating Obesity-Related Obstructive Sleep Apnea

Brath: DM

8.
Brauchen wir noch mehr Nierenschutz?

Brath: DM

Nephropathie: Therapie wirkt



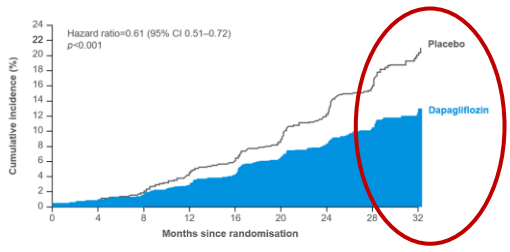
Incident CKD: at least 2 positive lab results at least 90 days apart or an administrative code;
positive result: GFR < 60 ml/min/ 1.73 m^2,
urinary albumin-to-creatinine ratio ≥ 30 mg/g, urinary protein-to-creatinine ratio ≥ 150 mg/g

KR Tuttle et al. N Engl J Med 2022;387:1430-31

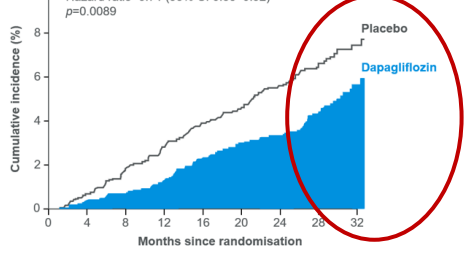
Brath: DM

Trotz RAS-Blockade und SGLT-2-Hemmung: hohes Risiko f. CKD-Progression & CV-Ereignisse bei Patienten mit CKD und T2D

DAPA-CKD: Dapagliflozin



Primary composite endpoint:
Sustained ≥50% eGFR decline, ESKD, or renal/CV death

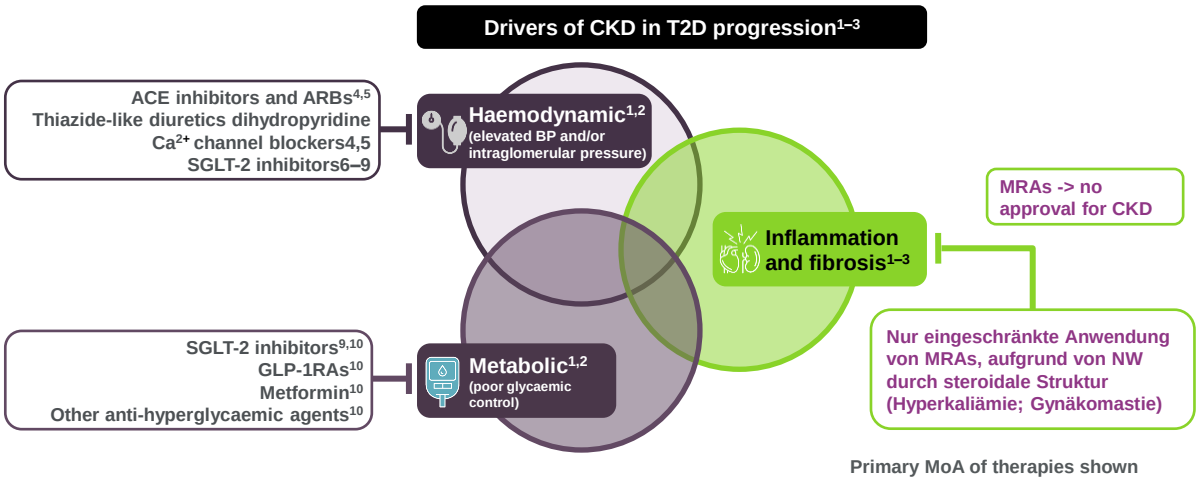


Secondary composite CV endpoints:
CV death or HF hospitalisation

Heerspink HJL, et al. N Engl J Med 2020;383:1436–46

Brath: DM

Vorhandene Therapien für Patienten mit T2D & CKD behandeln insbesondere hämodynamische und metabolische Komponenten

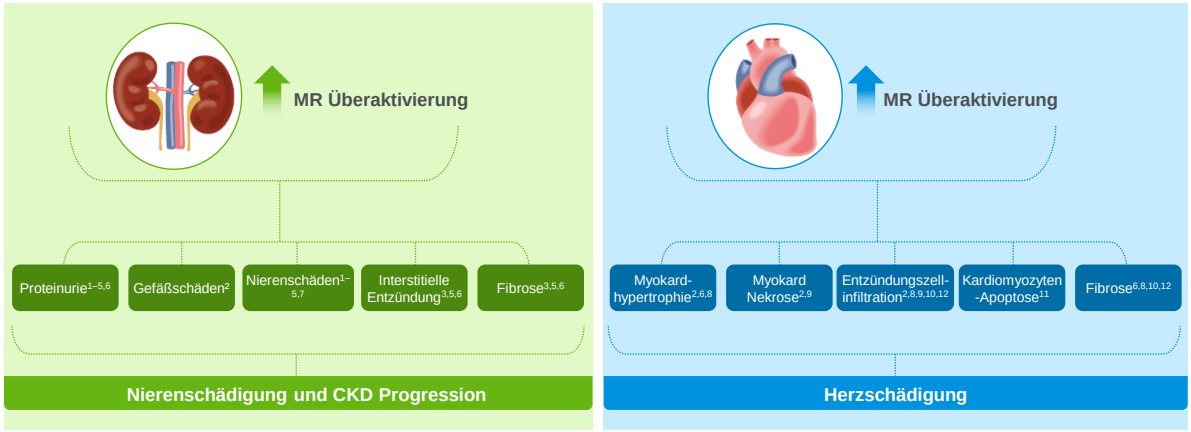


Primary MoA of therapies shown

1. Alicic RZ, *et al. Clin J Am Soc Nephrol* 2017;12:2032–2045; 2. Mora-Fernández C, *et al. J Physiol* 2014;18:3997; 3. Bauersachs J, *et al. Hypertension* 2015;65:257–263;
4. American Diabetes Association. *Diabetes Care* 2020;43:S135-151; 5. American Diabetes Association. *Diabetes Care* 2020;43:S111–1340; 6. Kidokoro K, *et al. Circulation* 2019:140;303–315;
7. Zelniker TA & Braunwald E. *J Am Coll Cardiol* 2018;72:1845–1855; 8. Heerspink HJ, *et al. Circulation* 2016;134:752–772; 9. Zelniker TA & Braunwald E. *J Am Coll Cardiol* 2020;75:422–434;
10. American Diabetes Association. *Diabetes Care* 2020;43:S98–S110; 11. Alicic RZ, *et al. Adv Chronic Kidney Dis* 2018;25:1941–191

Brath: DM

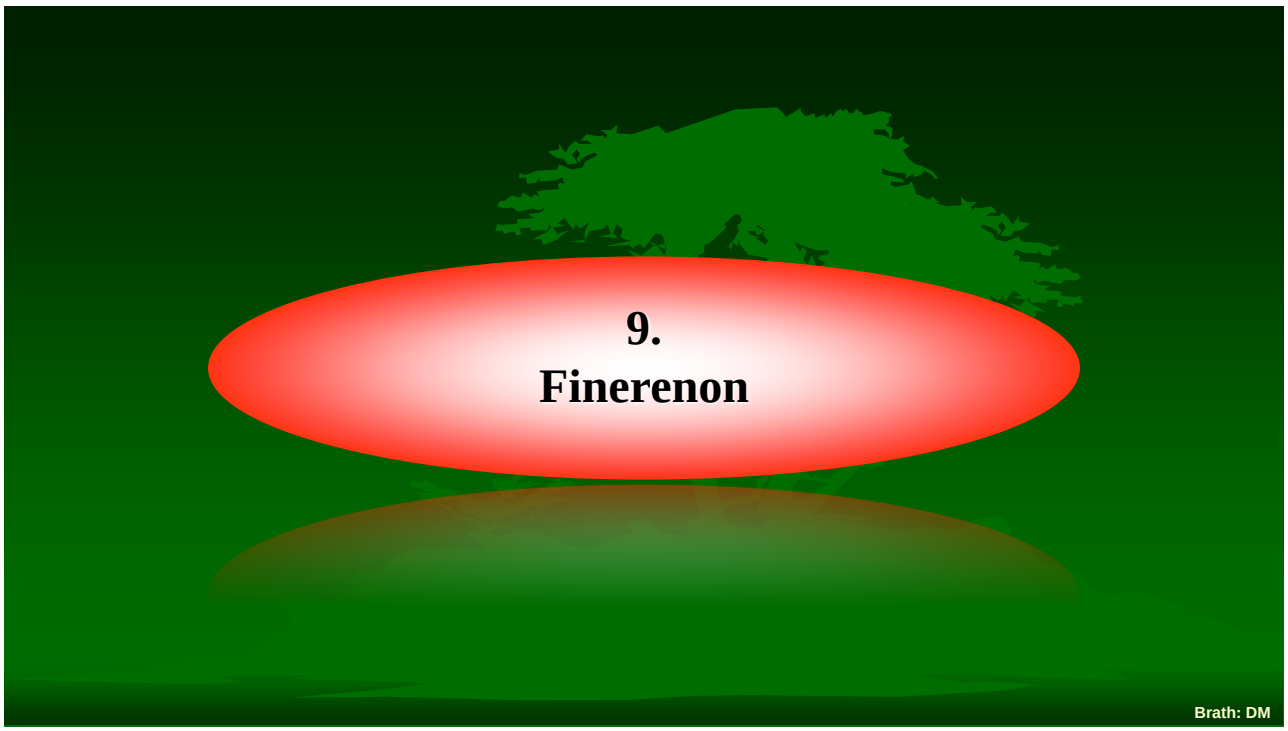
MR-Überaktivierung: in präklinischen Tiermodellen eine der Hauptursachen für Endorganschäden durch Entzündung & Fibrose



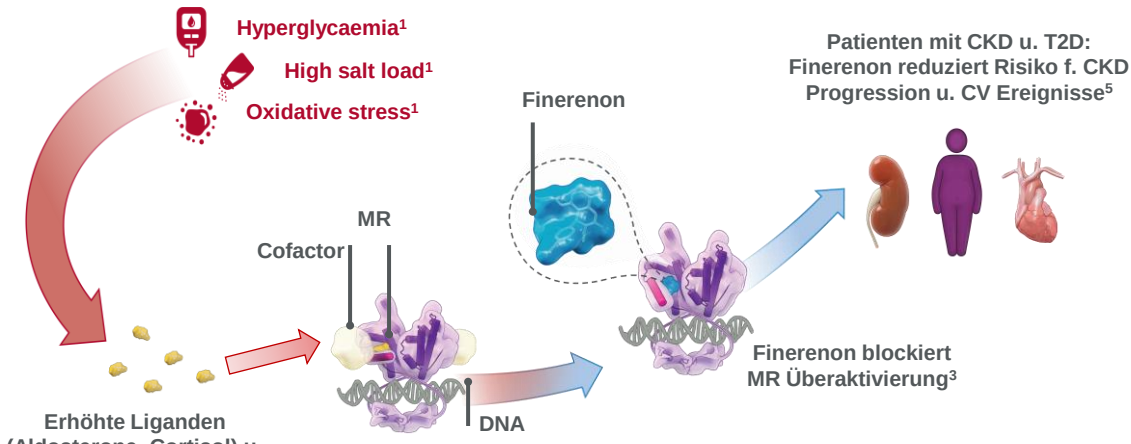
Evidence cited is based on data from preclinical animal models

1. Brown NJ, et al. Kidney Int 2000;58:1219–1227; 2. Rocha R, et al. Endocrinology 2000;141:3871–3878; 3. Blasi ER, et al. Kidney Int 2003;63:1791–1800; 4. Shibata S, et al. Hypertension 2007;49:355–364; 5. Siragy HM & Xue C. Exp Physiol 2008;93:817–824; 6. Nishiyama A, et al. Hypertension 2004;24:841–848; 7. Ma J, et al. Kidney Int 2001;69:1064–1072; 8. Yoshida K, et al. Hypertension Res 2005;28:447–455; 9. Rocha R, et al. Am J Physiol Heart Circ Physiol 2002;283:H1802–H1810; 10. Sun Y, et al. Am J Path 2002;161:1773–1781; 11. De Angelis N, et al. J Mol Cell Cardiol 2002;34:1655–1665;
12. Shen JZ, et al. Endocrinology 2016;157:3213–3223

Brath: DM



Finerenon: selektiver nichtsteroidaler MRA, blockiert MR Überaktivierung bei T2D and CKD



CKD, chronic kidney disease; DNA, deoxyribonucleic acid; MR, mineralocorticoid receptor; MRA, mineralocorticoid receptor antagonist; T2D, type 2 diabetes

1. Buonafine M, *et al. Am J Hypertens* 2018;31:1165–1174; 2. Buglioni A, *et al. Hypertension* 2015;65:45–53; 3. Agarwal R, *et al. Nephrol Dial Transplant* 2020; doi: 10.1093/ndt/gfaa294;
4. Khan NUA & Movahed A. *Rev Cardiovasc Med* 2004;5:71–81; 5. Bakris GL, *et al. N Engl J Med* 2020;383:2219–2229

Brath: DM

Finerenon: neuer, selektiver, nichtsteroidaler MR-Antagonist, different zu steroidalen MRAs[1–3]

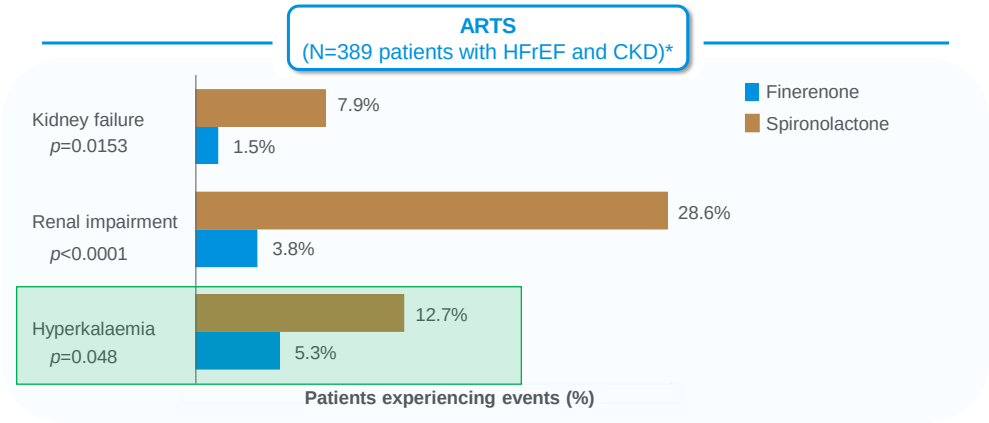
	Aldosteron Antagonisten		Finerenon
	Spironolactone	Eplerenone	Finerenone
Struktur	Flat (steroidal)	Flat (steroidal)	Bulky (nonsteroidal)
Wirksamkeit gegenüber MR	+++	+	+++
Selektivität für MR	+	++	+++
ZNS Penetration	+	+	–
Sexuelle Nebenwirkungen	++	(+)	–
Halbwertzeit	>20 hours*	4–6 hours*	2–3 hours#
Aktive Metaboliten	++	–	–
Indikation (SmPC)	kongestive Herzinsuffizienz[4]	HF und LVEF ≤40% oder ≤30%[5]	CKD im Zusammenhang mit T2D[6]

*bei Patienten mit HF; # bei gesunden Freiwilligen

1. Kintscher U, *et al. Br J Pharmacol* 2021; doi:10.1111/bph.15747; 2. Schwabe JW, *et al. Cell* 1993;75:567–578; 3. Tanenbaum DM, *et al. Proc Natl Acad Sci USA* 1998;95:5998–6003;
4. Pfizer Ltd. Aldactone (spironolactone) UK Summary of Product Characteristics. 2019. https://www.medicines.org.uk/emc/product/2899/smpc [accessed 28 Mar 2022];
5. Zentiva Pharma UK Limited. Eplerenone UK Summary of Product Characteristics. 2018. https://www.medicines.org.uk/emc/product/3665/smpc#INDICATIONS [accessed 28 Mar 2022];
6. Bayer AG. KERENDIA® (finerenone) Summary of Product Characteristics. 2022. https://www.medicines.org.uk/emc/product/13438/smpc [accessed 28 Mar 2022]

Brath: DM

Finerenon: gut verträglich, weniger Hyperkaliämia vs Spironolacton[1]



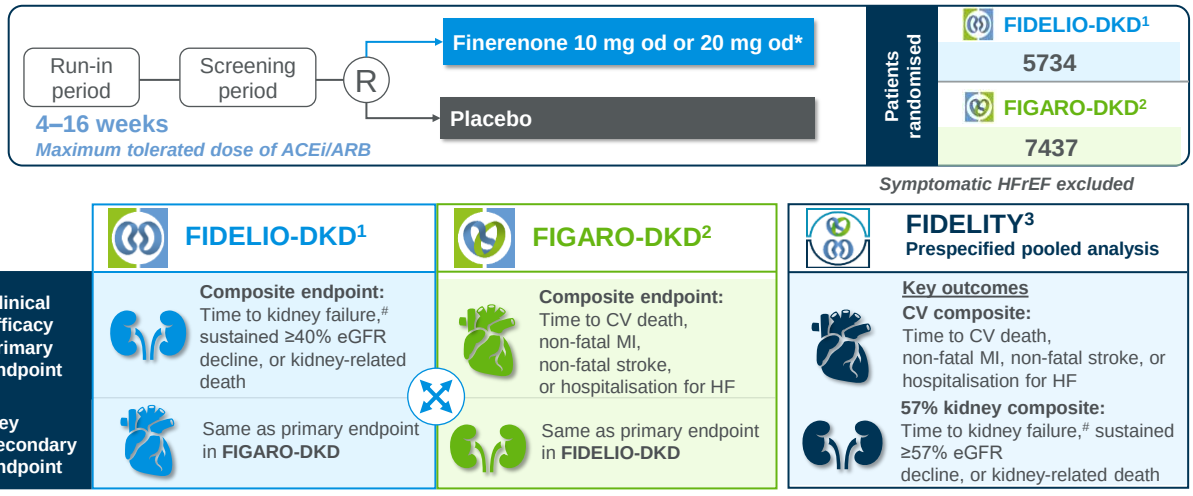
Worsening kidney failure and hyperkalaemia occurred less frequently in all groups of patients receiving finerenone compared with spironolactone

Finerenone is indicated for the treatment of CKD (with albuminuria) associated with T2D in adults.[2] For prescribing information please refer to the SmPC of the product applicable in your country. *Post hoc analysis in pooled dosing groups

1. Pitt B, et al. Eur Heart J 2013;34:2453–2463;2. Bayer AG. KERENDIA® (finerenone) Summary of Product Characteristics. 2023. https://www.ema.europa.eu/documents/product-information/kerendia-epar-product-information_en.pdf [accessed 03 July 2023]

Brath: DM

Phase III Studienprogramm: FIDELIO & FIGARO: Effekt von Finerenon auf Nieren- u. CV Endpunkte bei >13.000 Ptx mit CKD und T2D[1,2]



*Ptx received an initial dose of finerenone of 10 mg od or 20 mg od based on an eGFR at the screening visit of 25–<60 or ≥60 ml/min/1.73 m², respectively.[1,2] Up-titration to finerenone 20 mg od permitted at any time after visit 2 (month 1); down-titration to finerenone 10 mg od permitted at any time after start of treatment. Dose titrations initiated in response to changes in potassium and eGFR[1,2]; #kidney failure: initiation of chronic dialysis for ≥90 days, kidney transplantation or sustained eGFR <15 ml/min/1.73 m².[2,3]
ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CKD, chronic kidney disease; CV, cardiovascular; eGFR, estimated glomerular filtration rate; HF, heart failure; MI, myocardial infarction; od, once daily; R, randomisation; T2D, type 2 diabetes

1. Bakris GL, *et al. Am J Nephrol* 2019;50:333–344; 2. Ruilope LM, *et al. Am J Nephrol* 2019;50:345–356; 3. Agarwal R, *et al. Eur J Heart* 2022;43:474–484

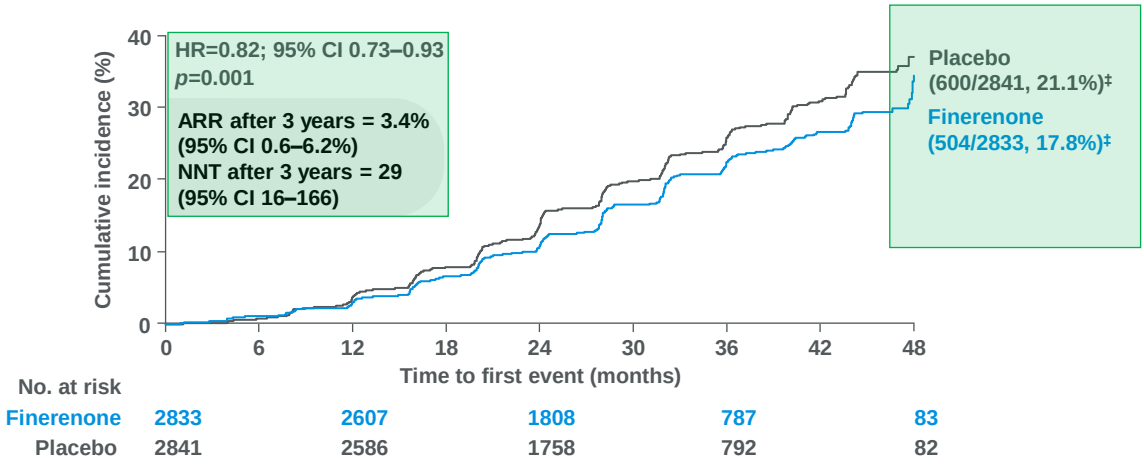
Brath: DM

a)
FIDELIO-DKD

Brath: DM

Finerenon reduziert signifikant Risiko des kombinierten renalen Endpunktes vs Placebo um 18%

Time to kidney failure*, sustained ≥40% decrease in eGFR from baseline#, or renal death



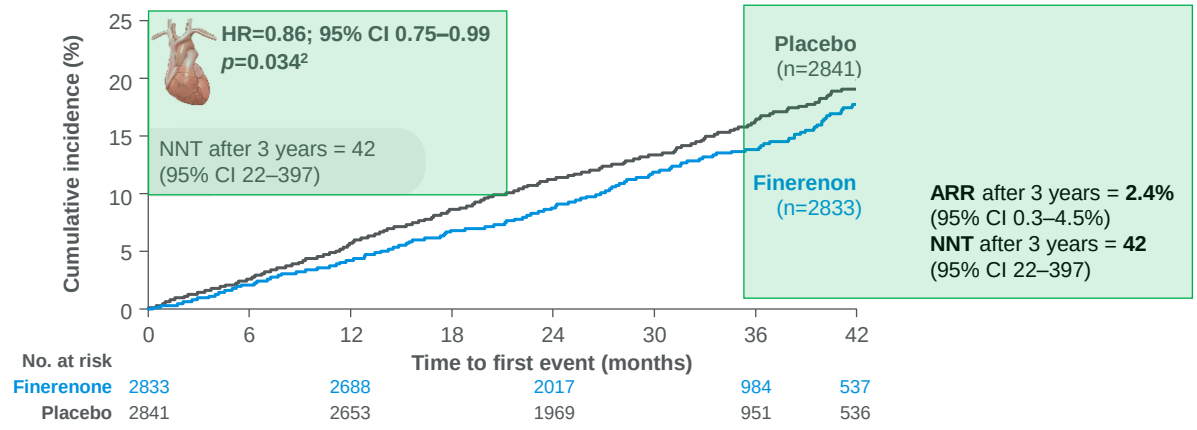
*ESKD or an eGFR <15 ml/min/1.73 m$^{2;}$ #sustained over ≥4 weeks; ‡over a median follow-up of 2.6 years

Bakris GL, *et al. N Engl J Med* 2020; doi: 10.1056/NEJMoa2025845

Brath: DM

Finerenon reduziert Risiko des sekundären kombinierten CV Endpunktes vs Placebo signifikant um 14%

Key secondary CV-specific EP: Time to CV death, non-fatal MI, non-fatal stroke or HHF[1]



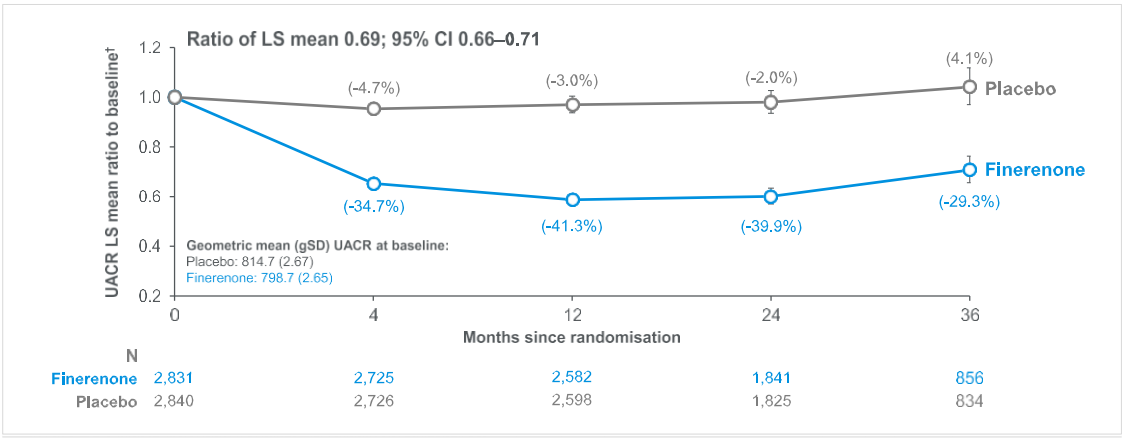
*Kidney failure (ESKD or an eGFR <15 ml/min/1.73 m2), sustained ≥40% decrease in eGFR from baseline, or renal death

Bakris GL, *et al. N Engl J Med* 2020; doi: 10.1056/NEJMoa2025845

Brath: DM

Finerenon verringert UACR im Vergleich zu Placebo um 31%

A lower mean UACR with finerenone vs placebo was maintained throughout the study



Data in parentheses are mean change from baseline; *Full analysis set. Mixed model with factors treatment group, region, eGFR category at screening, type of albuminuria at screening, time, treatment time, log-transformed baseline value time as covariate. Separate unstructured covariance patterns are estimated for each treatment group; †Data are LS mean/95% CI.
CI, confidence interval; eGFR, estimated glomerular filtration rate; gSD, geometric standard deviation; LS, least-squares; UACR, urine albumin-to-creatinine ratio
Reference Bakris GL, et al. Effect of finerenone on chronic kidney disease outcomes in type 2 diabetes. N Engl J Med. 2020;383(23)2219-29.

Bakris GL, *et al. N Engl J Med* 2020; doi: 10.1056/NEJMoa2025845

Brath: DM

Gynäkomastie: keine Häufung

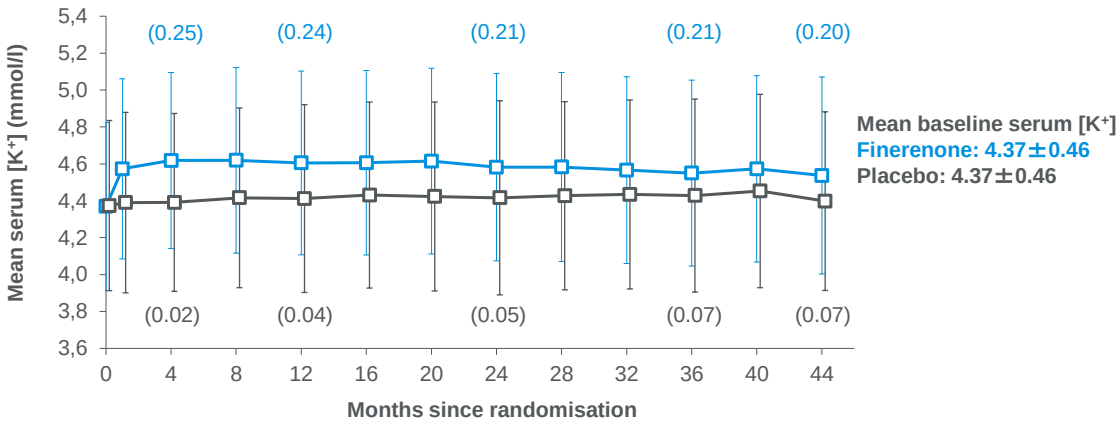
Treatment-emergent adverse events, n (%)	Finerenon (N=2827)	Placebo (N=2831)
Reproductive system and breast disorders		
Breast hyperplasia	0	3 (0.1)
Gynaecomastia	6 (0.2)	6 (0.2)
Kidney-related AEs		
Acute kidney injury	129 (4.6)	136 (4.8)
Hospitalisation due to acute kidney injury	53 (1.9)	47 (1.7)
Treatment discontinuation due to acute kidney injury	5 (0.2)	7 (0.2)
Hospitalisation due to acute renal failure*	70 (2.5)	71 (2.5)
Treatment discontinuation due to acute renal failure*	31 (1.1)	36 (1.3)

*Standardised MedDRA Query term 'acute renal failure'

Bakris GL, *et al. N Engl J Med* 2020; doi: 10.1056/NEJMoa2025845

Brath: DM

Finerenon: vorhersehbare moderate Steigung des Serum-Kaliumspiegel (ca. 0,2 mmol/L)

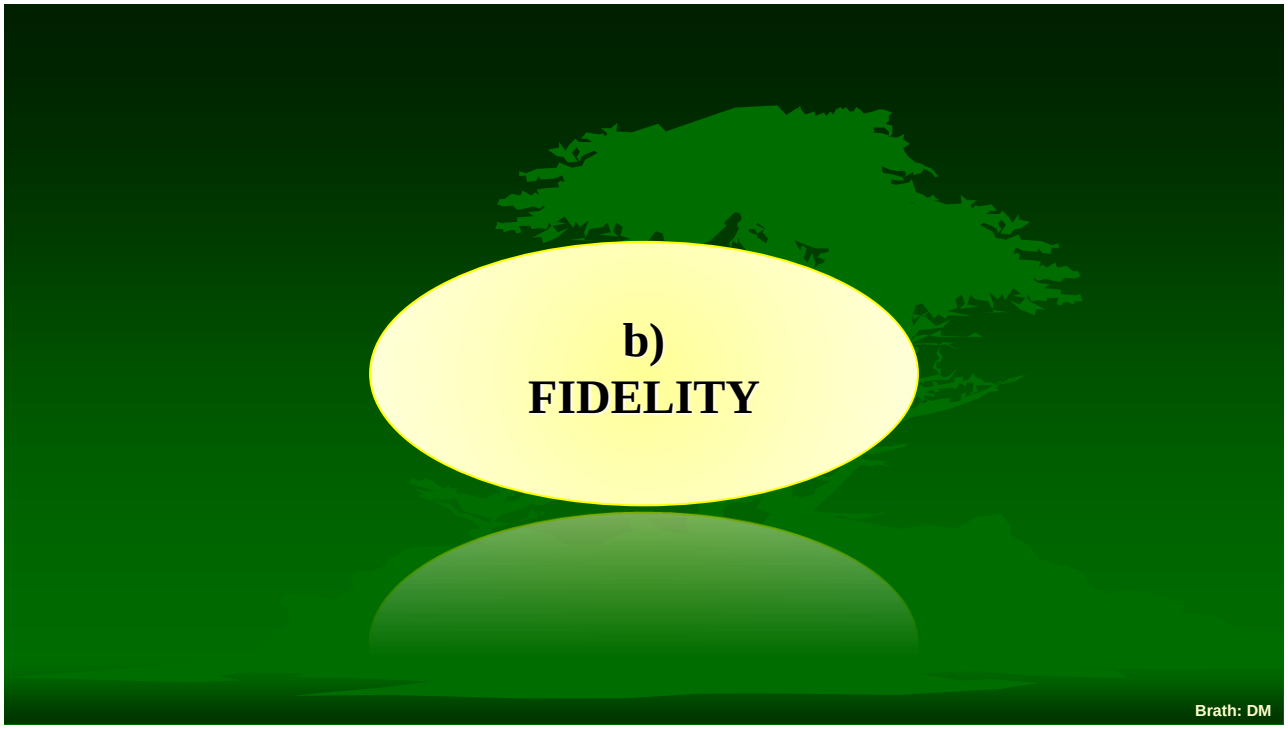


Maximum mean difference in serum potassium between groups = 0.23 mmol/l at month 4

Numbers in parentheses show change from baseline; error bars show standard deviation

Bakris GL, *et al. N Engl J Med* 2020; doi: 10.1056/NEJMoa2025845

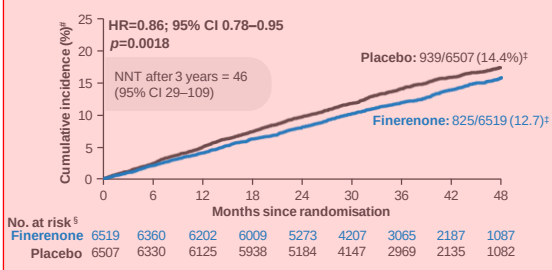
Brath: DM



FIDELITY-Analyse: Finerenon senkt Risiko für Progression von Herz-Kreislauf- und Nierenerkrankungen erheblich

CV composite

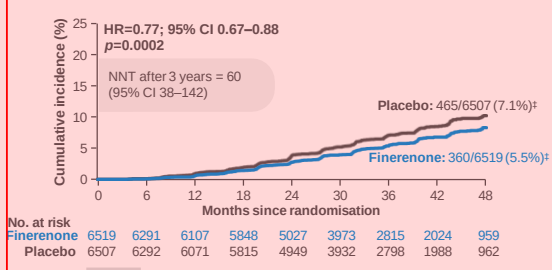
Time to CV death, non-fatal MI, non-fatal stroke, or HHF



14% reduced risk of CV morbidity and mortality vs placebo

Kidney composite

Time to kidney failure,* sustained ≥57% decrease in eGFR from baseline, or kidney-related death



23% reduced risk of CKD progression* vs placebo

*ESKD or an eGFR <15 ml/min/1.73 m²; events were classified as renal death if: (1) the patient died; (2) kidney replacement therapy had not been initiated despite being clinically indicated; and (3) there was no other likely cause of death; #cumulative incidence calculated by Aalen–Johansen estimator using deaths due to other causes as competing risk; ‡number of patients with an event over a median of 3.0 years of follow-up; §at-risk subjects were calculated at start of time point. CI, confidence interval; CKD, chronic kidney disease; CV, cardiovascular; HHF, hospitalisation for heart failure; HR hazard ratio; MI, myocardial infarction; NNT, number needed to treat

Agarwal R, *et al*. *Eur Heart J* 2022;43:474–484

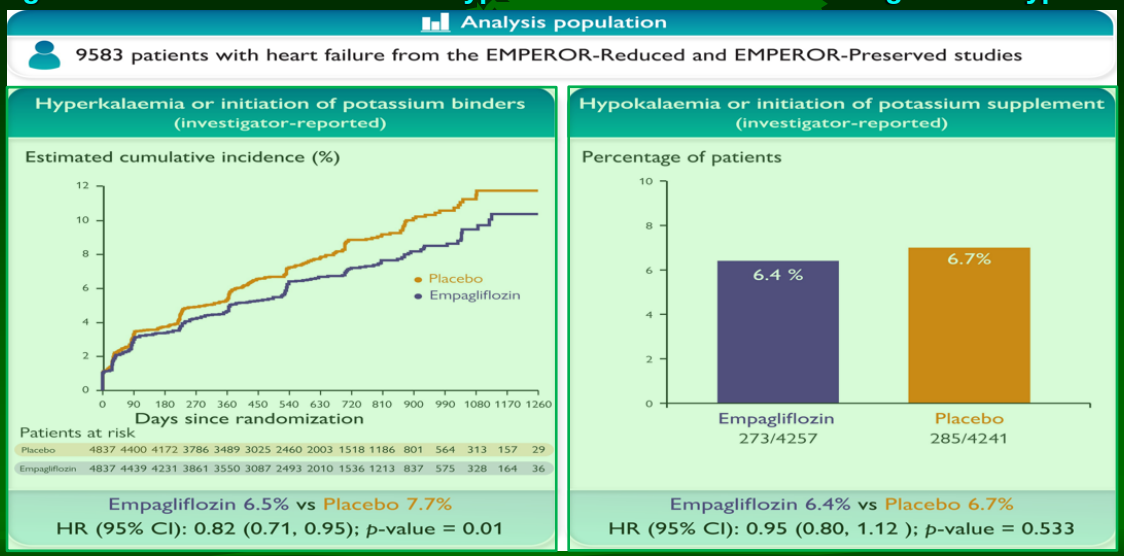
Brath: DM

c) Kombinationstherapien

Brath: DM

Empagliflozin: kaliumstabilisierend

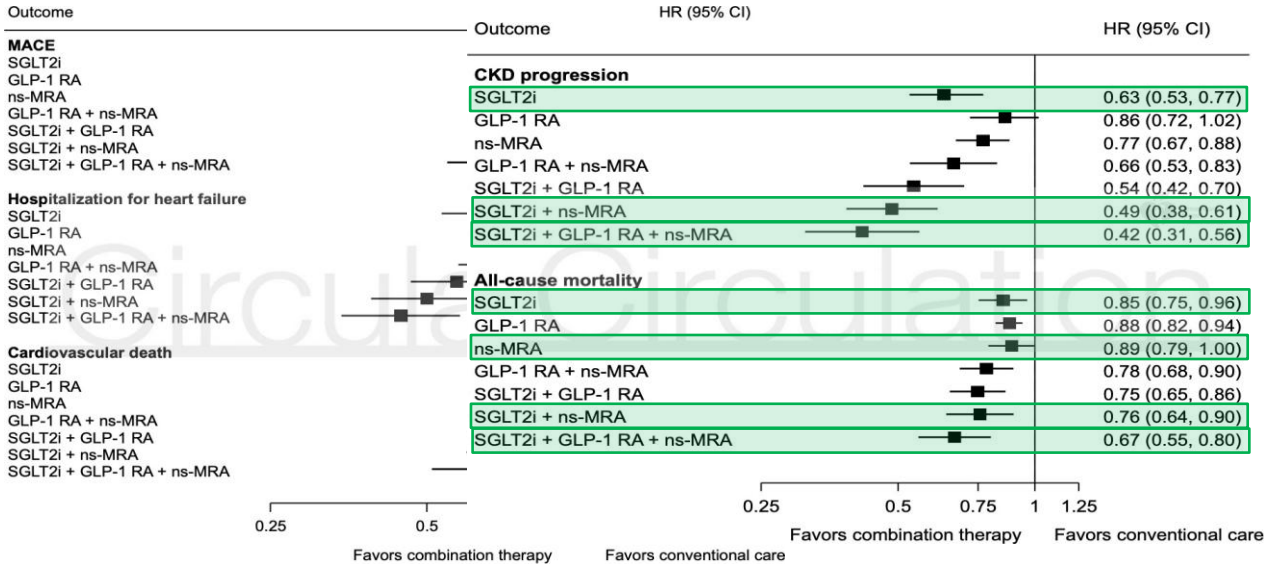
Empagliflozin reduced incidence of hyperkalemia without increasing risk of hypokalemia



Eur Heart J, Volume 43, Issue 31, 14 August 2022, Pages 2984–2993, https://doi.org/10.1093/eurheartj/ehac306

Brath: DM

Estimated Lifetime Cardiovascular, Kidney and Mortality Benefits of Combination Treatment With SGLT2-I, GLP-1 RA, and Non-steroidal MRA Compared With Conventional Care in Patients With T2DM and Albuminuria



Neuen BL et al., Circulation 2023, 2023https://doi.org/10.1161/CIRCULATIONAHA.123.067584Circulation

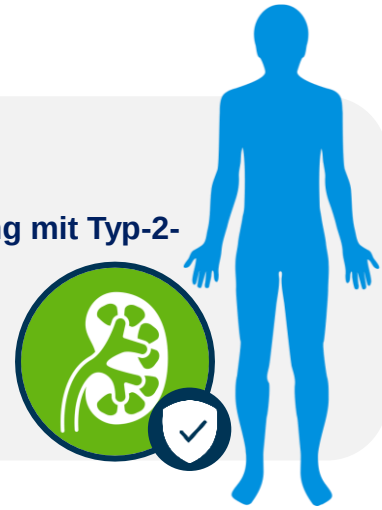
Brath: DM

Indikation

Finerenon ist zugelassen zur

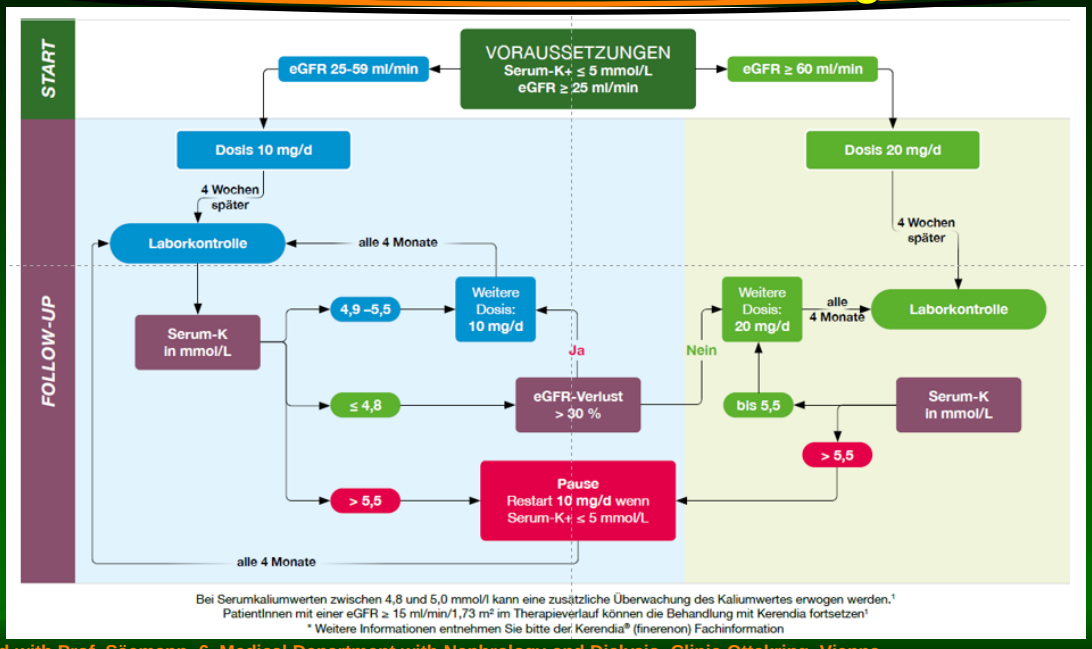
Behandlung von chronischer Nierenerkrankung (mit Albuminurie) in Verbindung mit Typ-2-Diabetes bei Erwachsenen

EMA Zulassung : Feb. 2022
Indikationserweiterung: Feb. 2023



Brath: DM

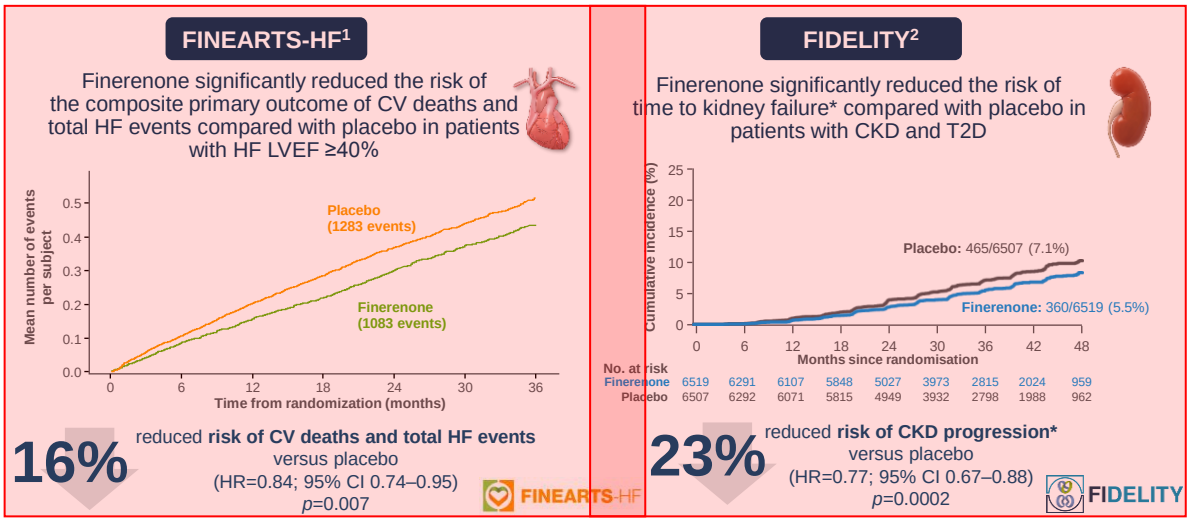
Finerenon Dosierschema: 1 x täglich



Co-Created with Prof. Säemann, 6. Medical Department with Nephrology and Dialysis, Clinic Ottakring, Vienna

Brath: DM

Finerenon: Multiorganschutz bei kardiorenalmetabolischen Patienten



Finerenone is indicated for the treatment of chronic kidney disease (with albuminuria) associated with T2D in adults. For prescribing information please refer to the SmPC of the product applicable in your country.
Finerenone is not indicated for the treatment of heart failure. Direct, cross-trial comparisons should not be made between these separate studies.
*The composite kidney outcome defined as kidney failure, sustained ≥57% decrease in estimated glomerular filtration rate from baseline over ≥4 weeks, or renal death.
CI, confidence interval; CKD, chronic kidney disease; CKM, cardio-kidney-metabolic; CV cardiovascular; HF, heart failure; HR, hazard ratio; LVEF, left ventricular ejection fraction; T2D, type 2 diabetes

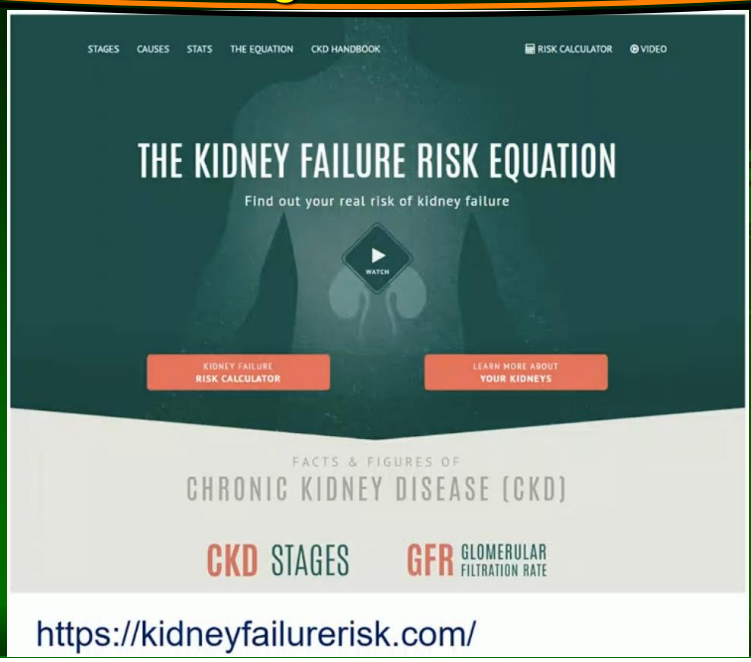
1. Solomon S, et al. ESC 2024. Hot Line Presentation 7; 2. Agarwal R, *et al. Eur Heart J* 2022;43:474–484.

Brath: DM

10.
CKD Risikorechner

Brath: DM

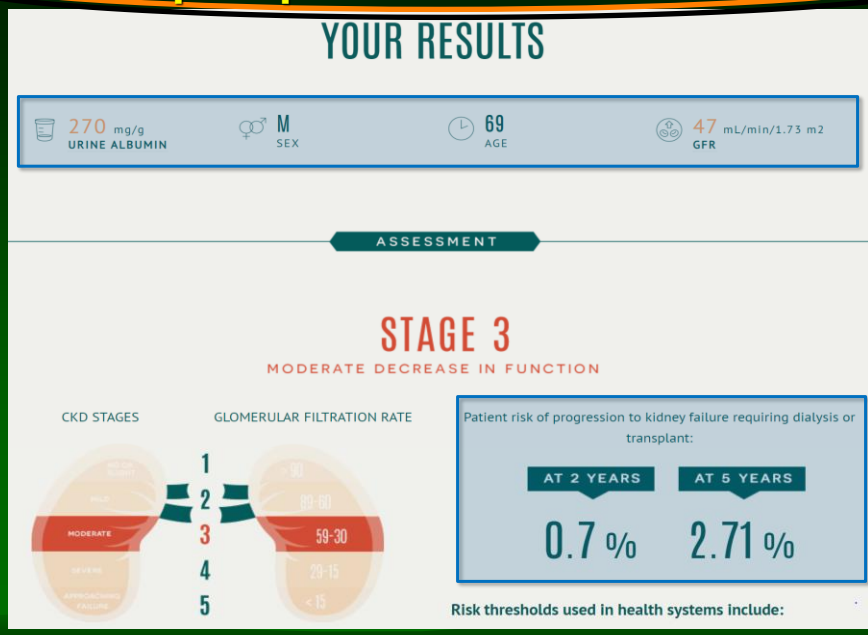
Nierenversagen: Risikokalkulator



kidneyfailurerisk.com

Brath: DM

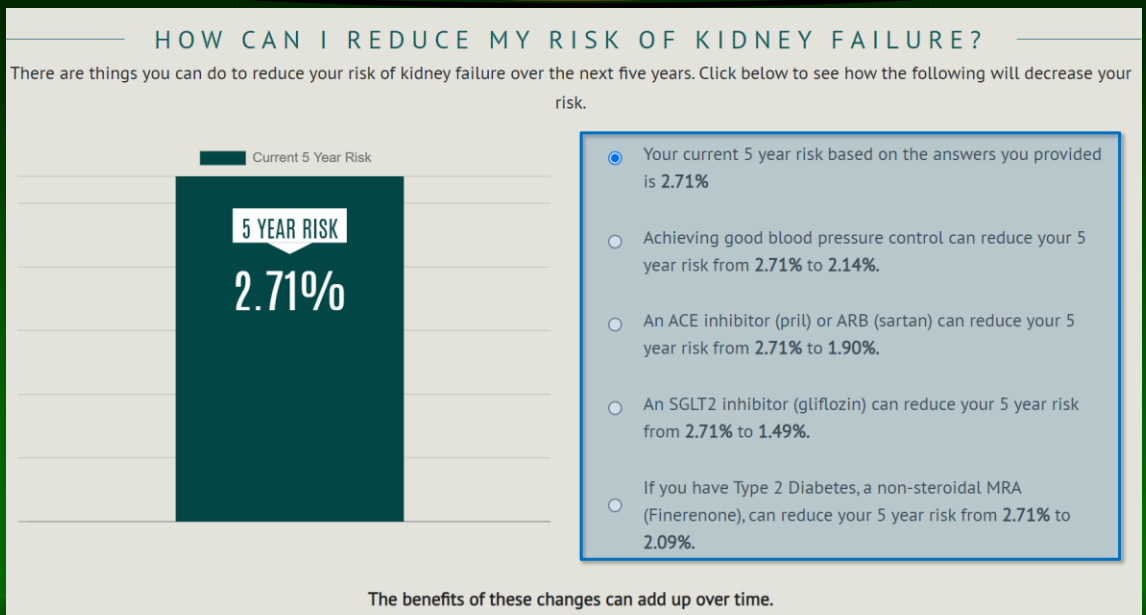
Nephropathie: Risikorechner



kidneyfailurerisk.com

Brath: DM

Nephropathie: Risikoreduktion



kidneyfailurerisk.com

Brath: DM

11.
Synopsis & Vision

Brath: DM

Biomarker für kardiorenometabolisch (multimorbid) erkrankte Personen

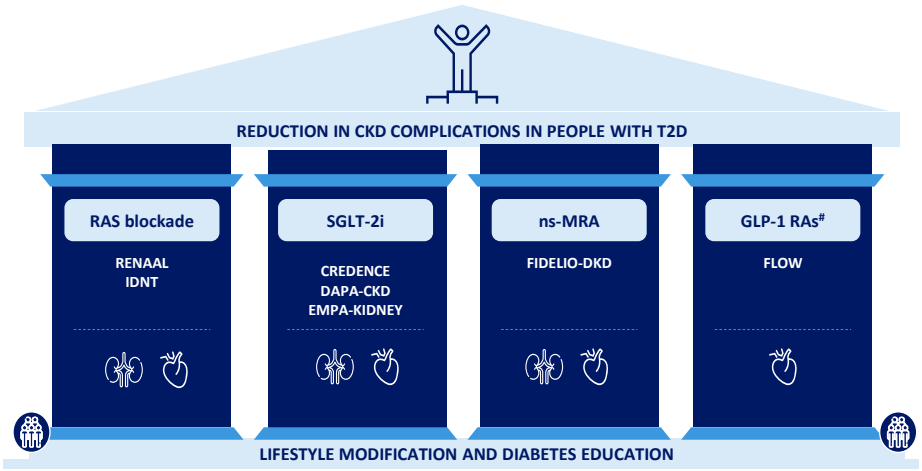
- eGFR
- Mikroalbumin/ Kreatinin-Ratio

NT-pro BNP

- HbA1c
- Zeit im Zielbereich

Brath: DM

Die 4 Säulen der kardiorenalen Protektion bei Personen mit diabetischer Nephropathie



Definitive place in the treatment of people with T2D and CKD remains to be established. Semaglutide is the only GLP-1RA demonstrating effects in a dedicated kidney outcomes trial. CKD, chronic kidney disease; CVOTs, cardiovascular outcomes trials; GLP-1 RAs, glucagon-like peptide-1 receptor agonists; ns-MRA, non-steroidal mineralocorticoid receptor antagonists; RAS, Renin–angiotensin system; SGLT-2i, sodium-glucose cotransporter-2 inhibitor; T2D, type 2 diabetes.

Adapted from: 2023 ADA, Standards of Medical Care in Diabetes - 2023: Diabetes Care, December 2022, Vol.46, Supplement 1; Agarwal R et al, Nephrology Dialysis Transplantation (2023) 38: 253–257

Brath: DM

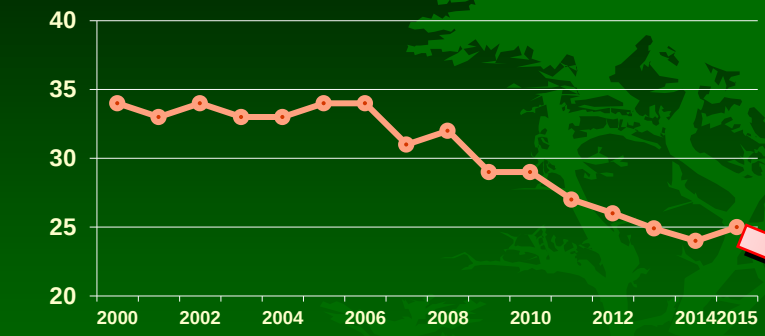
Risikofaktormanagement und Nephropathie

Intervention	T2DM, Relative Risk Reduction
Strict Glycaemic Control	20-40%
Renin Blockers	20-30%
SGLT2 Inhibitors	30-50%
GLP1-R Agonists	30%
Mineralocorticoïd Antagonists	20%
TOTAL Relative Risk Reduction; Residual Risk	98-99% 1-2%

Marre M, EASD Präsentation 2022

Brath: DM

Anteil v. Patienten mit Diabetes an neuen PatientInnen mit Nierenersatztherapie



23% Typ 2
2% Typ 1

Pat. gesamt	2986	3884	4256	4446

Öst. Dialyse- und Transplantationsregister, Jahresberichte

Brath: DM